1965

National Safety Congress Transactions

Volume 1

GENERAL SESSIONS

ANNUAL MEETING OF MEMBERS

CONGRESS BANQUET

LIST OF EXHIBITORS

GENERAL INDEX OF ALL VOLUMES

NATIONAL SAFETY COUNCIL
425 N. Michigan Avenue
Chicago, Illinois 60611

PLAINTIFF'S EXHIBIT tabbies WV-024316

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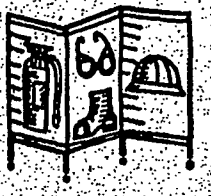
PLAN NOW TO ATTEND THE



1966 NATIONAL SAFETY CONGRESS

OCTOBER 24-27, 1966 / CONRAD HILTON HOTEL, CHICAGO

1967

1968

1969

1970

The Congress is always a big week, a worthwhile week for the 13,000 safety people who attend.

At the '66 Congress you can meet other safety people, with the same problems and responsibilities as yourself. You can exchange views and ideas on accident prevention, health, hygiene, and fire prevention . . . on safety in industry, traffic, school, at home and on the farm.

You can see the largest of all safety equipment exhibits at the Congress . . . an opportunity for you to make well-informed buying decisions for your company.

This four-day educational program, planned and presented by the National Safety Council, can be your most thought-provoking, most worthwhile safety experience in 1966.

Make plans early to attend the 1966 Congress and bring the other people in your organization who have safety responsibilities.

FUTURE CONGRESS DATES
1967 October 23-26
1968 October 28-31
1969 October 27-30
1970 October 26-29

NATIONAL SAFETY COUNCIL

425 NORTH MICHIGAN AVENUE • CHICAGO, ILLINOIS 60611

VOLUME 1 OF THE TRANSACTIONS
of the
53rd NATIONAL SAFETY CONGRESS

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NOTE: Mr. Louis H. Antoine was elected Vice President for State and Local Safety Organizations at the Annual Council Meeting held October 25, 1965. Following Mr. Antoine's death December 16, 1965, Mr. Green was elected by the Board of Directors to complete the 1965-66 term.

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Industrial gas masks and accessories.

Adolf and Company, 4915 N. Avers Ave., Chicago 25
Industrial clothing.

Advance Glove Mfg. Co., 901 W. Lafayette Ave., Detroit 26
Industrial work gloves and clothing.

Aetna Life Affiliated Companies, 151 Farmington Ave., Hartford 15, Conn.
Safety films and safety pamphlets.

Air Space Devices, Inc., 5428 Vineland Ave., N. Hollywood, Calif.
A safety device for protection from falling when climbing.

Akron Brass Co., 1450 Spruce St., Wooster, Ohio.
Fire fighting equipment and accessories.

Alan Wood Steel Co., Conshohocken Road, Conshohocken, Pa.
Abrasive rolled steel floor plate.

Allen System, Inc., 1325 N. Main St., Wheaton, Ill. 60187
Locating, identifying, and protecting underground utilities.

American Allsafe Co., Inc., 1245 Niagara St., Buffalo, N. Y. 14213
Drybow sweatbands, nylon fan guards and related products.

American Biltrite Rubber, 22 Willow St., Chelsea 50, Mass.
A complete line of safety soles and heels.

American Chain and Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn.
Sling chains and sling chain assemblies, wire rope slings and assemble-your-own wire rope slings.

American Industrial Safety Equipment Co., 3500 Lakeside Ave., Cleveland 14
Welding and cutting goggles, spectacles, welders' lenses, hard hats, visitors' spectacles, and goggle clips.

American LaFrance, 100 E. LaFrance St., Elmira, N.Y.
Fire apparatus and fire fighting equipment.

American Optical Co., 14 Mechanic St., Southbridge, Mass.
Head, eye, respiratory, protective devices; safety clothing; safety specialty products.

American Society of Safety Engineers, 5 N. Wabash Ave., Chicago 2
Professional society.

Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 1
Hand tools of spark-resistant alloys for use in explosive or flammable conditions.

Animal Repellents, Inc., P.O. Box 168, Griffin, Ga. 30223
Dog and bird repellents.

Ansul Co., One Stanton St., Marinette, Wis. 54143
Fire protection products.

Antrex Corp., 4355 N. Avers, Chicago, Ill. 60618
Safety Talker Message Repeater, portable public address systems.

Apex Safety Products, Washington and Elm Sts., Cleveland 13
Safety hats and caps.

Aquatic Equipment Co., Forest City, Iowa 50436
Aquatic search and rescue kit.

Atlas Safety Equipment Co., Inc., 175-179 N. 10th St., Brooklyn 11, N.Y.
Industrial safety belts, harnesses, and straps. Ladder climber's safety device. Sky Genie descent control.

B & K Instruments Inc., 3044 W. 106th St., Cleveland 11
Portable audiometer calibrators.

Bacharach Ind. Instr. Co., 200 N. Braddock Ave., Pittsburgh, Pa. 15208
Gas analyses instruments Humidity and temperature indicators and recorders. Multi-gas leak detectors. Air-flow velocity indicators.

W. M. Bashlin Co., 119 W. Pine St., Grove City, Penn.
Linemen's and industrial safety belts, slings, high voltage rubber gloves, sleeves.

Bausch & Lomb Inc., 635 St. Paul St., Rochester 2, N.Y.
Vision and audio testing equipment.

John Bean Div., FMC Corp., 1305 S. Cedar St., Lansing, Mich. 48909
Industrial fire trucks.

Bell Glass & Mirror Co., 1328 Flatbush Ave., Brooklyn, N. Y. 11210
Traffic safety mirrors.

Bell & Howell Co., 7100 McCormick Rd., Chicago, Ill. 60645
Motion picture cameras, projectors, and filmstrip projectors.

Best's Safety Publications, A. M. Best Co., Inc., 75 Fulton St., New York 38
Safety publications.

Best Mfg. Corp., Menlo, Ga.
Work Gloves.

Channing L. Bete Co., Box 112, Greenfield, Mass.
Scriptographic Booklets.

Bethlehem Steel Co., 701 E. Third St., Bethlehem, Pa.
Wire rope, sling and boom pendants, beam guard rail, and anchor safety nets.

Bliss-Rockwood, 38 Harlow St., Worcester 5, Mass.
Fire fighting and safety equipment, portable spotlights, foam liquids and fire fighting chemicals, fire protection systems.

H. L. Bouton Co., Inc., 320 Main St., St. Buzzards Bay, Mass.
Industrial eye protection, goggles, and spectacles.

W. H. Brady Co., 727 W. Glendale Ave., Milwaukee 53209
Self-Sticking markers and accident prevention signs.

Breath-O-Life Oxygen, 419 High Ave., Cleveland 44115
Emergency oxygen administration set.

Lester L. Brossard Co., 540 N. Michigan Ave., Chicago 11
Safety mirrors for industrial use. Liquid hand cleaner.

Stewart R. Browne Mfg. Co., 839 Stewart Ave., Garden City, N. Y. 11533
Portable explosionproof inspection lights.

R. H. Buhrke Co., Inc., P.O. Box 311, Fort Smith, Ark.
Occupational safety equipment—safety belts, straps, assemblies, harnesses, and allied products.

E. D. Bullard Co., 2680 Bridgeway, Sausalito, Calif.
Safety hats, caps, and accessories, industrial first aid kits, safety hoist hooks, vehicle alarms, air purifiers, and ear plugs.

CAH Industries, 10245 Pacific Ave., Franklin Park, Ill.
Self-extinguishing waste receptacle.

Casco Products Corp., 512 Hancock Ave., Bridgeport 2, Conn.
Hand-portable pressurized dry chemical fire extinguishers.

Cesco Safety Products, 2727 W. Roscoe St., Chicago 18, Ill.
Safety glasses and lenses, cup goggles, special purpose goggles, welding helmets, face shields, respirators, plastic aprons, and hoods.

A. B. Chance Co., 210 N. Allen St., Centralia, Mo. 65240
Hot line maintenance and line construction tools. Hot line tools.

Charleston Rubber Co., P.O. Box 4025, Charleston Hgts., S. C. 29405
Rubber, plastics, and rubber coated gloves, aprons and sleeves.

Chrysler Corp., 341 Massachusetts Ave., Detroit
Safety features in 1964 line of automobiles and trucks.

David Clark Co., Inc., 360 Franklin St., Worcester 2, Mass.
Muff-type ear protection.

The Coca-Cola Co., 310 North Ave. N.W., Atlanta 1
Coca-Cola served through the courtesy and cooperation of the Coca-Cola Bottling Company of Chicago.

Columbus McKinnon Chain Div., Columbus McKinnon Corp., Tonawanda, N. Y.
Sling chains, hooks, and coupling links.

Converse Rubber Co., 392 Pearl St., Malden 48, Mass.
Safety toe rubber footwear, industrial rubber footwear, protective clothing of rubber and neoprene.

Custom Materials Inc., 279 Billerica Road, Chelmsford 1, Mass.
Static-free permanently conductive polyolefin.

Davis Emergency Equipment Co., Inc., 55 Halleck St., Newark 4, N. J.
First aid kits, gas masks and breathing equipment, combustible and toxic gas analyzers, and protective hats.

Demp-Nock Co., 21433 Mound Road, Warren, Mich.
Pressure sensitive plastic film lettering kit.

Den-Va Co., 269 Meserole St., Brooklyn, N. Y.
Nylon safety spectacles

Dero Research & Development Corp., Park Ave., Huntington, N. Y.
Battery operated blinker lights

Detex Corp., 53 Park Place, New York 10007
Watchmen's clocks.

R. E. Dietz Co., 225 Wilkinson St., Syracuse 1, N. Y.
Lanterns, torches, flashers, barricades, and safety equipment.

Dockson Corp., 3839 Wabash Ave., Detroit 8
Spectacles, goggles, face shields, helmets, hats, and respirators.

Dow Corning Corp., 2914 Patterson St., Greensboro, N. C. 27407
Sight Savers, lens cleaning stations.

Duff-Norton Co., 100 Pioneer Rd., Box 1719, Charlotte, N. Carolina 28201
Hand chain hoists.

Dymo Industries, Inc., Box 1030, Berkeley 1, Calif.
Labeling device for use in office or shop.

Eagle Mfg. Co., 24th and Charles Sts., Wellsburg, W. Va.
Safety cans, cigarette-cigar butt cans, drain cans, drip cans, brass oilers.

Edex-Drivex Corp., 341 Moffett Blvd., Mountain View, Calif.
Multimedia teaching systems.

Edmont, Inc., 1205 Walnut St., Coshocton, Ohio
Coated and impregnated work gloves.

Electro-Beam Corp., Box 375, St. Joseph, Mich.
Warning lights, barricades, and accessories.

Electronic Specialties Co., Island Ave., Batavia, Ill.
Warning lights, barricades, and accessories.

Elkhart Brass Mfg. Co., Inc., 1302 W. Beardsley Ave., Elkhart, Ind.
Nozzles and other fire department supplies and fire fighting equipment.

Embossograf Corp. of America, 38 West 21st St., New York, N. Y. 10010
Sign-making machine.

J. H. Emerson Co., 22 Cottage Park Ave., Cambridge 40, Mass.
Resuscitation equipment.

Erdco Engineering Corp., 136 Official Road, Addison, Ill.
Gas vapor alarm systems.

Ex-Cell Metal Products Co., Inc., 2041 W. Churchill St., Chicago 60647
Waste cans, smoking stands, ashtrays, waste receptacles.

Fairmont Hydraulics, Div. Fairmont Railway Motors, Inc., 332 S. Michigan Ave., Chicago
Railroad maintenance equipment, utility construction and maintenance equipment.

Falcon Alarm Co., Inc., 20 Stern Ave., Springfield, N. J.
Fire alarms, sirens, horns, bells and other signaling devices.

Federal Sign and Signal Corp., 13625 S. Western Ave., Blue Island, Ill. 60406
Sirens, horns, bells, and warning lights for visual and audible signaling.

Fendall Co., 2222 Diversey Pky., Chicago 47
Spectacles, face shields, and cup-type and cover goggles.

Fenwal, Inc., Main Street, Ashland, Mass. 01721
Fire detector units, explosion suppression systems, smoke detectors.

Ferno-Washington, Inc., 6th and Pine Sts., Greenfield, Ohio
Emergency patient handling equipment and accessories for the first aid room.

Fibre-Metal Products Co., 5th and Tilghman Sts., Chester, Pa.
Safety hats and caps, face shields, safety masks, welding helmets, headrest and combination goggles.

Fine Organics, Inc., 205 Main St., Lodi, N. J.
Solvents, carbon removers, emulsion cleaners, polishers, and disinfectants.

Ford Division—Ford Motor Co., Box 658, Dearborn, Mich.
Ford passenger car with safety features.

Franklin Metal Products, 213-215 N. Des Plaines, Chicago 6, Illinois
Waste cans and drum covers.

Frommelt Industries, Inc., 465 Huff St., Dubuque, Iowa
Wrap-around portable safety welding shield; portable welding screen.

Fyrepel Products, Inc., 160 S. Williams St., Newark, Ohio
High heat protective clothing and equipment for industry, space-military, and fire fighting agencies.

The Fyr-Fyter Co., 221 Crane St., Dayton 1, Ohio
Fire extinguisher, automatic sprinkler systems, electronic alarm systems.

General Fire Extinguisher Corp., 1685 Shermer Rd., Northbrook, Ill. 60062
Fire extinguishers.

V. J. Giesler Co., 646 W. Washington Blvd., Chicago 60606
Emergency safety signs.

Gilbert & Barker Mfg. Co., West Springfield, Mass. 01089
Drum grounding device.

Glendale Optical Co., Inc., 130 Crossways Park Dr., Woodbury, L. I., N. Y.
Eye and face protective equipment.

Globe Div. U.S. Gypsum, 101 S. Wacker Dr., Chicago, Ill. 60606
Safety grating, cable tray, channel and fittings, slotted angles.

Globe Safety Products, 125 Sunrise Place, Dayton 6, Ohio
Resuscitators.

Golden State Signs, P.O. Box 396, Lacanada, Calif. 91011
Safety signs, danger and caution tags, badges.

B. F. Goodrich, Industrial Products Co., 500 S. Main St., Akron 18, Ohio
Industrial rubber safety footwear, and protective clothing.

The Granet Corp., 25 Loring Drive, Framingham, Mass.
Coated fabric work glove.

A. E. Halperin Co., Inc., 75 Northampton, Boston
Stretchers, first aid kits, and accessories.

Haws Drinking Faucet Co., 4th and Page Sts., Berkeley, Calif.
Emergency eyewash and showers.

Hazard Controls, Inc., 8127 Holman Ave., Delair, N. J. 08110
Warning lights, barricades, signs, reflectors, cylinder clamps, lockouts, ladder shoes, can carriers, flags, and barrier rope.

Warren Heim Corp., 222 N. 5th Ave., Mt. Vernon, N. Y.
Canvas buckets, bags, and protective covers.

Karl Heitz, Inc., 979 Third Ave., New York 10022
Eye protection accessories.

High Pressure Engineering Co., Inc., 1349 W. Reno, Oklahoma City 73109
High pressure pure breathing air compressors.

Hild Floor Machine Co., Inc., 1217 W. Washington Blvd., Chicago 7
Explosionproof vacuum cleaners and floor scrubbing and polishing machines.

Hilti Fastening Systems, 360 Fairfield Ave., Stamford, Conn.
Power-assisted drive tools that fasten pins and threaded studs into concrete masonry and steel.

Himco (Hopfeld Industrial Mfg. Co.), 745 A St., San Rafael, Calif.
Safety ladders, and fiberglass safety diving boards.

Holland-Racine Shoes, Inc., 386 W. 15th St., Holland, Mich.
Horsehide and cowhide safety shoes in work and dress styles.

Hooker Chemical Corp., Buffalo Ave., Niagara Falls, N. Y. 14302
Cotton and rayon fabrics with fire retardant.

Hy-Test Safety Shoes, Div., of International Shoe Co., 1509 Washington Ave., St. Louis 66
Safety shoes and conductive and nonconductive footwear.

Ideas, Inc., 118 Grand Ave., Laramie, Wyo. 82070
Stumble-free rubber over-the-floor extension cord.

Illinois Glove Co., 7301 N. Lawndale Ave., Skokie, Ill. 60078
Industrial work gloves and lineman's gloves.

Imperial Hammer Co., 3715 Rural St., Rockford, Ill. 61107
Lead and babbit hammers with safety grip handles.

Industrial Gloves Co., 700 Garfield St., Danville, Ill.
Industrial clothing and accessories.

Industrial Products Co., 2820 N. 4th St., Philadelphia 19133
Industrial clothing.

International Film Bureau, Inc., 332 S. Michigan Ave., Chicago 4
Safety films avilable on a sales and rental basis.

International Industries, Inc., 2311 Whitney Ave., Hamden, Conn. 06518
Seat belt reminder.

Interstate Rubber Products Corp., 908 Avila St., Los Angeles 12
Traffic cone-system for traffic control.

Iron Age Shoe Co., 1205 Madison Ave., Pittsburgh, Pa. 15212
Work and dress-style safety shoes and safety rubber footwear.

Irving Air Chute Co., Inc., 1020 S. Broadway, Lexington, Ky. 40501
Automobile seat belts, industrial harnesses.

Jackson Products, 5523 E. Nine Mile Rd., Warren, Mich.
Goggles, welding helmets, face shields, safety hats and caps.

Jerico, Inc., 5110 N. Elston Ave., Chicago 60630
Powerpress guards.

Johnson-Williams, Inc., 2300 Leghorn St., Mountain View, Calif.
Portable instruments for detection of toxic combustible gases.

Jomac-North, Inc., 863 Easton Rd., Warrington, Pa. 18976
Chemical and protective vinyl clothing and gloves, and terry cloth gloves and products.

Jones and Co., 861 Broad St., Providence 7, R. I.
Full-vision visor goggles and replaceable lenses.

Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh, Pa. 15230
Wire rope and chain slings.

Juhl Mfg. Co., 4110 Lincoln Blvd., Venice, Calif. 90292
Safety harness.

Junkin Safety Appliance Co., Inc., 3121 Millers Lane, Louisville, Ky. 40216
Interlocking barrier gate guard for power presses; safety shields for grinders; stretcher cases and stretchers.

Justrite Mfg. Co., 2061 N. Southport Ave., Chicago
Safety cans, bench cans, plunger cans. Oily waste cans. Electric lanterns and flashlights for use in hazardous areas.

Karel First Aid Supply Co., 4342 Ogden Ave., Chicago 23
Medical equipment for industrial hospitals and first aid rooms.

Kennedy-Ingalls, Inc., 3735 N. 35th St., Milwaukee 16
Protective clothing.

Keystone View Co., Market and Center St., Meadville, Pa.
Occupational visual service, driver vision test service, and gas sensing and recording instruments.

Walter Kidde and Co., Inc., 675 Main St., Belleville 9, N. J.
Portable fire extinguishers, and accessories. Automatic carbon dioxide fire extinguishing system.

Kimsafe, Inc., Campbell Road, Willoughby, Ohio 44094
Personal protection devices for industry.
Personal protection devices for employees in industrial plants.

Mathias Klein and Sons, Inc., 7200 McCormick Road, Chicago 45
Linemen's and electricians' hand tools, linemen's safety equipment, wire-pulling tools.

Knapp Brothers Shoe Mfg. Corp., 173 Spark St., Brockton, Mass.
Safety shoes.

J. Kunz Glove Co., 2141 W. North Ave., Chicago 47
Leather and rubber work gloves.

Lab-Line Instruments, Inc., 15th & Bloomingdale Aves., Melrose Park, Ill. 60160
Explosionproof refrigerators.

Walter G. Legge Co., Inc., 101 Park Ave., New York 17
Safety floor maintenance materials. Personnel and equipment grounding devices.

Lehigh Safety Shoe Co., First and Minor Sts., Emmaus, Pa.
Leather and rubber safety footwear including conductive and electrical hazard shoes.

L. M. Lind Engineering, 4432-36 N. Kedzie Ave., Chicago 25, Ill.
Safety device for press brakes.

Louisville Ladder Co., 1163 Algonquin Pkwy., Louisville, Ky. 40208
Fibreglas and aluminum steps, platforms, extension trestles, aluminum planks and stages, steel warehouse ladders.

3M Company, 2501 Hudson Rd., St. Paul 55119
Abrasive flooring material, filter masks.

Thom McAn Shoe Co., 25 W. 43rd St., New York 36
Safety shoes.

Julian A. McDermott Corp., 1639 Stephen St., Ridgewood, Brooklyn 27, N. Y. 11227
Warning and safety lighting for municipal industrial and utility use.

Machinery Center, Inc., 1201 S. 6th West, Box 964, Salt Lake City 10
Sala Safety Block.

Mack Products Co., 1324 Hird Ave., Cleveland 44107
Welders goggles.

Madison Chemical Corp., 35 S. 19th Ave., Maywood, Ill.
Solvents, herbicides, organic digestives, degreasers, cleaners, detergents, winter chemicals, insecticides, water and fuel treatments.

Magid Glove Mfg. Co., Inc., 2201 W. Wabansia Ave., Chicago, Ill. 60647
Industrial gloves.

Marathon Rubber Products Co., Box 448, Wausau, Wis. 54402
Industrial and municipal protective clothing.

Marbon Chemical Div., Borg-Warner Corp., Washington, W. Va. 26181
Portable highway safety signs.

Martindale Electric Co., 1375 Hird Ave., Cleveland 7
Protective masks and refills, protective eyeshields, and electrical testing instruments.

Medical Supply Co., 1027 W. State St., Rockford, Ill.
First aid kits and accessories. Resuscitation training aids, stretchers.

Meyer Machine Inc., Box 114, Red Wing, Minn.
Safety products for the protection of person while climbing.

Micro Switch, A Division of Honeywell, 11 W. Spring St., Freeport, Ill.
Safety interlock switches and electric controls for power machines.

Miller Allied Corp., 2425 Santa Clara Ave., Alameda, Calif.
Material handling slings and adjustable lifting safety beams.

Miller Equipment Co., Inc., 13th and New Sts., Franklin, Pa.
Linemen's safety equipment and accessories.

Millers Falls Co., 57 Wells Street, Greenfield, Mass. 01301
Shockproof power tools.

Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8
Complete line of safety equipment for industry and mining.

Mott Corp., 500 Shawmut Ave., LaGrange, Ill.
Safety mowers.

M-P Corp., 6466 Chene St., Detroit, Mich. 48211
Safety blade for rotary lawn mowers.

National Chemsearch Corp., Box 217, Irving, Texas,
Safety solvent; cleaners; degreasers, disinfectants; weed killers detergents; insecticides; and water treatments for industry.

National Marker Corp., 2314 Pawtucket Ave., East Providence, R. I. 02914
Fire extinguisher and alarm markers.

Newco Mfg. Co., Inc., 3636 Main St., Kansas City, Mo. 64111
Wire rope fittings, miniature slings, and a miniature crane demonstrating various lifts.

Northern Signal Co., Saukville, Wis. 53080
Flashers and barricades.

Occupational Hazards, 812 Huron Road, Cleveland 15
Occupational Hazards Magazine.

Ohio Chemical and Surgical Equipment Co., 1400 E. Washington Ave., Madison 10, Wis.
Resuscitation and oxygen breathing apparatus.

Ohio Turnpike Commission, 682 Prospect St., Berea, Ohio 44017
Information folders on safe turnpike driving.

Onox, Inc., 121 Second St., San Francisco 5
Skin-toughener solution for the treatment of athlete's foot.

Organized Labor Safety, 1200 Fifteenth St., N. W. Washington, D. C.
Safety Literature.

Osborn Mfg. Co., Box 271, Warsaw, Ind.
Safety pliers, lockout devices, mufflers-and-stretcher cases.

Oxygen Equipment and Service Co., 8335 S. Halsted St., Chicago
Resuscitator, inhalator, and aspirator.

Packwood Mfg., Co., Division Calgon Corp., 1545 Tower Grove Ave., St. Louis, Mo. 63110
Hand cleaners, waterless cleaners, germicidal cleaners, sanitizing compounds, and maintenance cleaners.

Paralta Equipment Co., 105 Industrial Road, Hammond, Ind.
Flashing lights, barricades, traffic cones, vests, flags, trouble lights, signs.

Patent Scaffolding Co., Inc., 38-21 Twelfth St., Long Island City 1, N. Y.
Wood and light metal ladders and stages, steel and aluminum scaffolds.

Pedley-Knowles & Co., 533 Second St., San Francisco, Calif. 94107
Safety and work nets of manila rope and plastic.

Albert W. Pendergast Safety Equipment Co., 6913 Tulip St., Philadelphia 19135
Industrial safety equipment.

The Pioneer Rubber Co., 1939 Tiffin Road, Willard, Ohio
Industrial gloves.

Pitman Mfg. Co., Grandview, Missouri
Hydraulic digger, derrick, and aerial devices.

Portable Light Co., Inc., 65 Passaic Ave., Kearny, N. J.
Portable searchlights, warning lights, and vehicular sirens.

Porto-Clinic Industries, Inc., 298 Broadway, New York 7
Complete portable driver testing and training unit.

The Positive Safety Mfg. Co., 1052 E. 134th St., Cleveland, Ohio 44110
Power press safety devices.

Power-Pak Products, 83 Clyde Ave., Buffalo 15, N. Y.
Fire extinguishers.

Prairie State Products Co., 3822 Lawrence Ave., Chicago
Industrial safety signs.

Protectoseal Co., 1920 S. Western Ave., Chicago
Safety containers for the handling, storing and dispensing of flammable liquids.

Pulmosan Safety Equipment Corp., 644 Pacific St., Brooklyn, N. Y. 11217
Respirators, eye protection, helmets, protective clothing, asbestos and leather gloves, safety glases, first aid kits, and face shields.

Puritan Compressed Gas Corp., 13th & Oak Sts., Kansas City, Mo. 64106
Oxygen breathing and respiration equipment.

Pyrotronics, Div. Baker Industries, 2343 Morris Ave., Union, N. J. 07083
Fire and smoke detection and alarm systems.

Racine Glove Co., Inc., Box 368, Rio, Wis.
Safety gloves and apparel for industry and fire protection, safety specialty products.

Radiator Specialty Co., 1400 W. Independence Blvd., Charlotte 8, N. C.
Traffic guides; cones, lights, flags.

Rainfair, Inc., 1501 Albert St., Racine, Wis.
Wet weather and safety clothing.

Ramset Fastening System, 289 Winchester Ave., New Haven, Conn. 06504
Low-velocity piston tool.

Randolph Laboratories, Inc., 1450 Frontage Rd., Northbrook, Ill.
Fire extinguishers and automatic fire extinguishing systems.

Record Industrial Co., 3301 Arch St., Philadelphia 4
Industrial safety shoes, work clothing and work gloves.

Red Wing Shoe Co., 119 Main St., Red Wing, Minn.
Safety workshoes, oxfords, and boots.

J. C. Renfroe and Sons, Inc., 1926 Spearing St., Jacksonville, Fla.
Safety clamps for lifting steel.

Reynolds Televator Corp., 1104 Sixth St., Muskegon, Mich. 49440
Telescoping, electrically operated scaffold.

Rite Hardware Mfg. Co., 540 W. Chevy Chase Drive, Glendale, Calif. 91209
Air-conditioned helmet systems.

Roll-Ezy Mfg. Co., 7032 N. Tahoma Ave., Chicago, Ill. 60646
Fluorescent light tube breaker.

Rose Mfg. Co., 2700 W. Barberry Pl., Denver
Automotive seat belts. Industrial safety belts, lanyards, net, and ladder safety devices.

Saastaa Operational Systems, Inc., 17000 W. Eight Mile Rd., Southfield, Mich. 48076
Safety tools, hydraulic fluid flow fittings and systems.

Safe-Cut, Inc., Div. Verkau Corp., 973 Market St., San Francisco, Calif. 94103
Steel band cutter.

Safety Appliance Corp., P.O. Box 689, Tyler, Texas.
Protective foot coverings.

Safety & Industrial Net Co., Edgerton St., East Hampton, Conn. 06424
Safety Nets.

Safety Box Toe Co., 812 Statler Office Bldg., Boston 16
Steel toes for dress, semi-dress, and work shoes.

Safety Clothing and Equipment Co., 1990 E. 69th St., Cleveland 3
Safety clothing and equipment for industrial workers.

Safety Enterprises, Inc., Peachtree 25th Building, Atlanta, Ga. 30309
Automobile safety stabilizer.

Safety First Products Corp., 175 Saw Mill Road, Elmsford, N. Y.
Portable stored pressure dry chemical fire extinguishers.

Safety First Shoes, Inc., 9th and Greenleaf Sts., Allentown, Pa. 18105
Safety shoes for industry, railroad, and military use.

The Safety Journal, Anderson, South Carolina
Safety publication.

Safety-Sight, Inc., 1640 Gorsuch Ave., Baltimore 21218
Radiator water level gauge.

Safeway Safety Products, 918 Blackhawk Blvd., Rockton, Ill.
Safety Cans.

Salescaster Displays Corp., 1010 E. Elizabeth Ave., Linden, N. J.
Illuminated moving message signs.

W. H. Salisbury and Co., 401 N. Morgan St., Chicago
Linemen's rubber protective devices.

Sawyer-Tower Products, Inc., 76 Stanley Ave., Watertown 72, Mass.
Industrial protective, and safety clothing.

Schuberth Corp., 1205 Champlain St., Toledo, Ohio 43604
Safety hats and caps, face shields, accessories.
Helmets, safety hats, and caps, safety goggles, and wrap-around protective goggles.

Scott Aviation Corp., 225 Erie St., Lancaster, N. Y. 14086
Respirators, inhalators, and environmental protection equipment.

Seco Mfg., Inc., 4461 W. Jefferson, Detroit 9, Mich.
Fire fighting equipment.

Seiberling Latex Products, 215 Plum St., New Bremen, Ohio
Industrial rubber gloves.

Sellstrom Mfg. Co., Highway 53 at U. S. 14, Palatine, Ill.
Eye and face protective equipment.

The Servus Rubber Co., 1136 Second St., Rock Island, Ill.
Rubber footwear of all types.

Fred Silver & Co., 145 Sussex Ave., Newark, N. J.
Traffic Safety Mirrors.

Singer Safety Products, 445 N. Lake Shore Dr., Chicago, Illinois 60611
Gloves, portable welding screens.

Snyder Mfg. Co., Inc., 1458 Fifth St., New Philadelphia, Ohio
Air suits, hoods, splash and dust suits, shoe covers, safety vests, flags, fabric and film laminations, and fiberglass containment closures.

Speakman Co., 301 E. 30th St., Wilmington 99, Del.
Emergency eyewash and showers.

Sonoscope, Inc., P.O. Box 155, Lansing, Mich.
Combination tape recorder and automatic slide projector.

Sperry & Hutchinson Co., 53 W. Jackson Blvd., Chicago 60604
Stamp incentive programs.

Standard Industrial Products Co. of Ill., 3527 Farmington Rd., Peoria, Ill.
Dunking station smoking receptacles.

Standard Safety Equipment Co., 431 N. Quentin Rd., Palatine, Ill.
Acid and chemically-resistant clothing.

Standard Signs Inc., 3190 E. 65th St., Cleveland 27
Industrial accident prevention signs and road work area protection equipment.

Stephenson Corp., Box 1000, Red Bank, N. J.
Radar speed control, breath test for intoxication, resuscitator.

Stephen-William Co., 2014 W. Wabansia Ave., Chicago 47
Safety signs and posters.

Stihl American, Inc., 34 Clinton Ave., Ridgewood, N. J.
Rescue equipment.

Stonehouse Signs, Inc., 842 Larimer St., Denver 4.
Accident prevention signs and tags.

Stop-Fire, Inc., New Brunswick, N. J.
Fire extinguishers.

Surety Rubber Co., North High St., Box 97, Carrollton, Ohio 44615
Safety apparel, gloves, sleeves, aprons, and specialized protective equipment.

Survivair, Division of U. S. Divers Co., 3323 W. Warner Ave., Santa Ana, Cal.
Self-contained breathing equipment. Wet pick-up vacuum unit. Voice amplifiers.

Target Sales Co., 282 Delaware Ave., Buffalo, N. Y. 14202
Safety signs, safety clothing, and flags.

S. G. Taylor Chain Co., Inc. 3-141st St., Box 508, Hammond, Ind.
Alloy steel chain and fittings.

Titmus Optical Co., Inc., 1015 Commerce St., Petersburg, Va. 23804
Safety frames, safety lenses and vision tester.

Tri-Tix, Inc., 6411 N. Mequon Rd., Mequon, Wis.
Safety cones and traffic posts.

U-C-Lite Mfg. Co., 290 E. Prairie St., Crystal Lake, Ill.
Battery-operated electric hand lanterns, flashers and emergency lights.

United States Rubber Co., 1230 Avenue of the Americas, New York 20
Safety footwear.

United States Safety Service Co., 1535 Walnut St., Kansas City, Mo. 64108
Industrial eyewear and hearing protection.

Visual Dynamics, Inc., 156 Fourth Ave., Bay Shore, N. Y. 11706
Driver Improvement Poster Packages.

Wagner Sign Service, Inc., 3100 Hirsch St., Melrose Park, Ill. 60160
Changeable copy displays for employee relations and safety programs.

Watchemocket Optical Co., Inc., 232 W. Exchange St., Providence 3, R. I.
Safety goggles, respirators, face shields and safety signs.

Welsh Mfg. Co., 9 Magnolia St., Providence 9, R. I.
Respirators, safety spectacles, goggles, safety hats, faceshields, and welding helmets.

R. D. Werner Co., Inc., Box 580, Greenville, Pa.
Nonconductive fiber glass ladders, stages, and scaffolds.

Western Industries, Inc., 2742 W. 36th Pl., Chicago 60632
Electric parking control and security gates.

Westinghouse Electric Corp., 2519 Wilkens Ave., Baltimore 3
Portable pneumatic pump unit for closed chest cardiac resuscitation.

Wheeler Protective Apparel, Inc., 224 W. Huron St., Chicago 10
Industrial safety apparel.

Whelen Engineering Co., Inc., 42 Kirtland St., Deep River, Conn.
Emergency and warning lights, flashers, and beacons.

Williams Jewelry and Mfg. Co., 4544 N. Western Ave., Chicago, Ill.
Safety plaques, trophies, awards, emblems, badges, and incentives.

Willson Products Div., Electric Storage Battery Co., 2nd and Washington Sts., Reading, Pa. 19603
Personal protective equipment for industry.

The Wilson Rubber Co., 1200 Garfield Ave. S.W., Canton, Ohio 44701
Rubber, neoprene, and plastic gloves.

Wire Rope Corp. of America, Inc., 609 N. 2nd St., St. Joseph 1, Mo.
Wire rope slings.

Worklon, Inc., 64 New York Ave., Huntington, N. Y.
Special purpose clothing—acid-resistant, lint-free, static-free and fire retardant.

American Industrial Hygiene Association, 14125 Prevost, Detroit 48227
Information about associations activities.

American Medical Association, Council on Occupational Health, 535 N. Dearborn St., Chicago 60610
Occupational Health literature.

American National Red Cross, 18th and D Sts., N.W., Washington, D. C. 20006
First aid, water safety, and small craft safety.

American Optometric Association, 4030 Chouteau Ave., St. Louis 10
Educational material on vision and highway safety, and industrial safety techniques.

Chicago Fire Department
Information on the work of the Fire Prevention Bureau.

Chicago Police Dept., Traffic Div.
Traffic safety.

Dept. Health, Education & Welfare, Public Health Service, Third & C Sts., N. W., Washington, D. C. 20201
"50 Years of Protecting the Worker's Health."

Federal Safety Council, U. S. Dept. of Labor, First & D Sts., N. W., Washington, D. C. 20212
President's Safety Award Programs.

Inter-American Safety Council, 2 Rector Street, New York
Safety publications, visual aids, and films, in Spanish for industrial, highway, and home.

National Fire Protection Assoc., 60 Batterymarch St., Boston, Mass. 02110
Information on the work of the Association with elected passout materials.

National Society for the Prevention of Blindness Inc., 16 E. 40th St., New York, N. Y. 10016
Literature and information on industrial and vocational school eye health and safety programs.

President's Committee on Employment of the Handicapped, Washington 25, D. C.
Information on Hire-the-Handicapped Program.

U. S. Department of Commerce, Coast and Geodetic Survey, Washington, D. C.
Small craft safety.

U. S. Coast Guard, Washington, D. C. 20226
Boating safety.

Safety Motivation from the Top

UPPER MANAGEMENT MOTIVATION

By FRED M. BORWELL
General Mgr., Engine-Material Handling Div., Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Allis-Chalmers believes that "Total Safety"—a program that integrates accident prevention into all activities of the company and all activities of its people—is essential. In this concept we recognize the interdependence of occupational safety with traffic, home, recreational, and public safety. All of these safety activities are necessary to help us in reaching our fundamental objective: to advance the well-being of our people and associates.

Thus, it is the policy of Allis-Chalmers to promote safe living by an effective accident prevention program in all phases of our operations—manufacturing, design, sales, research, and employee and community relations. This program utilizes the best principles of safety engineering and education to reduce both industrial and off-the-job accidents and generally to advance the well-being of our people, the company, and its customers.

In each establishment of the company it is the responsibility of the operating executive to make this safety policy effective. Under his direction, every member of management is responsible for applying these safety engineering and safety education principles to the *employees* and *work* within his jurisdiction. It is the function of staff safety personnel to promote the use of these safety principles and provide technical services to assist operating management in their application.

It is the responsibility of every employee to cooperate with the safety program by observing in his daily work all safe practices, policies, and standards. Additionally, each employee has the responsibility to call to the attention of his supervisor any hazard in need of correction and to suggest safety improvements.

The Allis-Chalmers "Total Safety" concept extends into three important areas—company personnel, products and customers, and the public. Our concept and policy is implemented in these vital areas by the following programming:

Personnel

1. Development and application of Allis-Chalmers safety standards for plant facilities, equipment, tools, work methods, and guarding based on applicable legal and voluntary codes, rules, and standards as a minimum.
2. Safety inspection to identify potential hazards.
3. Accident investigation to determine future preventive action.
4. Accident records and accident cause analysis to determine accident trends and targets for corrective action.
5. Education and training in general safety principles and specific techniques. On-the-job safety instruction by the supervisor and periodic supervisory contacts for new instructions, follow-up, and general safety motivation.
6. Protective equipment to provide injury protection.
7. Industrial hygiene studies to identify potential health hazards and develop necessary control measures.
8. Safety publicity and promotion to step up program interest and participation.
9. Off-the-job accident prevention in cooperation with public and private agencies to promote the application of accident prevention principles to non-work activities.

Products and Customers

1. Application of the principles of safety engineering to product design to facilitate safe manufacture and safe use.
2. Development of operating instructions embodying principles of safe operation

to assist the customer in the safe use of equipment.

3. Embody safety research in product research and development to improve the product from the manufacturing and customer safety standpoints.

Public

1. To project the safety program in cooperation with public and private agencies to reach the families of Allis-Chalmers employees.
2. To cooperate with national, state, and local programs in safety projects intended to reach the communities in which Allis-Chalmers plants and offices and other facilities are located.

MIDDLE MANAGEMENT MOTIVATION

By HARRY E. RITTER
Vice Pres., Manufacturing, Greenlee Bros. & Co., Rockford, Ill.

The Greenlee Bros. Co. is working on its second 100 years of operation and have gone through many changes and additions in products during that time. Our company consists of four plants, of which two are in Rockford, Illinois, one in Genoa, Illinois, and the other in Holland, Michigan.

The Greenlee plant in Rockford consists of three different manufacturing divisions, one which manufactures special metal removal transfer lines, woodworking machine for furniture and plywood operations; a second division manufactures a complete line of wood boring tools, knockout punches, high pressure power pumps for use with our pipe benders and pushers, a third division consists of a captive foundry and production foundry both of which pour gray iron castings.

Our Genoa plant manufactures many of the small items that are complimentary to our boring tools and bender lines. At the Rockford Machine Tool Co. the main products consist of planer mills, shapers, slotters, sheet metal forming equipment, and die casting machines. In Holland, Michigan, there are two main products one of which is a wood working planer and the other is the manufacture of die casting machines up to 1,600 Tons lockup pressure.

The total employment of these plants is slightly over 2,000 employees. My area covers the responsibility for manufacturing and related services for the corporation. Along with this goes the responsibility for accident-free operations.

You must look at your organizational structure to see if it is designed to motivate divisional superintendents and plant managers. Until about four years ago, the cost of accidents in our company was not well-known or publicized, and as a result there was no active accident prevention program. Prior to this time, the safety director reported to the industrial relations director which was at a staff level with no authority over the manufacturing in relation to safety.

With changes that allowed manufacturing for the company to come under one man, it was then possible with the help of the insurance department to request that safety be placed under the responsibility of the chief manufacturing person. Request was granted because I felt that we could do more with the program in this manner. So the first point in successful motivation is to have an organization structure that will allow it to function and to continue.

At this point you might want to argue this arrangement, but I felt if I could show the superintendents that I was personally enthused about accident prevention, I could then motivate them to action. I am sure I was personally motivated in the whole area of property conservation after attending a week's session at the Factory Mutual Laboratories in Boston on fires, explosion, etc. Even though I had been a volunteer fire chief for several years, this really opened my eyes to the work that needed to be done. So I say the second point in motivating others is to motivate yourself.

The third point in selling the job of accident prevention to our division superintendents was to secure some type of program which would aid them in their task. Prior to this last year, I had, on many occasions, requested help in the form of training or educational materials that could be provided, but until the appearance of the American Mutual Insurance Company, this had not been forthcoming. This was the first company that had a program to offer our people and who were willing to help us organize and implement a thorough study of accident prevention. It was at this point that it was necessary to then show the materials that were going to be available and to sell our superintendents on the worth of this program. So, I say that in order to motivate this group, it was necessary to have a plan that could be presented to them for their approval and subsequent action.

At our company, we have found the best time to have a meeting of superintendents and plant managers in the Rockford area is to conduct 6:30 A.M. breakfast meetings. I find this time in the morning is very productive and the minds of people are very clear and nerves are not jangled. It was at this point that the superintendents thoroughly discussed the program and weighed the pros and cons and finally, after a great amount of discussion, they were convinced that a program was a sound approach.

I will not go into the details of this program since most of the details involve the foremen and other supervisors which is designated to the speaker who follows, but I point out that important here was the fact that the superintendents really made this decision to proceed, and without their making that decision, it would have been difficult to implement the program. So, in this fourth point, we would have to say that the essence of success is for the operating people to sell themselves on a program rather than be told that this is the program.

An interesting point developed this past year that was promoted and pushed by the superintendents in direct opposition to a general policy that I had used in the past years concerning accidents and this was as follows:

We had taken a stand that if a person had an accident, we would not have him return until he was able to completely do his previous job. After reviewing this general policy concerning the wages paid under an accident, the morale of the individual and the need of getting a man back to work after an accident, our superintendents proposed that we try to bring a man back after an accident if he can at least do 50 to 60 per cent of that job or a similar job. Their feeling was that this would tend to make others in our plant more conscious of accidents.

I mention this because I believe it shows the flexibility that you must allow yourself to readily change your mind upon further recommendations of a group who are going to be so close to the accident prevention programs. This flexibility certainly tends to make them more interested, and I sincerely hope that it continues to motivate them in this area of accident prevention.

Until we started active accident prevention programs, we had kept costs of accidents in the dark, perhaps, not intentionally, but because accidents and cost of accidents are a nuisance and a distasteful item and in the past seemed to carry less importance. In this connection, we show our superintendents the total cost of these accidents in terms of workmen's compensation. We also send them to hearings before Industrial Commission where this situation arises, so they can become aware of the attitudes of the Commission, the attitudes of the lawyers, the attitudes of the people who were injured. We feel that this has been an excellent piece of information for them and has made them realize how this affects the profit of our company.

The old adage I am sure was, and still is in some people's minds—"The insurance company pays for it," and they are right—except—who pays the insurance company? We all know, or we should all know that it is the company, the Greenlee Company in our case, that pays the insurance, so this is another means that we are using to instill interest in our people for accident prevention as it is a direct cost of the operation of our company.

Another important point in the motivation of these people is to have a goal that is attainable. By this I mean, divisional goals such as a calendar year, a six month period, a pre-determined goal and, an even further one we are considering now is to go to a

departmental goal, so the foremen can become more conscious of the program. Here we speak of divisional goals not only in terms of frequency and severity but also cost related by divisional operations. After all, in our company we detail scrap losses, salvage losses, any other things that can be contributed to a small unit, so let's do the same thing with cost of accidents.

Along with setting goals, we must have a tie-in with how we will publicize these goals and the results compared to the goal. This we do with reports to all superintendents and managers of the different divisions and around the plant we post the results of accident free days that divisions accumulate in order to continue competition between divisions. From this, superintendents devise their own programs and with flexibility as to how they will handle the department supervisors.

Certainly one of the most important points in moving division managers is to demonstrate the willingness to spend money. This may sound elementary but our superintendents devised a plan of their own to accommodate the recommendations from their foremen on improvements that had been made. It has kept us hustling. Many of the items which they recommend have resulted in our willingness to spend the money to correct an unsafe condition. Up to this point, we have been willing to spend any amounts of money to be safe, whether it be for personal protection or plant protection. So when you ask your superintendents to come up with requests for improvements in accident prevention, you must be prepared to spend the money. If you don't —forget the whole program.

In an effort to show you where we have been and where we are now, I wish to point out that our effort is in the right direction, we have made results and our projection for the next three years will be an improvement over our present record.

In conclusion, I would like to summarize the main points that I consider in motivating middle-management people. They are as follows:

1—Organization
2—Personal motivation
3—Program
4—Managers selling themselves
5—Flexibility of policy
6—Communication of costs
7—Attainable goals
8—Comparisons and review

HOW A FIRST LINE SUPERVISOR MOTIVATES PEOPLE TOWARD SAFETY

By DEAN A. ARMSTRONG
General Foreman, Delco-Remy Div., General Motors Corp., Anderson, Ind.

General Motors' Delco-Remy Division, is one of the real pioneers of the automotive electrical equipment industry with a heritage of continuous operation dating back to 1896.

Just as we are proud of our long-time record of leadership in this industry, we are equally proud of our safety record. We have worked hard for it.

The will to work safely is to have been motivated. Before we can expect to motivate people toward safety for any length of time; we must be sincere and have a deep concern for their welfare. This is how one finds their button; this is how to turn them on. Become genuinely interested in other people. Be a good listener. Encourage others to talk about themselves. Talk in terms of the other man's interest. Make the other person feel important—do it sincerely. These are the tools of the trade. Believe me it works!

The easiest job I ever had was foreman in a department of about 50 people making field coils. All I did was come to work, get the people started every morning, check over the schedule, decide what to run, write this on a card and give it to one of my utility

men, and make sure everything was running. The balance of the time was spent talking to the employees of the department. Total time running the department averaged around three hours per day.

These people knew I cared about them and they responded. They responded to satisfy their basic need of being a part of the department or group and also of being praised and appreciated. When a person is motivated to satisfy his need, his whole mental attitude changes. He becomes a person with something to look forward to, he begins to set goals for himself, and he begins to react like a person with meaning to his life.

How do you get a group of people with the willingness to perform the acts for which they are responsible? Here are the motivating forces I use to get this job done!

Recognition and praise—I use this not only to build confidence but to produce better teamwork and quality.

Job importance—When a person knows the purpose behind his job, the part it plays in the overall business, he usually develops a greater interest in his job.

Curiosity—as long as there is something to be learned, found or discovered this will be a stimulating effect.

Fear—The removal of fear is necessary——fear of job loss, fear of supervision, fear of security loss—in order to get at the individual's potential.

Aim in life is the most important motivation factor of all. Every individual strives for happiness in life. The use of this ingredient makes every man willing to accept responsibility.

If we can use these motivating forces, we will find that the disinterested, half-awake person has turned into a wide-awake, alert, questioning individual. This is the kind of person that makes a good employee in the eyes of production. If he is motivated, all we need to do is instruct him in certain methods for production, and we find that by keeping him motivated, we increase his personal output tremendously.

Why then can this idea not be applied to safety? If we can keep him motivated and can instruct him in safety, we should have no problem in getting good results in the area of safety, the same as in the area of production. We have the person in a good, alert frame of mind, and we all know that this is the ideal state of mind for people when we are considering safety.

Let me tell you about a worker by the name of Jim Smith. Jim is a man 40 to 45 years old. A constant complainer. Nothing is ever right. The punch press he ran, wouldn't run to suit him. The material given him to run was always bad. He hated authority over him, and it made him mad if any supervision watched him. He had a don't-give-a-damn attitude and his record of injuries proved it. Here was a difficult man to learn to know. He constantly had on a cast iron shield.

I was determined to find Jim's button. Weeks of one-sided conversations went by. Slowly I was piecing together Jim's background. He felt bitter toward society. Every once in awhile he would go out and tie one on. Seemingly, trying to forget the past. Finally, I learned he had been in the Korean War. He had been a prisoner of war for a year and a half. He was still bitter at life, because he had had to be the one to go through this. After Jim found someone to talk to about this terrible experience of his life, he began to change and change rapidly—evidently I was the outlet or pressure valve he needed. This was like a terrific load lifted from him and he acted like he was at last free and starting a new life for himself.

O.K., we have found the man's button! Now, how do we go about getting the job done safely? Here are some basic principles for safe workmanship which I believe to be essential: One of the most important principles of safety is having the active support of top management. Here is an example which perfectly illustrates this principle.

We were involved in a period in our safety program at Delco-Remy where we were once again trying to bring safety consciousness into the minds of the people. We did this through the use of pencils, pens, and ice scrapers with safety slogans on them. We were endeavoring to get everyone thinking about safety.

At this time, I had a utility man setting up a winder in one of my departments. He had his hand in a "pinch point." When he activated the winding arm to check his setup, the hydraulic pressurized arm came

down on his fingers. The result was what we call "a near miss." His fingers were hit, but he didn't lose them nor were they permanently impaired. I reported this accident as a matter of record to our office and the next thing I knew—we had visitors in the department. Stu Garlic, our factory manager, Ken Lewis, our safety director and our superintendent of the plant. They had come to see where and how this "near miss" accident happened.

You can imagine the impression that this left in the minds of the people of not only this department but the whole plant. Here were the head moguls, the top dogs, taking the time to see how a man had nearly been seriously hurt. This is what I call Active Top Management Support.

Maintain good employee relations. A harmonious working force under a good leader is more receptive to safety teachings than one made up of malcontents pulling in different directions. A working unit may be welded by a good leader into a group in which safe workmanship flourishes. Leadership and good employee relations are primary needs for a foreman who wants to make a good showing in production and cost control as well as safety.

Develop safety instructions for every job. The hazards stem from the job and the supervisor or foreman must be better informed in an over-all way about the jobs in his area than anyone else. Safety is not an extra, a luxury, a specialty to be attended to after everything else is done. It is an indispensable part of the good job. If a supervisor knows everything about a job except its hazards and how to remove them, his knowledge is incomplete and ultimately his production will suffer.

The foreman must become as familiar as he can with the operating characteristics of each machine in his area; how it can be improved for safety; its peculiarities of operation; how fatigue and monotony can be minimized in its operation. Also, the foreman should have a good working knowledge of all the jobs in the department, sufficient to enable him to recognize their hazards, whether they involve the operation of machines, the use of tools, or the handling of materials.

In the same way, the foreman should know the electrical, fire and other hazards inherent in materials that come into the unit: solid, liquid, or gas; raw or finished stock; process chemicals. He should also know the department and plant regulations in regard to all these factors.

Lastly, it is essential that the foreman know how and where to get help if he needs it, and that he be willing to seek such help. The usual and best source of aid is the company's safety department and Plant Protection Department.

Safe workmanship: Safety results from organization policy. It is not primarily something that men ought to be wheedled into; it is to be required and expected, just as production is required.

It is desirable that authority be exercised tactfully and skillfully. Safety is not well enforced with an iron fist. The "get-tough" approach has never been an effective instrument for getting safe workmanship. Setting a good example: The supervisor in charge of a department must practice what he preaches. Such a statement should perhaps go without saying, except that the principle is so often violated. Nothing will wreck a department's safety record faster than a demonstration by the foreman that he is merely giving lip service to the safety program. He will be judged among his crew by the attitude he displays and the actions he performs rather than by what he says in safety talks.

This principle was illustrated recently by the back three departments of our plant. This area is loaded with all types of big turning and drilling machines running cast iron. Our problem here was mainly revolving spindles. We knew from experience that rings and wrist watches were very hazardous around this type of equipment.

The problem was kicked around for awhile and finally our Safety Engineer, Jack Ayres, came up with the idea to let supervision set the example. All foremen wore their wrist watches on their belts and the rings came off. Well, the nakedness worked. It wasn't long until every operator had taken off his rings and wrist watch. Even today there is no enforcement necessary—it has been established as standard operating procedure.

Alertness: The first violation of a safety rule may not cause a worker to be hurt;

it may be the 50th or the five thousandth. Repeated violations of safety rules are less likely to occur in the persence of an alert supervisor. It is not the violations consciously seen and uncorrected that cause trouble so much as the acts seen but not noticed.

Alertness to observe physical conditions and installations are equally important. The supervisor should be constantly on the alert for defects that may develop in machines or structures for bad housekeeping, for material out of place, for bad arrangement of machines and processes, for every other unsafe condition that might breed accidents.

Instruct each new employee. In a large sense, every effort the leader makes to promote safety is educational. A teaching job is required when a new man comes on the job. How he is broken in, what he is taught about his job and his surroundings will greatly determine the elements of safety in his working life. Safety indoctrination upon employment may be principally or partially the responsibility of the immediate supervisor, depending upon company procedure. Regardless, the supervisor is the one who introduces the new worker to the job and gets him started off right. it may be said that if the machine is "right" and the man's use of the machine is made "right," safe operation can be expected.

There are several other ways to teach safety from month to month and day to day. First, is a safety talk at least once a month. In these talks safety rules are stressed and accidents reviewed. Then there are what I call "pointed" reminders, these are with utility men, stressing safety while working on equipment. These are almost daily occurrences. Next is the "casual" or safety reminder brought out in daily conversation with my people. Last is the "incident." This covers correction of unsafe acts or practices found in daily work.

Personal contact may well be the supervisor's most powerful device for getting his people to work safely. The most important of all is individual contact—talking to each person at regular intervals, as often as possible and on a planned basis.

Never be too busy to listen to what an employee thinks is unsafe. If possible, make an attempt to correct an unsafe condition that is important to any given employee. If the problem is something that must be lived with, take the time to explain the proper and safe method to operate under the conditions as they exist. Working with the company's safety program—While the foreman has the primary responsibility for safety in his department, he is not required to fight it through alone. The safety engineer cannot do the foreman's job for him, but he can help. It is a cardinal principle of good safety administration that the safety engineer acts in most situations, in an advisory capacity, and does everything possible to maintain and strengthen the supervisor's authority in his own department.

Safety committees, inspection, posters, bulletins, suggestion systems and safety meetings are all devices for maintaining employee interest and for stimulating the safety program. As such, they are helpful to the foreman in his own efforts to maintain a safe department. They are, in a sense, the tools of the safety trade.

All you can do is hope that all these things which I have mentioned will help. Let's list them again:

1. Have active support of top management.
2. Maintain good employee relations.
3. Develop safety instructions for every job.
4. Require and expect safe workmanship.
5. Set a good example.
6. Be alert.
7. Teach safety.
8. Promote safety by personal contact.
9. Work with the company safety program.

It helps to make it a team effort. Duscuss the problem with your people. Let them know that you, working together, can prevent the accidents that come when feelings get the upper hand over good judgment. Together, you can go a long way toward solving this difficult problem.

Never has there been a safety device or a safety program that some human being could not disrupt or impair. The human factor that operates at all levels in industry is perhaps the most potent factor for success or failure of a safety program. The president of a company who approves or

"drags his feet," the safety director who works hard or coasts along, the foreman who emphasizes safety or subordinates it to production, the janitor who cleans well or does only the minimum—all these are important factors to safety in the company. Safety can be achieved only by working through all these people. In every area of industry the human factor must be dealt with.

No one wants to get hurt, suffer a loss of income important to them and their families, or become a statistic in the National Safety Council's records of fatalities. Yet the human factors involved are such that only the most aggressive, broadly-based, around-the-clock effort can be acceptable in the area of employee safety. Company president or janitor, each has an important role to play in making a safety program work. Never has there been a safety device, whose effectiveness could not be cancelled by a careless human being. Never a safety program, that disinterested employees could not turn into a complete failure.

Here is an example where we failed. The man's name is Dick VanSickle—30 years old—excellent employee. We had found this man's button, and he was doing a bang up job. His normal job assignment was a stock chaser for our Final Assembly Department. One day he was going about his job. He was in the storage area, and he spotted some parts that he needed on the second tier, about 10 feet above the floor. His normal reaction to this situation would have been to take his Fork Lift Jack Stacker, bring the load down from its position, remove the parts he wanted and return the balance of the load to its original position. But this time Dick decided to take a short cut. He stood on the forks and lifted himself on the forks into the air by pushing the lift button, first by his thumb and then by his foot. He obtained the parts he needed and then proceeded to push the down button with the toe of his shoe. Here is where disaster struck. As Dick held to the main support of the fork, it moved down past the permanent mast of the jack-stacker and the end of Dick's second finger was sheared-off.

You all know the helpless feeling of wondering where an accident will strike next. To know you have not done enough, but still not knowing what else you can do. What will it take to erase the terrible feeling of not being in control of the problem? You have all shared these feelings at home with yourself.

The next day comes and you keep finding buttons. You keep talking. You look at your accident record, and it reassures you that you are on the right track. All you need to do is renew your efforts. Your employees tell you of their interest and desire to make this a safe, good place to work. The safe productive days go by and once again you're fighting for a new record of accident free work.

How much employees care—how well they have their safety self interest at heart—are the keys that unlock the doors of any industrial plant that considers itself a good safe place to work. The only people who can turn those keys are you and me. A sincerely interested and enlightened top management can put the keys in our hands. But we have to turn them. After we've got the doors open—we have to turn on the light and show the way—by doing the things I have just outlined for you.

This is our responsibility.

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AUTOMOTIVE AND MACHINE SHOP SECTION

SAFE USE OF NUTS AND BOLTS

By F. E. GRAVES
Technical Director, Russell, Burdsall & Ward Bolt & Nut Co., Portchester, N. Y.

There are very few appliances, assemblies, or anything we use from day to day which do not depend upon the safety of the nuts and bolts fastening them together, whether they be washing machines, automobiles, aircraft or what have you. There is considerable misconception about factors of safety in the use of fasteners.

One of the very important things in the safe and proper use of threaded fasteners is to recognize what the identification markings mean. The head markings do have significance. If you see a bolt head with no grade identification marking it means that basically it is an SAE Grade 2 or its ASTM equivalent. It has at the moment a strength rating of 69,000 psi. I say "at the moment" only because fasteners of this classification are in the process of being upgraded to 74,000 psi.

A head marking with three radial lines indicates a strength level of 120,000 psi ultimate tensile in the sizes ¼" through ¾". The importance of this, of course, is that if you run into any maintenance problem where a bolt in a piece of equipment has to be replaced and the original bolt head marking had three radial lines, if you do not recognize the significance of this marking and install a bolt with no markings, you will not have the strength level that the design calls for.

A marking of six radial lines indicates a heat treated alloy bolt which has an ultimate strength of 150,000 psi. Again, when the designer chooses a nut and bolt he bases it on the available strength level of the bolt. So it is easy to see that if he designs on the basis of an SAE Grade 8 (equivalent to an A-354 Grade BD) he is assuming that any bolt that is used will have the strength level upon which his design is based, whether it be in shear or tension. In replacement, if the bolt head marking is not recognized and someone should just take a bolt out of a bin in the stock room and put in one with no mark, you can be pretty sure there will be the chance of a failure and in some cases it could be a very serious failure.

Other markings we are involved with—this particular one shown on the slide is a structural bolt marking, A-325. These are made of medium carbon alloy steel heat treated and have an ultimate tensile strength of 120,000 psi. The new bolts covered in specification A-490 have an ultimate strength of 150,000 psi. These are designed for use with structural steels, although they are used for many things you might run into, such as crane-ways and other types of construction that are not necessarily buildings or bridges.

Again, I cannot over-emphasize the importance of replacing in maintenance operations the correct bolt for the one taken out. There is a case history (there are many, but one that I will mention), where a dealer in surplus material found that he could sell a large number of ½" x 3" alloy bolts for aircraft maintenance. He found that on the surplus market he could buy a sizable quantity at 10¢ on the $1.00, let us say, for these ½" diameter bolts except that they were 4" long. He purchased them and inasmuch as it was very difficult to cut them off to 3" in the hardened condition, he had them annealed and then cut them off to 3". He supplied them to size but unfortunately did not re-heat treat them. These were used in a Government aircraft landing gear and as it happens, back when President Kennedy was in office, one of the planes that he was on had the landing gear fastened with these bolts and the landing gear collapsed. There was no serious accident as you all know, because you *didn't* hear about it, but the landing gear did collapse. It was all traceable to someone buying bolts, not realizing what the head markings meant, annealing them to cut them off and not re-heat treating them.

While the heat treated cap screw has the three radial marks, the bright cap screw has no mark. The machine bolt is just about out of existence in our industry. There are a few made but they are not very popular, and I think really you should consider only SAE Grade 2, SAE Grade 5 or SAE Grade 8, and their equivalents in the ASTM specifications.

In a normal rigid joint, the bolt resists the design force or operating force to pull the members apart. The factor of safety in a casting, forging, what have you, is dependent upon the inherent strength of the material and regardless of what that factor of safety figure happens to be (let us say for example it happens to be 4 to 1 which is a common figure with ASME), your thinking is that the inherent strength of material is the only thing taken into consideration and, regardless of how you use this, you are going to have a 4 to 1 factor of safety. This is not true with a threaded fastener. If you have available, let us say, a clamping force of 20,000 lbs. based on the strength of fastener material, but you tighten the fastener to develop only 5,000 lbs. of clamping force, the extra inherent strength of the fastener is doing you no good whatsoever except to resist shear.

If excessive external tension is exerted upon a bolted joint, the interface can separate. If it is a gasketed joint that, when it separates will allow poisonous or explosive vapors to escape; or if it will cause any mechanism to fail; and you create a clamping load of only 5,000 lbs., this is the only strength you have. The fact that this particular bolt has the clamping strength of 20,000 lbs. does not give you that factor of safety. This is one of the most misunderstood things in the use of fasteners—you cannot base your thinking completely on inherent strength. You have to base it on methods of tightening and what you accomplish with this fastener. We have had many cases where people experiencing joint failure went to larger or stronger bolts and still didn't solve the problem because they never torqued the bolts to the load they were supposed to. I am sure you can realize that when you have a joint where the interface should not open up for safety reasons, it doesn't make any difference how strong the bolt is if it isn't clamping with sufficient force.

The smartest thing to do when you recommend something is to recommend the higher strength fasteners to show the additional strength per dollar you get. If you are using SAE Grade 5, again equivalent to ASTM A-325, what you get for your dollar is greater clamping strength and this is really what you are buying. You are not buying pounds. The old concept that anything that is bigger and heavier is stronger has long gone by the boards in our Industry and in many other industries, as I am sure you are all aware. At any time that you may be requested or are interested in giving a recommendation on threaded fasteners, I would suggest that you do recommend the higher strength fasteners.

Here is another example: We will take a 1¼" SAE Grade 2 bolt—it has a clamping force at proof load of 27,100 lbs. Here we have an SAE Grade 5, ¾" bolt, proof load 28,400 lbs. It is 1,300 lbs. higher in its rating of clamping force, yet the 1¼" Grade 2 bolt costs 277 per cent as compared to the ¾" Grade 5 at 100 per cent. Now most people looking at this 1¼" bolt would think that this definitely is a much stronger fastener, and yet it isn't. We can go even further on this with a ⅞" diameter bolt, hot-headed because it is a practice in our industry for many people. This has only a proof load of 12,900 lbs. If we drop back to a ⅝" Grade 5, it has 19,200 lbs. clamping force; considerably more than the ⅞" Grade 2, and yet the ⅞" Grade 2 costs 154 per cent over the ⅝" Grade 5. I bring these examples up to point out the advisability to suggest the use of the highest strength fasteners—take advantage of what we have learned in our industry in making bolts.

I have been talking basically of what we call solid or rigid connections. Now consider a gasketed connection in which the functional strength of the bolts is too great if they are tightened up to their proof load. What we have is a bowing effect of the flange because the bolts were clamped too tightly. This happens to be a case history on a hermitically sealed compressor made by one of the largest companies in our country. They have leakage and it happened to be handling a gas that was toxic. They tried to solve the problem by using larger and stronger bolts and this resulted in more bowing of the flange itself and resulted in more leakage. We were called in on the

problem and we eventually found out that the answer was (1) put in a harder gasket so that you did not get that much compression and (2) to use slightly smaller bolts and not tighten them up as much. I bring this case up to emphasize that when you have problems there is no rule of thumb that goes right across the board. You do have to analyze it. We solved this case by recommending that they use smaller bolts, space them a little closer and tighten them correctly.

One concept of bolting that many people don't realize is that actually a bolt installed correctly and tightened correctly basically acts as a spring. A bolt should not be tightened beyond its proof load if there is going to be fatigue action present. Instead, it should be kept within its elastic range where it can act like a spring. In any steel material or any basic metallic material, there is a rule of thumb that applies that it will stretch 1/1000th of an inch for every 30,000 lbs. of unit stress per inch of grip length. What this means is that if you are bolting a connection and at the interface you have a condition where you might have had scale on the flanges, or something that would cause the grip length to decrease very slightly either by scale dropping out or by compression of the flange material, you reduce the grip length.

There would be a reduction in clamping force and it would be on a straight percentage basis of the overall clamping force in unit stress. In other words, if there is one inch of grip length you are stretching that bolt 2/1000th of an inch to develop 60,000 psi unit stress. If in this case, we have 3 inches of grip then you are stretching it 6/1000th of an inch to develop 60,000 psi unit stress. Now, if for one reason or another, you do redute this grip length by scale falling out or by indentation of the bolted surface, you reduce it by 1/1000th of an inch, the clamping stress then drops down to 30,000 psi in the case of the one inch grip length and only to 50,000 psi in the case of the three inch grip length. So, if there is a type of connection where you are having trouble in maintaining tightness, which happens generally where you have castings or structural shapes that are delivered from the steel mill rolled hot with mill scale, by the dropping out of some of the scale you reduce your clamping stress by 50 per cent in the first example, and reduce it by only 16 per cent in the second example.

In our industry there is a subject on which there are definitely two schools of thought. This is the comparison between the application of coarse threads and fine threads. I will say that ten years ago the automotive industry used about 80 per cent fine threads. Today the situation is exactly reversed and they use 80 per cent coarse threads. I would like to briefly go into the reasons for it. The stress areas for a ½" bolt coarse thread is .1419 square inch, where a standard fine thread is .1599 square inch. If you calculate this mathematically you would immediately say that the fine thread is the bolt to use, as it has the greater stress area; but when you put a nut on this bolt and you tighten it up, what happens is that you cannot develop the full strength in the stress area. With the coarse thread fastener, normally if you overtighten the nut the bolt will fracture. With the fine thread, if you overtighten, normally what happens is that the threads fail in progressive shear and you have a stripped connection. Unfortunately, even if you are using a torque wrench, it is set to kick out at a certain pre-determined torque load and it kicks out when this torque level is reached, but you don't know whether that bolt is stripped or not. One automotive company has put through a ruling that for all critical connections in their vehicles nothing shall be used except coarse threads for this very reason. If, for some reason, the wrench is out of adjustment and someone overtightens the bolt, it breaks. This becomes automatic inspection. If the bolt breaks it is removed and replaced with another one. However, with fine threads the wrench would kick out and the automobile would go out with a connection that was stripped, and no one would know it until it failed.

One of the illustrations we try to use to put this point across is to draw up a hypothetical thread which is much finer than the standard fine thread. Its stress area is .1779 square inch. Therefore, if you figure it mathematically you would say this is the strongest bolt, but if you visualize what will happen with a very shallow thread, you know that if you put high stress on it this thread is going to strip and you will end up with a much weaker connection. I am

bringing this point out because as people who are interested in safety, you should not be misled by the fact that the fine thread fastener has the greater stress area. It is true on paper, but when you put it into practice you normally don't get these results. I am saying this because we as a company make both and we couldn't care less what you order. If someone orders coarse thread or fine thread we have American standards and International standards for both, but we know that when you get up to high strength levels this greater stress area is misleading.

If we assume that the average thread stress is 100 per cent, the thread adjacent to the bearing surface where the highest stress occurs is 179 per cent in the coarse thread, but it is 231 per cent in fine thread. This is what accounts for the progressive shear that occurs. The material has to be stronger to withstand the higher stress concentration.

I would guess that 90 per cent of people, if they used a jam nut, would use it with the jam nut on top of the standard hex nut. This is the way that seems to be traditional and yet from a purely technical point of view, it is incorrect. The idea of a jam nut, naturally, is to prevent the nut and bolt combination from loosening. When you put the jam nut on this way all you are really doing is introducing additional frictional resistance at the interface between the jam nut and the standard nut. If you reverse the position you are also accomplishing this, but because the standard hex nut is the stronger of the two, you are stretching the bolt thread off lead and you are introducing not only frictional resistance at the interface but also at the thread flank.

I looked out of the window at the wing of a plane and there was a stenciled NAS number for the screws that were used in fastening the skin of the plane and underneath it, "Maximum torque 20 inch-pounds." I think this is rather typical of people tending to worry about overtightening. What so many people don't realize, and again it is all tied back to the safety aspect, if you undertighten a fastener you will have premature failure. A failure occasioned either by a joint loosening and allowing toxic material to escape, or by causing a fastener to go into fatigue if the clamping load exceeds the design stress. To me, listing a maximum torque and not a minimum torque is wrong. The maximum was on there to prevent someone from overtightening and breaking or stripping the screw. There should also be a minimum. It is very easy to undertighten, if you are not careful, and end up with a joint that fails.

Someone has asked if there are any forms of washers that indicate the axial load on the bolt. The answer is that there are. They are, however, not specified in any code. The Belleville washer does not indicate axial stress. In England they do have a washer with small projections on the bearing surface and if the tensile stress is at the proper level, they claim you can use a feeler gauge between the washer and the bolting surface to find out if the axial stress is sufficient. There are none that are accepted as a standard in this country.

Q. What effect on the tensile strength or the holding power does a lock washer have?

A. Frankly, it is pretty much nil. If you bring a bolt and nut combination up to its proper clamping load, you have flattened the lock washer out long before you ever reach this load. Normally, it will flatten out, unless it is a very special one, at about 30 per cent of the specified clamping load, and from that point on it becomes a flat plate washer and does no more than a hardened flat washer will do. I assume you are talking now of the split lock washer. I will qualify my answer in that with sheet metal work in using the stamped hardened washers, where you don't have a rigid connection, they do perform a service but in the basically rigid joint a split lock washer does not really contribute anything to the strength of the joint.

Q. Is there a recommendation to use them or not to use them in certain areas, and to use certain types of washers?

A. Well, the split lock washer is used pretty much because of tradition. I have yet to see any tests which show that it prevents loosening of the bolt. Now, again I will make the qualification of the internal-external tooth washers for sheet metal; but if you are clamping something solidly together you have to visualize that by the time that washer springs apart so that it can do any good, the connection is already loose.

Q. Are common washers used in high strength joints?

A. I would never use a common washer in high strength connections, and I presume you mean a non-heat treated washer. A flat hardened washer is what you should use. In fact, this is in the specification of all structural joints using high strength steel bolts.

Q. What specification?

A. It is published in ASTM and in the Research Council specs, which are put out by AISC and the Industrial Fasteners Institute.

In the type of connection you mention, it is very desirable to use a hardened washer. If you use an alloy bolt and the proper nut with it to bolt together relatively soft materials, and torque correctly to develop full clamping load, you are going to compress the material that you are bolting. You may have an instantaneous load at the level you desire, but five minutes later you won't have it. The hardened flat washer should be used with your alloy bolts and nuts. Unless, again, you are using the alloy bolt strength as a shear property. In this case, it isn't that important.

Q. What is the acceptable way of holding two nuts on a bolt where the bolt is loosened up periodically for adjustment purposes?

A. Frankly, if I were going to design it, I would put on a prevailing torque lock nut. The use of the jam nut is decreasing with the use of the prevailing torque lock nut. A prevailing torque lock nut would be a single nut that could have various configurations. It would either have a plastic insert or a deliberately deformed thread that would prevent it from loosening. We as an industry sell many fewer jam nuts than we did, let's say, ten years ago.

Q. What is the difference between a cap screw and a finished hex bolt?

A. The latest ASA Standard says "cap screw—finished hex bolt." That's the latest terminology, so from that you can necessarily determine that a finished hex bolt and a cap screw are the same as far as the ASA is concerned. Cap screws were originally developed for use to go into tapped holes. Their length tolerance is and was always minus; in other words, nominal length minus the tolerance. Bolts were always plus—nominal length plus the tolerance so that they would extend through the nut. However, what evolved was that they both ended up basically with the same tolerances.

Q. Do you think that the use of the toothed washer will tend to decrease?

A. No, I wouldn't say so. We have an SAE subcommittee at the moment which is involved in drawing up a new washer specification, and I am sure they will include the internal-external tooth washer. We all use it.

Q. Is there an advantage in the use of a Phillips head?

A. The advantage of a Phillips head as opposed to a slot—there is a definite advantage, and also with the new Pozidriv head which will be in the new ASA Standards. This is a development of Phillips International. The advantage is that you get a higher driving torque without your driving bit camming out. Pizidriv has better driving characteristics. The Phillips bit will work with the Pozidriv recess and both of these are better than the slot. They enable you to develop a higher tightening torque.

Q. Does automotive design wheel bolt applications based on the bolts being tightened to close to their proof load?

A. No. This is a very good point. They are deliberately over-designed. You know yourself that when you personally torque one to where it squeaks, you figure it is tight. Now, if every time a wheel was changed on an automobile, it was done by a qualified mechanic with a torque wrench, they probably would have three bolts per wheel instead of five or six, but Automotive recognizes that this is not a practical approach, so they do over-design it.

Q. Isn't the number of bolts per wheel decreasing?

A. Well, this is the trend. Some years ago it was six, then it went to five, and I am sure in some cases, to four. I haven't seen it myself but it could easily be that.

Q. Will you explain again why wheel bolt assemblies are over-designed?

A. They designed so that—let us assume that there are five bolts—two or three could come out and there is still enough strength in the remaining ones to keep the wheel on. Now, if they designed so that it was necessary to have five bolts in there at all times and whoever changed a wheel did not have a good reliable means of tightening the bolts, you could end up with a wheel that came off. So they deliberately overdesigned it so that there would be a real safety factor.

Q. Can you explain excessive wear in a wheel bolt connection?

A. Well, now which wore away? The material you were clamping with the bolt head or the bolt head itself? It would be hard to imagine that the bolt head would wear.

Q. No, the bolt head did not wear. The bolt was on the wheel in place where the mechanic had left it. The material on the wheel itself had worn away and eventually it came right out over the bolt head.

A. This is a difficult question to answer without knowing the hardness of the material of the wheel rim. As an example, I got some samples from a customer to test the material that they were bolting together and the hardness was down as low as 13 Rockwell B, although their specs are up around 55 Rockwell B. Whoever stamped the rim out must have had a batch of material that was very low in hardness; this could occur. In answer to your question, I couldn't say now whether it was the fault of the bolting procedure or not, but I would guess that the rim material must have been defective.

NEW SAFETY CONCEPTS

By F. J. DERY
Safety Dir., Industrial Safety Section, Ford Motor Co., Dearborn, Mich.

My contribution cannot properly be called a "New Safety Concept." Most concepts are probably not new anyway, only old ideas newly applied. It is probably as old as the history of man in that it is simply the recording of ideas of people and the transmitting of these ideas to others. In our case, the ideas are concentrated in the area of safety.

On a quarterly basis at Ford Motor Company, we receive from our safety engineers, a report on all outstanding safety activities that have occurred in the previous three months. We do not want routine information such as how many safety permits were issued or how many slings were inspected. We want only that information which would be of interest to our office or of interest to other safety personnel within the Company. When this information is received, it is screened and loosely categorized into four subjects—Take Heed, Think Ahead, Safety Promotion, and Information.

The "Take Heed" items are those that could occur at any of our activities.

The "Think Ahead" are those safety ideas that denotes long range planning for consideration of preventing accidents that may occur in the future.

"Safety Promotion" reviews work done by our safety personnel to promote safety. These include safety contests with brief descriptions, special safety shoes sales campaigns, and training programs.

Typical of the ideas included in our Quarterly Safety Review under the category "Take Heed" was the following:

"Recently, a member of the Safety Unit, during a routine inspection of the Maintenance Repair Shop where a large portion of construction activity is being done, observed an extremely hazardous practice. Two welding carts were found with the hoses attached to the gages with pressure showing on the gages, the torch attached to the end of the hoses, and the torches locked in the tool box, which is mounted on the cart. Upon finding the condition and recognizing the seriousness of this practice, the Safety Unit immediately contacted Maintenance Management to correct this unsafe practice. It was emphasized that a leak at the torch could result in the tool box being filled with an explosive gas, and a source of ignition, such as a welding spark, or a lighted cigarette could result in a violent explosion. All personnel assigned to burning and welding operations were reinstructed to make certain that the torches are disconnected before storing them in the tool box, and that any future violation of these unsafe practices would result in disciplinary action."

Unless you were acquainted with a particular incident from this cause, there might be very little reason to think about the hazard of this practice. It is quite realistic to assume, however, that a torch might leak, that regulators and valves on cylinders might not be closed tightly, that tool boxes might fill with a mixture of explosive gases. The inclusion of this "Take Heed" item gave all of our safety engineers the opportunity to think of the potential hazard of this incident, as well as the hazard of confining any equipment that might leak explosive gases.

Among the "Think Ahead" items is the comment, "Removed from service four high speed grinders that were found to exceed safe maximum RPM." Another was as simple as this: "It was noted through injury studies that employes performing operations on the underbody were lacerating their heads on the sharp edges of the underbody. Bump helmets were supplied, thus modifying the effect of a safety hazard." Since we have 20 Assembly Plants, the benefit of the study made at this one plant was shared by 19 others.

If I were operating in a single plant company, I would consider developing this technique, involving the foreman, as the individual who would be reporting ideas that he had put into effect to eliminate or reduce safety hazards or poor practices in the past three months. Don't be fooled into thinking that the foreman doesn't have excellent safety ideas. Putting one or two ideas from each foreman into a "Quarterly Safety Review" and distributing it to all the foremen, might prove to be very gratifying. After all, we make the foreman responsible for the safety of the people in his activity—why shouldn't he be looking for other people's safety ideas and also be willing to share his ideas with others?

We have found that the value of our Feed Back Program lies in its ability to broaden our safety people by sharing the concentrated safety experiences and ideas of all of them. No one man in a life time could be expected to have more than a small percentage of these experiences personally. Yet here is an opportunity to learn from them and apply their lessons.

An idea such as this is only of value if it is put to work.

NEW SAFETY CONCEPTS

By J. G. CULLEN
Safety Supr., Engine & Foundry Div., Ford Motor Co., Dearborn, Mich.

The objective of the Machine Guard Standard is to outline the fundamental principles of mechanical guarding and establish basic standards for the guidance of machine tool builders and departments responsible for the guarding of machines and equipment within our plants.

At first, it may seem presumptuous to say that industrial safety and standardization mean the same. Such a statement cannot be supported in its full implication. It is true, however, that without standardization, industrial safety cannot reach its full effectiveness.

These two activities came to be bosom companions this way. Industrial accident prevention existed years before the National Safety Council. Many industrial firms, shocked by deaths and injuries in their plants, instituted accident prevention programs. For years, plants seldom communicated among themselves. But the need for communication became evident and finally expressed itself in the formation of the National Safety Council. While standardization was not mentioned, this desire for an avenue for the exchange of views for a means through which solutions to common problems could be developed was in effect an expression of a need for standards.

Accident prevention, however, predates these activities. Its beginning is found in the early factory inspection legislation passed by several states. Massachusetts leading the way in the early 1890's. Though not fully recognized, standardization was

the underlying theme of this early activity. Standardization had been practiced at the company and industry-wide level as a mass-production tool for many years, but its significance in accident prevention was not recognized until a few years after the birth of the National Safety Council.

The Council believed that while it could function effectively in a leadership capacity, it was not organized to conduct a program of standardization of proportions indicated.

It consulted the National Bureau of Standards which called a conference to discuss establishment of procedures for standardizing safety practices.

It was decided at this conference to study the suitability of standardization procedures of the A.S.A. for use in accident prevention. This resulted in an invitation to the A.S.A. to recognize its membership and use its procedures for standardization in the field of industrial safety.

National industrial safety and national standardization in their broadest application started from a recognized need for uniform approaches to common problems.

The Ford Motor Company has long recognized the desirability of having Manufacturing Standards that develop and keep pace with technological advances. The Company has benefited substantially by the application of the numerous Manufacturing Standards developed under the Manufacturing Standards Program. Many of the savings and advantages accruing to the company as a result of the Machine Guard Standards Program cannot be readily calculated in dollars and cents. It would be difficult to accurately evaluate the dollar savings from reduced vendor negotiations, reduced design time, reduced machine and equipment maintenance, and greater employee safety.

We do know, however, that many accidental deaths have been caused due to the absence of a guard. At the 15th Air Force Base, March Field, California, a saw operator with 30 years experience on wood working machinery sneered at the idea that circular saw blades could break. "In all my life," he said, "I've never seen a saw blade break." This particular day, the guard was not on the circular saw that he was operating and the blade broke. X-ray examination at a hospital finally disclosed that one of three pieces of the broken blade had been driven through the man's skull, leaving behind a cut so small that the first aid nurse had merely covered it with a band-aid. The man died three hours after the accident.

The design of guards must take into consideration the conditions under which they will be used. Guard dimensions must be adequate to provide the needed protection and yet be suitable for handling by one employee in most cases. Large guards should be sectionalized or provided with access panels or doors for servicing of equipment. In guarding the point of operation, as on a press, the guard must give the desired protection to the operator without reducing the output of the machine and without creating other adverse conditions which may offset its effectiveness.

Methods of attaching guards to machines or equipment must be suited to the use of the guards. They must be substantial and permit easy removal and replacement. Mounting should be permanent where no removal will be necessary.

When establishing Machine Guard Standards, we must also keep in mind State Codes and Regulations. A few states like California, New York and Pennsylvania demand that any machine guard have state approval before it is used. Each of these states sets up its own standards, sometimes a guard acceptable in one is not acceptable in another.

Part B, chapter 2, of the Illinois regulations starts this way:

"The rules shall apply to all moving parts of machinery and equipment used in the mechanical transmission of power."

Part B, chapter 3, of the rules goes into the problem of guarding points of operation of all kinds of machines. Like some other state codes, the rules detail the exact type of guard to be used for any one of a dozen of operations.

The model code of Safety Regulations, published by the International Labor Office, United Nations Organization, notes that as far as practicable, the point of operation of working machines shall be effectively guarded. In Indiana, Industrial Rule No. 6 sets up a very reasonable definition of machine guarding: unless otherwise spe-

cified, the term guarded shall mean that the object is so covered, fenced, or enclosed that accidental contact with the point of danger is reasonably remote. If your company operates in two or more states or countries, you will have to familiarize yourself with a lot of different regulations.

We all realize we are moving into highly technical era. Activity will be on a high technical plane. Not technical necessarily in the sense of science and engineering (although they too will move forward to greater heights than ever before) but such activities as management, education, human relations and accident prevention will be carried on only by those skilled in such activities. In this highly technical era, industrial safety and standardization must go hand in hand. One will never be completely sure of maximum safety unless personal opinion is set aside in favor of codified opinion as expressed through standards. No one will be able to possess the technical information necessary to a dependence on personal opinion. This makes codified opinion, expressed through standards, a source of information rich in experience and knowledge.

NEW SAFETY CONCEPTS

By HARRY B. HEGGER
Safety Eng., St. Louis Assembly Plant, Ford Motor Co., Hazelwood, Mo.

We created more interest in the safety program at the St. Louis Plant by getting our top management active in accident prevention.

When I first set up the "Board of Inquiry" at our plant, I had many reasons in mind: I wanted to create more interest in the so-called "Ivory Row," the top management of our plant. I wanted to promote more interest in the field of accident investigation by including our top management. I wanted to get top management interested in accident prevention, not only when a "lost time" injury occurred, but also when there was a near-miss or an unusual incident. I wanted top management themselves to conduct the investigation, to find the cause of the accident, and to make a decision of "What corrective action is necessary to prevent the recurrence of this accident?" In case of an injury, when the medical department advises us that the employee is ready to return to work, top management must decide when, where, and how we return the man to a full-time job, and not create a light-duty operation for him.

When I set up the "Board of Inquiry," there was one rule that I insisted on following. These investigations must be kept objective and factual. Before the investigations began, it was made quite clear to all members of the board that the purpose of the inquiry was to obtain information, not for finding fault or attempting to place the blame on any particular individual.

When I selected the members for the "Board of Inquiry," I picked five members of management; the planning and engineering manager, the production manager, the industrial relations manager, the plant physician, and myself, the plant safety engineer. I selected the planning and engineering manager because he is responsible for the process activities of our production operations, the equipment in our plant and the tooling necessary for producing automobiles. He is responsible for the preventive maintenance of our plant facilities, and the perpetual good housekeeping that is very necessary. He supervises the industrial engineering department and oversees the methods improvement activities. The purchasing department reports directly to his office, making final approval of all equipment, tooling, supplies, and materials that are necessary for the operation at the St. Louis plant. This man is also responsible for all other indirect labor departments, the production control and traffic departments.

Number two member of the board, the Production Manager is responsible for our five basic production departments; the body,

build department, paint, trim, chassis and the pre-delivery department.

The third member of our board is the industrial relations manager who is responsible for the personnel section, labor relations, plant security, employee services, and the medical department. This man is the back-bone of the safety program. He approves the safety policies, rules, regulations that are put into effect. He advises management and the union what the company policies are and enforces them.

The fourth member of our board is the plant physician. He supervises the medical activities of our plant hospital. During our production hours, we have a full-time doctor and two full-time registered nurses on duty. In addition to the general medical record of each employee, we maintain daily records of minor and serious injuries that are reported to our plant hospital.

I include myself as a member of this board. I am responsible for the safety program at our plant. I inspect and approve all new equipment and tooling that is purchased and installed. I am responsible for the hygiene facilities in our plant, the ventilation, lighting, lead control, noise control, protective equipment, and protective clothing. I am responsible for the daily, weekly, and monthly inspections of the building, equipment, and tooling at the plant. I promote our program through the plant newspaper, letters to management, daily contact with the line supervision, posters, and safety grams.

When a disabling injury occurs, a near-miss or an unusual incident happens in a particular department, the manager, his superintendent, general foreman and his foreman are invited to participate in the investigation; they automatically become members of the "Board of Inquiry."

When a disabling injury occurs, the "Board of Inquiry" is called into session. The manager of the industrial relations department opens the investigation by identifying the injured, giving his name, classification and any other personnel information that may be of value during our investigation. If the case is not an injury, the industrial relations manager describes the incident, elaborating on the possibility of serious injury.

Next, we call upon the foreman to give us a detailed description of the accident, the near-miss, or the incident that occurred. He tells us where it happened, exactly how it happened, when it happened, the agency involved, if the employee performed an unsafe act, or if there was an unsafe condition present at the time of the accident. Our plant physician gives his professional opinion of the extent of injury and estimates the extent of disability. He describes the type of medical treatment that the injured will receive, surgery, physical therapy. He also offers his opinion on how the individual will co-operate and respond to this treatment.

During the investigation, corrective action is worked out in a "round table" discussion. All members of the board must agree on the corrective action that is to be taken. Using our five-step procedure, we agree on one of the following: Remove the hazard, guard the hazard, change the operation, protect the employee. If it is impossible to take any one of these steps, our only alternative is to warn the employee that the hazard is there. This automatically becomes the responsibility of the foreman to have daily communications with his employee.

We conclude our investigation with the "Board of Inquiry" by discussing the rehabilitation action that is to be taken. How and when do we return this employee to work on a full-time job. No doubt, there will be medical restrictions when this employee returns to work, and we cannot create a light-duty job that will satisfy his restrictions. Fortunately, we do have full-time operations, such as bench and repair operations in our trim department that we can assign for this rehabilitation period. Again, the members of the board must all agree on when and where we are to place this employee when he returns to work.

In conclusion of this investigation, we have learned what caused the accident and we have agreed to the necessary corrective action to be taken. We publish the facts, our findings, the agreements, to all levels of management. The publicity value of this "Inquiry" is showing that top management is interested enough to take time out to investigate the cause of the accident. It

draws much needed attention to accident prevention by keeping management interested and active in the safety program.

In the past five years, I have kept management informed on our safety performance through various programs. The four programs that have been the most successful are: The Serious Injury Index, line supervisors giving five-minute talks to their employees each day, five minute talks at the plant manager's weekly cost meetings, and the "Board of Inquiry."

Our safety performance for the past five years shows a definite continued improvement in frequency rating from a 4.13 in 1961 to a .31 for 1965. Our serious injury performance shows a tremendous improvement. In 1961 we experienced 90 serious injuries per million hours worked compared to 21 serious injuries per million hours worked in 1965.

Keep your top management interested in the safety program, and keep them active in the program.

NEW SAFETY CONCEPTS

Application of the Ford Motor Company's Serious Injury Index Within the General Parts Division

By THOMAS L. KOPKE
Div. Safety Engr., General Parts Div., Ford Motor Co., Ypsilanti, Mich.

A basic requirement in any safety program is the need for information that measures the effectiveness or ineffectiveness of the various areas of the program. To be truly effective this measure must remain sensitive to changes as they are made. It should be able to reflect the improvement that resulted from the newly installed material handling devices, the change in the style of gloves in a troublesome department, or the effectiveness of last month's safety poster contest.

We are all aware of Z16.1, the American Standard Method of Recording and Measuring Work Injury Experience. Much has been written in various safety periodicals, from time to time, on the merits of this standard. There are many proponents who advocate the use of the *frequency of disabling* injuries as the sole measurement of the effectiveness of our safety efforts. A smaller, though equally vocal, group would use only the *severity rate* for this purpose.

It is well recognized by both groups, however, that the greater the reduction in either of these statistics the less sensitive it becomes as a tool for the measurement of the affect, good or bad, of adjustments in our program.

Our division of the Ford Motor Co. employs approximately 17,000 hourly and salary employees at six plant locations in Michigan and Ohio. We are engaged in the manufacture of a wide variety of automotive parts, hardware, and accessories.

Four years ago, action was taken on a corporate-wide basis to develop a more accurate barometer to measure the frequency of accidents that would encompass more than the disabling injuries as defined by the Z-16.1 standard.

If we were to review the 1964 work injury experience of the Ford Motor Company, we would find that the company had a frequency rate of .81 disabling injuries per million manhours worked. Our general parts division had a frequency rate of .41 for the same period.

It is readily apparent that after disabling injuries company-wide have been reduced to less than one every one and a quarter million manhours, or within a single division to one every two and a quarter million manhours, the application of Z16.1 statistics is relatively insensitive to minor changes in the program.

In cooperation with the medical activity and after a period of trial application, a criteria for the classification of serious injuries has been developed. Classification of injuries is left in the hands of the plant physician. Injuries to be measured must be

determined to be occupational in origin, and the definition for each classification has been deliberately restricted to only the more serious of the non-disabling types, to assure that the seeking of medical treatment by the employees will not in any way be discouraged as the result of this program.

Without going into the exact definitions, our serious injuries are broken down into the following types:

A—Abrasions
B—Burns
C—Contusions
E—Eye Cases
F—Fractures

Also included are:

H—Certain Ear Cases
L—Lacerations
P—Puncture Wounds
O—Certain Occupational Diseases

To aid in the further statistical classification and analysis of these serious injuries, the part of the body involved, where applicable, is also recorded. Six broad areas of the body are used—namely:

1—Head
2—Hand
3—Arm
4—Body
5—Leg
6—Foot

As stated earlier, the general parts division, in 1964, had a frequency rate of 44 as the result of 12 disabling injuries. During the same calendar period, 668 serious injuries were recorded. Computed in the same manner as the frequency rate, we had a frequency of serious injuries, or as we call the statistic, a serious injury index of 24.55 serious injuries per million manhours worked.

This permitted us to thoroughly investigate, take corrective action, and measure the effectiveness of our program on approximately 56 times the number of incidents than would have been possible with the application of only the Z-16.1 standard.

After a serious injury occurs and is treated, information relative to the incident is transferred from the medical records to a serious injury investigation report. In addition to serving as a notification to the supervisor of the employee that the incident is considered a serious injury, we have found that requiring the supervisor to check the boxes under the accident type, unsafe act, unsafe personal factor, unsafe mechanical or physical condition, and the status of the corrective action, has improved the quality of his investigation and reporting of the incident on the required "Supervisor's Investigation of Injury."

When filed in the various offices, the four parts of the completed "Supervisor's Investigation of Injury" comprises the detailed record of the incident available for future reference in the event of medical or compensation complications.

The original 5"x8" card, with its accident brief, remains as our working report for use in statistical analysis. Depending upon the information contained in the supervisor's reports and the exact nature of the injury, our safety engineers, will on occassion also conduct an investigation of the serious injury and recommend additional corrective action.

Plastic tabs are positioned in coded squares across the top of the card to identify the type of injury and the part of the body involved.

When the accident brief cards are filed in a box on the top of his desk, the safety engineer has at his finger tips a reference of his serious injury experience. At a glance he can see the type of injury or the part of the body that may be involved in any sudden build up of injuries. For example, by pulling all the number 6 tab cards, he has a record of all cases involving foot injuries. A review of the accident briefs permits the safety engineer to quickly determine any patterns, conditions, or areas of the plant or safety program that require corrective action or stimulation.

In this plant, substantial progress has been made in reducing the number of fractures and contusions. As can be seen by the tabs on the cards in our box, the major problem area remaining involves minor lacerations to the hands.

Map pins may be positioned on a layout of the plant to pinpoint the location of serious injuries. This gives the safety engineer vital information at a glance. Concentrations of injuries become apparent and show the safety engineer where he most

effectively can devote his time on the floor to correct the unsafe practices or conditions that may ultimately result in a disabling injury.

In the office, the layout can be used in conversations with members of supervision in reviewing the serious injury experience of their area of responsibility on the floor of the plant. In the conference room, it can be utilized as a training aid in the periodic sessions devoted to safety and work injury experience attended by all line and staff supervision in the plant.

During 1965, the location of serious injuries involving maintenance personnel are being spotted with blue pins. Injuries to all other employees are being designated by red pins. We are analyzing these statistics to determine if there is any correlation between the location of high concentrations of injuries to production employees and the serious injuries being experienced by the maintenance personnel. Amassed together, the serious injuries also provide statistics on which action can be taken.

About 60 per cent of our serious injuries involved the employees' hands and arms. A breakdown of our disabling injuries would reveal almost this same percentage of involvement of the hands and arms of our employees. By taking corrective action to profect the exposed parts of the body, and through the more effective guarding of points of operation, and through material handling method improvements, we will reduce the potential for a repeat incident resulting in a disabling injury. We were even concerned with the smallest statistic of 3.8 per cent eye cases, since our plants all have 100 per cent eye protection programs in the manufacturing areas. Increased emphasis was given to the enforcement of the rules governing this program.

We also concentrated on the fractures and contusions. When we strike against, are struck by, or are pinched in an object or piece of equipment hard enough to cause a serious injury, we perhaps were only a fraction of an inch or a few foot pounds of energy away from an amputation or a disabling injury. Our 1965 experience shows a reduction in these areas. We attribute it directly to the corrective action taken as a result of this program.

These same 668 serious injuries broken down by the day of the week and by the shift on which they occurred also gave us valuable information to relay to our supervisors. 92 serious injuries occurred on the 1st or midnight shift, 280 on the 2nd or day shift, and 296 on the 3rd or afternoon shift. In comparing the percentage of total injuries per shift and the percentage of total hourly employment per shift, we find that 54.5 per cent of the employees worked days and these employees accounted for only 41.9 per cent of the injuries, while the afternoon shift had 44.3 per cent of the serious injuries with only 34.7 per cent of the employment. This reflects the increased employment throughout the division in 1964 that resulted in the new or low seniority employees working afternoons. Additional attention was devoted to the indoctrination and training of these employees.

Each shift experienced their highest total of injuries for the week on Mondays. It would appear that our employees do not come back to us after a weekend off, rested and ready for work, but rather fatigued from weekend trips to visit aunt Suzy or their favorite fishing site and therefore are more prone to be injured.

Our supervisors were requested to be more alert to the unsafe practices of their employees on Mondays, to include in their five minute safety talks references to weekend safety and the need to be alert to accident situations at all times. Finally, we changed the timing of the safety talks so that more were given on Mondays, not only to bring safety messages to the employee when they are most needed, but also to give the employee an additional short break on the job while safety is being discussed.

Application of these serious injury statistics has been of great value. We feel we have taken corrective action that has reduced our potential for disabling injuries. Even our serious injury index has reflected an improvement from year to year. Our index has dropped from 31 serious injuries per million manhours worked in 1963, to 25 last year, and it has been reduced still further to 19 thus far in 1965.

It has paid off in safety citations earned by approximately 21 per cent of our supervisors whose employees worked the entire calendar year of 1964 without experiencing a serious injury.

It has resulted in some of our individual plants establishing new plant records for manhours worked without a disabling injury, and still others established new records for their respective industries. We are satisfied for the present that we have developed a valuable tool in the measurement of the effectiveness of our safety program and hope that in the future we will have controlled our serious injuries to the point that at some future session of the Automotive and Machine Shop Section we will be discussing an even finer method of evaluating our safety performance.

SMOKE SIGNALS

(A skit about communication in the safety program)

By C. D. BRAINERD, J. B. HYNES, J. R. STONE

Each scene in this skit will point out one of the problems in communication that confronts a foreman in dealing with his men. In all five scenes the foreman involved is on the graveyard shift. He comes to work 10:00 P.M., and his job is to clean up all the mistakes made on the other two shifts, so they can start out with a clean slate the next day and goof things up all over again. He goes home at 7:30 A.M. and very seldom sees the superintendent, who very seldom makes a show until about 8:15, so it is easy to see that communication between these two individuals could be a problem.

To relieve this situation the superintendent came up with a great idea, a log sheet. The log sheet was intended to bridge the gap between shifts and make the running of the plant a smooth, continuous, trouble-free operation. The idea was to write on the log sheet anything you wanted to pass on to the next shift or anything you wanted them to pass back to you. Get it down in black and white; that was the idea.

There were several things wrong with the idea, but since the superintendent had come up with it, nobody pointed them out to him. When the superintendent comes up with an idea, you don't make brownie points telling him he's got rocks in his head, even though this fact is obvious. You learn to roll with the punches in the log sheet idea, because this thing works both ways. You have your day in court when you enter your notations for the next shift. You can confuse them just as much as they confuse you.

I am sure that one not familiar with the log sheet system would be at a loss to fully understand the ground rules for the use of this instrument. I'll run through these rules for you so you will better understand the delicacy of the relationship between the parties involved.

1. Don't put down anything you might want to take back later.
2. Refrain from being specific; broad hints are close enough. Let 'em figure it out themselves.
3. Do not volunteer to do anything for another shift; let them cover up their own mistakes.
4. Do not explain in detail; keep it foggy and beat around the bush, until you really know the angle.
5. Watch out for traps set by smart alecks on the other shifts. You can't be too careful.
6. Don't write plain; smudge it a little. A soft dull pencil is best for this purpose. You can erase, too, when you change your mind.
7. Do not wash hands before writing.
8. Never leave sheet where it is easy to find, make them hunt for it.

These are the general rules relative to the log sheet, and these rules are followed the world over wherever this form of communication is used.

Our foreman has learned to operate his department, not according to the log sheet, but, rather in spite of the log sheet. He usually takes a quick glance at the sheet

when he comes in at night, separates the wheat from the chaff and then goes on about his business. He is an expert at this screening process and being a strong advocate of the theory that every week is "be kind to your ulcers" week, he always comes up with about 90 per cent krud.

In all phases of business, including the safety program, communication is imperative to implementation, but "For crying out loud," says our foreman, "is this log sheet really necessary?"

Let's take a look at this problem from where he stands. Let's get this right from the horse's mouth. Here is the first scene, "The Log Sheet."

(Enter foreman — walks to desk — starts searching for log sheet.)

(To audience)

Don: This guy on the other shift is a slob. Just look at this desk. All this junk. He's just like a pack rat; brings everything back to his desk and drops it. I can dig down through this junk layer by layer and tell every move he's made all day.

I wonder what the heck he did with that log sheet. It looks to me like he could cooperate. We agreed to leave the log on top of this desk, but there isn't room for it with all this other junk.

(Picks up a handful of papers and goes to waste can—notices clip board and log sheet in can—removes same and goes back to desk.)

Now I wonder why he did that. Threw the log sheet in the waste can and left all that junk on the desk. Maybe he had the intention to clean off the desk and got his wires crossed. What I should do is toss the damned thing back in the can, and let him answer to the super. I wouldn't know what he wanted me to do to bail him out, and then he would catch hell from the super.

Wait a minute, old boy. Don't fall for a booby trap like that! He would swear he cleaned off the desk and left the log sheet there, right in plain sight. Then you know who would get the shaft—your uncle Dudley. I may not be too smart, but I'm sure not stupid. I'll just play it cool and ignore this little shananagan.

Let's see what little gems I have tonight. Boy, this is sure a hot one. I am certainly happy he got this one on the log as the first item. This whole place would have come to a grinding halt if this was put off too long. "You owe the flower fund $2.00." Isn't that a big deal. I know I owe the flower fund $2.00, but how am I going to pay up? I suppose I should get up in the middle of the afternoon and come in here to pay the $2.00. In a pig's vestabule. Let 'em sue me. They can drop dead before I send 'em any flowers. By golly, that's the way it works at that. Guess I'll have to pay up.

The second item says, "Mount new tires on new wheels on receiving dock." That makes a little more sense. We need those tires and wheels. Ordered them over two months ago.

(Goes to phone—dials number) (Fred answers from receiving dock).

Fred: Receiving dock.

Don: Who's speaking?

Fred: This is Fred.

Don: Fred, this is Don Brainerd. Do you have some wheels and tires down there for me?

Fred: Yes, we got 'em.

Don: That's good. Maybe things aren't all snaffed up after all.

Fred: What was that?

Don: That was just a little private joke of mine.

Fred: I didn't get the punch line, Don.

Don: Forget it. Is Sam Johnson out there?

Fred: He's here.

Don: Send him in here, will you.

Fred: Hey, Sam, the boss wants you. *(Hangs up phone).*

Don: Well, I'm off to a good start. So far things check out 100 per cent, and let me tell you something, that's a double eagle on this course. The other night that clown had me looking all over for the pick-up truck. The silly pot licker drove it home. Here I am looking all over and callin' the cops and everything, and all the time the damned truck is parked in his driveway.

He had left his car in the parking lot and drove the pick-up home. He didn't know his mistake till he and his old lady started to the movies. She said, "I'm not ridin' in no pick-up to no movie." He had to come over after his car, and the cops nailed him before he had gone 2 blocks. I let him

sweat for awhile. Told the cops I never saw him before in my life. They were all set to haul him in when I told 'em different. The cops didn't think it was too funny, but they were good eggs and told us to quit acting like a couple of teen-agers.

I wonder where that Sam Johnson is. *(Enter Sam Johnson).*

Don: Where you been, Speedy?

Sam: I was out there lookin' at those tires and wheels. What they for?

Don: They are for this winter. Snow tires and extra wheels for the trucks. We put the tires on the wheels and leave them mounted. Then in the fall and spring, all we have to do is change wheels.

Sam: You mean them tires go on them wheels?

Don: That's the idea.

Sam: Boss, I don't think it's gonna work.

Don: What makes you say that? Everyone is getting extra wheels for their snow tires.

Sam: There is something wrong, Don, my kid's got bigger wheels than those on her tricycle.

Don: Wheels always look small without tires. Go out and get one. You better bring in a tire, too.

(Sam leaves to get wheel and tire.)

Don: One of the toughest parts of my job is to keep guys like this from running me all over the plant on these wild goose chases. I could run my tail off if I didn't watch myself. I wrote it right down on the log sheet. It's probably still here. Let me see, that was away back in August or was it in July. Oh, I'm sure everything is OK. Old Sam just doesn't realize how small wheels look without the tires.

(Sam re-enters, carrying 20" tire and 10" wheel.)

Sam: They look too small to me.

Don: That's an optical illusion, Sam. They always look smaller with the tires off.

Sam: Yeh, but look at the tire. Looks mightly big for that wheel.

Don: Tires look bigger when they're off the wheels. It sorta works in reverse. Wheels look small and tires look big.

Sam: Why don't we try 'em and see.

Don: I was just about to suggest that.

(Sam tries to assemble wheel and tire and wheel goes right through.)

Sam: Like I said, them wheels is too small.

Don: Somebody goofed.

Sam: Who?

Don: I don't know for sure, but I'm certain I'll be asked that question.

Sam: That's near for sure.

Don: Let me look at that log sheet. It must have been in July.

(Frantically goes through old sheets still on clip board.)

Sam: Can't you find it?

Don: It's here someplace. I saw it. I remember. The one thing I can't remember is if I made the note on the log or if it was one of the other shifts.

Sam: Keep lookin', boss, and quit sweating.

Don: Here it is, and it's written in ink and on the day shift, July 24th. *Order wheels and snow tires* 10-20"; 20-10". If that isn't a huge mess that dumb jerk has ordered 10" wheels and 20" tires.

Sam: The tires are 14", boss.

Don: What size are the wheels?

Sam: Looks like they're 10" to me.

Don: I've got news for you, Sam, that still won't come out right.

Sam: What are you going to do?

Don: One thing sure, I'm not going to mount 14" tires on 10" wheels.

Sam: No, that don't work too good.

Don: Are these the only wheels on the dock, Sam?

Sam: No, there are some bigger ones and there are more of these 10" jobs.

Don: Why didn't you say there were some larger wheels out there. You gotta sharpen up, Sam. My old ticker won't take many of those deals.

Sam: I guess I just got carried away with them little wheels. We have 12 of these big tires and 12 wheels that are bigger than these 10" ones, but I don't know what size they are. You didn't ask me if we had bigger ones.

Don: OK-OK. How many trucks do we have?

Sam: Six—right on the nose.

Don: How many tires would we need for six trucks? Now use your head, Sam.

Sam: Thirty tires, including the spares.

Don: For crying out loud, Sam, I mean snow tires, and you know that's what I meant.

Sam: Twelve, yeh, twelve and that's what we have—twelve 14" snow tires.

Don: OK, Sam, get 'em mounted.

(Sam leaves and Don again directs his attention to the log sheet for July 24.)

Don: I wonder what he is going to do with those small wheels. It's right here as plain as the nose on your face. "Order wheels and snow tires" and right under that it says "tent stakes, 10-20" and 20-10"." Oh, oh, now I get it, he was passing this on to the afternoon shift. Sure, tent stakes, he was getting ready to take his kid on a camping trip. Those figures didn't have anything to do with the tires and wheels. He wanted the wood shop to cut some tent stakes for him on the afternoon shift. How cheap can you get. This damned log sheet can sure get mixed up. If I hadn't remembered about that camping trip, old Sam could have spent all night trying to figure out those tires and wheels.

Narrator: You can see that in this case having it down in black and white was not good enough as a system of communication. If the written word fails to get through, let us turn to a more direct and simple communication medium; man-to-man talk.

You know how valuable it is to have the feed back from the other guy when you're talking to him teeth to teeth. A meeting is the place to iron things out. There simply can't be any misunderstanding when you are all sitting there hearing all that is said. So, the best system seems to be to go right to the top; don't fool around with the little guys; get all the top dogs together and you'll get some decisions made.

And, then by all means, simplify the thing so even your cocker spaniel could understand it. That's the way to communicate—or is it? Well, let's see.

Here is a situation that took place in a plant a couple of weeks ago. One of the customers ordered 24 experimental connecting rods. The type of steel to be used in the forging operation required special treatment, so it was necessary to set up an identification system so the special order would not become mixed in with the regular current model connecting rods.

A meeting was held with the various department heads, and it was decided that a good healthy "dab" of yellow code paint on each of the 24 connecting rods would give them the necessary special identification. You can't get much simpler than that.

Even though the various department heads all agreed on the yellow paint code system, the special connecting rods got lost. See if you can figure out why!

Here is Scene two, "Rods is Rods"

(Enter foreman—walks to desk.)

Don: I wonder what happened to those 24 experimental connecting rods. I don't see how we could have made a mistake, Production, Material Handling, and Reliability Department heads were all in the meeting. They were supposed to be shipped yesterday afternoon. I'll check with the shipping dock foreman; maybe he can give me a clue.

(Dials phone—shipping dock foreman (Mike Adams))

(Mike answers phone).

Mike: Hello, Mike Adams speaking.

Don: Mike, this on Don Brainerd. Have you had any special experimental connecting rods code painted (yellow) show up at your shipping dock?

Mike: What did you say?

Don: Have you had any connecting rods, painted yellow, show up at your shipping dock?

Mike: Painted yellow? What are they doin' painting the inside of the engine now?

Don: Don't give me any of your wise cracks. This is serious. We got over 500 bucks tied up in each one of those rods.

Mike: Well, what about the yellow paint deal?

Don: Didn't your boss talk to you about the special yellow paint code?

Mike: Come to think about it, I did hear him mention something about yellow paint a couple of weeks ago when he got back from some meeting. He no more got in the office when his "old lady" called. Right after that he put his hat and coat on and took off. I heard him mumble something about yellow paint on the way out. I thought maybe his "old lady" was crowding him about some

paint job at home; she's quite a fire ball, I guess.

Don: Well, look, Mike, haven't you got someone working for you that would know if any connecting rods painted yellow showed up at your dock?

Mike: Yeah, Old Earl on the scales would know if anyone does. He's right outside my office. Let me send him up so you can talk to him.

Don: (Turning to audience after hanging up phone). What a note! You know if we lose those special rods, it will take about six weeks to run 'em over again. It takes five weeks to get that special steel, a week to alter a set of dies and about five days to forge the rods.

I'm telling you, we simply have to locate those rods before they get mixed in with another shipment. They had better show up or we all might get the sack.

I know one thing, I made the rods and put the "dab" of yellow paint on 'em like my boss said. Then they went to Heat Treat. I followed them that far.

(Enter Earl Huffnagle—Scale man).

Earl: Hello, Don, you want to see me?

Don: Earl, have you received any special connecting rods, code painted yellow, you know, a "dab" of yellow paint for identification?

Earl: I don't know nothin' about special rods or this yellow paint deal you're talkin' about. We get parts down here all the time that's got paint drizzled on 'em, all colors, too. Where does that paint come from anyway?

Don: Look, Earl—Have you seen a small container of 24 connecting rods painted yellow come over your scales?

Earl: No, I ain't seen a small container. Only thing I saw was a big regulation stock gon with 24 little connecting rods lying in the bottom.

Don: Yeah, Earl, that's the ones. What did you do with them?

Earl: I threw them in with a full gon of rods. We shipped them out last night. Didn't made much sense to me to ship 24 little rods in that big 500 lb. gon, thought they might get lonely.

Don: Ohono, Earl, you didn't!

Earl: Oh, yeah, Don, I did. Say, why all the crying over 24 little old connecting rods? We ship 5 to 10 thousand every day.

Don: Earl, didn't that yellow paint mean anything to you?

Earl: Not a damn thing. I have stuff come over the scales evedyday painted up like a rainbow, pay no attention to it.

Don: You mean to tell me you don't know what the yellow paint means?

Earl: I sure don't, but I sure would like to find out.

Don: Oh, boy? I gotto get going; have to put a tracer on those rods, for crying out loud.

Earl: Don, why do they "dab" them rods with paint—don't make 'em no different—to me rods is rods.

(Both exit in a hurry).

Narrator: We will have to take a dim view on meetings as the perfect system. The problem is to implement all the decisions made in these meetings, and that is where the "foul ups" usually come.

But, we must communicate, so let's turn to a communication device—the telephone. When Mr. Bell invented this device, I'm sure he visioned it to become a social curiosity and not the economic necessity it has turned out to be.

If you give it some thought, you will have to acknowledge both the unique advantages and disadvantages of the telephone as a communication medium. A little guy can tell a big guy to drop dead over the telephone and get by with it; so the telephone has built the courage of many normally timid individuals.

Another observation worth noting is the fact that you can't see the face of the one to whom you are talking. His lips can be saying one thing and all the rest of him can be saying something entirely different.

The telephone is a big step forward from the telegraph, which was a big step forward from the tom-tom, but as wonderful as the telephone is, it has its faults.

Let us view the next scene, which centers around a telephone conversation. This is the situation, and as you will see, all is not crystal clear in the conversation. The night shift area maintenance foreman receives an anonymous phone call involving a complaint about a hole in the floor and inadequate

lighting. The employee making the call is not only vague about the location of the hole but "in the dark" as to where he works, who he works for, and the total reason for his job.

Did this ever happen to you? Did you wind up with a "short fuse," or did you "stay" with the employee until you had all necessary information. Think it over.

Here is scene three: "Come to Me Wherever I Am."

(Foreman enters and walks to desk.) (Phone rings and foreman answers.)

Don: Hello.

Employee: Down here where I work it's unsafe.

Don: What do you mean? What seems to be the trouble?

Employee: Well, they dug a hole in the floor next to the aisle, and somebody's going to fall into it. I damn near did, and besides that, there ain't enough lights in here.

Don: OK, OK, what building are you in?

Employee: What do you mean, what building? It's down here where I work.

Don: OK, where do you work, and who's your foreman?

Employee: I work on the engines, and it's in the building where you turn to the left after you come in from the parking lot and you walk toward the railroad tracks.

Don: Well, that helps, but who is your foreman?

Employee: My foreman?

Don: Yes, your foreman.

Employee: Oh, I guess his name is Gus, but he ain't here, he's on vacation.

Don: What's his last name?

Employee: Gosh, I don't know, all they ever call him is Gus.

Don: If he's not there, who are you working for now?

Employee: He's a new guy; they call him "Lefty," but he's not around. I haven't seen him since I came in.

Don: Who is the general foreman and superintendent in your department?

Employee: I never heard of no general foreman, and I guess the superintendent is from Plant 11.

Don: What's the superintendent's name?

Employee: Boy, you got me, but he's a tall, thin, grouchy guy; and he wears glasses and drives an Oldsmobile. That's all I know.

Don: Well, to get back to where you work; which building did you say it was?

Employee: Well, I didn't say, but it's the one by the railroad tracks where I work on engines.

Don: It is near the press plant?

Employee: Yeah, the press plant is about 90 rods yonder.

Don: Which direction from you?

Employee: Well, let's see, the sun sets out that-a-way — that'd be West, wouldn't it? Yeah, then it's to the left of that.

Don: That would be South.

Employee: Yeah, I guess that's right.

Don: OK, now the tracks you mentioned; which dock are you talking about?

Employee: What do you mean, which dock?

Don: I mean the number or name of the dock, like 15 or 25 or XYZ.

Employee: Gosh, I don't know except it's by the railroad tracks, and they switch railroad cars in and out every once in awhile.

Don: What do they load or unload from the railroad cars?

Employee: Well, once in awhile some big machines come in on flat cars, and they unload them with "cats."

Don: What else do they unload?

Employee: Well, mostly "load." There's a couple cranes on one end and they load steel.

Don: What kind of steel?

Employee: Mostly stuff they bring from all over the plant in little carts and dump.

Don: How do they load the railroad cars?

Employee: Oh, they got a magnet on the cranes they pick up steel and dump it in railroad gondolas.

Don: That's at the scrap pits, track 14. Now where do you work from there?

Employee: Well, I work in the building next to the other track.

Don: OK, then you would be in Bldg. 338, Track 15.

You said you work on engines. What kind of work do you do?

Employee: I get the engines ready and bolt them down.

Don: Bolt them down to what?

Employee: I put 'em in racks and bolt them down in the racks, then they put the racks in railroad cars and then they haul the railroad cars to California and to Texas and to New Jersey.

"Jees," you ask a lot of questions. How about that hole I was telling you about?

Don: Well, look, fella, first I have to know where it is.

Employee: Well, I tole ya. You guys and the safety department are always preachin' safety. Why don't you do somethin' about it?

Don: We will, we will. I'll have someone down there just as soon as I can. Now, what's your name so we can look you up to show us the exact location of the hole?

Employee: Now, wait a minute, I don't want to get mixed up in this, and get somebody in trouble. All I want is get the hole fixed and some lights before somebody gets hurt. You know, I believe in safety.

Don: OK, fella, OK, we'll be there.

(Foreman hangs up phone and exits).

Narrator: OK, if phone conversations fall down, and meetings have shortcomings and even written log sheets are not what they are cracked up to be, just where do we go from here? How does this sound—we are going to eliminate all three in the next scene. Here we are going to involve only one man and his foreman. The foreman is going to put one of his men in business for himself. He will cut communication and instructions to the core and merely tell the employee what he wants as the end result.

The foreman has a big gon filled with small special screws. He called to one of his men, George Grove, and said, "count 'em." And George started to "count 'em." There couldn't possibly be a slip up here—do you want to bet?

Here is Scene Four. We call this one, "Button, Button, Who's Got the Button."

(Enter foreman, walks to desk—next enter employee, George Grove, who walks to foreman's desk.)

George: Don, we just had a disaster out there.

Don: Did anyone get hurt?

George: No, but we sure are in a mess with those little screws we've been counting.

Don: Is that a fact. What kind of a mess are you in?

George: How close does that count on those screws have to be?

Don: Damned close; my boss wants to know just how many we have, not about how many, no approximation, exactly how many right on the nose.

George: Couldn't we just lump 'em off and give him a figure? he wouldn't know the difference, would he?

Don: George, you have been around here for 22 years, and you know the old man as well as I do. When he wants to know how many, he means just that.

George: We lump count all the other parts. How come he's so damned exact on this one?

Don: Those are special screws, and we have to order them away ahead. He wants to know how long it will be until they are all used up.

George: I figured it was something like that.

Don: What about this mess you said you were in? You have been working on that count off and on for the last three days.

George: I'm going to have to have a couple more days before I can give you a figure on 'em; an exact figure.

Don: What have you been doing. I told you I had to have that count before tomorrow morning. Haven't you been working on it. I can't watch you guys every minute. Haven't you been counting them?

George: We've been counting 'em, Don, but for gosh sakes, a whole gon of those damned little screws takes a lot of counting. There must be a million of them little devils in that gon. Why don't we just lump 'em off and give him a figure. We can count 'em later on when that gon gets down a little.

Don: We can't do that. Haven't got that much time. We have to know where we stand and by tomorrow morning.

George: Tomorrow morning!

Don: That's right—tomorrow morning.

George: We won't make it, Don, we just won't make it.

Don: What do you mean, we won't make it? We gotta make it! You have part of 'em

counted, haven't you? You been working at it three days.

George: Yep, three days work right down the drain.

Don: What do you mean by a crack like that? Three days work down the drain?

George: That's the disaster I told you about.

Don: You haven't told me about it yet, but I sure wish you would; or putting it another way, what happened out there?

George: You won't get sore, will you, Don?

Don: I'm already sore, and I don't know yet what kind of a mess you're in.

George: It wasn't my fault, Don; it was that cockeyed truck driver from the shipping department. Whoever put him on a truck should have his head examined.

Don: I happen to be the one who put him on the truck.

George: Oh, it was you. I didn't know that.

Don: Don't try to blame your mistakes on the truck driver. Go ahead and tell me what happened. Was the truck driver helping you count the screws?

George: Helping? He cancelled out my three days count with one big sweep, if you want to call that helping. That guy is a menace to the human race when he gets on that truck, he goes like a maniac.

Don: He does a lot of work. You have to keep going to get things moved around here.

George: He sure moved my count on those screws.

Don: You sound like he ran over you.

George: The only reason he didn't hit me is because I was on my break. You can't even have a break with any security with that guy loose.

Don: He's not that bad, and you know it.

George: He loused up my count when I was on break.

Don: How could he possibly do that?

George: That guy is a genius at two things; being stupid and lousing things up. He doesn't know rights from lefts and that includes his feet. His old lady must have left him on a merry-go-round too long when he was a kid.

Don: So, what does that have to do with spoiling your count on the screws?

George: Well, you know how many of them damned little screws there are in that gon?

Don: No, I don't know; that's what I wanted to find out, that's why I told you to count them.

George: Don, quit clowning. You know I didn't mean it that way, this is serious.

Don: Brother, you don't know how serious this deal will be if we don't have a count for the old man in the morning.

George: Yeah, I know, but did you ever count up to a million—that's a long ways to count.

Don: What do you mean, a long ways to count?

George: Just imagine now—three hundred thirty-one thousand one hundred and twenty-one—three hundred thirty-one thousand one hundred and twenty-two—three hundred and thirty-one thousand one hundred and twenty-three. That would drive a guy nuts.

Don: It would get monotonous, I'll admit.

George: I got up to two thousand by that method, and I couldn't even see where I'd been in the gon, so I figured out a system.

Don: But, your system backfired, eh, George?

George: Not by a damn sight. It was old cockeye that fouled me up—the system was air tight.

Don: What about this system?

George: Well, I figured I would use the same idea you use on a speedometer on your car. You know how when 99 comes up the next number is 100?

Don: Don't tell me you used a speedometer to count screws?

George: You're clowning again, Don; you know damned well I didn't.

Don: I'm not sure yet what you did.

George: Listen now, Don, because this is my system.

Don: I can assure you that I'm very happy that we are finally getting around to that.

George: I'll ignore the wise crack and proceed.

Don: Please do.

George: Anyone can count to 100, right?

It's sorta fun, but to a million? That ain't fun. It would drive you off your rocker.

Don: True, true.

George: Well, I got an empty gon and put it beside the one with the screws in it. I put 'em about one foot apart, and then I got a stock pan and set it up on the edge of them two gons. I would count out a hundred screws from the full gon and toss them in the empty gon, then I would toss one screw in the stock pan.

Don: That sounds like good thinking.

George: I had that whole gon of screws counted out 100 at a time, and every screw I had tossed in the pan represented 100 screws counted and in the other gon.

Don: Good thinking, George.

George: All I had left to do was to count the screws in the pan and multiply by 100, and I had the count for the whole big gon of screws.

Don: George, I hate to ask this question, but I have no choice. What happened?

George: Well, it was time for my break, and like I said, I left that pan of screws sittin' up there between those gons.

Don: Yes?

George: When I came back, the empty gon was gone and the pan was on the floor. The screws were scattered down in the cracks and all over the place. Old cockeye said they needed the empty gon, so he just took it, Said he didn't know anything about a pan of screws falling.

Don: Holy cow, you lost your count!

George: Don, you will never make a truer statement, nor one that hurts me more.

Don: We have to have that count tomorrow morning; what are we going to do?

George: Estimate, Don, estimate, we'll have to lump count 'em.

Don: Guess we will. Do you remember how many screws were in that pan?

George: If I knew that, I wouldn't be in here bothering you.

Don: No, George, I mean about how full the pan was.

George: Yes, approximately.

Don: Well, I'll you what to do; but if you ever say I told you to do it, I'll deny it.

George: I won't say nothing to nobody.

Don: Fill that pan to where it was as near as you can remember, count 'em, multiply by 100, and then bring that figure in here to me pronto. Understand?

George: Yeah, I understand. I already did that.

Don: You did?

George: It comes out 537,123 screws. Right on the nose.

Don: Why didn't you tell me this in the first place?

George: You said you didn't want to bunch count 'em.

Don: That was before I knew what happened.

George: Bunch count is the best we can do now, boss.

Don: You go back out there and dig up every last screw you can find; on the floor, in the cracks, everyplace and put them in that tub.

George: Some of them are going to be pretty hard to find. I grabbed a handful out of the pan and threw 'em at old cockeye.

Don: Out of the pan, before you counted and multiplied?

George: Yep!

Don: Well, that will give us a short count. If they don't have enough according to the count, they will order more, but that's in our favor.

George: Suppose they end up with too many?

Don: George, reducing inventories is easy. If we have too many, we can lose a few. The tough thing to do with inventories is build 'em up when they're short, get it, George?

George: I get it, you son of a gun, I get it!

(Foreman and employee exit).

Narrator: We have just about run out of ideas, but we still have one left. How about signals as a communication device. The Indians used smoke signals, and they didn't get fouled up, as far as I know. They use traffic signals at street intersections, and there are not too many accidents at location protected by these devices. Railroads run trains both directions on a single track with a minimum of crack-ups.

You know, by golly, this signal idea might

help get us out of this rut. Our final scene we will call, "What Happened to Bill"?

(Foreman, Don Brainerd, enters scene and walks to his desk.)

Don: I don't know why it is, but some of these guys just can't make it in after payday. They get a dollar in their pockets, and they're off to the races. Gotta hurry and get it spent. Yesterday was payday, and the damned bunch of 'em were here. I could hardly find enough work for them to do. I even got the place cleaned up; and I can assure you that is done only when we have plenty of manpower.

Tonight, out of 31 men, seven didn't show up. I just ran down the list and besides the regulars (I have three characters that I call regulars because they are always off after payday), besides the regulars, I have four guys off who usually are pretty dependable. Of these four, three called in sick. They said they had the summer flu. The last guy didn't call in, and I hate to call him in the middle of the night. He might be sick, too, and I would feel like a damned fool if I got him up out of a sick bed to answer the phone.

Wait a minute—I believe this man, his name is Bill Goff, I believe he is in a car pool with a couple other men who work here in the shop. I can't let this absenteeism get out of hand. I never would have enough men to run my department. These three guys, including Bill, live on farms and they take turns driving. One of them, they call him Elmer, I think, delivers parcel post packages from the receiving dock. He's in here about every night delivering a package.

(Elmer enters carrying a package—walks to desk and places package on floor.)

Elmer: Here's a package for you, Don. Weighs about a ton. What's in there, lead?

Don: No. I think it's some new gears for one of our lathes.

Elmer: Do they ever make gears out of lead?

Don: I don't think so.

Elmer: Cost us $8.11 freight on that package, just from Chicago. I ordered a kitchen range from Sears and Roebuck, and the freight on that was only a little over 10 bucks. Sears is in Chicago, too, you know.

Don: This was fast freight, and that costs more.

Elmer: It does for a fact.

Don: Elmer, are you in a car pool with Bill Goff?

Elmer: Yes, we ride together.

Don: Do you know why he isn't on the job tonight? Did he send in word with you?

Elmer: He intended to come to work, but we stood him up.

Don: What do you mean you stood him up?

Elmer: We didn't pick him up.

Don: Well, that's not a very nice thing to do to a man who is depending on you. Just not pick him up.

Elmer: We went over there, but he didn't show. We figured he drove his own car, so we came on in.

Don: Oh, you didn't talk to him.

Elmer: Yes, I talked to him after I got into the shop and saw he wasn't here, I phoned him.

Don: Is he sick?

Elmer: No, he's hale and hearty; but is he ever burned up. Not at us, but at his old lady.

He said he'd be in as soon as he gets things organized out there.

Don: I hope so. We're a little short of men tonight. What's his problem, anyway?

Elmer: It's pretty complicated.

Don: I though you said he and his wife were going round and round.

Elmer: That's just part of it.

Don: What else is bothering him?

Elmer: Let me fill you in all the way.

Don: OK.

Elmer: Did you ever ride in a car pool?

Don: No.

Elmer: One rule is that you don't wait. If a guy doesn't show, you take off and leave him. Otherwise, you would be late to work every night waitin' for guys. In our pool you're either waitin' for us, or you get left.

Don: I can see this would be a problem.

Elmer: Well, this guy, Bill, lives away back off the road and in the winter he lets the snow pile up in the lane—parks his car out by the road and walks to the house; so we always pick him up at the end of his lane by the mailbox.

Don: He wasn't there tonight, though.

Elmer: No, he wasn't. Usually when he wants us to pick him up, he puts the flag up on his mailbox. When we see the flag up, and he isn't in sight, we lay on the horn, and he boils out of the house and down the lane. He knows that we would be in our rights to just drive off, even if he is hot footin' it down the lane.

Don: You wouldn't do that, would you?

Elmer: No, but he is usually there waitin' for us.

Don: But not tonight.

Elmer: The flag was "down" on his mailbox, and Charlie Smith, he's the other guy in our pool, and me stopped anyway. We blew the horn eight or ten times and waited for him. It was dark up around his house, and there was only one little light burning out in back. We could see that his car was gone. And his cow was turned out. So we figured he had gone on ahead of us in his own car.

Don: Well, he didn't show up here yet.

Elmer: We came on in and looked around for him, and then I called him on the phone. His old lady answered and she was really laffin! I asked where Bill was, and she said I wouldn't believe her if she told me, and she kept on laffin'.

Don: Where was he?

Elmer: At that moment he was out in the barn takin' a bath.

Don: In the barn?

Elmer: That's what she said, and then I heard Bill yellin' as he came in the house.

Don: What was his wife laughing at?

Elmer: It is funny when you think of it, but I'd hate to have it happen to me.

Don: What happened to Bill?

Elmer: Well, it all goes back about two years. You remember when he was doing all the plumbing out there at his house. He nearly drove the guys in the pipe shop nuts askin' 'em questions about pumps and pipes and things like that.

Don: Yes, I remember when remodeled his place. Did a nice job, I hear.

Elmer: He put in the biggest septic tank you ever saw, 8' deep and 10' square.

Don: Yes, I heard about that.

Elmer: He never made a good cover for the tank. He had too many other irons in the fire at the time. He just put some old planks over the top and shoveled on a foot or so of dirt.

Don: That is not good. Did it cave it?

Elmer: No, it didn't cave in. Today he started to build a cover for the tank; he had finally got around to it, had his corn all in and all his chores caught up. He had dug all the dirt off and banked it up around the edge and was all set to start working on the cover tomorrow. He worked clear up till dark, got ready to come to work and was readin' the paper when he remembered he hadn't put the flag "up" on the mailbox. He rared up out of his chair, out across the front yard, and went head first into that damned septic tank.

Don: Holy cow, what a horrible thing to fall into.

Elmer: The worst of it was, he couldn't get out.

Don: Couldn't his wife help him?

Elmer: She had took the car and was down the road to the neighbors with the kids. He heard us stop and blow the horn, and he hollered. We even heard him, but figured it was his cow bawling.

Don: How in the devil did he get out?

Elmer: Well, he stood there on his tippy toes to keep his nose above the surface and waited. Every once in awhile he would holler, but to holler he had to jump up in order to keep from gettin' a mouthful. In about an hour the old lady came back; and when she heard him and got a flashlight and found him, she just stood there and laughed. Then she had the kids come out and have a look, and they all laughed.

Don: How did he finally get out?

Elmer: They passed a ladder down to him, and then washed him off with the hose.

Don: What a mess!

Elmer: He didn't smell like no rose, I'll bet.

Don: No, that's for sure! I'll be he didn't!

Elmer: His wife wouldn't let him in the house to clean up, made him go out in the barn and use the watering tank. All the time, she was laffin' and he was gettin' madder and madder.

Don: I don't blame him.

Elmer: His old lady is about twice as big

as he is, so he just boiled inside and didn't say much.

Don: Where does he stand now?

Elmer: He got clean enough in the barn that she let him in the house, and when I talked to him, he was goin' to take a bath in hot water and then come on in to work in his car.

Don: I hope he gets here soon. Did he hurt himself in any way?

Elmer: Just his feelings and his pride. Too bad he didn't remember to put that flag "up," we would have gone back to his house and looked for him if the flag had been up.

Don: Well, thanks for filling me in.

Elmer: (Turns to leave). If he had only put that flag up.

(Exit foreman and employee).

Narrator: The five scenes in this skit were humorous, but the problem prompting us to present the skit at this meeting isn't one bit funny. There is not a single person in this room who has no communication problems. Let us refer directly to the safety program in your plants or more specifically to the safety problems in your own departments.

Where do you have your trouble? Is it in knowing how to operate safely, or is it in putting into effect what you know is safe. I think you'll all agree that, generally speaking, we have pretty well planned objectives in our safety programs, and that, in most cases, we have just about all the facilities we need to work toward these objectives. But, somewhere along the line these plans peter out, and we have accidents that were actually anticipated in our planning. We knew that hazards existed and that unsafe acts were a problem, but control of these accident factors was somehow lost.

The safety people in this audience are not excluded in this problem. If we stand by and see our good plans go for naught, we should not attempt to ease the situation by coming up with new plans. Maybe we should stay with the plans we already have and look the system over for leaks and breaks. Then we should plug the leaks, patch and re-enforce the breaks, and give the plans another try.

When a safety program appears to be falling down, it is usually found that there is a breakdown, not in the program, but rather in the implementation of the program. These breakdowns invariably involve poor communication; between management and foremen, between foremen and their men or between the men themselves.

Implementation is communication. There is no perfect single medium of communication. All forms of communication must be used and not just once, but over and over again.

Can you go overboard on communication? I don't think so, at least not in the safety program. In those I've seen, there has always been a shortage in this area.

So, keep this skit in mind back in your plants no matter what your job is. Remember that smoke signals might have served old Chief Rain in the Face well, but in the safety program we must have complete understanding all the way down the line.

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NOISE MEASUREMENTS IN THE CEMENT AND QUARRYING INDUSTRIES

By ANTHONY WOEWUCKI, JR.
Director, Industrial Hygiene Dept.
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I will briefly sketch the background of the problem of noise in industry, both from the standpoint of the effect of noise on people and also the legal aspects, such as workmen's compensation for its damaging effects to hearing.

Noise—unwanted sound—has three principal effects on a person:

1. Behavior—fatigue
2. Speech interference
3. Loss of hearing

The noise I speak of is the industrial noise in the audible frequency range of 20 cycles to about 10,000 cycles per second with an intensity range of about 80 decibels to 120 decibels (db).

Continuous loud noises develop a sense of annoyance with resultant feeling of irritability and fatigue. There doesn't appear to be any other significant behavioral response other than this sense of fatigue.

Communication between workers by speech is severely impaired, in general, and occasionally made impossible by loud noise.

Continuous loud noise also causes permanent partial hearing loss by damaging the nerve system of the inner ear.

Industry is concerned with all three effects of noise; behavior, speech interference and hearing loss. However, my comments will pertain to the loss of hearing effect of loud noises.

The foremost purpose in the prevention of noise-caused hearing loss is, as with the prevention of other occupational diseases and injuries, the preservation of the total health and well-being of the worker.

Failure to do this results in a physically impaired worker who is unable to fully enjoy the pleasures of living.

In the industrial environment, the impaired worker may be less efficient and, of course, disability results in compensation claims whether it be from physical disability or physiological impairment.

Dating from the test cases for compensability of loss of hearing from industrial noise in the states of New York and Wisconsin, there have been quite a few claims filed in various states, notably, Wisconsin, New York and California. Although only four states have specific laws, there are probably 30 other states where noise deafness is compensable in one way or another.

States that are considering legislation include Rhode Island, New Jersey, Michigan and Pennsylvania. States considering amendments which would have added occupational hearing loss to their legal schedules include Colorado, Illinois and Arizona. I am confident that the number of states passing such legislation or amendments will grow with the passage of time.

I would like to make a few background comments on the hearing conservation criterion curves which I have used as a basis of evaluating the degree of hearing loss potential of various noises which I have measured in the cement manufacturing and quarrying industries. These criteria are patterned after the curves proposed by Jones and Church, Medical Research, Division, ESSO Research and Engineering Company, Linden, New Jersey and published in the December 1960 issue of the American Industrial Hygiene Association Journal, titled "A Criterion for Evaluation of Noise Exposures."

These curves, as in the case of most hearing conservation criteria, are based upon the varying sensitivity of the human ear to noises of different frequencies.

Essentially, the ear is less sensitive to noises in the lower frequencies (blow 300 cycles per second) as well as the noises in the higher frequencies (above 4800 cycles per second). It is more sensitive to damage from noises in the mid-frequencies of 300 cycles to 4000 cycles per second.

Most industrial noises cover a wide range of frequencies and unfortunately, a majority of the acoustical energy in an industrial noise is generally located in the mid-frequency

range, which is the sensitive range for the human ear.

Therefore, to evaluate the hearing damaging ability of a noise, one must analyze the noise at least by octave band in order that the over-all spectrum of the noise in question can be observed. A single over-all sound pressure level in decibles is not enough to give this necessary information. In the course of our examination of the various noise spectrums which I have measured, we will come across examples of similar noise levels, however, with different distributions of the acoustical energy throughout the audible range.

The equipment used was the Bruel and Kjaer Sound Levelmaster, Model 2203, and Octave Filter Set, Model 1613.

I have attempted to keep these observations in the order of material flow from quarry or mine to finished product, except in the case of drilling, which I will discuss later.

A Diesel shovel observation indicated an over-all sound level of 106 db. The energy spectrum is fairly flat with a rising and falling intensity in the 4,000 cycle area. This will illustrate the criterion curves of Jones and Church as mentioned earlier.

Essentially, we have a series of exposure-time lines plotting the permissible noise exposure in hours per day or hours per week plotted against the sound pressure level in decibels for various frequencies in the audible range. Thus, to take an example, the curve for 20 hours per week or four hours per day permits a level of 88 db. at 500 cycles per second, 88 db. at 1,000 per second, 89 db. at 4,000, etc. These are for noises that are continuous and apply to continuqus exposure of the worker throughout the day, naturally allowing for a lunch period. The noise analysis of the diesel shovel indicates that a permissible exposure of one hour or less without ear protection is the maximum permitted in order to effectively conserve the hearing of the worker so exposed throughout his work life.

Using an empty Euclid truck driving out of a mine, three tests were run, with a range from 112 to 118 decibels, the over-all sound pressure level very high.

With a Euclid truck loaded in low gear, the over-all sound level was 109 db., which is significantly less. Note that the acoustical energy is concentrated in the lower frequencies, around 125 cycles, which is good. Very little of the energy is in the range of the ear's highest sensitivity, which would be 500 to 2,000 cps.

Studying a Caterpillar Tractor DW-20, the spectrum follows a pattern similar to the previous one, although more of the acoustical energy is in the higher frequencies (500-1,000 cps.). This makes the noise more hazardous even though the over-all level is lower. This is 104 db., the other was 109 db.

With a 42-inch gyratory crusher, the over-all sound level was 100 db., with most of the energy concentrated in the lower frequencies, therefore there is little hearing exposure.

Using the same piece of equipment, the measurement was taken inside the operator's glass booth. The over-all level should read 87 db. There is no exposure from this noise whatsoever.

Testing a 48-inch gyratory crusher, the over-all level was 102 db. A greater portion of the energy was in the high frequencies than in the case of the 42-inch gyratory.

A 30"x42" jaw crusher, registered an over-all level of 100 db, with the acoustical energy distributed similar to the gyratory. In this particular case, the crusher is located in a low ceiling building and the operator's station is almost directly over the crusher. The building, I feel, permits quite a bit of reverberation of the noise.

A similar jaw crusher in the open, permits a dissipation of the noise from the crusher since the sound has essentially a fairly high degree of directivity which is aimed directly upward. Both were crushing limestone.

A Penn impactor, held an over-all sound level of 109 db, and a good portion of the acoustical energy extends into the middle frequency range. This increases the hearing exposure. The loaded Euclid was 109 db also, but most of the noise was at 125 cps.

With a 600 H.P. reverse impactor, at 106-107 db, the pattern was similar to the Penn impactor.

A 4-foot Symons mill registered 102 db, with the acoustical energy spectrum relatively flat and extending into the middle and high frequencies, a higher hearing exposure than the 48-inch gyratory at 102 db.

A 3-foot Short Head Symons Mill, with

97 db had energy distribution similar to the 4-foot Symons.

With a Jeffrey Hammer Mill at 114 db, a great deal of the acoustical energy is concentrated in the lower frequencies, but a sufficient amount extends into the middle frequencies to produce a hazardous noise.

A Tyler Screen, 8x5, showed 108 db, and though a lot of the energy is in the lower frequencies, there is sufficient in the middle and upper frequencies to make this hazardous.

Another Tyler Screen at 106 db indicated over-all noise less than in the preceding test, but more of the energy is in the middle and upper frequencies, which in effect makes this a more hazardous noise.

A test of a Wet Mill feed, showed 103 db with a good portion of the acoustical energy concentrated in the middle frequencies. This offers a hearing exposure.

A Wet Mill discharge at 104 db had acoustical energy distribution essentially like the feed, however, more of the energy is in the lower frequencies. This cuts the hearing exposure down somewhat.

Three kilns, one gas-fired, at 99 db, one coal-fired at 103-6 db and one oil-fired at 105 db had most of the energy concentrated in the lower frequencies. Hearing hazard is slight.

Of the three observations on kilns, the lowest one, the gas-fired, has more of its energy toward the center frequencies, which, therefore, offers a greater hearing loss exposure than the other two. However, I do not consider the exposure in the gas-fired kiln as being significant.

Test of a Finish Mill feed, 10'x34', showed a range from 107 to 110 db, depending on location along mill. The acoustical spectrum essentially follows the pattern of the raw mills. Hearing exposure is very high. Fortunately this plant is automated.

At a smaller mill than the previous one, the acoustical spectrum is essentially the same, only lower in intensity in the frequency range of 500 to 2,000 cps. Hearing exposure is high.

Finish Mill discharge, at 102 db has a spectrum essentially the same as the feed but lower in intensity. This is typical of a mill, whether it be a raw mill or a finish mill. Hearing exposure is moderate to low.

Bag packing operations registered 94 to 98 db, with the energy concentrated in lower frequency, offering no hearing loss exposure to the worker.

In both a coal car shaker at 118-20 db, on empty car, and a raw material car shaker at 128 db, the intensity was extremely high in all frequencies, offering a severe exposure to the hearing of the worker, who should have constant ear protection, regardless of how short the time that he is exposed.

In a motor room, (101 db), the acoustical energy extends into the middle frequency range, increasing the exposure to the worker to a moderate level.

In a coal mill (109 db), although the principal acoustical energy is concentrated in the lower frequency range, it is not sufficiently low in frequency to completely eliminate exposure of the worker to moderate potential hearing loss.

In Summary: Areas of high exposure to the hearing of the worker include mining equipment, such as jumbo drills and shovels; secondary crushing equipment, such as impactors, hammer mills and screens. Raw and finish mills, depending on their size, and also some miscellaneous areas, such as car shakers, clay wash mills and coal mills.

Hauling by truck, primary crushing, packing and around-the-kiln firing floor offer a relatively low exposure to the hearing of the worker.

What are the possible avenues of noise control and hearing conservation? The most complete method would be the removal of the workers from all operating areas through automation. This, no doubt, will be the procedure on all plants now being built. Such automated plants, naturally have much higher capacity equipment than the older plants with an accompanying increase in noise level. However, the workers are essentially maintenance men who just pass through areas rather than remaining for any length of time.

This transient exposure even though high, I have found in one study, to be of relatively short duration in most cases which brought the actual hearing loss exposure down considerably. In the particular automated plant that I visited, there were only two workers for whom I recommended ear protection—the driver of a DW-20 Caterpillar, and the

primary crusher operator. Both workers were continually exposed to the noises during the course of the work day.

With the presently operating non-automated plants, actually reducing the noise of a piece of equipment, such as a mill or an impactor is just about impossible. However, you will recall that one of the graphs of a primary crusher was 100 decibels taken near the gyratory crusher and the next graph was taken inside the operator's glass booth and the level was now 87 db. Actually, even at 100 db there was no exposure, I merely wanted to illustrate the use of the enclosed booth as a technique. Such a method can probably be used effectively in the mill buildings and I am sure it probably has been. However, I have not seen such an application.

Controlling the intense noise from pneumatic drills so far doesn't appear too promising. I say this principally because although the Bureau of Mines studies produced a significant noise reduction, we must bear in mind that the volume of air being handled by these mufflers is relatively low. Actually, it was about 64 cubic feet per minute. In the pneumatic drills for quarrying and mining, the capacities are much higher. From the formulas used in the calculations, a corresponding increase in muffler size would be necessary to handle this air volume. I'm not saying that all the air is going out through the exhaust port. Naturally, a certain quantity is going down the hollow drill stem as well as leaking and, of course, rotating the drill, but I am sure it is still much higher than 64 cfm. coming out of the exhaust port. Furthermore, the resultant noise levels still offered a high hearing loss exposure.

It should be remembered that noise factors causing hearing loss are:

1. Over-all intensity
2. Distribution of noise energy over audible range 20 to 10,000 cycles per
3. Duration of exposure on a daily basis as well as over the years
4. The on and off nature of the exposure

No. 3 is an important one. Measuring a worker's exposure to the noise in hours per day.

I have a Unico Noise Exposimeter which I hope to use for time of exposure studies in order to find out if the worker is subject to hearing loss. Knowing the type of noise from the analysis and the time he is exposed from the exposimeter reading, the criterion curve can be used to measure his actual degree of hazard and possible extent of hearing loss.

Where the noise cannot be controlled and where the worker cannot be isolated from the noise by enclosures or through automation, then the use of personal ear protection, such as ear muffs, should be considered. I have seen a few plants that are using them in varying degrees. Muffs are rather uncomfortable in the summertime if it's hot, however, they have definite advantages over ear plugs and the cost is relatively low.

As a part of the hearing conservation program, audiometric testing of newly hired workers who will be in noisy exposures should be made. In order to check on the effectiveness of the program, particularly if ear protection is worn, then the use of periodic audigrams every year or every two years, is a good check on this control program.

GROUND FAULT PROTECTION FOR PERSONNEL AND EQUIPMENT IN QUARRIES AND MINES

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The purpose of this paper is to define the objectives of Ground Fault Protection, to discuss the standard 4160 Volt Ground Fault Protective System which has been in use for many years and well illustrates the basic principles involved, to show the natural development of the 480 Volt System from this standard 4160 Volt System, and to describe

the additional protective features which have recently been developed. It is hoped that this discussion will be helpful to those operators who do not have Ground Fault Protective Systems and are desirous of installing them.

Below are listed a few terms used in this discussion:

The term "Ground" itself means earth potential which is the same in all parts of the earth, or in any object that touches the earth through zero resistance.

"Solid Ground" or "Equipment Ground" is the direct connection of a structure or piece of equipment to earth by means of a "Grounding Conductor" and a "Ground Rod" or a series of inter-connected ground rods.

"Ground Network" is a protective network of conductors which ties together the frames of various units or structure and/or pieces of equipment and which in turn is solidly grounded through aluminum resistances so that all elements of structure and equipment will maintain constant earth potential under all normal and abnormal conditions.

"Grounded System" is a system of conductors in which at least one conductor or point (usually the middle wire or neutral point of transformer or generator windings) is intentionally grounded.

A "Resistance Grounded System" is intentionally grounded through a predetermined calculated resistance.

A "Ground Fault" is an insulation failure which allows electrical connection between phase and ground.

"Ground Fault Current" is the current flow between phase and ground at the time of ground fault.

A simple fundamental to remember in relation to the flow of ground fault current is that theoretically an ampere that flows out of one terminal of a transformer must find its way back through some other terminal. The basic concept of ground fault protection is that the ground fault current be provided with a low resistance metallic path back to the transformer so that it can be controlled, detected, and disconnected.

The objectives of a ground fault protective system are:

1. To protect personnel from exposure to dangerous "voltage to ground" by limiting this voltage to a safe value.

2. To protect electrical equipment from severe damage at the time of ground fault by limiting the current-flow through the damaged spot and disconnecting the equipment as quickly as possible from the power source.

3. To isolate the faulted portion of the system instantly at the time of fault without disturbing the balance of the system and thus limit the outage time to the one faulted section only.

4. To reduce the hazard of electrical power cable fires due to high resistance faults which allow just sufficient current to flow to produce excessive heat but not enough current to trip overload breakers.

The essentials of a Ground Fault Protective System are included in the well known 4160 volt ground fault protective system, which is standard in the open pit mining industry today and which we shall review as a basis for the development of the 480 volt system.

The system described has a wye neutral point but the same protection can also be applied to the 2400 volt Delta system by the simple addition of a zigzag grounding transformer sized to handle the limited ground fault current and connected to the 2400 volt transformer terminals to provide a wye neutral point.

The standard 4160 volt ground fault protective system consists of a wye-connected transformer feeding a 4160 volt circuit through an automatic circuit breaker. (Automatic in this usage means automatic trip at predetermined values but manual reclose.) The 4160 volt circuit consists of a cable containing the three phase wires, A, B, and C, and a ground wire, G, (or three ground wires in the phase interstices). The ground wire (or wires) is connected to the frame of the equipment at one end and to the neutral of the transformer at the other and affords a metallic low-resistance path back to the neutral point of the transformer. A resistance of predetermined value is placed in this ground return just before it enters the transformer.

This system employs (a) Equipment Grounding—by metallic path to a low-resistance (5 amperes or less) station ground, and

(b) System Grounding—which provides, (1) a positive metallic low-resistance path, with resultant low IR drop, back to the neutral of the transformer to provide a positive tripping current at the time of ground fault, and (2) a predetermined resistance at the transformer neutral which allows a ground fault current flow large enough to trip the ground relays and remove the faulted section from the system, but at the same time limits the "phase to ground" voltage to which personnel can be exposed to a maximum of 100 volts. (Voltages over 100 are considered dangerous.)

Two ohms are arbitrarily selected as the maximum allowable resistance of the metallic ground return path from the equipment back to the transformer neutral.

As 100 volts is the maximum allowable voltage drop, the maximum allowable current flow is limited to 50 amperes. With a phase to neutral voltage of 2400 volts (4160 divided by the square root of three) impressed on the system, 48 ohms is required as the neutral resistor to limit the maximum current flow to 50 amperes, with all other components of the system at zero resistance. This determines the maximum possible fault voltage of 100 volts. All other components of the system, however, such as phase wire, switch gear, contact of man or machine to ground have a certain resistance so the possible voltage is much less than 100 volts and seldom exceeds 50 volts.

The necessity for a ground fault protective system was first recognized approximately 35 years ago at the advent of mobile electric shovels and draglines which were supplied by 2400 and 4160 volt power systems. The necessity for the protective system was caused by the high incidence of fatalities to the operating personnel due to motor and cable insulation failures. The fatalities usually occurred to men getting on or off the shovel, working on the bucket or some part of the machine while standing on the ground or perhaps just sitting or leaning against the machine.

After many years of test modification in design due to increased experience and engineering know how, and improvements in relaying equipment by the manufacturers, the principle was finally resolved into that of the present day standard 4160 volt ground fault protective system.

This high voltage scheme proved so successful in practice that in about 1945 operators naturally began to investigate why some similar scheme could not be applied to the 480 volt system for mobile mining machines. The problem, however, was not so easily solved by simply assembling the equipment we have today. Because the equipment, such as 480 volt wye connected transformers, zig-zag grounding transformers, CTs, and relays of sensitive enough rating for the 480 volt circuits, was not available at that time.

A committee of electrical operating people under the auspices of the Open Pit Mining Association and in conjunction with General Electric, Westinghouse and Mines Equipment Company, now the Joy Company, developed the necessary equipment, tested it under operation, packaged it and presented their recommendations at the 1947 Open Pit Mining Association meeting in Champaign. Through development of compatible control equipment, 480 volt ground fault protection has been developed into a practical working system.

The 480 Volt Ground Protective System is identical in layout to the 4160 volt system—only the electrical values have been changed. As in the 4160 volt system, the current is limited to a predetermined value by the addition of a resistor of specified value in the ground return circuit to the transformer. For present equipment available, the currents are limited to a range of from 5 to 35 amperes as recommended by the various manufacturers. For the purpose of illustration, we shall arbitrarily select 25 amperes as a suitable maximum ground current. The phase to neutral voltage of 277 volts is divided by the 25 amperes to determine the size of the current-limiting resistor as 11 ohms, assuming no other resistance in the ground fault circuit. Using the same 2 ohm value as in the 4160 volt system as the maximum allowable resistance in the ground return path, the maximum possible fault voltage is thus 25 amperes times 2 ohms, or 50 volts.

Again, as in the 4160 volt system, the principal applied is to limit the ground fault voltage to which a man can be exposed to as low a value as possible while at the same time allowing enough ground current to flow to actuate detection and disconnect components. Quite often this latter point is over-

looked in thinking primarily of keeping the fault current to as low a value as possible, and it is found that a fault of normal resistance when added to the neutral resistance does not allow a fault current of sufficient size to trip a feeder breaker. Therefore, the breaker will continue latched in and the ground current, although limited to a safe value will continue to flow until either a relay or some other component of the system fails, or the fault either clears itself, or becomes solidly grounded with resultant tripping of the breaker from overload.

Ordinarily, the system is safe under such conditions, since the ground fault current is limited to its predetermined value. A hazard, however, does exist to the extent that the fault might persist long enough to burn out the ground resistor or some other component, thus opening the ground return path allowing full voltage to be applied at the faulted location. In other words, the system would revert to an ungrounded condition as though the ground protective system did not exist. Therefore, it is imperative that each system be designed carefully to assure that ample ground current is provided, though limited, to cause positive action of disconnect relays. Most manufacturers now agree that the ground current value should not be limited to less than four times the burden required by the current transformer for positive trip of the relay.

The effectiveness of the 480 volt current-limiting resistance-grounded fault protective system can be best illustrated by assuming various practical operating conditions and determining the actual voltage to which a person could be exposed if in contact with a mobile mining machine.

One of the first things to remember is that the contact resistance between the machine treads and earth is indeterminate and, contrary to common impression, is usually high as proven by test and history over the years. For our discussion purposes, we will settle on 100 ohms as a fair value for the shovel treads contact resistance. For contact resistance of man to ground, 100 ohms is also assumed as a value for simplication of explanation and calculation. It should be remembered that the flow of fault current to ground through this high contact resistance causes a high voltage drop or potential difference between the machine frame and earth. This potential difference is the shock hazard to which personnel is exposed.

At the time of "phase to ground" fault, the current flows through the line conductor to the machine, through the fault to the frame of the machine and returns to the neutral of the transformer by two paths. One path is through the metallic ground conductor with the low impedance of a recommended value of less than 2 ohms and the other is through the earth to the station ground network and thence to the transformer neutral. On the return path to the earth, there is a parallel path at the shovel. One part through the shovel treads contact to ground and the other through the man to ground, combining into a single value of return ground current.

The lower half shows the equivalent impedance drawing. The current flows through the line conductor for which the impedance is assumed as 1 ohm, to the fault at which point the current flow splits through metallic return ground wire with an impedance of 2 ohms and through the parallel path of the treads and man for which 100 ohms each is assumed as a nominal contact resistance to ground. The contact resistance between the two where they combine to form a single current path is R2 which is assumed to be 25 ohms. From here the current continues through the ground to the substation ground network R1 of 5 ohms or less where the currents combine through the resistor ZG of 11 ohms through which it returns to the neutral of the transformer. For single phase faults, the voltage is 480 volts divided by the square root of three, or 277 volts to neutral. The parallel paths of 100 ohms leave a common path of 50 ohms which combined with R1 and R2 leaves a total of 80 ohms paralleled with 2 ohms or a common path of 1.95 ohms. The total resistance of the circuit is then 1 plus 1.95 plus 11 or 13.95 ohms. 277 volts divided by 13.95 leaves a total fault current IT of 19.85 amperes of which the current IT-1 is .484 amperes. The current IR-4 through the contact resistance R-4 of the man is then ½ of .484 or .242 amperes and the voltage drop IR is .242 x 100 ohms or 24.2 volts to which the man is exposed.

As a person's contact resistance with earth is very indeterminate, let us see what happens when the man makes a good earth

contact of 10 ohms and also when he makes a poor contact of 1000 ohms so that we may see the trend of the shock voltages to which he would be exposed. In one case the man has a 10 ohm resistance with the maximum fault current IR-4 through him being .882 amperes which times 10 ohms gives an IR drop or potential difference to which the man is exposed of 8.82 volts.

The man can also be assumed to have a resistance of 1,000 ohms where the current IR-4 becomes .0293 amperes which times the man's 1,000 ohm resistance is a potential difference of 29.3 volts.

Therefore, with all other system components remaining the same the shock hazard to the man increases as his contact resistance to earth becomes greater. In each case, however, the maximum voltage to which the man could be exposed would be the product of the maximum predetermined current of 25 amperes times the maximum allowable resistance of 2 ohms for the ground return path or 50 volts which is considered to be a reasonably safe voltage for accidental exposure to man. Therefore, it should be again emphasized that it is very important to keep the maximum resistance of the metallic ground return path to the under 2 ohms so that when combined with the maximum allowable ground fault current, a hazardous voltage will not be developed.

We have so far outlined the theory and basic elements of the 480 volt ground fault protective system. Certain further additions are desirable in order to make the system fully functional. These are: (1) A means of detecting the fault and disconnecting the faulted section of the system; (2) A means of continually monitoring the continuity of the ground wire; and (3) A means to check the functioning of the detection and disconnect units.

Detecting and Disconnecting the Fault. There is a basic ground fault protective system with a circuit breaker and under voltage trip added. The under voltage trip circuit must remain closed in order to keep the circuit breaker engaged. To this is added a ring type current transformer through which the phase conductors pass and which is connected to a normally closed relay inserted into the under voltage trip circuit. A ground fault which causes a current differential in any phase induces current flow from the current transformer which opens the relay, breaks the under voltage circuit and drops out the circuit breaker. A phase current differential of 3.5 amps induces a 0.5 amp flow from the C.T. A current of 0.25 amps actuates the relay.

Ground Continuity Check is provided by adding a monitor current to the system. A 480-12 volt transformer provides the monitor current which is carried to the equipment through a monitor wire in the cable (one of the three ground wires in the interstices of the phase wires is insulated for this use) and thence back to the transformer via the ground wire circuit. This ground circuit passes through a coil which closes a relay in the under voltage trip circuit. Consequently, the monitor circuit must be closed to hold the circuit breaker in. If this circuit is interrupted by a break in the ground wire, the relay opens, breaks the under voltage trip circuit, and drops out the circuit breaker. Thus it is impossible to operate unless the ground circuit, upon which we depend for protection, is intact and continuous.

Equipment Check is also provided by current from the 480-12 volt transformer. A circuit from this transformer, including a normally open P.B., is passed through the ring transformer. A simulated ground fault current can be passed through the ring transformer by pressing the push-button. If all units are operating properly, the circuit breaker will open.

The cable recommended for use with the ground fault protective system is type SHD. This cable has three shielded phase conductors, two bare ground wires and one insulated ground wire which is used as the monitor conductor. The shielding and two bare ground wires are all tied together at connection points so that they all combine to form a common ground conductor.

Shielding is recommended in this cable because it reduces corona effect and because it makes it virtually impossible to get current leakage from phase to phase (without being intercepted by the ground conductor), which can happen with simple bare ground wires. The original SHD cables—circa 1958—were very stiff, difficult to handle and would not roll up on the small reels of some

underground mining equipment. Today, however, the cable manufacturers have improved them to the point that their flexibility equals that of the unshielded type and no handling problems are experienced.

Since this system detects faults and disconnects them very early in their development, location of cable faults particularly in shielded cable, can be a problem. Older type fault detectors will not work on shielded cable. Recently a cable-tester, fault-locator combination has been developed which we have used successfully. Very basically and briefly, faults are located by this equipment by subjecting the disconnected cable to high-voltage high-current pulses which tend to break down across the fault with a loud audible thump. By walking along the cable while it is being subjected to these pulses, the fault location can be pin-pointed by locating the "thump" location.

Five-pin plugs are used—three pins for the phase conductors, one for the ground conductor, and one for the monitor conductor. The monitor pin is shorter than the others so that when disconnecting the plug, it disconnects before the others instantly breaking the monitor current and dropping out the breaker so that a plug can not be pulled under load.

All United States Gypsum mines and quarries that use 4160 & 480 volt mobile equipment are protected by these systems, and we consider that our experience with them has been most satisfactory and successful.

PRODUCTION WITH SAFETY THROUGH PLANNED SAFETY OBSERVATIONS

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The basic idea of a job safety observation is very simple. It is essentially nothing more than observing employees do their respective jobs in order to find out whether or not they are working their jobs safely. Simple though it may sound, the job safety observation can be a powerful tool for preventing accidents. Such observations are more than merely keeping one's eyes open for unsafe practices. Actually, three kinds of safety observations can be distinguished. They are:

1. *The incidental safety observation*
2. *The deliberate safety observation*
3. *The planned safety observation*

Let's discuss each one briefly.

Incidental Safety Observation

A supervisor usually has many duties that taken him back and forth across the area in which his men work. As he goes from place to place, he does much of his planning and thinking. The good supervisor, however, will also keep his eyes and ears open while on the go. He won't let himself become so wrapped up in his thoughts that he doesn't see what is going on around him. He may check the sound of a troublesome machine as he goes by, or glance in the direction of a new man, or make a mental note of a poor housekeeping condition, or casually check some scaffolding being erected—all while he is on the go. In other words, the good supervisor goes about *alert*. He always does a lot of so-called *incidental* looking and listening.

It is exactly the above kind of casual and incidental looking that spots many unsafe practices. The on-the-go observation may spot one man working without his goggles, another one staggering along under a load too heavy for one man, and still another one throwing a heavy tool to a co-worker. The supervisor who is wrapped up in his thoughts won't see such unsafe practices.

Such things are seen, not necessarily because a supervisor sets out to look for them, but because a supervisor was alert and looked in the right direction at the right time. The supervisor who is alert and has a "set" for spotting unsafe practices is making, we say, incidental safety observations.

The key to effective incidental safety observations is to look at what men are doing as you are on the go from place to place. Look with safety on your mind. If you don't already have this habit, you can quickly acquire it by reminding yourself to look for unsafe practices. Before you start out simply say to yourself, "Look for unsafe practices!" It won't be long before you will be looking for unsafe practices automatically.

Once a supervisor develops a strong "set" for spotting unsafe practices, his men will claim he sees them through the back of his head. At least, that's the way it seems.

Deliberate Safety Observation

The deliberate safety observation goes a step beyond the incidental safety observation. It is more than merely a matter of being alert for unsafe practices. The supervisor pauses in whatever he has been doing, and deliberately observes how a man handles some part of his job. He observes from a safety standpoint. He wants to know whether or not the man is working the job safely.

Such deliberate safety observations may be triggered off for any of a number of reasons. The supervisor may know the man is relatively new on the job. He may want to check, therefore, on how the man is doing. Or, the job may be a particularly hazardous one, and he may decide to take advantage of the opportunity to observe the man do it. Or, the man may have a reputation for working unsafely which makes the supervisor want to observe him carefully.

Whatever the reason that impels a supervisor to observe a man doing a job, or some step of a job, the observation is "deliberate" once the supervisor concentrates his full attention on how the man works the job. The deliberate safety observation is definitely more than a casual glance at a man doing his job, although it may sometimes start out that way.

Planned Safety Observation

The planned safety observation goes the final step. It is a deliberate safety observation that has been *planned*. It is usually a part of a continuing program of safety observations designed to check regularly on how safely all hazardous jobs are worked by all men who must work them.

Here is a brief general description of a planned safety observation that will be discussed more fully later: The supervisor decides in advance which one of his men he will observe. He may also decide what specific job he will try to observe the man doing. Thereupon, he makes it a point to observe the man do the job. If the job cycle is relatively short, he may observe the man from start to finish. If the job cycle is too long to be covered by a single observation, he plans to observe the man again at some later date to complete his observation.

Any unsafe practices observed are corrected by means of tactful and friendly reinstruction. If no unsafe practices are observed, the man is complimented. Lastly, the supervisor makes a record of whom he observed doing what job on what date. The purpose of the record is to help him plan future observations.

You can see from the above description that a planned safety observation is a special accident prevention tool much like a job safety analysis. It is planned. It is deliberate. It takes time and effort.

Are All Three Kinds Needed?

To do a real good job of detecting unsafe practices, all three kinds of safety observations are needed. Each kind supplements the other two. Together, they accomplish the maximum detection of unsafe practices.

The incidental safety observation needs no lengthy argument in its favor. It makes sense for a supervisor to be alert for unsafe practices as he goes about his area of responsibility. Such casual safety observations are always rewarded. If you see men working safely, you can take satisfaction in that fact. On the other hand, if you see men working unsafely, you can be glad you got to them before an accident did.

The deliberate safety observation has one powerful argument in its favor. *You will see more unsafe practices if you take the time to deliberately observe for them.* You can't expect to spot all unsafe practices while on the go. It takes deliberate observation to bring many of them to your attention. Aside from that, there may be special reasons why you should make it a point to observe how a man does a specific job. If he is new at the job, you may want to satisfy yourself that he knows how to work the job safely. If

the job is unusually hazardous, you may want to check how he handles it.

The argument for planned safety observations is that planned observations do not *leave to chance who will be observed doing what job.* The observations are planned on a regular basis so all men are observed doing all hazardous jobs over a period of time. Planned observations are also the basis for answering such questions as: Why is Smith having so many accidents? Will Brown's physical condition enable him to do his work safely? Did Jones, the new man, benefit from his job instruction? Has Walker decided to cooperate now that he has been warned about unnecessary chance-taking? Such questions imply special reasons why men should be observed doing their work. The planned safety observation is the tool to get the answers.

Who Requires Observation?

Let's assume for the moment that you agree there is merit in the idea of planned safety observations. That brings us to an interesting question. Should you plan to observe all of your men over a period of time or only those who are a special problem?

We think it is best to plan safety observations for all men under your supervision. Singling out special cases for such observations runs the risk of some men feeling that they are being "picked on". Even more important, when you confine such observations to "problem" men only, you limit the benefits gained from this important accident prevention tool. *Any employee who does hazardous work is a good candidate for planned safety observations because such observations are the way to assure the work is being done safely.*

It is true, however, that some employees need special attention in the form of more frequent planned safety observations than do others. Four such employees are:

1. *The inexperienced man*
2. *The accident repeater*
3. *The known unsafe actor*
4. *The "incapacitated" man*

Let's discuss briefly why these four kinds of employees are especially good candidates for planned safety observations. Also, let's see why the experienced employee who is no special problem should also be given planned safety observations.

The Inexperienced Man

The inexperienced man needs frequent planned safety observations because such observations are the best way to find out what he knows and doesn't know about working safely. If you don't spot and correct his unsafe practices early, you run the risk that he will suffer a serious accident because of not knowing better. Or, you run the risk that his unsafe practices will become ingrained habits of work. Either way, you have a problem.

That raises the question of when an employee should be regarded as inexperienced. A good rule is to regard a man as inexperienced unless you know otherwise *based on your own observations and experience with the man.*

The man who has, to your knowledge, never worked a given job title before should be regarded as inexperienced, no matter how much he claims to know the work. Observation will quickly tell you whether or not he is experienced.

A second man to regard as inexperienced is one who has not worked a particular job for a very long time, say, several years. He may have forgotten small but important details of the job. Or, the details of the job may have changed through the use of different tools, equipment or materials. What he doesn't know may cause his accident.

A third man to regard as inexperienced is one who has worked a given job on short, infrequent, and irregular occasions. He may know the job generally, but his limited experience may mean there is also much that he doesn't know. Here, again, safety observations will determine what he knows and doesn't know.

Lastly, there are times when even a generally experienced man may be regarded as inexperienced. For example, an unusual repair or maintenance job may come up which the man has never done before.

The Accident Repeater

Some men seem to have a special affinity for accidents. They are commonly called accident-repeaters. Such men need frequent safety observations. The observations will usually provide a clue as to why the man is an accident repeater.

He may be impatient or easily upset when something does not seem to go right. He

may be awkward in his movements. He may be trying to work too fast. He may act as if he didn't have sufficient aptitude for the job. Perhaps he just has a lot of unsafe work habits.

These are but some of the ideas that may be suggested when observing the accident repeater. From them, you may get additional ideas about what to do to protect him from further accidents.

The Known Unsafe Actor

Some men are chronic unsafe actors. They are always ready to take an unnecessary risk. They don't hesitate to violate safety rules to save themselves some time or effort. They have their own notions of how to do a job.

Fortunately, such men are relatively few in number. If you have any such men, check them frequently with safety observations.

Knowing that they are being observed, tends to put a damper on their chance-taking. Frequent corrections remind them you are on to their unsafe ways.

Even when they don't respond to such treatment, planned safety observations are not without value. They serve to establish a record of noncooperation that can be used to justify disciplinary action if the man persists in his unsafe ways.

The Suspected Incapacitated Case

You may have reason to believe a man is physically or mentally incapable of working safely. Planned safety observations are useful when that is the case. Such observations may confirm your suspicions that he is a hazard to himself or others. On the other hand, they may suggest that the man's chronic condition in no way interferes with his ability to work safely.

A supervisor owes it to the man suspected of being incapable of working safely to check him out with a series of planned safety observations. If a man is incapable of working a certain job safely, the fact should be recognized and acted upon before it is too late.

I recall the case of a mentally afflicted old-timer who was put up with and worried about because of misguided sympathy by supervision. He walked unseemingly in front of a truck one day. He lived, but not to walk again.

Let's now consider the "experienced" man. Many supervisors don't see why they should plan safety observations for experienced men.

The Experienced Man

The largest percentage of accidents occur to men who are, by any standards, experienced in the work their position titles require them to do. That fact alone is sufficient reason for applying planned safety observations to such men.

Most supervisors know experienced men are not immune to working unsafely. Such men often develop unsafe short-cuts and effort-saving habits. They will even argue that what is unsafe for someone else is not unsafe for them. Some will belittle obvious hazards. They will point out they have never been hurt yet. Unfortunately, some will learn the hard way.

They can also be a problem in another way. Because they are experienced, they often have considerable influence over younger, inexperienced men. Even when they don't intend to influence other men, they do. They set the example. When they work unsafely, other men tend to follow suit.

Clearly, then, a supervisor must spot and correct the unsafe practices of his experienced men. Planned safety observations will help him to do so. That's our argument for applying planned safety observations to experienced men.

Before leaving the subject of what men to observe, one point needs emphasis. It is a mistake to try to observe all men an equal number of times in any given period. *All men are not equally in need of safety observations.* Some are less experienced than others. Some have a greater disregard for safety. Some have a history of accidents and near-accidents. Some are mental or emotional problems. Some do more hazardous work than others.

All this adds up to the conclusion that some men need more frequent safety observations than others. However, that does not mean any man should be excluded from such observations entirely.

Jobs Requiring Safety Observations

We discussed the kinds of employees who should be given the benefit of planned safety observations. Let's now consider what kinds

of jobs those employees should be observed doing.

A job is defined as a series of steps that accomplishes a definite work goal. By this definition, hooking up a crane lift is a job. So is "changing a mill roll", "lubricating a truck", "operating a grinder", and "replacing fluorescent tubes". Safety observations are directed at jobs, as defined above, not at position titles.

A position title may encompass only one job. For example, the sole job of a "feeder" may be to feed material into a machine. Usually, however, a position title will involve several, and sometimes even a great many, separately identifiable jobs. For example, a given equipment operator may be responsible for not only operating the equipment, but also for making adjustments, lubricating, and cleaning the equipment.

Each of the latter is, by our definition, a different job.

What Jobs to Observe

The definition of a job means that a supervisor may have a great many jobs done by the men under his position. That raises another interesting question. Should a supervisor plan to observe his men do all of the jobs their positions require them to do or should he concentrate on certain jobs only?

For practical reasons, we think he should concentrate on certain jobs instead of trying to observe all. Here's why: Not all jobs are equally hazardous. Some jobs never or rarely produce accidents. Other jobs may have a bad reputation for involving accidents. Most jobs are somewhere in between these two extremes.

Therefore, put the emphasis on observing your men do the jobs that are known to be hazardous, that is, those jobs with a history of repeated accidents and those jobs with a great potential for serious injury, (even when there is no repetitive accident history).

Your time for making such planned, safety observations is limited because of the many other things you have to do. It makes sense, then, to concentrate on the jobs that are most likely to produce accidents.

Making a List of Hazardous Jobs

It is generally a good idea to make a special effort to identify for each position title those particular jobs that require emphasis on safety. Once developed, such a list is useful in a number of ways. It can be used to identify jobs that should be covered by a job safety analysis. It serves to remind supervision of what jobs require extra emphasis on safety when instructing new men. It suggests which jobs should be covered by planned safety observations.

Making such a list is a relatively simple matter. Most supervisors have a pretty good idea of which jobs are, relatively speaking, hazardous and worthy of extra attention. If several supervisors who are responsible for the same operations put their heads together, they can quickly develop such a list.

A convenient form may be made for developing a list of jobs which call for special emphasis upon safety. Develop your list as follows:

1. *Record position titles.* Where the form reads "position title", record for each such space one of the position titles that you supervise. Remember, position titles are not jobs. Different industries have different occupations or position titles. In the steel industry, for example, common position titles include craneman, roller, millwright, bricklayer, lidman, and larry car operator. The railroad industry has titles like brakeman, conductor, and car inspector. The telephone industry has titles like lineman, installer, and splicer.

Without a doubt, you know the titles that characterize the positions you supervise. Record them, one to each position title space, on the form.

2. *Record the hazardous jobs.* Consider the first position title you have listed. Ask yourself, "What is the most hazardous job a man in this position has to do?" Think of the different jobs he has to do regularly. Which in your opinion is the most hazardous? Be guided by your knowledge of past accidents and by a job's potential for serious injury. When you have decided, record the job on the first line under the position title.

Almost any job can be identified in two or three words by combining an *action* word, e.g. repairing, unloading, oiling, feeding, changing, etc. with the name of the thing to which the action is applied. Here are some examples: "loading truck," "operating coil-winder," "changing rolls," "installing switch," "cleaning vat," "changing motor," and "using burning torch." You can do the same for the jobs your men do.

For each position title, record and number only those jobs that you feel require a special emphasis upon safety because of their potential for producing accidents.

3. *Check against the opinion of others.* This is optional, but certainly advisable. If there are other supervisors who supervise the same operations or work as you do, check your list against their opinion. Ask them if they think you have omitted any hazardous jobs. Do they agree that the ones you have listed are hazardous or common sources of accidents.

4. *Let accidents add jobs to your list.* Whenever accidents occur, let the facts of the accident help you decide whether the job involved should be added to the list. Usually, any serious injury accident brought on by a man's own actions should be sufficient to add the job to your list.

A list of hazardous jobs, such as we have described, is of little value unless some use is made of it.

Benefits of Planned Safety Observations

You already know the main purpose of safety observations is to spot unsafe practices. There are also some indirect benefits that you should know about. Safety observations are a good thing because they serve to:

1. *Check effectiveness of training*
2. *Promote on-the-spot correction*
3. *Provide opportunities to compliment*
4. *Develop cooperative safety attitudes*
5. *Promote learning more about men*
6. *Suggest better job methods*

Let's discuss each idea briefly

Safety Observations Check Training

The best way, and sometimes the only way, a supervisor can be sure a man has absorbed his initial job safety training is to observe him doing the job. When you have instructed a man in how to do a job, you can not rely on merely asking him if he understood. After being instructed, most men are reluctant to admit they don't understand. Many will say they understand even when there are some things they don't understand. Even asking them specific questions is sometimes not sufficient. Explanations tend to be general. They omit details.

When a man tells you how a job should be done, it is not the same as when he shows you how a job should be done. That's why safety observations are useful to check training.

Observations Promote Prompt Correction

Training in the form of a tactful correction is usually more effective than talking generally about safety to a man. A correction is more personal. It relates to something he did or failed to do. He is more apt to listen to the instruction given under such circumstances. Whether he *accepts* the instruction given is another matter. That depends, in part, upon how skillfully the correction was made.

Our point is that the safety observations create many informal, on-the-spot safety training opportunities. They catch unsafe practices early before they become entrenched work habits.

Opportunities to Compliment

Most safety observations confirm that men are working safely. That is simply because men more often work safely than not. That means a supervisor will have many natural opportunities to compliment his men for working safely, e.g. "Say, Joe, I watched you handle that equilobrator. That's exactly the way it should be done!"

All men appreciate an honest compliment. Many will respond to such compliments with even greater willingness to cooperate on safety matters. Moreover, it is just as right to compliment men who show a concern for working safely as it is to correct men who don't work safely.

Proper Safety Attitudes

When a supervisor makes safety observations a regular practice, he helps develop proper safety attitudes in his men. By making a special effort to observe them, by correcting unsafe practices on the spot, by complimenting examples of working safely, you in effect tell your men that you are serious about safety. Such actions speak louder than words. They are examples of leadership that impress men that you mean business about safety. Your men are more apt to work safely when they know you make a special effort to observe them from the safety angle.

Learning About Men

Safety observations help a supervisor to learn more about his men. Such observations soon tell him who his "safety" problems are,

and in what way they are a problem. There is a man who tends to rush things too much. He cuts safety corners to save time. There is one who gets impatient when things don't go the way he expects. He is apt to kick something rather than figure it out.

There is a practical joker, a hazardous clown, always ready to show off. There is one who doesn't know the meaning of housekeeping. He just throws things on the floor. On the other hand, there's a man who characteristically works safely. Furthermore, he doesn't get flustered and upset in an emergency.

These are but a few examples of the many things you can learn about your men through safety observations.

Better Job Methods

Ideas about how to improve job methods are frequently a by-product of safety observations. Such ideas are not limited to safety. They may be ideas about doing the job more quickly, improving the quality of the job, eliminating material waste, or using more efficient tools.

When a supervisor deliberately concentrates his attention on how a man does a job, he may see wasted motion, unnecessary exposure to hazards, sources of material wastage, bottlenecks in the job sequence, and many other troublesome features of the job in progress.

Such awareness often suggests better job methods.

Conducting Planned Safety Observations

Suppose you plan to make a safety observation of John Doe doing a specific hazardous job. Should you tell John Doe in advance that you intend to observe him, or should you try to observe him without drawing his attention to the fact?

The answer depends upon John Doe and your reason for observing him. Sometimes a man should be told that he is about to be observed to see if he works a job safely. There are also times when the man to be observed should not be told in advance, when it pays to observe him without his awareness of the fact. Let's see why this is so.

When to Tell in Advance

Let's assume that you have never made a safety observation of John Doe doing the particular job that you plan to observe him doing. It could be that he is relatively new at the work, and that you had an experienced man break him in on the job. Now, you want to satisfy yourself that he knows how to do the job safely. That's your reason, let's say, for wanting to observe him do the job. The question is, should you tell him in advance or not?

Under those circumstances, a man should be told that he is about to be observed and for what purpose. Here is why. When a man knows that he is being observed and also why, he will work the job *as safely as he knows how.* That's only natural.

Under the circumstances, any man would want to demonstrate that he knows how to work the job safely. If, under such conditions, the man does something that is unsafe, you can be sure that he did so because of honest ignorance. Normal men don't deliberately work unsafely when they know they are being observed by a supervisor exactly to find out whether or not they know how to work a job safely.

On the other hand, if the man does work the job safely and correctly in every other way, you can be satisfied that he *knows.* The principle is: *tell the man in advance if you want to learn what he knows and doesn't know about working the job safely.* Telling him in advance, in effect, motivates him to try his best.

Three kinds of men who should be told in advance that you are about to observe them are: (1) the "new" man who has been instructed on how to do a job, but never checked out by observing him do the job, (2) the "transfer" man who has worked the job under other supervision, but never under yours, and (3) one of your regular men whom you have never checked out with a planned safety observation on the job you intend to observe.

In each case, telling the man in advance would motivate him to demonstrate what he knows.

When Not to Tell in Advance

Let's assume that you know that John Doe knows how to work the job in question safely. You know this because you have observed him doing the job safely in the past. You may want to observe him do the job again to satisfy yourself that he is, in

fact, working the job in the safe way that he knows it should be worked. (Remember, a man won't necessarily work a job the way he knows supervision expects him to work the job.) If that is your purpose for observing John Doe, should you tell him in advance or not?

Under those circumstances, a man should *not* be told in advance that you are about to observe him. Telling him would defeat the purpose of your observation.

What you really want to find out is how he works the job when uninfluenced by supervision. Therefore don't tell him in advance. Observe him from a distance, without drawing attention to yourself. You don't want him to be aware that he is being observed.

If, under such conditions, the man works the job safely, you can be reasonably sure that he usually works the job that way. On the other hand, if you observe him do something unsafely, like short-cutting a precaution to save himself some time and effort, you can reasonably conclude that he usually does the job that way.

Furthermore, you know he knows better, because you observed him work the job correctly in the past *when he knew you were checking him.* So, you have a safety problem. The man is not working the job in the safe way that he knows he should.

The principle is: *don't tell the man in advance if you want to find out how he works the job when he is unaware that he is being observed by supervision.*

Four kinds of men who, normally, should not be told in advance that you are about to safety observe them are: (1) the known "unsafe actor" whom you suspect takes all kinds of chances when he thinks he can get away with it, (2) the "accident repeater" who needs to be observed to find out why he gets in difficulty so often, (3) the suspected "physically unfit" man who needs to be checked to see whether or not his condition does affect his ability to work the job safely, and (4) the normal experienced man who you know understands how to work the job safely, but who may not be using his safety know-how.

Concealing Your Observations

Never attempt to conceal a safety observation by deliberately taking a concealed position from which to observe the man. For example, don't hide behind equipment. Such tactics are not only ridiculous and risky, they are unnecessary. What you risk in terms of good will and respect is not worth anything that you could possibly learn.

If the man in question, or some other employee, sees you "hiding," you can be sure that the word will get around. You'll get yourself a reputation that is hard to live with and hard to undo. No one likes a "Sneaky Pete."

Observe the man at a distance from any normal position that you might be in if you were observing the area generally. If there are other men about, the man observed will not think you are paying any particular attention to him, even if he does see you.

Remember, the purpose of a safety observation is not to spy on a man to catch him in the wrong. The ultimate purpose is constructive, namely to prevent accidents. The immediate purpose is to apply friendly correction and persuasion where needed. That does not call for observing men from concealed positions.

Basic Steps of Planned Observation

There are four steps that distinguish the planned safety observation from the other kinds of safety observations. They are:

1. *Prepare for the observation*
2. *Make the observation*
3. *Contact the man observed*
4. *Record the observation*

Sometimes, a fifth step is necessary:

5. *Make a follow-up observation*

Let's discuss each step in detail.

Preparing for the Observation

Three simple things should be done to prepare for a planned safety observation:

1. *Decide what man you intend to observe.* Don't decide on a man merely because he happens to be convenient to observe. Have a reason for selecting him. The reason may be something about the man, e.g. in experience, or a reputation for risk-taking, or an accident-repeater history, or some physical or mental condition that you suspect may influence him to work unsafely.

A very good reason also is simply that you have not made a safety observation of him in a long while, and you feel he is due.

2. *Decide the job you intend to observe him doing.* This is no problem if a man's position requires him to do only one or two regular jobs. However, when a man's position requires him to do a number of different jobs, then have some reason for selecting a particular job. Don't merely plan to observe him doing whatever he happens to be doing when you come along.

If you have no particular reason for selecting one job in preference to others, then *observe him doing that job that has gone the longest without a planned safety observation.*

That brings us to a problem. How will you know what jobs you have observed the man doing in the past, particularly when you have many men to supervise and they do a great many different jobs? You can't possibly keep in your head which men you observed doing what jobs on what dates?

You really need a simple record, one that you can look at and tell in a glance which jobs you have observed for any one man, and which have gone as yet unobserved. That would make it a simple matter to decide what job to observe him doing next.

On your record form you should number the position titles and the jobs that are designated as hazardous. Such a record might be used for a quarter period, say January to March inclusive. The duration of the period could be whatever you wish to make it.

The names of the employees who work for the supervisor are recorded. The number under each name indicates the position the man works regularly. They are the numbers that are associated with the position titles listed. Provide columns to the right of the names for recording what jobs have been observed, and give each column a number. They are the code numbers of the hazardous jobs shown as mentioned earlier.

The No. 1 box for Smith for instance might show the entry, 1/6/S. That means Smith was observed hooking up a crane load (Job #1) on January 6th and he did it safely (S). Smith's entry in No. 2 box might be 1/20(U). That means Smith was observed positioning a crane load (Job #2) on January 20th and he did it unsafely (U).

Now, you are Smith's supervisor, and you decide you are going to do a safety observation on Smith again, how would a glance at the record tell you what jobs you would observe? You might decide to re-observe him on the No. 2 job because the record indicates he worked that job unsafely the last time you observed him. Or, you might decide to observe him on the No. 3 or No. 4 job because the record indicates he has not been observed on those jobs in the current period.

The aim of a supervisor who uses such a record would be to observe all of his men do all jobs recognized to be hazardous. Put another way, his aim would be to fill in the blank boxes on the record. When used as described, the record becomes a tool for deciding quickly what job to observe.

3. *Refresh your awareness of the job's safety keypoints.* Whether this step is necessary or not depends upon how thoroughly you are familiar with the job procedure and the safety precautions that apply. You may find it worthwhile to mentally review the safety keypoints of the job. Or, if there is a Job Safety Analysis written on the job, you may want to review it briefly. That will insure that you know in advance the recommended way to do the job safely. You wouldn't have to do that but a few times before you knew the job thoroughly from a safety standpoint. In any case, it is your judgment that decides whether this step is necessary.

Let's summarize. To prepare for a planned safety observation, follow these three steps: 1. Select the man. 2. Decide the job. 3. Refresh your awareness of the job's safety keypoints.

Making the Observation

Let's assume you are going to tell the man that you are about to observe him. In that case, there are two parts to the safety observation: (1) telling the man what and why, and (2) observing him do the job.

1. *Tell the man what you intend to do and why.* Explain to the man that you want to observe him to see whether he can work the job safely. Use a friendly approach so that he does not feel ill at ease. Make sure he understands the observation is merely a check to see if he needs further instruction on how to work the job safely. For example:

"Hi, Bob! Say, Bob, I stopped by because I want to see how you handle changing the equilobrator. It's a tricky job, and a man can get hurt badly if he doesn't do things just right. Suppose you go right ahead. Do

it the way Harry showed you. I'll stand out of your way, off to the side. Just concentrate on doing the job safely. When you're through, we'll get together and discuss it. I may even be able to give you a few pointers."

Your introduction should be brief, friendly and to the point. If the man wants to say or ask something, listen. There is never anything wrong with a minute of friendly conversation.

2. *Observe the man.* Be sure to stand clear of the man. Give him plenty of elbow room. Don't stand directly in his line of vision. If you do, the sight of you may distract him from the job.

Be alert for any unsafe practices. Is he by-passing safety devices? Is he using his tools and equipment safely? Is he using them in an unsafe condition? Is he wearing his personal protective equipment? Is he working on moving equipment when it should be shut down? Is he assuming a hazardous position in any way? Is he failing to give signals that he should be giving? Is he creating a hazardous housekeeping condition while he works?

These are but a few of the major unsafe practices that you should be alert for when you observe any man do a job. In addition, of course, look for the safety keypoints that are particular to the job you are observing.

If you observe the man doing anything unsafely, don't interrupt him unless you feel there is a risk of a serious injury accident. In other words, let minor unsafe practices go uncorrected *until after the job is completed.*

The reason is this. He may do several minor things unsafely. If you interrupt to correct each one, you are very likely to upset the man. Very few of us can stand repeated interruptions of our work without getting irritated, especially when the interruptions are corrections. *Don't hesitate to interrupt the man if you see him commit or about to commit an unsafe practice that may result in a serious injury accident.*

Contacting the Man

Whether he has been told in advance or not, the planned safety observation is always ended by contacting the man observed. If he worked the job correctly and safely, he should be complimented in a simple unceremonious way. For example:

"Bob, that was fine. That was just the way it should be done. You'll never get hurt doing it like that!"

The simpler the compliment, the better. Don't overdo it. A compliment that is laid on too heavily tends to be embarrassing to most men.

If the man worked unsafely, he should be corrected. The form the correction takes will depend upon the circumstances. It may be a simple reinstruction, or friendly persuasion or a firm warning, or even disciplinary action.

Most often, however, the circumstances will suggest a tactful reinstruction of the man. That should always be the case when the circumstances indicate the man did not know he acted unsafely.

When you do reinstruct a man, apply the golden rule. Do unto him as you would have him do unto you. Normal men are never eager for correction. Some will feel badly about having to be corrected.

Therefore, always reinstruct in a friendly, tactful manner. Don't make him feel stupid. Here's an example of a tactful correction, given to a man who was told in advance that he was to be observed:

"Bob, that was pretty good. I noticed you were careful to take a good lifting position when you raised the equilobrator. Here's another point to remember. When you lowered the equilobrator, you had your hand on the side, like this. You can get your fingers pinched against the housing that way. See how? Hold it on the top instead. Like this, see? That way your fingers will always be in the clear. Everything else was fine. Do it that way, and you'll never get hurt."

Notice the friendly tone of the correction. Notice also how the correction started out as a compliment, and ended as one. It is a rare man who will take exception to being corrected like that.

Recording the Observation

Recording a planned safety observation on the form discussed a moment ago is very simple. Locate the box that coincides with the man's name and the code number of the job you observed. (The reverse side of the record form can be designed so that the code numbers of the jobs continue to 12.)

The simplest type of entry is a check mark (✓) in the appropriate box to indicate an

observation. That does not tell us, however, *when* the man was observed and the *outcome* of the observation. Therefore, the recommended entry is one that indicates date and result.

If the period covered by the record is a given month, record by number the day the observation was made, and follow that number with either an S or a U to indicate he worked the job safely or unsafely. Thus, 6/S would indicate he was observed on the sixth of the month and worked the job safely.

If the period is a quarter or longer, 2/10/U indicates the man was observed on Feb. 10th, and he worked the job unsafely. When such an entry is made in the appropriate box, it tells who was observed on what date doing what job with what result. How long do you think it would take you to make an entry like that?

Sometimes, under shift or turn work, a group of men may rotate their time under several supervisors over a period of several weeks. Where that is the case, the supervisors can record their observations on the same record, providing the record is located where each supervisor has access to it.

If this is done, each supervisor should initial his observation entry when he makes it. Where possible, supervisors should coordinate their observations in this way. A simple glance at the record will tell any supervisor what men have been observed doing what jobs by what other supervisors.

When new men come under a supervisor's direction, their names are added to those already listed. When a man makes a "permanent" move to a higher position, his name is re-entered on the list with the new position title code number.

Making a Follow-up Observation

When a man has been reinstructed on the basis of having been observed working a job unsafely, an effort should be made to observe the man again, doing the same job, soon thereafter. The idea is to see whether or not the correction did any good. Naturally, under the circumstances, the man should not be told in advance that he is about to be re-observed.

If the re-observation confirms the man is now working the job as instructed, don't hesitate to compliment him. That accomplishes two things. It lets the man know that you do follow-up after making a correction. It also gives him a little added incentive to continue working the job as instructed.

If re-observation reveals that the man has ignored the correction, contact the man. Get his reason for ignoring your reinstruction. It could be unintentional oversight on his part. If the facts suggest he is simply unwilling to cooperate, you have a problem on your hands.

Methods of Correcting Unsafe Practices

Because correction of unsafe practices is so much a part of safety observations, let's consider the main methods for correcting a man observed working unsafely. Given in the order of their normal occurrence, there are five methods you should know about. They are:

1. *Simple reinstruction*
2. *Reasoning and persuasion*
3. *A warning reprimand*
4. *A corrective interview*
5. *Penalty discipline*

Let's discuss the first one.

Reinstructing to Correct Practices

Use simple reinstruction to correct a man observed working unsafely when (1) you know he acted unsafely because he did not know better, (2) you are in doubt as to whether or not he knew better, (3) you believe he will respond favorably to reinstruction, even though you know he did know better, or (4) you want to establish "for the record" the fact that he was reinstructed.

The following is *one* way to reinstruct a man:

1. *Explain what was observed.* Tell the man exactly what you observed him doing that was unsafe. Be specific and concrete, not general. For example, *"John, I just noticed that you lifted that box with your legs straight and your back arched down to get the box"*, not *"John, I saw you lift that box unsafely!"*. It is important that you do this because it establishes the precise unsafe action that is the focus of correction.

2. *Explain why it is unsafe.* By telling or by a combination of telling and showing, explain why what you observed is unsafe. Make sure he understands what could happen and how it could happen. Don't simply tell

the man something is unsafe or incorrect. He must understand why and how. For example, *"If you lift that way, John, you're putting all the strain on your back, and almost none on your legs. It's very easy to sprain even a strong back lifting that way because a man's spine isn't designed to lift like that."*

3. *Explain the safe alternative.* By telling him or by a combination of telling and showing, explain the safe alternative. Explain points in their normal order of occurrence. Check to make sure he understands. Have him explain it back to you or have him show you, whichever best checks his understanding. For example, *"Here is the safe way to lift.* (Demonstrate) *Notice my back is almost straight. My knees are bent. I'm in a squat position. When I straighten up, the strain is all on my legs. They can take the strain. It's the legs that do the work, not the back. O.K., you try it."*

4. *Try to convince him.* End your reinstruction on a note of persuasion. For example, you might cite a back injury case that resulted from unsafe lifting. Or, you might explain how severely a back can be injured. Or, you might point out how a back injury might leave him unable to work for a long time. The point is, say something that will motivate him to use his newly acquired know-how.

Reinstruction should always be friendly instruction. People don't listen well when they are angry at the person explaining. Therefore, avoid saying anything that will embarrass or humiliate the man.

If others are close by, take him off to the side. He'll appreciate that. Keep in mind that you are not only trying to tell him, you are also trying to sell him. End your reinstruction on a friendly note.

Administrating an Observation Program

The planned safety observation is an accident prevention tool that the individual supervisor can use on his own initiative to promote safe working practices. Such observations do not need to be part of department-wide or plant-wide program of safety observations. Nevertheless, there is no denying that the maximum benefits are obtained when all supervisors of a department, division, or plant participate in regular planned safety observations.

The rest of my discussion concerns how to install and control a planned safety observation program in an organization unit such as a department. It is intended primarily for higher levels of supervision who have the authority to inaugurate such a program, and who would have the responsibility for installing and controlling it.

If you are a first-line supervisor, i.e. have direct supervision over production and maintenance employees, the discussion should still be of interest to you. It will give you an understanding of what is involved in the installation and administration of such a program. You may be in a position some day where you do have the authority to start a planned safety observation program.

Many plants and even entire multi-plant companies have installed safety observation programs of one kind or another. Most have gotten very satisfactory results, and have continued such programs. Some have been disappointed, and have abandoned their programs.

When the results have been unsatisfactory, the reason invariably is because the safety observation program was inadequately installed, guided, and controlled by higher supervision. The most common mistake has been the one of dumping the responsibility for the program in the laps of first-line supervisors, and expecting that the planned safety observations would take care of themselves from there on.

No safety observation program can be effective if that is the approach. The program must be correctly installed, and higher supervision must take active responsibility in guiding and controlling it. Unless they do that, the first-line supervisors, speaking generally, are not likely to put forth their best efforts.

What follows is a broad brush description of how to install and control a safety observation program. The fine details must of necessity be omitted since they can only be determined on the basis of knowing the local situation.

Installing the Safety Observation Program

There are five basic steps to installing a planned safety observation program. They are:

1. *Establish a "blue-print of the mechanics*
2. *Train all supervisors in what, why and how*

3. Identify jobs that warrant safety observations

4. Establish a "minimum requirement" guide

5. Emphasize guidance during the initial period

Let's discuss each step.

Establishing the Mechanics

Before the program is installed, the mechanics of the program must be decided. The following questions should be considered:

Will you request supervisors to make some record of their planned observations, or will you leave it entirely up to the supervisor to decide whether or not he wants to maintain a record? If you want a record kept, what kind of a record? How should it be kept?

If you leave it up to the supervisor will you provide him with a record form that he may use? How will higher supervision control the program? How will the unit head be kept informed of the program's progress?

The *general* answers to these questions will be developed in some of the following sections. Your job in establishing the mechanics of the safety observation program will be to adapt to general answers to your specific situation.

Training the Supervisors

Once you have decided the mechanics of the program, the supervisors involved need to be trained. In addition, the supervisors will have to be informed of the mechanics of the program.

We can not tell you how to go about training your supervisors in what they need to know to carry out a safety observation program. The contents of such training we have already indicated. For the details of how to conduct the actual training, discuss the matter with plant training personnel. All that remains is to inform them of how the program precedure has been established for your unit, e.g. section, department, division, or plant.

One further point. Training supervisors is more than a matter of informing them. Planned safety observations mean a measure of extra effort. Supervision must be sold on the idea that such a program will pay off with fewer accidents, and in the long run, less work for them. That is exactly what the program will accomplish if carried out correctly.

Identifying Hazardous Jobs

It is not absolutely necessary to precede a safety observation program with an effort to identify those jobs that are hazardous and worthwhile observing. The selection of jobs for observation can be left up to the judgment of the individual supervisor, once he is oriented to concentrate on the relatively more hazardous jobs.

Nevertheless, based on considerable experience, we do recommend a special effort to identify (by position title) the more hazardous jobs. The list of jobs that results will serve to make more definite what the task of observation is. It will provide some concrete guidance for supervisors.

Perhaps the quickest way to identify the relatively more hazardous jobs done by each position is to assign the task to a group of supervisors who supervise the same positions. Forms should be provided for the supervisors to record their judgments as to the jobs worthwhile observing. In that way, the opinions of the supervisors can be obtained independently, and then pooled.

One person, preferably a general supervisor, should be given the responsibility of drawing up a master list for *the group of supervisors who supervise the same positions.* Once such a master list has been developed, the supervisors concerned therewith should be given copies or given access to it.

Any list so developed can be added to by actual accident experience. For example, a recent accident may be the basis for asking supervisors to add the job involved to their list of jobs to observe via planned safety observations.

Establishing a Minimum Requirement

Should it be left up to the individual supervisor to decide how often he will make planned safety observations in, say, a month? Or, should some reasonable minimum requirement be established as a guide for supervisors to follow?

While there are arguments for and against either approach, our experience favors the minimum requirements principle. It provides the supervisor with a definite number of planned observations to shoot for as a target,

yet it does not limit him to any number if he wishes to make more.

A minimum requirement should always be stated in terms of a definite period, e.g. a month, two months, or a quarter. Periods longer than a quarter are not recommended. The simplest way to state a minimum requirement is in terms of the number of planned safety observations expected per man per period. Thus, "one per man per month" means one such observation is expected per man supervised each month.

The minimum requirement must be reasonable. It is self-defeating to set the minimum too high. Better fewer observations done correctly than many observations done hastily or, worse yet, observations not done at all. The objective of a safety observation program must never be to see how many observations can be reported each period. The real objective is the detection and correction of unsafe practices on hazardous jobs.

Consideration should be given to the size of a supervisor's area and the number of people he supervises. "One per man per month" is one thing for the foreman with 15 men in one small location, and something else again for the foreman with 40 men spread over several acres of plant.

One suggestion that may help: discuss what the minimum requirement should be with the first-line supervisors who will have to try to meet the requirement. Indicate a willingness to reconsider the minimum after experience has been gained. Supervisors are eminently fair about such things when properly consulted.

Emphasizing Initial Period Guidance

Once the program is started, a special effort should be made to check and guide supervisors who must make the safety observations. Despite the previous training given, many of the supervisors will have questions.

Moreover, there will be some who misunderstand one thing or another about the procedure to follow. Questions and misunderstandings should be cleared up in the first month of the program lest some supervisors develop incompatible practices.

The major responsibility for guiding first-line supervisors belongs to their immediate line superiors, i.e. general foremen, general supervisors, and section heads. The latter should check with each supervisor under their direction with these questions in mind: Does he know how to prepare for a safety observation? Does he know how to make one? Does he know how to record observations correctly? Does he understand the reason and purpose of the program? Does he have any questions about the program?

The object is to make sure that each man starts out right. Many such programs founder exactly because they lack this type of initial period guidance.

Controlling the Observation Program

Higher supervision must follow up the introduction of a safety observation program with activities that reflect their continuing interest. Most important, they must exercise control of the program. Here are some things that can be done:

1. *Suggest names of men to be safety observed*
2. *Suggest jobs that warrant safety observation*
3. *Check safety observation records now and then*
4. *Contact men recently observed occasionally*
5. *Maintain a record of the unit's performance*

Let's discuss each one generally.

Suggesting Names for Observations

The responsibility for deciding which man will be given a safety observation should normally be left to the supervisor who must make the observation. However, higher supervision within the unit, especially second-line supervisors, should feel free to suggest the names of men who warrant special attention *when there is a special reason.*

For example, suppose it comes to the attention of a section head that a particular man has had a half a dozen or more accidents in the past year. On that basis, he may request that the man be given concentrated safety observations to find out what is wrong.

Such initiative on the part of higher supervision conveys an interest in the safety observation program. In the main, however, the responsibility for deciding who will be observed at any particular time belongs to the first-line supervisor.

Suggesting Jobs for Observation

Here, again, the responsibility for deciding what jobs will be observed at any particular time should be left with the first-line supervisor. Sometimes, however, higher supervision will do well to request that observations be concentrated on a particular job. For example, investigation of a serious injury accident may reveal a faulty job procedure. If the same job is done by a number of men on the same or different shifts, it may be a good idea to check how others are doing the job. On that basis, a department superintendent may request his supervisors to observe the job in question being done by all men who regularly do so.

Such initiative demonstrates support of the safety observation program in addition to satisfying the immediate reason for the request. Second-line supervisors, in particular, are in a good position to recommend specific jobs for observation.

Checking Observation Records

When safety observation records are kept to facilitate planning observations, such records should be checked by the responsible second-line supervisors. Each general foreman, for example, should be made responsible for checking the records of his foremen.

The record check is an important tool for controlling the safety observation program. It should be guided by the following questions: (1) Are entries being correctly recorded? (2) Is the minimum requirement being met? (3) Are any men being excluded from safety observations? (4) Have some men gone too long without a safety observation? (5) Are re-observations being made when called for? (6) Are some jobs being observed too frequently merely because of convenience?

Such a check of observation records should be made at least once toward the end of the period for which the record is intended, e.g. at the end of the month for the monthly record. It is also advisable to spot check such records irregularly during the period.

Sometimes, a supervisor will make no observations until near the end of a period when he knows the record will be checked. That usually means the observations are made hurriedly under time pressure, and that is not good. A quick check in the middle range of the period will discourage such practices.

Contacting Men Recently Observed

Now and then, it is a good idea for second-line supervisors to contact a man who, according to the safety observation record, was observed recently. For example, the record may indicate that John Doe was observed yesterday, and that he worked the job safely. Does John Doe recall being contacted? Does he understand the purpose of safety observations? Have they been explained to him?

Even when made infrequently, such contacts are useful. They let employees know that higher supervision has an active interest in safety observations. They give higher supervision a chance to check employee reactions. They serve to check the correctness of records. Such brief contacts with men recently observed need not be burdensome when done on an every now and then basis.

Establishing the Unit Performance

When a safety observation program is installed on a plant-wide basis, top plant management may be interested in the progress of the program in the various departments. That raises the question of how to report the performance of a department (or other unit) in a uniform and meaningful way.

The practical type of report is one which describes the department's performance as a percentage of the departmental minimum requirement for the period. A simple example illustrates the principle:

Department A has 100 men and a minimum requirement of "one per man per month". If only 90 observations were made, the performance for Department A would be 90 per cent. Target performance would be 100 observations, or 100 per cent. Observations made over and above the minimum requirement would mean a performance percentage above 100.

When some such report is used to keep higher plant management informed, it is essential that departments are not made to feel they are competing with one another for the highest performance score. That type of pressure almost invariably results in a meaningless "number game".

It is the *quality* of the safety observations made that counts, not mere numbers reported.

Types of Safety Observation Records

The safety observation record form discussed may not be suitable for your situation. Your best solution may be to draw up the kind of record form that meets the requirements of your situation.

It must be emphasized again that a safety observation program need not require the keeping of a record. It is better to have planned safety observations with no record-keeping than no planned safety observations at all.

Nevertheless, the advantages for planning and control do warrant that serious consideration be given to maintaining a simplified record.

FAIL SAFE DEVICES ON HEAVY QUARRY EQUIPMENT

SAFETY REQUIREMENTS AND EQUIPMENT AVAILABLE

By E. T. ANDREWS
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In the automotive industry, a fail safe device or system is one designed and installed on a vehicle which will provide a means of stopping the vehicle in the event the service brake system is incapacitated or fails for any reason. Fail safe, as related to braking, is simply a coined expression for a device or system that can be used for emergency stopping.

Legal requirements for an emergency brake system control for combination vehicles have been in existence under ICC safety regulations since 1943. The first phase for emergency braking was the requirement for automatic application of the trailer brakes in the event of a physical breakaway from the towing vehicle. Then the ICC required a manual control to close off loss of air pressure on the towing vehicle after the physical breakaway. The third requirement, effective in 1956, made it mandatory to have a separate control enabling the driver to apply the trailer brakes in case of emergency, and in the event he failed to do so, the trailer brakes were automatically applied when the system air pressure dropped below 45 psi.

The components used in the air brake system could be considered fail safe apparatus, but were commonly referred to as tractor and trailer emergency protection devices.

With a typical air brake system, a parking brake also is required to hold the vehicle stationary. As you know, the drive line hand brake also has been referred to as an emergency brake and has often been used for emergency situations. At speeds below 20 mph, it can be effective, but at higher speeds and with heavy loads, it certainly is not in a fail safe classification.

Because of apparent ineffectiveness of the parking brakes, as installed on heavy duty equipment to hold and maintain the vehicles on the grades on which they were operating, spring brake actuators came into existence on vehicles equipped with compressed air for braking.

The spring brakes originally were designed for parking and not stopping the vehicle. However, when California revised the Vehicle Code to require an emergency stopping system on all air-braked vehicles, single units as well as combination tractors and trailers, spring brakes were used as parking and emergency stopping brake actuators.

A remote type spring brake actuator installed on the frame was attached to the slack adjuster lever arm with a cable or steel rod to apply the brakes when air pressure holding the heavy spring in the release position was exhausted through driver operation of the control valve. A spring force of 1,400 to 1,600 pounds exerted on the two brakes was adequate to hold the vehicle after it was stopped but was borderline in stopping

the moving vehicle at speeds above 20 mph.

Other manufacturers for "S" cam brakes have the integral type spring actuators in combination with the brake chambers. For the wedge type brakes the piggyback spring brake actuator is mounted on the backing plate. The actuation of the spring brakes is all the same; however, the control systems may vary, depending on the operator's choice of having the system strictly manual or manual and automatic.

We also designed and developed a series of air operated parking and emergency brake safety actuators. Time does not permit to go into the details of the systems for all four actuators; however, I will comment briefly on each. The DD3 is our general purpose double diaphragm actuator for service, parking and emergency brakes. The SD3 is a single diaphragm mechanical lock rotochamber type used in a brake system for heavy off-highway vehicles. A single diaphragm service and parking brake actuator is used on for trailers and a double diaphragm actuator for service and emergency braking with a split or dual system. Except for the .DD2, all actuators are equipped with a mechanical lock arrangement for parking the vehicle.

A typical DD3 system provides regular service braking through the foot valve. If, for any reason, the service brake system is lost, the driver operates the emergency control valve which applies air pressure to the auxiliary diaphragm from an isolated emergency reservoir. Should the driver continually use the emergency system with a failed service brake system, the brakes will apply automatically to lock on a 45 psi application. Should the emergency system fail, an automatic brake application also is made. To park the vehicle, the same control valve is used; however, the mechanical lock engages the push rod to prevent a release of the brakes.

This system is fast to respond, and under emergency conditions, maximum brake application of 100 psi air pressure is available to apply the brakes on the one axle. A graduating type control valve is now under development for improved emergency braking of the vehicles.

In a split air brake system, using a dual brake valve supplied from two separate air reservoirs, one portion of the valve delivers air to the front brakes and the other portion of the valve controls the rear brakes. This can also be arranged for diagonal split or with three axle vehicles, front and rear, and rear only.

For a complete fail safe system, we also would recommend a separate manual control. The dual systems are developed for both air and hydraulic brakes.

A new system recently developed for a front loader air hydraulic brake is the axle by axle protected emergency system in which the vehicle will not be without brakes regardless of a single failure. Should the service brake fail to respond to application, a manual control valve is capable of applying both axles simultaneously. If the malfunction is in the hydraulic system in either axle, the control valve applies the brakes on the other axle. The off-highway vehicle manufacturers are interested in this system on original equipment, and the components can be made up into a kit for installation on vehicles in service.

I have attempted to cover briefly the emergency brake systems currently available for heavy duty vehicle. With a greater emphasis on brakes in the interest of safety, you can expect continued efforts to develop new brakes and brake systems. Brakes that are properly designed, engineered and maintained should not fail under normal conditions, but when emergency conditions beyond our control arise, fail-safe braking can be a lifesaver.

PREVENTIVE MAINTENANCE

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Since this subject was assigned before our "fail safe" experimental program was completed, the "preventive maintenance" referred to herein would apply to added maintenance for a fail safe system over the conventional air brake system. Our experience indicates

the same preventive maintenance is required and must be applied to the added fail safe equipment, as to a conventional system. This includes replacing torn boots, defective diaphragms, properly adjusting slack adjustors and the daily blowing out of air reservoirs. These preventive measures, along with daily inspection of piping, lines, air compressors and the drive mechanism, all are mandatory in maintaining effective air brake systems. Let us not be misled by the expression, fail safe; such systems do not eliminate preventive maintenance. We have referred to our experimental program. I believe it would be interesting and appropriate at this time, to outline briefly our experience with three fail safe braking installations.

The experimental program began as a result of a "lost-time" accident, resulting in minor injuries, wherein the brakes on a front end loader were brought into question. The incident called to mind the subject of a paper presented by Mr. Vince Gallagher, Safety Engineer, Materials Service Company, at a CQ&MA Section Session at the 1963-64 National Safety Congress.

Today, we are so exposed to other people's catastrophes by the news media that no real comprehension is present until a shocking accident occurs to us, then it becomes a sad and realistic personal experience. Fortunately, the accident that motivated our test program was a minor personal injury, with some lost-time and no property damage. There was no evidence of a mechanical failure in this accident. The machine involved was a front end loader operating on a ramp with 10 to 13 per cent grade approximately 200 feet long. Contemplating the results of a brake failure in this operation is enough to make your hair stand on end. Up to this point, our interest in a fail safe device had been academic.

Inquiries revealed two types of equipment that are in wide use in the highway trucking industry. One is a complete reserve circuit, including an additional reservoir, check valve, lines and piggy-back chambers. The other type of equipment is an air compensated spring actuator, comprising lines and a piggy-back chamber. In both of these devices the compensating chambers and diaphragms use push rod extensions from the regular service brake chamber.

We refer to the straight air device as the "straight air circuit," and the spring actuated device as the "spring brake."

The spring brakes were installed in all four wheels on a four-yard rubber-tired loader at our Algonquin, Ill. pit. The cost of this installation was approximately $204.00 for supplies and ten hours labor. This was installed in September of last year and through Sept. 11, this year, it had been in service for 2,785 operating hours. We experienced no additional maintenance problems and the last test found the safety brakes 100 per cent effective.

We are happy to add that, although this loader is working 70 per cent of the time in ramp stockpiling operations, the use of the safety device has not been required. However, the operator can testify that after the air tanks have been drained the night before, the engine will not move the loader until the air pressure is up to 70 p.s.i., which is minimum operating pressure and an added safety feature.

In addition, any type of system failure (including air lines torn off at the wheels) will actuate the spring brakes, effecting a safe stop.

In November of last year we installed the straight air type equipment on a five-yard loader, in fact, the same loader that experienced the aforementioned accident. This unit is at our Crystal Lake, Ill. plant. The equipment was installed on the rear axle only, at a material cost of $207.00 and twelve hours labor. We have had no experience wherein the emergency device was required for a panic stop. In testing this system after 2,750 operating hours it was found 100 per cent effective.

In March, 1965, we installed a second straight air device on the rear axle of a twenty-ton quarry truck, at a total cost of $252.00 for material, and 24 hours labor. This straight-air-circuit has a valve in the operator's compartment which applies the emergency brakes instantly. We can verify this from an experience the operator of this truck had while dumping waste material down a forty foot embankment. The embankment gave way under the rear wheels and the truck started down. The operator threw the emergency valve and jumped safely from the truck. Instead of the truck ending up in our pond, the safety brakes held it at the bottom of the slope. Returning

this unit to service was a matter of two extra men and a dozer to tow it back up into the yard. Had this vehicle been free to travel it would have stopped in water 12-15 feet deep. An analysis of the labor and downtime necessary to put this vehicle into service, had it not been equipped with the safety device, will not be gone into here. Unfortunately, our operating books are geared to show money spent, not saved.

We had another incident occur in which a torn boot had not been replaced. This tear allowed sand to enter the emergency locking device in the straight air component on the five-yard loader. This required removing the defective boot and cleaning foreign matter (sand, etc.) from the cam and rollers, allowing them to function normally.

These three vehicles were tested Sept. 13 to determine the efficiency of our fail safe systems. In all cases they became noticeably effective at a point just below the low range of operating pressure (70 p.s.i.) down to 40 p.s.i. From 40 p.s.i. down, the brakes were fully applied.

The man hours referred to in our installations reflect errors in trying to match various types of fittings with hoses, and tubes and having no installation diagrams. One of the best ways to correct the installation problem is to pressure the manufacturers of rubber-tired mobile equipment and the manufacturers of the fail safe braking components into working out these problems for us. To this end, it is now a matter of Consumers Company policy that all replacement rubber-tired mobile equipment be furnished with the emergency brake system installed as a part of the original purchase.

We have standardized on a circuit including spring brake chambers at the wheels, with an emergency valve located in the operator's compartment.

In conclusion, I think it is necessary to point out that inadequate brakes, through design by the manufacturer, or overload by the user, cannot be made more effective by the installation of the best fail safe devices available. You still cannot get "something for nothing." Your fail safe systems will have the same efficiency as your service brakes and preventive maintenance program.

SPECIAL PROBLEMS IN THE TRAINING OF QUARRY SUPERVISORY PERSONNEL IN SAFETY

By COLE A. ALLEN
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The title of this discussion has two implications, first that there is a problem in the training of quarry supervisory personnel in safety and second that there is something unique or special about the problem. For the purpose of this discussion, I will talk principally to the situation with respect to first-line supervision, the foreman.

First, I believe there is evidence that a problem exists. I propose to discuss some of the evidence.

Second, the problem is most evident in small independent, quarry operations of the stone, sand and gravel people. Quarries which are part of a large enterprise, such as the cement, lime and minerals products industries are in relatively good shape.

Third, I believe the problem is management-centered. It rests, to a large extent, in management attitude toward safety in general and also in limited recognition of the essential role of the supervisor. This is particularly so with first-line supervision and is evidenced, to a large degree, in inadequate plans for the screening, selection and development training of foremen.

Fourth, much of the problem is characteristic of what exists in industry generally, especially among small business.

Fifth, there is really nothing unique about the problem and a few factors that seem to be peculiar to the quarrying industry are similar to what exists in segments of the construction industry.

With respect to the role of supervisors and supervisors' safety training, safety professionals are in agreement on the foregoing five points, which I will consider to be premises for my discussion.

1. The supervisor has the key responsibility in preventing accidents, since the principal duties of the supervisor are the very means by which the major elements of the safety program are carried out.

2. The supervisor must be trained if he is to reach optimum effectiveness in carrying out his duties.

3. Safety education and training are an integral part of the total development of a supervisor and cannot effectively be handled as something separate.

4. Supervisor training should be standard management policy and should be based on clearly defined objectives which relate to the specific duties of the supervisor.

5. An essential initial phase of the training in accident prevention methodology is the development of a positive attitude toward safety.

In yesterday's meeting and today's as well, your section has presented a program that is keyed almost entirely to safety in the production operations, safety in terms of mechanical and physical safeguarding, safety in terms of production methods, safety in terms of worker behavior.

Most of what you have heard may not be startlingly new to you, either in its philosophy or its detail. However, despite our having heard much, if not all of it before, there appears to be an appreciable lag in putting it to practical use.

Safety professionals tell us that accidents happen where management permits them to happen. They also tell us that the knowledge to prevent practically every accident occurring in industry is already known. It would appear that evidence to support those convictions can be found in some elements of the quarrying industry.

A quick reference to the accident developments in the quarry industry reveals that the disabling injury frequency rate and the type injuries occurring have not changed significantly in the past 15 years. Does this mean that the sum total of accident prevention skill and effectiveness has not advanced in the past 15 years? My own opinion is that the knowledge has increased, but the use of that knowledge has not progressed.

Whatever the scope of the effort is today, I doubt seriously that it is sufficient to support adequately the profit and growth goals of the employer. I say this because simply holding the line is not enough. The costs of individual injuries are continuously moving upward, not solely because of broadening Workmen's Compensation laws and spiraling benefit levels, but also because of a variety of equally important influences which are likely to be even stronger in the future.

All this means an increasingly larger tab for the employer to pick up both for the direct costs of the injuries and accidents and for their indirect costs as well. The only way to offset this added operational cost is by cutting accident occurrence to an irreducible minimum.

The accidents that are currently emerging from the industry are identified not with unprecedented accident causing factors, but primarily with familiar elementary discrepancies in mechanical and physical protection and worker behavior.

These are all situations which come under the almost continuous observation of first-line supervision who, in these instances, do not appear to understand the significance of what they look at. Why this is so has a bearing on my discussion. There are strong indications that our safety counsel is not reaching the foreman level where it can be most effectively applied. If we are not getting the message across in its more elementary components, we have little hope for its more sophisticated elements.

To accomplish a useful purpose, the abundance of technical safety information that is available must become an integral part of the production system and the work discipline. This means that it must be installed and sustained in the same manner as any other operating discipline. It is a matter of management policy, plan, organization and control.

The management plan for accident control, as most of you know, embraces about eight key elements, (1) Management Policy and Leadership, (2) Assignment of Responsibility, (3) High Quality Supervision, (4) Safe Working Environment, (5) System of Safety Inspections, (6) Systematic Maintenance Program, (7) Standards for Employee

Selection and Training, and (8) Accident Investigation System.

The key objective of the program is to establish and perpetuate at the worker level an environment which, with respect to physical conditions and worker actions, precludes the occurrence of accidents.

Next to the direction and leadership given by management, the most important person in the safety program is the one who is intimately involved in its day-to-day implementation, namely, the foreman.

The foreman's position carries important duties in teaching safety, enforcing safety and working safely himself. As a normal routine part of his functions, he is involved directly with practically every element of the program, training and motivating workers, installing and preserving a safe work environment, surveillance of the work methods, First Aid administration and accident investigation.

He is in a strategic position in the industrial organization standing as he does between management and the worker. His influence can be considerable. To the extent that he is a leader, a teacher, a dependable, accurate, energetic and resourceful person, he possesses important attributes of a successful foreman. To the extent that he also knows thoroughly his employer's operating policies and understands their implementation, and his own responsibilities for their implementation, he and his work crew should make a maximum contribution to his employer's operating goals.

There are two facts we must keep before us. First, foremen are not born with the knowledge and skills of effective supervision, they must acquire them through some sort of learning process. Second, if management intends to get the most out of its supervisory force, it should know what constitutes effective supervision and train and develop foremen to that level of performance.

Such training is not intended to serve solely the organization's accident prevention interests. The training proposed is all-around development, to make the foreman more efficient in every element of his position functions. Certainly if the employer looks to his supervisory ranks for the source of his future managerial people, such development programs are indispensable.

Training is particularly needed by first-line supervision. While the training should be focused primarily on production requirements, it would include complete understanding of the safety policy and program, and the techniques of carrying it out in the foreman's area of production responsibility.

Earlier I stated that one of the premises that holds from my remarks is "Supervisor training should be a standard management policy and should be based on clearly defined objectives which relate to the specific duties of the supervisor."

This leads me to ask just exactly what is the quarry foreman's job, or the crusher foreman's job, or the maintenance foreman's job? If we are to tailor the training to the specifics of the job, we ought to know what the job is in complete detail.

This question was directed to a number of management people in your industry, actually approximately 20 quarry operators in various parts of the country. It produced a variety of responses. In most instances, the response was ambiguous, an off-the-cuff expression of what the employer thought the job to be. In other words, it was largely a personal opinion, not a recital or reference from a written position description or job specification, simply because such management tools were not used.

It would have been interesting to have asked the foreman concerned what he thought his job was and how he found it out. His notions would have made interesting comparison with those of the man who pays his salary. Situations of this sort are more prevalent in industry generally than we are prone to believe and something more than communication is involved.

A second question inquired what criteria is used in determining that a supervisor is, in fact, a good supervisor. This, likewise, produced a variety of responses, in several instances personality oriented rather than performance oriented. Typical of the responses are:

1. He ought to know his job, he worked his way up and has been a foreman for five years.
2. He gets an honest day's work out of the men.
3. He gets along well with people.
4. He gets out the tonnage we want.

Some of you whose management is dedicated to standards of job performance and systems of individual performance appraisal should take note of the rather simple performance standards that satisfy some quarry management. Probably in the absence of clear-cut job definitions and performance standards, oversimplified evaluations are to be expected.

A third query had the purpose of ascertaining what are the characteristics looked for in good foremen apart from technical skills in the production function. These are the personal qualifications that are looked for in a man in selecting him for a supervisory position. Ordinarily, this query produced a listing of those personal attributes of people that are universally admired, honesty, integrity, dependability, sobriety.

Knowledge of his work was also mentioned, although it was not certain in some instances just how this quality was measured, since there was uncertainty just what the foreman's work was. I think you will agree that the purely personal characteristics of an effective supervisor merit a much more comprehensive listing.

The conclusion I draw from this is that many of the managements covered in this small sample have not given the supervisory function the hard-nosed attention that seems to be needed if the supervisors are to make the vital contributions they can and should be making to the employer's profit and growth goals. Under such circumstances, the safety training of the supervisors is suffering the same neglect.

The inquiry into position descriptions was not a completely barren undertaking. Descriptions were available in several instances but in only one instance did the accident prevention responsibilities of the foreman appear.

I am inclined to believe that much of the difficulty in training supervisory people in safety is linked to this lack of precision in defining their duties and authorities and in setting criteria for their personal qualifications for the position.

This latter consideration is important in two ways. An effective supervisor brings certain talents to the job that are essential to his performance and which ordinarily cannot be instilled in him by conventional industrial training processes. Secondly, management must exercise care to identify those people who cannot or will not respond to training, and waste no time and money on them.

Since it is reasonable to expect that any training to develop a person's understanding and skills would be first centered on the elements of his job, a clear-cut determination of the elements of the job is a prerequisite to any organized training.

One of the more definitive job descriptions reviewed was that of a pit or quarry foreman. His duties were spelled out essentially as follows:

1. Direct supervision of workers engaged in extracting rock from the quarry, including a. removal of overburden; b. hand stripping; c. drilling; d. blasting; e. loading and f. hauling.

2. Periodic inspection of the work site, equipment and work practices to insure safety.

3. Maintain desired standards of rock quality.

4. Hold operating costs to predetermined levels.

This embraces the general scope of activities that are characteristic of the average quarry foreman's job, to install and be surveillant of work methods, issue work instructions, assign workers to tasks, supervise people at work and to maintain equipment and the work site.

In the absolute, this position obviously requires a man with a full knowledge of the technical details of quarry work and an equally fair knowledge of the safety codes and safe practice guides that apply to each element of the work, equipment and work methods. He also needs a skill in determining rock quality and in cost control. All this is essential not only to guide his own conduct efficiently but also to instruct and motivate his subordinates.

How does a quarry foreman acquire and strengthen his skill in his job functions? Does he pull himself up by his own boot straps or is he given carefully planned guidance from his superiors? This is a matter that management cannot leave to chance since so much is at stake.

We must recognize that some degree of foreman education and training is taking place in many small quarries. First, it

emerges as a sort of by-product from periodic supervisors meetings which are held mainly to discuss production and employee relations matters and resolving other operational problems that have arisen. An attentive and retentive foreman can learn much from such meetings. A second source of training is in safety committee activities, foremen's safety meetings and similar special purpose activities. This is especially so where there is an active safety program spearheaded by an energetic person to whom safety administration responsibilities have been specifically assigned. Neither of these activities is likely to be an effective substitute for planned, programmed total development.

The safety training, particularly where it is conducted by a safety director or by an insurance company representative, has reduced value when it is operated as something distinct and separate from the main stream of total supervisor development.

As a starting point, management should have a firm understanding just what are the specific duties of the foreman and the skill level required to perform those duties effectively. With this accomplished, one of the main hurdles in safety training will be negotiated. It will serve as a guide to the selection of supervisors, provide specific targets on which to zero in training programs and be a basis for evaluating the performance of personnel.

Many quarry employers have limited selectivity in choosing supervisor material, in fact, quite limited selectivity for labor generally. This is especially true for quarries located in isolated areas and which draw their manpower from nearby small communities. Well educated and highly skilled people are normally not attracted to the work which is looked upon as laborious and dirty. Such limited selectivity in labor generally places a high premium on high-quality supervision.

Advancement of a worker to a supervisory position is often a matter of seniority or longevity. The system seems to provide for the man with the most experiences to inherit the supervisor's job although, in one section of the country, the powder man ordinarily has an inside track on the quarry foreman's job.

Consequently, we find many foremen who have reached their present status by this road and without any great abundance of coaching and counseling from management en route. They proceed about their tasks more on the basis of habit than on planned procedures. Just how effective they are in their current assignments and how much more effective they could be with special attention should have management's interest.

When the job content and performance criteria have been established, management should evaluate their supervisory personnel to determine just how well the supervisors are doing and in what areas of their work performance could be strengthened by better understanding and sharper skills.

There is evidence that a number of foremen will fall far short of the ideal and because of limited personal and intellectual assets, may not be expected to improve much beyond their present performance level. These people will need to have complete, detailed work safety rules made up for them, covering each function they supervise. They then become enforcers of the written word. They themselves will have to be bossed rather than managed by their own superiors.

Both education and skill training are likely to be needed for those foremen who show promise. How this is achieved is open to several possibilities. Some needs of an educational nature are common to all supervisory people and can be handled in group sessions. Subjects such as company operating policies and rules, labor relation policies, labor laws of the state, specific labor contracts, hiring, induction and training procedures, techniques of effective supervision, worker motivation, human relations, safety policy, equipment maintenance programs, work planning, interdepartment coordination, production control, quality control, cost control and public safety are typical of what can be handled in group sessions.

It should be noted that there are short courses made available by educational institutions and professional societies, including a number of correspondence study courses that fill some of the need.

Other subjects, particularly those relating to technical details or production tasks, are more suitably handled by individual instruction such as direct-line management coaching and counseling.

That part of the total training that is concerned essentially with accident prevention

principles and methodology can likewise be separated into group and individual applications. Details on the format and techniques for conducting safety training is given expert exposition in Chapter 6 of the National Safety Council book "Accident Prevention Manual for Industrial Operations." This is an authoritative reference for quarry management in setting up and conducting its own programs.

Because of the somewhat modest educational and intellectual background of many foremen in the industry, it should be expected that their development in safety will be heavy in safety education as well as in safety training.

Most of the safety training should logically be keyed to the specific safety technology of the quarrying industry. If the quarry is located in a code state where a specific safety code for the industry has been promulgated by an official body, it would be important to drill the foreman to an effective understanding of each element of the code.

It is not unusual to meet quarry operators who have no safety reference literature on their book shelves, not even the state safety codes where they apply. They seem to rely heavily on instinct and experience which may serve some of their requirements but certainly not all.

ASA Standard M28.1, "Safety Procedures For Quarries," is a useful and authoritative guide and it serves as the source material for most state safety codes. There are additional safety codes or standards which are important to supplement or to round out the understanding of the basic quarry safety codes. Such ASA standards are:

1. A12—Safety Code for Floors, Wall Openings, Railings and Toeboards.
2. A14.1—Code for Portable Wood Ladders.
3. B15.1—Safety Code for Mechanical Power Transmission Apparatus.
4. B19—Safety Code for Compressed Air Machines and Equipment.
5. B20.1—Safety Code for Conveyors, Cableways and Related Equipment.
6. B30.2—Safety Code for Cranes, Derricks and Hoists.
7. C1—National Electrical Code.
8. C2—American Standard Code for National Electrical Safety.
9. Z2.1—Safety Code for Head, Eye and Respiratory Protection.
10. Z49.1—Safety in Welding and Cutting.

These codes are highly useful in the training.

A very useful general reference is the publication "Safety Quarry Operations" prepared by your Section for National Safety Council publication. There are also a number of National Safety Council data sheets which cover important elements of quarry safety and which should serve as a basis for instruction.

Constructing an in-plant course of safety instruction for supervisory people, keyed to such codes and standards is relatively simple. While there is a shortage of good visual aid material specific to quarry work, judicious use of other material that is available, slides and motion pictures, can be most effective in the programming.

There are a variety of outside courses in safety training for supervisors that will supplement the in-plant program. Probably the most useful are the short courses of the one-night-per-week type conducted by a number of educational institutions in cooperation with local ASSE chapters and Safety Councils. Equally important are a number of correspondence study courses which are available. The October, 1963, issue of the Journal of the ASSE has a comprehensive listing of the outside study courses.

We should not overlook the assistance your insurance carrier safety representative can give you in structuring and conducting in-plant safety training courses.

Among the more complex safety activities that require educational and training attention are occupational health, especially dust control, hearing damage control, and protection to the public from blasting vibration and air pollution. These can produce unusually heavy expense to the operator if there is any fault in control measures. The foreman has an important role in keeping the lid on this loss potential and he must be given the knowledge and skill necessary to protect his employer's interest adequately.

A number of quarry foreman who reach their present level after a long arduous climb from the ranks are rugged individualists with typical old-school attitudes toward safety, not unlike what is frequently encountered in the heavy construction industry. He learned his lesson the hard way and expects

others to do the same. Safety activities he regards as something that detracts from the tough facade he wants to maintain. This old-school attitude is usually reflected in other elements of his duties such as ability to maintain good labor relations. It is not unusual to find such foremen more oriented in their thinking toward labor than toward management.

Converting such attitudes is no simple matter and management may have to resort to the heavy-handed tactics that this type seems to understand best. The tolerance and paternalistic attitude that is often displayed by management toward these non-conformists, primarily on the basis that they are old-time employees, is frustrating to the heart of many safety men.

In any event, if management will accept the fact that supervisors must be educated and trained to the demands of their position and if management has credible criteria which establishes job content and provides a basis for measuring performance, the first big step in the safety training will be taken.

If, as a second step, management will use such criteria to appraise and take inventory of the current skill levels of their supervisors, it will know where the foreman is in comparison to where he ought to be and have a basis for embarking in a program of supervisory development that will be objective and serve as a real boost to operational efficiency.

With care in selection and a sound development program, management will be not only producing supervisors who are peak performers today but are the nucleus of tomorrow's management.

Do all that is needed in the total development of supervisors and their skills and accident prevention will easily fall into place.

ROOF CONTROLS IN UNDERGROUND QUARRYING

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The object of this presentation is to focus attention on current roof controls employed in underground quarrying and to suggest methods and techniques that warrant consideration by the industry.

The information presented is based on an extensive literature search covering underground quarrying of limestone and crushed stone, and visits to 11 selected underground quarries in seven states. It is believed that the quarries visited comprise a representative sample of the industry.

Roof control is vital in the safe operation of underground mines and the conservation of mineral resources. Prevention of accidents caused by uncontrolled falls of roof and rib is a serious responsibility that must be shared by management, labor, and the various safety inspection agencies.

Ordinarily, roof controls in underground quarrying appear to be quite simple because prerequisites for economical mining are a relatively massive rock for roof and solid pillars of adequate size. Unfortunately this ideal combination is not always realized. Natural environment changes may occur unexpectedly as mining progresses, revealing variations in the roof rock such as stratification, joints, fissures, potholes, and slips. The principal man-made change, not considering excessive room widths and undersize pillars, is uncontrolled blasting practices causing overbreaks in roof and ribs. The effect of time, temperature, and humidity changes on unsupported roof must also receive consideration. A case in point is a record of an extensive fall of roof in an underground quarry that was exposed and stood unsupported for about 60 years.

The amount of artificial roof supports observed was rather limited except in a few quarries which will eventually be used for storage purposes. The supports usually consisted of a few sets of rib steel, concrete reinforcement at portals, and spot roof or rock bolting. In some instances roof bolts

were being installed where the stability of the roof and ribs was questionable due to jointing, fissuring, potholes, and sloughing. In one quarry, holes were drilled systematically in the roof to release gas pressure which apparently had contributed to roof instability.

In most underground quarries visited, equipment used by employees when testing and scaling high roof ranged from specially equipped mobile aerial rigs to regular mining equipment such as mobile drilling and loading units. In others, reliance was placed on experience, visual observation of the roof and rib conditions, and either a long bar or industrial gun to dislodge questionable material.

In a few quarries, programs for regular and systematic testing and scaling of roof and ribs along travelways and working areas were in effect.

The consensus of safety engineers is that one of the most important requirements in any roof control program is regular and systematic testing of roof and ribs *(25) (11)*. Testing implies visual examination supplemented by the sound-and-vibration method using proper sounding and testing devices. Special rigs or aerial towers equipped with basket platforms are essential where bench mining is practiced. They should be high enough to permit testing and scaling all the roof and sides with the minimum of exposure to the operators *(36)*. Any loose or doubtful material detected should be taken down immediately or supported adequately. Under some conditions, it may be necessary to abandon the area and provide suitable barricades to keep out personnel.

Admittedly, a serious problem still exists in testing large masses of loose roof or rib material which may, due to the weight of the mass, give little or no indication of its true condition. Current research by the Bureau of Mines indicates the possibility of applying sonic techniques in evaluating situations of the type described *(17)*.

A method of evaluating the consistency and thickness of massive roof strata noted in a few quarries simply consists of drilling exploratory holes at irregular intervals either from the surface or underground. A decrease in acceptable thickness or discovery of planes of weakness (stratification) has prompted some operators to either reduce the width of openings, abandon the area, or apply roof bolts to stabilize the roof. The information obtained from the exploratory holes is helpful but does not always indicate the relative stability of the roof.

The stability of mine roof can usually be determined by use of a variety of devices designed to measure movement of roof and/or ribs *in situ* over a period of time. All rock, regardless of physical structure, is elastic to some degree. The amount of movement (roof sag) that can take place over a given span without fracturing varies and depends on a number of factors. Neverthless, measurement of the movement can serve as an indicator to warn when a dangerous condition is being reached.

Rock movement measuring devices that are commercially available range from relatively simple assemblies *(26)* to complex electrically actuated instruments *(35)*. These include roof and floor convergence extensometers *(15)*, differential roof sag measuring stations *(15)*, visual roof sag measuring bolts *(30) (9)*, rib to rib roof sag measuring stations, stratascope *(8)*, and roof bolt compression pads *(18)*.

An extensometer for measuring roof and floor convergence is any device that will measure accurately the vertical distance between a permanently fixed point in the roof with one set in the floor. Also, they may range from telescoping rods which must be read periodically, to spring-loaded rods fitted with recorders. This same technique may be applied to measure movement between ribs of pillars. However, the fixed measuring points in the ribs must be anchored deep enough to minimize the effect of sloughing.

Measurements of differential vertical movement between roof strata show when, where, and how much movement of the various strata occur. This may be accomplished by drilling roof bolt holes to various depths and suspending mine roof bolts from the bottom of these holes. Either the roof line or a fixed point in the floor can serve as a base for measurement.

Visual roof sag measuring bolts are finding wide application in coal mines to permit observation of roof sag at intersections. In this method a roof bolt is anchored in a vertical borehole at a horizon in the roof considered to be massive and firm. The bolt

must be long enough to permit the headed end of the bolt to protrude a few inches from the collar of the hole. Three bands of reflective tape, ½-inch wide and of varying colors, are attached to the protruding end of the bolt with the top band being even with the collar of the hole. The bolt should be installed as the roof is exposed, and the amount of roof sag that occurs after this time is determined by observing and measuring that portion of the tap that is still visible. Admittedly, this is not a precise method but some mine operators have found it helpful in predicting impending roof failure in time to provide additional support.

Rib to rib roof sag measuring stations involve fixed points set in opposite ribs of an opening and stretching a taut-string between these points. A tension spring is used at one fixed point to assure uniform tensioning when the string is periodically used. A scale is suspended from an eye-bolt or equivalent device installed in the roof at mid-span. A change in subsequent readings will indicate the amount of roof sag taking place.

The stratascope is an optical instrument, similar in principle to a periscope, used to examine the interior of boreholes. Fractures, separations, and changes in composition of the strata penetrated by the borehole can be observed. Periodic examinations will permit detection of progressive deterioration of the strata. Essentially, the stratascope consists of 4 sections: (a) the bottom section fitted with a monocular eyepiece, (b) and (c) tubular extension sections, and (d) a headpiece containing an electric light bulb and a reticle having .05-inch graduations. Each section has an outside diameter of 1¼ inches. When all sections are used, holes up to nine feet in depth can be explored. The external power source may be either a lantern-type dry cell or an electric cap lamp battery. Where long term records are desired, a camera may be attached to the eyepiece to obtain photographs.

A device that will indirectly indicate sag of stratified roof is the roof-bolt compression pad. It was developed to measure bolt tension but may be used for a variety of purposes. The compression pad consists of two circular steel plates between which a layer or rubber is bonded. A center hole is provided for inserting the roof bolt. As the tension in the bolt is increased, the rubber element in the pad is compressed and at the same time expanded laterally. A calibrated gage is used to measure the increase in circumference. The compression pad may be used to evaluate anchorage effectiveness, check installation procedure and workmanship, check the quality of bolting materials, and measure the installed tension and the tension at any time afterward. The last application described may be used to estimate roof sag or roof instability when the pad shows a load increase.

There are other techniques that may be used to measure rock movement but they generally require the services of specially trained engineers to apply and interpret. Some of these are photoelastic coatings and patches *(27)*, photoelastic stressmeters *(28)*, micro-seismic techniques *(19)*, hydraulic pressure cells *(23) (16)*, borehole deformation gages *(20)*, and a variety of mechanical and electrical resistance strain gages *(35)*. Any technique that will provide a time record showing rate and magnitude of deformation is generally preferred. (References listed give details of construction and application of the various techniques.)

I have stressed the importance of rock movement measurements because visual examination alone may not be enough to evaluate the true condition of the roof. Unless measurements are made, the mine operator is faced with the serious problem of balancing experience against change. Knowledge of roof and rib behavior reduces risk because it provides the mine operator an opportunity to decide whether the area should be abandoned or roof controls applied.

Where the openings are relatively wide and high, roof controls in the form of conventional supports may not be feasible, particularly after bench mining has progressed. Under most circumstances, the application of mine roof bolts would offer numerous advantages over conventional supports with respect to safety and efficiency. One reason for the rather limited use of roof bolts appeared to be a lack of information regarding roof bolting.

Any one of many factors relating to roof bolting can be the topic of an entire paper. Time and space limitations permit only a brief discussion of the essential factors involved. Details may be found in the publications listed at the end of this paper.

Data compiled from Bureau of Mines records show that about 40.8 million roof bolts were installed in bituminous coal mines during 1964. During this same period, surveys by bolting material manufacturers and others indicate that about 1,200,000 roof bolts were installed in noncoal mines, tunnels, underground gas and other material storage facilities.

Briefly, the principles of roof bolting involve (a) suspension *(32) (22)*; (b) beam building; (c) combination suspension and beam building; and (d) reinforcement of walls affected by shear and compression stresses. Laboratory tests and field experience indicates that the most efficient bolt installations are those in which the bolts are installed and pretensioned as soon as possible after the roof is exposed.

The principal types of roof bolts are the slot and wedge type and the headed expansion shell type. Other types that are finding application will be described later.

Practically all roof bolting materials used in coal mines are manufactured in accordance with specifications approved by American Standards Association *(13)*. The significant features of these specifications relate to quality, dimensions, minimum yield strength, interchangeability, and identification.

Hand-held pneumatic percussion drills were originally used to drill holes for roof bolts. Today, drilling equipment may be either of the percussion type or hydraulically operated rotary drills used singly or in multiple units mounted on mobile rigs. A recent development is the hydraulically operated combination rotary and percussion drill. Dust suppression or dust collecting systems are usually an integral part of all drilling units.

Installation procedures depend on the type of bolt used. Hole diameter is critical for both slotted type and expansion type bolts and hole depth for slotted type bolts. A 1¼-inch diameter hole is generally drilled to anchor a 1-inch diameter slotted type bolt. The most commonly used expansion shells are designed to anchor in holes drilled with 1⅜-inch bits. Bureau of Mines tests have shown that a slight increase in hole diameter may significantly reduce the anchorage capacity of the anchor. Hole size is critical. To assure that holes of proper size are drilled it is necessary to first use the proper size bit and to periodically check the hole diameter with a hole gage.

A number of tests have been designed to evaluate how efficiently bolts are installed. One of the prerequisites of an efficient bolt is that the anchorage be strong enough to reach the yield strength of the bolt used. Torque tests imply that a torque wrench is actually used to estimate the tension of the installed bolt *(1) (3) (5)*; however, it is necessary to first determine the torque-tension relationship for the particular bolt and plate combination used. Normally, the torque-tension relationship may vary from approximately 40 pounds tension per foot pound of torque to 80 pounds per foot pound when hardened washers are used. These washers are used primarily to reduce friction between either the nut and the plate or the bolt head and the plate.

Anchorage tests have been standardized and involve the use of a hydraulic ram and a device to measure bolt displacement at various increments of applied load *(2) (4) (6) (7)*. The maximum bolt tension is the load at which bolt displacement is continuous with no further increase in applied load.

A breakdown test consists of simply increasing the load on a bolt by hand until no further increase in load is indicated *(31)*. Either a torque wrench or ordinary wrench may be used to tighten the bolt against a calibrated hydraulic ram or load cell. The bolt is tightened one complete rotation at a time, and the bolt tension recorded at the end of each turn. The maximum bolt tension reached is considered to be the anchorage or load carrying capacity of the rock.

Experience in coal mines has indicated that systematic pattern bolting offered the safest and most efficient means of controlling mine roof. Guidelines used to determine spacing are few and are usually based on normal support requirements and controlled experiments *(21)*. Generally, the pattern spacing ranges from three feet to five feet both across and along the opening. Spacing in hard rock generally is greater than in so-called soft and fragile rocks.

A variety of materials are used to provide bearing between the bolt head and the roof rock. Steel in the form of bearing plates, ties, channels, and landing mats are being used. The dimensions of the bearing plates usually depend on the type or rock, jointing,

and other geological features. In any event, the bearing plate must be strong enough to prevent the loaded bolt head or nut from pulling through the plate. Heavy gage cyclone fencing is used where extensive fracturing is evident or suspected to develop. The use of wood in the bolt assembly is not recommended for long term roof bolt installations.

The problem of developing satisfactory anchorages in relatively soft rock has been a continuing one. However, progress in resolving this problem is encouraging.

One of the first attempts to improve the anchorage in soft materials was reported in 1949 in a limestone mine in Missouri *(33)*. The method includes the use of a slit steel tube in conjunction with a slotted type bolt. The tube is 8 to 14 inches long and about three-fourths of its length is slit into four strips. It is slipped over the anchored bolt and driven tightly against its wedged end by a sleeve-type driving rod. Apparently, the deformed slit tube reinforces the available anchorage.

A groutable hollow re-bar bolt is being currently marketed for use in both soft and hard rock *(34)*. It is fitted with an expansion shell so that the bolt may be prestressed prior to grouting. A plug containing a grout tube is positioned at the collar of the hole before the bolt is tightened. The grout is forced by a pump through the grout tube between the bolt and the wall of the hole until the grout flows out through the hollow portion of the bolt, commonly called the de-air hole.

Another type of groutable roof bolt consists of perforated steel half sleeves fitted with cement grout, tied together, and inserted into a drill hole of suitable diameter *(10)*. A steel reinforcing bar is then driven through the grout filled sleeve, forcing the grout through the perforations and against the periphery of the bolt hole.

Resin formulations are now being used as grouting and bonding material to anchor bolts *(14)*. One type commercially available utilizes a technique in which a predetermined volume of resin is injected into the bolt hole, and then the bolt forced into the resin. The bolt is usually of the reinforcing type with or without threads at the bottom.

A resin-seated anchor bolt has been developed by a German research organization for use in soft materials *(29)*. The resin used is a polyester-type in a glass cartridge approximately 12 inches in length and 1⅛-inches in diameter. The cartridge contains about 15 per cent resin and 85 per cent filler (coarse-grained quartz). The cartridge also contains a small glass tube containing the activator or hardener. A foam rubber ring is fixed around the head of the cartridge to hold it in position until the bolt is driven. Depending on the formulation, gel time may be as low as two minutes and set time about 30 minutes at 63° F. The bolts generally used are high-strength 1-inch nominal diameter, having about 12 inches of left-handed threads on the top and six inches of righthanded threads on the bottom. The top end is tapered to facilitate breaking the cartridge and mixing of the resin. A rubber retaining washer is used at the base of the upper top end threads to retain the resin at the top of the hole.

An explosive-anchored bolt has been developed by the Bureau of Mines for stabilizing mine roof, particularly, in relatively weak formation *(24)*. The bolt is anchored by expanding a section of steel tubing with either a paraffin or a water-coupled explosive capsule. The explosive-anchored bolt consists of (a) a length of 1-inch bolt stock welded to a section of tubing; (b) a length of 1¼-inch O.D. tubing with a 0.120-inch thick wall, and (c) an explosive capsule. The principal components of the explosive capsule are a thin-walled tube to hold Primacord[2] of different strengths, an electric blasting cap, and a coupling agent.

It is with some diffidence that I presume to discuss blasting operations in underground quarries. However, it is a recognized fact that blasting operations have an important bearing on the stability of the roof and pillars in underground quarrying, particularly pillars where bench mining is practiced.

Generally, fracturing horizontally stratified roof may be attributed to drilling too close or into the roof. This situation is easily corrected by change in the location of the roof holes and closer control of the drilling. However, many instances were observed where the pillar ribs exhibited systems of cracks penetrating into the ribs which eventually caused the ribs to slough. This cracking or overbreak can be minimized by use of either the smooth blasting or cushion blasting

techniques. Messrs. Langefors and Kihlström describe and illustrate examples of controlled blasting in a recent book *(12)*. In any case, it is suggested that you consult your explosives supplier regarding the actual applicability of the smoothwall blasting technique.

Experience, examinations, tests of roof and ribs, measurements of roof and rib deformation, proper use of explosives, and roof bolting definitely contribute to effective roof controls in underground quarrying. Furthermore, to realize the greatest benefit from any roof control program, each underground operation should have written rules and regulations to work by. The prevention of roof-fall accidents by application of effective roof controls demands the full cooperation of every segment of the industry.

[2]Trade names are used for information only, and endorsement by the Bureau of Mines is not implied.

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USES OF COMMUNICATION EQUIPMENT IN QUARRY OPERATIONS

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Communication in our industry is accomplished by various means, so we in our plants use various types of equipment for this purpose. These are the telephone, intercom system, TelAutograph, teletype, telegraph, the industrial band radios, citizens band radios, signs and posters, all being part of communication to get a message through.

The telephone system consists of an automatic switchboard installed in the main office which operates over 100 extension lines with about 250 phones connected. With this automatic system, the operator handles only the incoming or transferred calls. Any interplant or inter-office call may be had by dialing the three digits of the party being called. For outside or long distance calls, they may be dialed direct from any of the extensions without use of the operator. By using this system, we have faster service, less interference, and more correct calls.

The intercom system consists of three master stations with call stations connected to each master. This system is interlocked between our plant offices, stockroom, repair shops, electrical shop, engineering department, concrete department, and the three truck storage areas. By selecting the proper call station, a message may be sent to any one of the departments or may be used to page someone in any of the departments. This is a time-saving system and does not tie up the telephones.

The TelAutograph is used by the dispatchers to relay orders to the men in the transit mix plants. Orders as to truck number, amount of yards, and type of mix to be loaded is written on the office machine and this is copied by the plant telescriber which is located beside the operator. With this information, the correct truck is loaded with the proper mix.

The Teletype is operated from the main sales office where the orders taken are typed to the plants on three copies, one for filing, one for truck delivery, and the third as a work sheet. This system can be operated by one person in the sales department. The data forwarded to the plants is complete with all information for the dispatcher to deliver the orders.

The telegraph is used in our stock room for ordering parts, permits, or sending messages. Its primary purpose is for the acquisition of Maryland state roads permits to move heavy equipment. The order, typed direct to the state roads office, is returned in a typed form within a few moments permitting the trailer operator to make the move with a minimal loss of time.

The Industrial Band FM radio units operating on 47.48 megacycles play a large part in our communication system. With ten base stations, 35 mobile units for salesmen and expeditors, and an additional 25 sets in our mixer trucks gives us good coverage in the Baltimore city and suburban areas. The base stations are located at our main sales office, the ready mix plants, blackton plants, and aggregate plants, so that salesmen and expeditors may contact any plant with orders to provide the customer with better service. The radios also have been a great help in public relations when used by our men to call for help at the scene of an accident, or a lady out of gas.

on a back road, or the reporting of fires along the highway.

The citizens band radio is a 5-watt unit and operates on 27.015 megacycles and costs about $185 installed. These small units used for inter-plant communication are installed in the plant offices, the cars, pickup trucks, the leaders, and the bulldozers. The use of these is the best way we know to keep in contact with our key men and equipment operators for fast and safe communication.

These units have many advantages in the operation:

1. Office contact with supervision at all times.

2. Office contact with leaders for faster dispatching.

3. Calls to shop for equipment breakdowns.

4. Detection of electrical storms in summer.

5. Close communication with flagmen at blasting time and many other operating advantages too lengthy to mention.

Also, these low frequency radios are not hazardous around electric blasting caps for safety in your operation, as noted in certain pamphlets made available by the Institute of Makers of Explosives.

Signs at the entrance to plant property stating that it is private property.

Clearance under 33,000 volt overhead lines as indicated by a warning sign for large equipment operators.

A sign indicates all 2-way Industrial Band radios must be turned off in quarrying area.

Directional signs are used for truckers and visitors.

A sign indicates the property protected by special police to keep trespassers out.

Stop signs are installed at all plant road intersections to prevent accidents.

Signs indicate 15 mile speed limit in plant areas.

Warning signs caution drivers to drive slow around plant buildings.

Others warn of blind corners for truck traffic.

Others direct "No visitors in quarry area, no visitors in the plants, only employees with proper safety equipment."

Different safety slogans are carried on the bumper of each inter-plant truck.

The company-wide safety slogan which is on about 200 trucks that haul in the Baltimore area is as follows:

"Watch That Child!"

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1965

National Safety Congress

Transactions

Volume 5

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53rd NATIONAL SAFETY CONGRESS

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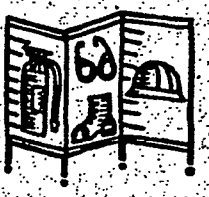

1966 NATIONAL SAFETY CONGRESS

OCTOBER 24-27, 1966 / CONRAD HILTON HOTEL, CHICAGO

1967

1968

1969

1970

The Congress is always a big week, a worthwhile week for the 13,000 safety people who attend.

At the '66 Congress you can meet other safety people, with the same problems and responsibilities as yourself. You can exchange views and ideas on accident prevention, health, hygiene, and fire prevention . . . on safety in industry, traffic, school, at home and on the farm.

You can see the largest of all safety equipment exhibits at the Congress . . . an opportunity for you to make well-informed buying decisions for your company.

This four-day educational program, planned and presented by the National Safety Council, can be your most thought-provoking, most worthwhile safety experience in 1966.

Make plans early to attend the 1966 Congress and bring the other people in your organization who have safety responsibilities.

FUTURE CONGRESS DATES
1967 October 23-26
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meant to have the precision or accuracy which one would expect to find in the laboratory. With these considerations, I feel the following to be reasonable specifications for tubes for industrial hygiene use:

1) Each batch should be calibrated by the manufacturer at concentrations related to the TLV. Preferable test points would be one-half, one, two and five times the TLV. This recognizes that with changes in the TLV there would have to be corresponding changes in calibration. For any one contaminant, however, this does not appear to be a major problem.

2) The response should be correct to within ± 25 per cent of the concentration. The response referred to should apply to the entire system—air mover as well as tube.

3) Interferences, temperature, pressure, and humidity effects, and shelflife information should be clearly listed with each box of tubes.

4) Air flow rates should be indicated. It is not unreasonable to expect that the air movers supplied by the manufacturer be correct to within ± 5 per cent. If auxiliary air movers are needed to extend the working ranges of the tubes, alternative calibrations should be provided and flow rates should be specified.

In order to assure that there is proper uniformity and control on the performance of chemical detector tube systems some independent central agency should act to certify the performance. The AIHA and the ACGIH have requested of the Surgeon General of the Public Health Service that there be established within the Division of Occupational Health a program of research and development to carry out this task. It is too early yet to see if such can be done, since any major change in emphasis in or additions to the activities of the division must pass policy considerations.

The service has replied, however, that it was in agreement with the general principles of the two professional societies on the need for performance standards and for some mechanism to assure that these standards are met.

The actions of the professional societies are in themselves significant in their recognition of the need for putting the chemical detector tube systems in the perspective of scientific quality. With enlightened use of reliable testing equipment, we can help make the workplace a more healthful environment.

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EYE PROTECTION PRACTICES FOR GIVEN EXPOSURES

By CHARLES HOLDER, JR.
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In the last 20 years, 1946 to the present, 130 Du Pont employees have suffered eye injuries resulting in lost time or permanent disabilities, and 187 additional employees were involved in incidents which resulted in eye injuries less severe in extent but

still serious enough to interfere with the performance of their work, at least temporarily. Of these 317 employees some lost their sight entirely, others suffered only partial impairment, while the lucky ones, in time recovered completely.

Fifty-six, or nearly 18 per cent of this total of 317 injuries occurred in the year 1946 alone. Last year, however, at our more than 300 plants, laboratories, construction sites and warehouses where approximately 100,000 employees work, only one Du Pont employee suffered a lost time eye injury and two were injured less severely. So far this year, for the first time in the 20 year period, although three lesser eye injuries have occurred, not one of these 100,000 individuals has suffered a lost time or permanent disability eye injury! To place this comparison in even clearer perspective with the year 1946 when there were 56 eye injuries, it should be noted that our employee rolls are presently 25 per cent higher than they were in that year.

It was all too obvious that our eye protection policies which had been adopted back in 1912, and which we thought were pretty good, were not effective. The eyes are such an important part of the body that we just couldn't be satisfied with this safety performance. There are no tolerable injury levels where personal injuries are involved; this is doubly true where the eyes are concerned. Something to improve our safety performance had to be done, and it had to be done promptly.

In the early 40's much thought had been given to better ways to protect the eyes of our employees. Some plants, particularly the larger ones, had already improved their policies. One of these, the Chambers Works in New Jersey, achieved spectacular results, reducing their eye injuries from a high of 26 in 1945 to only one in 1949.

We took a good hard look at the company's eye protection policy. At first glance it appeared to be a good policy. It stipulated that eye protection would be worn wherever the hazard required such protection. That's hard to argue with! Upon closer examination, however, there were several serious flaws in the policy.

First, the company's eye protection posture was based on an individual job basis rather than on an overall area consideration. It had been believed that we could always recognize the hazard and relate it to a particular job, or even to a particular aspect of the job. A review of our injury experience proved how wrong this assumption had been. It was found, to our chagrin, that the exposure often comes from a direction or a source completely unsuspected. We had assumed that the threat to our employees' eyes was limited to certain specific jobs, that it was confined to neat little areas outlined by yellow lines on the floor or that it was restricted to only those environments which experience had proved to be suspect.

Second, it was realized we had relied entirely too much on the judgment of the employee to decide for himself whether eye protection was needed or not. It hadn't been spelled out in hard and fast rules which would permit no interpretation or misunderstanding. Employees were not wearing eye protection, because they had not recognized the existence of a hazard. We had failed them by not requiring that they wear eye protection.

Third, it was apparent that our employees were not really convinced, perhaps because we were not entirely convinced ourselves, of the need for eye protection.

It wasn't too many years ago that many employees looked with disdain on all forms of personal protective equipment. Another contributing factor to the failure to wear eye protection was that it had not been fitted properly in the first place nor was it being properly maintained.

Three basic flaws! The wrong approach to the whole problem was by far the most serious shortcoming, but the other reasons were hardly less important.

This study of our eye injuries was positive proof that eye injuries could be prevented only if we turned our back on the individual job approach and adopted meaningful area eye protection policies. To paint a yellow line on the floor a few feet away from a metal working lathe and say, "Eye protection is required inside the line but not outside," is not realistic. The sliver of metal thrown from the machine doesn't stop at the yellow line, and besides, employees frequently forget to put their safety spectacles back on as their work takes them back and forth across the yellow line.

The first thing that had to be done was to adopt an area eye protection policy. We designated as "eye protection areas," a particular operation, an entire floor, a whole building or, in some instances, complete plants. Signs proclaiming the eye protection requirements were posted conspicuously at all entrances to such areas.

While this change in outlook was the most important step, it was by no means the only one. We learned how to fit safety glasses properly. Some of our people were sent to safety spectacle suppliers for instructions, and their representatives were encouraged to visit our plants frequently to help us all they could. To make it even easier to get and keep a good fit, in some of our larger plants such as the Chambers Works, mobile units were provided which regularly followed a prescribed route around the plant, so that employees knew when and where they could get assistance with their eye protection problems without having to leave their jobs or walk all the way across the plant.

Before any plant could implement these new policies it had to embark on an intensive educational program. The plants did their best to convince their employees that eye protection requirements were for their own good. The new rules were set up to protect their eyes—not to make their jobs more difficult. Then, when this was accomplished (and in most instances it took months and in some plants it even took years to get the whole story across) the new policies were put into effect.

An important key to the success of the adoption of the new program was the participation and example set by supervision. In some instances where resistance was strong, supervision wore the recommended protection long before the new rules were promulgated.

The new rules weren't imposed on every area in the plant at the same time. The more obvious eye hazards areas got first attention. For instance, the yellow lines in the maintenance shops were removed and the entire area designated as one in which eye protection must be worn at all times. In due time, this policy was extended to maintenance work wherever it might be performed. If a carpenter or a pipefitter worked at his job in an otherwise unrestricted area as far as eye protection was required, he wore his safety spectacles because of the hazards of his work. Then the more hazardous operating areas were so designated, one after the other, and finally certain areas of lesser exposure were so classified. The trend over all the years has been to extend the eye protection requirements to more and more areas. The wider eye protection policies we adopt, the fewer eye injuries we suffer.

Enough of background, let's get specific about eye protection practices. The basic eye protection required on our plants is the standard safety spectacle manufactured to the specifications of ASA Z2.1. There are, as you know, a number of reputable suppliers of safety spectacles meeting these specifications. Nothing less is acceptable on our plants. Eye protection is no place to cut costs. Cheap, substandard spectacles are more expensive in the long run.

In certain areas, such as in maintenance shops, side shields are required to give that added degree of protection the extra hazards of the operation require. Side shields of the type permanently mounted to the lens frame are preferred, since these give a greater degree of protection than the "clip-on" or removable side shields. Admittedly, there is less employee resistance to the removable side shields, particularly from those who wear prescription spectacles and find a certain amount of disenchantment with wearing side shields on personal activities away from the plant.

The standard safety spectacle, even with side shields, is intended primarily for protection against flying objects. It gives some protection against splash hazard but not complete protection. Where the threat is from harmful liquids, coverall goggles with flexible fitting frames of rubber or plastic, which give a tight fit to the face, offer good protection, or cup-type goggles are worn. The cup-type goggles are used for chipping and grinding, gas welding and cutting, dusts, mists and sprays.

Visitors and other non-Company employees entering our plants are required to comply with our eye protection policies. For the infrequent or casual visitor lightweight plastic spectacle-type eye protectors are provided. These can, if desired, be worn over the visitor's personal spectacles. This type

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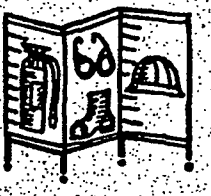

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1967

1968

1969

1970

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53rd NATIONAL SAFETY CONGRESS

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POWER PRESS AND FORGING SECTION

USE OF AUDIO-VISUAL AIDS TO TRAIN SUPERVISORS

By B. G. MOXLEY
Safety Supervisor, Stamping Group, Chrysler Corp., Detroit, Mich.

Our training program for supervisors is an exclusive one. Each and every one of our 2,000 men on the stamping group management roll attended a one-hour training session weekly.

All *new* management people joining our organization—of which there were 247 added during the year 1964 and an additional 282 in 1965 making a total of 529—were required to attend a full 40-hour week of training at group headquarters.

You can readily see that we are concentrating on our lone foremen. Our continuous audio-visual approach includes our own 78th-slide presentation, which is narrated with the *following* script:

"Just whose responsibility is safety in your plant?

"The safety administrator? Yes—*to some degree.* It is his responsibility to set safety policies, see that safety equipment is installed, to enforce safety regulations and to be constantly alert to hazards, *but*—

"He *is only one man among many.* He can't be everywhere at once and he can't supervise every employee all the time, so, perhaps, we should look at—

"*The employee.* After all it's his welfare so therefore he should be responsible for his own safety—and you're right, *but*—

"*He's human.* He has to be educated and reminded constantly that safety is a way of life and not a game of chance. So that brings us down to—

"You guessed it—*You!* Joe Supervisor. You're the one who lives closest to your employee—you're the one who knows your equipment and department better than anyone else. Safety is *your* responsibility.

"Basically, we are metal formers. We form dies which in turn go into presses to form sheets of metal into parts that are then assembled into sub-assemblies, which in turn are then shipped to our customers—the car assembly plants.

"Of course we have to have a large supporting group of maintenance people to set up and keep our operation moving.

"Each of these operations has its own individual set of hazards. How aware are you of the hazards in your stamping group plants?

"For instance, did you know that although the skilled trades personnel comprise about 10 per cent of our employee group that they have 30 per cent of the lost-time accidents?

"Or did you realize that the laceration is the most common type of accident in our press room operation and results from employee failure to wear proper protective clothing, or, that with a 100 per cent eye protection program, we still experienced over 2,500 eye injuries in 1964, or, that in the non-productive area, careless operation of vehicles and improper lifting are two of our biggest sources of accidents?

"Accidents are most likely to happen where unsafe acts take place—and unsafe acts take place where unsafe conditions exist.

"Our question is—how aware are you of the unsafe acts and unsafe conditions that exist around you in your stamping plant?

"To find out, we've prepared a test of safety awareness that you will be asked to take right now.

"You have before you a list of 20 numbers. Each one represents a picture that will be shown on the screen. As the picture appears, ask yourself, "what unsafe act or what unsafe condition exists in this picture?" You will be allowed to view the picture for 15 seconds, during which time you will write your answer.

"Okay—let's have a look at the practice slide and then we'll go directly into the test.

Next slide shows man smoking cigarette under "No Smoking" sign.

"Okay—you should have written next to the sample question—"smoking in prohibited zone" or words to that effect.

"Now we'll go on to 20 similar pictures and you will write your comments next to the appropriate number.

(Twenty test slides are then shown.)

"Okay, let's find out what your safety I.Q. is. We're going to go back over each of the pictures and see how you did. As we discuss each picture put a plus or a minus next to your answer so you can figure your own score.

"In picture No. 1 you have a wide range of possibilities. The stock is not properly fastened and could break loose under operation. The man is operating a drill with gloves that could get caught and cause extensive injuries. The same applies to the Fancy-Dan necktie and the long sleeves on his shirt. To top it all off, he doesn't even have his safety glasses on! We'll grant that this is an extreme case, but we're sure you've seen worse—or have you? If you've named any *one* of these unsafe acts, give yourself a plus.

"You may have had to look a little closer at the second picture to pick up the unsafe condition. Take another look, though, and you'll see a set of palm buttons on the press bed while a set of safety engineered press buttons on the stand in the foreground are ignored. Someone's asking for trouble here.

"If you missed the damaged switch box with exposed electrical wires, write "shame" beside answer No. 3.

"In the fourth picture, you see a foot pedal without a guard. Any passer-by could step on it at the wrong time, or a piece of heavy material could fall on the pedal—and wham! In a second's time a lost-time accident.

"In slide 5 we have a serious technician hard at work. In fact, he's concentrating so hard that he has overlooked the electrical lock-out switch and has not inserted it into the shaft so that he can work safely. He may not be here tomorrow—and there may be another case in emergency today.

"In picture No. 6, we see two girls cooperating beautifully in how to do things the *wrong* way. Under no circumstances do we allow two operators to operate one set of palm buttons! Someone's bound to get out of phase and then we're in for trouble.

"In slide 7 we see a man who is not long for this world. If that chain cuts loose, he's a gone cookie.

"In No. 8, you see two violations occurring simultaneously. The hi-lo operator is carrying a load that obscures his vision—and the hand truck operator isn't watching where he's going. Disaster is about to strike!

"No. 9 slide shows a hi-lo operator making like Sir Lancelot riding out to slay dragons. If he doesn't come down to earth with the forks of this truck, he may be slaying other workers rather than dragons.

"Here's another hi-lo driver playing it unsafe. The forks are too close together and the steel is not banded. Balancing tricks may be good for cocktail parties, but they have no place in a stamping plant.

"Improvised stock tables in No. 11 can lead to nothing but trouble, and right over his shoulder you can see that he has a sample of the safe way to stack stock.

"Need we say anything about No. 12? The last we heard of this employee he was spotted as an unidentified flying object over Salt Lake City.

"There is always someone who wants to try defying the laws of common sense. No. 13 might just get away with this type of lift hook-up—but on the other hand, he might not.

"We had one man like No. 14, who tried pounding with a mushroomed tool. That was several months ago. The tool shattered and a piece of the metal pierced his abdomen. The doctors are still trying to decide whether to leave his souvenir inside him or operate and remove it.

"In No. 15, we have two unsafe conditions in one act. First, the guard is not in place and second, the tool rest is set too far away from the grinding wheel.

"No. 16 has canvas shoes!—And in a steel storage area at that! Someone's asking for trouble.

"The lady in No. 17 is very careful about her grooming. She wouldn't be caught dead

with a lock of hair out of place. But if she doesn't get that roller guard down, she might not have to worry about her hair tomorrow. The undertaker will provide that service as part of his regular fee.

"Obviously the man in No. 18 has never seen an acetylene tank explode, or a ruptured oxygen tank shoot off like a guided missile, or he'd never forget to lock those tanks in place with the chains provided for that purpose.

"No. 19 is an operator working safely—he thinks. He has proper hand protection and safety glasses, but look at that exposed chain, sprocket and flywheel on the press.

"And finally, in No. 20, here's a man taking a gamble on departing this world rapidly. The lower coils of steel are not chained, and if that one-in-a-thousand accident should happen and that upper coil cuts loose, all I can say is—I'd rather not be there.'

"Now, take a few seconds to add up your score.

"If you batted in 18 to 20 safety home runs, we figure you're in the big leagues.

"If you scored 16 or 17 right we'll accept you in the minor leagues but you'll have to do better in order to make the big time safety league.

"If you hit 15 or less we suggest you take up water polo—this just isn't your game.

"Seriously, safety awareness is the first step in accident prevention. You can't do something about unsafe conditions and unsafe acts until you become aware that they are unsafe.

"Our ultimate goal is to keep an accident from happening in the first place and this is accomplished in two ways.

"First, correct the condition. Replace the guard that has been broken. Install the equipment that is needed to prevent the hazard—*and* make sure that each of your employees has the right tool available for the right job.

"The second step is to educate the employee to work safely. Nothing beats a direct contact. Let him know that you are concerned for his safety. Point out to him the possible hazards in his job. *Teach* him how to perform his job safely. *Insist* that he work safely at all times *and* resort to disciplinary action if necessary so that there will be no question that you mean business.

"Talk safety—act safety—and live safety—if you are to maintain the safety record you are capable of, and remember—

"Safety is *your* responsibility."

If you are interested in some of the mechanics of putting the 78-slide program together, I'll give you a brief rundown.

First, we used a Sony T11-5, tape recorder—which is the one used here today. It is a selfcontained synchronization unit and is inexpensive. It lists for $125.

All of the pictures were taken with a Yashica J-5 35 mm camera which is about as simple to operate as any we've found. Using Hi-speed Ektachrome that has a 160 ASA rating. There is seldom much need for additional lighting.

The art work on the cartoons are purchased from the outside but many companies have people in their engineering departments who can supply this service.

The titles were made with movable letter sets with a background of some art paper.

The program itself was narrated and coordinated by a member of the group staff industrial education section.

The script was developed by the safety, communication and industrial education sections of the group personnel department.

Our hopes are that variations of this program, dealing with specific plant safety problem areas, will be developed by each plant. As each area, die-setting, hi-lo operation, welding, crane hooking, and so on is developed we would want to make distribution throughout the rest of our plants.

For the small amount of cost involved we feel that it is *one* of many possible ways that we can give our supervisors repeated shots of safety awareness that should reflect in a continuing betterment of our safety record.

You have seen and heard this technique applied in but one area.

It can be readily adapted to almost any situation whether it be in machine repair, steel storage, die setting, etc.

The cost is less than nominal, approximately $200 pro-rated for 2,000 supervisors, we are talking of pennies.

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PRESENTATION OF THE WILLIAM H. CAMERON AWARD TO THE PUBLIC UTILITIES SECTION

By W. G. JOHNSON
General Manager, National Safety Council

It is a particular pleasure to present the William H. Cameron Award, because Bill Cameron hired me in 1937 and gave me my first promotion in 1940. I have great respect for the memories of the determined man who steadily built the Council's strength between 1913 and 1942.

I also appreciate having the souvenir leaflet honoring the 50-year history of the Public Utilities Section, particularly for the roster of section officers. Some of the men who served as early as 1916 were still active when I came into this work, and I will remember the fine work they did on behalf of the National Safety Council and its Public Utilities Section.

The safety movement as a whole is particularly indebted to the Public Utilities Section in two ways not counted in the Cameron competition:

1. We are working asiduously to extend safety to small business through trade associations. As we do this the question may naturally arise as to whether trade associations "compete" with the National Safety Council and its services to its members. We can show that this is not the case because of the situation we have in the Public Utilities Section and a few of the other strongest sections—namely, where the trade associations have the best programs, we find that the Council's sections are the strongest. Understanding of this permits us to push the trade association approach in new industries with the greatest of vigor.
2. As I go about the country I have remarked that time and time again public utility executives are the strong right arms of the state and local safety councils. No industry is doing more for state and local safety organizations, and this is a great evidence of the citizenship role of public utilites, as well as a major contribution to the strength of the safety movement.

The purpose of the Cameron Award is not solely to recognize the best section. The underlying purpose is to stimulate more and better sectional activity. In this the plan has been notably successful—the amount and quality of sectional material and activities has doubled during the brief history of the Cameron Award.

Judging of the award is carefully done, because you can readily see the sensitivity of judging relative performances of components of the Council. Different staff members separately grade the various categories of activities scored in the competition using rules laid down by the committee of judges. The gradings are discussed with the committee, but no modifications are made except as the criteria for judging may be revised and improved. No members of the committee of judges speaks with regard to the evaluation of his own section. Thus the integrity of the judging process has been exemplary.

The Public Utilities Section has ranked well up in the competition for several years. After many times as a bridemaid, the section is now the bride!

Among the sectional activities which were outstanding were the following:

1. The newsletter was judged good, and only the excellent newsletters of a few other sections kept it from being the very top.
2. Membership activities were by far the best of any section.
3. Technical publications activity ranked just below the top performance of the best section.
4. The Congress program was judged outstanding.
5. The categories of off-the-job safety activity, training, and associations work were the best of any section.
6. Audio visual aids ranked just below the top section.

It is a great pleasure to present to Ted Wickord, your General Chairman, the trophy

which is emblematic of the William H. Cameron Award for your 1964-65 performance. My congratulations to Mr. Wickord, to all the members of the section executive committee, and to the members of the section who had the wisdom to select this outstanding group to guide the section's affairs this past year.

SAFETY STAFF VS. FIELD MANAGERS — A PACKAGE FIELD MANAGERS WILL BUY

By J. D. WARD
Outside Plant Safety and Training Administrator, American Telephone & Telegraph Co., New York, N. Y.

Governor Pyle has described a safety man as a combination of evangelist, doctor, lawyer and engineer. While in various stages of his day to day existence this is true, the facet I would like to approach is his role as evangelist. I will try to share with you some basic concepts we in the Bell System use to promote safety, and how we have reconciled the dichotomy that can sometimes exist between the field forces and those of us presently holding staff positions.

The field manager has his problem and some basic responsibilities in terms of production, quality, sales and costs. There are times when safety takes a back seat to his other more pressing objectives. There are times when all of us have taken chances and gotten away with it. We, as safety men, are here to convince our colleagues in the field that these risks must be minimized through good organization, planning and control. We also can serve a function as the conscience of our fellow employees in developing where the needs are and finding ways and means of correcting problem situations.

It is in this latter role that we, as the Safety Staff of the Bell System, came to realize that we had a basic weak spot among our people who are required to climb poles and work on ladders above ground. Roughly, this force consists of 95,000 people and there are over 22,000,000 poles in service that they could conceivably climb.

The problem was accentuated as we reviewed every working aloft accident for the past three years. I suppose at this juncture we could have come to the conclusion that working aloft was just more hazardous than other work operations, for certainly in a business such as ours climbing is basic, and our people certainly should know how to climb.

Our thinking didn't go this way, however, and our next step was to proceed into the field to try to observe what the problem was. We found the problem in fairly short order. It was basic—our people didn't know or had forgotten their original training on how to climb and work aloft safely. Furthermore, much of our supervision was in the same boat.

One of our concepts in the Bell System is that there is a right way to perform a work operation. We don't believe that safety should be taught apart from other training items but should be an integral part of all training. The men we found that did not know how to work aloft had been trained the right way but had just lapsed into bad work habits. Our problem was now defined—what could we do about it? We, as the safety staff, had the responsibility to come up with an idea that would be universally acceptable to the field forces, that they would be willing to spend time and money on, and that would be of the most immediate benefit to the force that needed it.

The only way to approach it was through the eyes of a field man. The easiest way would be to repeat the man's original training. We doubted, however, that this would accomplish the desired end result, as this was the same training that was so soon forgotten, and we are now dealing with a much more experienced force. We felt that

we had to explain more of the "why" of working safely aloft as well as the "how." We knew from past experience that a "talking at" type of training package developed a "ho-hum" response from the people being trained. We needed something that the trainee could participate in. We also knew that the trainee had to have some basic motivation to accept the concepts that we were trying to get across.

Our challenge then was to provide a training package on how to work safely aloft that would:

1. Demonstrate the right, safe, and economical way to do a job
2. Motivate the trainees to accept the training
3. Promote the "whys" of working aloft safely in order to equip our people for better judgments
4. Allow participation
5. Permit controls to evaluate the effect of training

The package we developed contained the following elements:

1) Phase A consisted of the presentation of the problem, explanations and demonstrations of the forces at play in the job operations that are encountered every day, and the re-enactment of six fatal accidents depicting the results of not properly considering the potential effects of these forces. During these demonstrations, information will be developed on what can be done to safely handle the stresses and strains present in outside plant in order to work more safely when working aloft.

2) Phase B consisted of presenting the material to be used in Phase C, giving instructions on its use, and directing the trainees to their assignments.

3) Phase C consisted of the work assignments. The foremen and the trainees assigned to him, preferably his own crew, will proceed to a pre-selected work location to perform the assignments covered in lesson outlines. To be the most effective, Phase C should follow Phase A on the same or following day. In no case should the time interval between them exceed one calendar week.

The training starts after a short introduction with the playing of a tape made by one of our foremen who had an employee involved in a fatal accident. This particular accident involved an electric shock case and really serves as an attention getting device to drive home the personal aspect of safety.

Following the tape we proceed into some of the whys of safe working aloft. Our first analogy, one we will use throughout the training package, is a comparison of our plant to a trap.

The instructor points out that if we disturb the balance of the trap it will spring, and that what we are dealing with in our plant is a pretty delicately balanced situation. The trap consists of all the problems one can encounter when climbing a pole:

1. Not testing the pole before climbing
2. Failing to recognize the effect the work would have on the balanced center pole
3. A shock load
4. A pole that is rotted off or broken below ground level
5. Effect of moving weights (or a man climbing)
6. An unsupported rotted pole
7. When you swing to the low side you again upset the balance.

I am striving to briefly give you an idea of how fundamental we had to get to push our points across. Were this an actual course you would be participating with your solutions to some of these problems.

The stage is now set to apply what has just been demonstrated cooncerning the stresses and strains that are fundamental to an outside plant condition. Our method of application is the re-enactment of actual accidents that have happened and to elicit comments from the group on what could or should have been done in each case. We hope with these demonstrations to convince the individual that observations and tests are for his benefit and for his own safety and welfare.

The first re-enactment we present is this:

Due to a road widening project our line must be moved. The workmen are required to transfer the existing plant to a new pole line that has been set. The transfer is in progress. Two men are on the job and made the following decisions:

1. Not to cut the wire from the ground to avoid service interruption

2. One man would go down the road and place work signs
3. The other man climbed the old pole to remove the wire

We also fill the trainees in on other facts concerning the situation such as the rake of the old pole, the tension each way, the age of the pole and height, the placing of guys and any other attachments that may be on the pole. The instructor now brings the trainees up to date by telling them that the workman has untied the wire on the field side and released it from the pole. He has then swung around to the road side and is about to remove the wire.

At this point the trainees have been given all the facts known to the two workmen who were doing this job and all can proceed with an analysis:

1. Why did the workmen assume the pole was safe to climb?
2. Should the wrapped guy wire on this pole have warned the men of danger?
3. What specific safety precautions could have been taken before climbing the pole?
4. Could men have performed the work safely from the ground?
5. How could this job have been done safely?

Once the discussion has finished, the instructor then proceeds to what actually happened. At a pre-arranged signal an assistant triggers the trap and the pole with the workman falls across the road. Result: Fatality.

The next case concerns a man using his ladder. He is assigned to install a new telephone in a residence. On arriving at the house, he found an existing drop wire from the house to a span clamp located across a street to the rear of the house. He placed his ladder on the street side against the span and climbed the ladder to remove the old drop. At this juncture, we again would discuss what the employee did wrong as well as what could have been done to do the job properly. What actually happened; As the man removed the drop the tension was released from the strand causing the strand to swing away from the ladder then rebound throwing the employee off. Result: Fatality.

The third re-enactment concerns two installers assigned to connect a new order which required a drop wire to be run across a two-way street. One installer fastened the drop wire to the terminal pole and proceeded to terminate the loop. The second man placed the wire on the ground across the street and then climbed the pole on the right to attach the wire. He carried it across his body so that he was inside the angle formed by the wire. Again, with the situation set we would proceed to analyze the rights and wrongs of this situation. To trigger this trap, the car to the right is propelled across the wire in the road catching the wire as it crosses it and pulls the man from the pole. Result: Fatality.

Our fourth re-enactment is essentially the same situation as the second. This time the man is a repairman sent on a case of trouble. In order to clear the trouble, he must lower the wire from the house to the strand to the ground. He again makes many of the same mistakes:

1. Ladder placed adding tension to drop wire
2. Ladder does not have strand hooks, is not lashed
3. Man didn't use belt around ladder and strand
4. Ladder is extended and one run above strand
5. No effort made to remove tension from wire

This time when tension is released, the strand swings away from the ladder further than the length of the ladder and the man falls with his ladder. Result: Serious Injury.

Our next situation involves a two-man crew assigned to dismantle a line which crosses a non-navigable river. The crew proceeded to the location on the west side of the river and cut 10 wires (each weighing 50 pounds) leading to the next pole 645 feet away. They then crossed the river by a bridge and each climbed one pole of an H fixture on the guy side of the pole. One man cut the five lines on his side of the fixture and passed the cutters to his co-worker who cut the other lines. Again the trap was sprung with the load released from the river side of the fixture. The men were found beneath the pole—one dead and the other seriously injured.

Failure to test the poles (placed in 1927) was a contributing factor and would have revealed one pole completely rotted off and the other hollow to about 10 feet above ground. Any number of preventive measures could have been taken had this fact been realized.

Our last re-enactment concerns a situation where a man was assigned to remove a cable from a building that was about to be demolished and transfer the cable to a new pole to pole strand. Slack had already been pulled and the cable partially unlashed from the existing strand. The employee placed his ladder against the building and climbed it to remove a terminal and also to remove the remaining lashing to free the cable from the building. The cable was being temporarily supported by a ⅜" line. As he removed the support the load shifted violently —the hand line broke—the terminal pulled across the employee's safety strap causing the ladder and employee to fall. Result: Fatality. In this case the employee placed himself in the trap. The slack load in this case was probably a minimum of 500 pounds. As in most of these cases the irony was that other help was readily available both in terms of other employees and mechanical help.

Up to this point we have tried to dramatize and discuss the penalty that poor observation and poor planning have had in several working aloft situations—none of them uncommon to the everyday work operations that our men are required to perform. Through open discussion and questioning we have asked the men themselves to analyze each of these cases to determine what was wrong. We have also presented the consequences.

Having provided the motivation towards the right way of doing a job and having explained some of the "whys" of working with a plant that is under stress, we can proceed to the right and safe way to do a job. During this phase of the training which we recommend should follow immediately, we have the foreman work in an on-the-job location with his men both demonstrating and having them demonstrate to him the proper analysis of a situation and the proper use of tools.

This is what the foreman will try to accomplish in this half-day session:

1. Tools—proper inspection and care
2. Observations — what safety measures and tests are required in the job
3. Tests—as a result of the observations, how do we conduct the tests
4. Climbing—hazards to be alerted for
5. Working—what stresses and strains exist, what are power clearances and the effect of what the craftsmen will do on the existing balances
6. Mid-strand Practices—what different or new methods are required.
7. Extension Ladders—what are the special considerations of using ladders
8. Wires—how are they placed in a safe manner

The foreman first explains the importance of safe tools. One of the most important tools is the body belt, it must be inspected for checks, cracks, firmness of rivets and deterioration of stitching.

A handline is also important. It should be inspected for any signs of deterioration, opened and examined inside for loose or frayed fibers, powder or dirt that will cause it to wear out faster.

One of the essentials of working aloft is knowing how to carry your gear. Carrying a handline *secured* to a wrench or any other part of the belt can be dangerous. The use of a carrier or a loop underneath the belt will allow the handline to run free should it become snagged on any foreign object. This is the only way a handline should be carried aloft.

Throughout the entire afternoon we constantly refer back to written practices, so if the trainee should subsequently forget the proper way to work, he knows where he can look it up.

It is essential also that the men know their climbers are in good shape. Visual inspection for any loose rivets or worn straps should be made. At least once a week his climber should be tested using a plane test on a pine board. The gaff should cut in within one inch. If they don't, honing may be necessary to sharpen the cutting edges.

The cut-out test is another indication on the reliability of climbers. The gaff is jabbed into the board at a 45 degree angle and then lowered to horizontal. If horizontal pressure

then causes the climber to cut out, remedial measures should be taken.

Eye protection is also covered. Spectacle type glasses should be used when danger exists from low impact particles. A different type should be used when working near high impact material as demonstrated by the trainee.

Some telephone operations do require the wearing of insulating gloves. To make sure these rubber gloves are in good shape, a captive air test should be performed prior to every use.

Under conditions where there is possibility of power leakage, we use a B Voltage tester. Checks should be made on the tester itself. They should be tested once a week at the garage location and date posted on the cover card. Visual inspections are also made for loose ferrules, frayed or loose wires. The temporary bond should also be inspected as should the B shunting capacitor. This capacitor is used when voltages are found to determine the extent of the leakage.

Ladders are a tool that we rely on that must be inspected to insure safety. The foreman goes over the rope, rungs, siderails and tests for lateral play by standing the ladder on its side. This should be done at least once a week.

As part of getting the total picture we must examine the safety of the pole which we are required to climb. First is external examination for cracks that could indicate deterioration or could affect where you plant your climbers as you climb. Pole markings can also be a hazard and, let us not forget our old friends the politicians.

We should know what is above before we climb power—light fixture—attachments.

With a ground on the pole we should test it for extraneous voltage. Through the use of the B voltage tester which we have just examined, we determine the exact situation. The light fixture should be tested too. Finding some indication of voltage, we use the shunt capacitor to determine whether the indication was true or false. Some fixtures give false indications and the shunt capacitor drains off energy that can develop from non-hazardous leakages. Finding it OK, we use a temporary bond to equalize any difference in potential between the fixture and the strand.

Testing the physical condition of the pole is also important. The pike test which will tell us whether or not the pole is broken off below ground level. We sound poles by the use of a heavy hammer to find whether or not there is any interior deterioration. A sound pole will ring sharply when hit by a hammer. A soft pole will give a soft thud and also the hammer will sink in if the pole is unsound underneath the shell.

See what the pole looks like underneath the ground. Most deterioration can be detected within 12 inches of the surface. So, dig around the pole to a depth of about 12 inches and use a prod to determine whether or not there is any rot below ground.

In some cases, it may be necessary to do a bore test on the pole. This is usually done only when other means fail to tell us the soundness of the pole or there are questionable indications. As the man bores he examines the shavings, and after he bores, he must insert a treated plug to bring back the integrity of the pole.

An alternate means for testing for a broken pole is with the use of a handline around the strand. Care must be exercised not to pull the pole towards traffic or towards yourself in such a manner that a broken pole could cause injury. Without a strand, we can use the rope test by placing the line sufficiently high on the pole to give about a 45 degree pull.

Any pole which is doubtful should be supported. The cant hooks keep the pole from twisting. Lacking other mechanical means to support the pole, three pikes can be used.

When working in mid-strand it's essential that we know how good the strand is. Will it support our weight? A line passed over the strand and then the gradual applying of the full weight of the man will soon tell.

There are times when you are in a tight spot and raising your ladder could be a problem. There is the handline method of getting your ladder up. If space is no problem, you can walk the ladder up. Always have your ladder hooks extended.

For heavy work we require the ladder be lashed at the strand. When performing light work, however, the use of the body belt is required. The body belt is fastened around the strand, the ladder rung and yourself. It

should provide a safe condition under which to work.

The trainee is often required to raise and lower wires under varying conditions. We believe the best way is to raise the line from the ground. A drop wire reel can be positioned on one side of the road, the drop wire is run flat across the road and then raised to the strand by use of a handline tied to the drop wire with a bowline. It is essential that this bowline be used so that should the drop wire become entangled in any foreign object, or should a passing vehicle chance to catch the drop wire, it will run freely through the knot. Having the drop wire raised to the strand, we can proceed to terminate it without putting ourselves in the trap.

Likewise, in lowering a drop wire, it can be done with a real degree of safety from the ground.

Working in mid-span and controlling heavy loads, it is important that not only the ladder hooks be extended, but the ladder should be at least two rungs above the strand and lashed to the strand.

One of the basics in teaching safety aloft is to do as much of the operation from the ground as possible.

There is a test that accompanies the course. It is a question and multiple choice answer type of test that is designed to determine the effectiveness of the training and to point out additional review that may be necessary. It can also be given at a later date to determine the retention value of the training material.

What is the purpose of this training? When an employee is going to climb a pole, he must realize that he must exercise all of his climbing skills to do it safely.

I hope you noticed how this on-the-job training teaches the practical means of avoiding the traps of the morning session. As you can see we have put together a rather full day of training—mixing techniques and encouraging participation. We have strived to get the trainee's attention and to hold it through accident re-enactment. We have provided some real basic fundamentals on handling stresses and strains and avoiding the traps of working aloft. Participation has been elicited and indeed required so that the trainee can show that he does understand. We have proven the economical and safe way of handling any situation is the only right way.

We test at the end of each of the various phases of training to insure good control. These tests are designed to drive home the lessons that are learned during the training period. We have put a package in the field manager's hands that is effective, not only in promoting safety, but also in helping his production by virtue of teaching the right way of doing a job. Our experience has shown that we can do the production job safely.

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THE GRAY AREA

By W. B. KOUWENHOVEN, Dr. Ing.
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When the respiration and the pulse cease, an emergency develops which is frightening. Under these conditions the person is "clinically" dead and a physician may write a death certificate. It is well known, however, that there is usually sufficient oxygen in static blood to support life for about two minutes. After four to six minutes have elapsed,[1] the brain begins to die and "biological" death sets in. The *Gray Area* is the period between "clinical" and "biological" death.

If you are on the scene, it is your responsibility to immediately initiate resuscitative measures; otherwise the alternative is death. You will have to breathe for the victim and circulate his oxygenated blood in order to keep him in the *gray area* until help arrives, or until you are able to resuscitate him and restore his natural functions.

The common causes that may result in the stoppage of breathing and the heart are: heart attacks, drowning, insect stings, asphyxia, and electric shock. Since most of you assembled here are in the engineering field, it is desirable to consider the effects of electric shock on the breathing and the heart.

Electric Shock

In electrical accidents, the most common path of the current through the body is from hand to foot. The trunk, with the heart and lungs, lie in this pathway and may be affected by the shock. An electric shock may be harmless or cause traumatic consequences. It may:

1. Temporarily paralyze the respiration, with continuation of the heart beat until the oxygen in the blood is exhausted;

2. Interrupt the circulation by throwing the heart into standstill or ventricular fibrillation, and gasping attempts to breathe may continue for about 45 seconds; or

3. It may stop both the respiration and the circulation simultaneously.

In ventricular fibrillation the heart no longer contracts effectively; instead each bundle of heart muscle operates by itself without regard to the others, and there is no circulation. It may be compared to an 8-oared racing shell. At each call for "stroke" by the coxswain the crew pulls together and the boat goes forward. If one of the oarsmen catches a crab or his oar strikes a piece of driftwood, the coordinated action of the crew is lost and chaos results. Forward progress ceases. To restore forward motion to the shell, all the oarsmen must cease their individual efforts, come to rest, and then be restarted by the coxswain.

FIGURE 1 shows a diagram of the heart and its electrocardiogram. Electrical signals

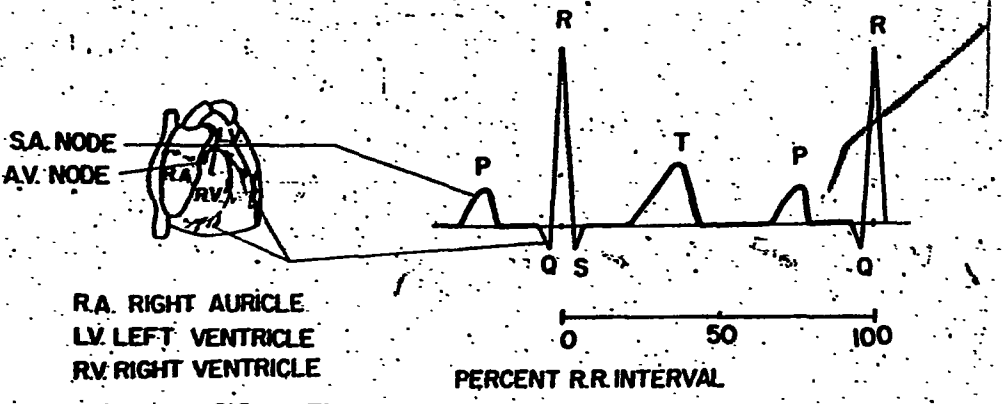


FIG. 1—The heart and its electrocardiogram.

from the brain control many of the body operations and the heart is no exception. The heart, however, has its own center, the sinus auricular node, and may operate without signals from the brain. The electrocardiogram shows the electromotive forces set up in the heart as measured by electrodes on the wrists and ankles.

The sinus auricular node is the coxswain of the heart and it gives the orders for the heart to beat. The *P* wave is the small electrical signal that it sends to the heart fibres. This signal travels down through the tissues and the nerve fibres that lead to the ventricles, setting up the *QRS* complex. This is completed in a few milliseconds and then the muscular contraction of the heart follows immediately. When this is completed the heart recharges by chemical means, as represented by the *T* wave. Following the *T* wave there is a short rest period before the next *P* wave gives the signal for the next stroke.

The effect upon the heart that an electric shock may cause will, of course, depend upon the current, the duration of the current flow, and the point in the heart cycle at which the shock falls. The heart is especially vulnerable to short shocks that fall in the *T* phase.[2]

RANGE OF EFFECTS OF ELECTRIC CURRENT

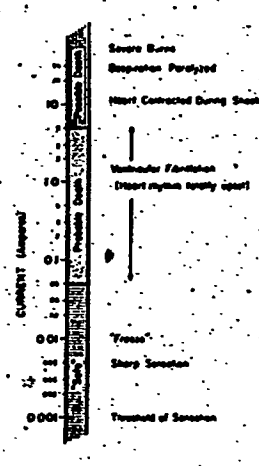


FIG. 2—Effects of one-second shocks on the human body for a current path from hand to foot.

FIGURE 2 shows the effects of one-second shocks on the human body for a current path from hand to foot. A shock of this duration covers the entire heart cycle. The threshold of sensation is 1 ma. A current of 4-7 ma's produces a sharp painful sensation, and one instantly releases his hold on the circuit.

Man has two sets of muscles: (1) the flexor muscles with which he grips, and (2) the extensor muscles with which he hits.

An electric shock of 9 to about 25 ma's (Dalziel)[3] causes a man to freeze to the circuit if his flexor muscles are excited first; if it is the extensor muscles that are excited he may be thrown away.

A current of 50-60 ma's to slightly over 4 amperes may put the heart into ventricular fibrillation, causing the circulation to cease. In such cases the victim often gives a few gasping breaths. The human heart rarely recovers spontaneously from ventricular fibrillation.

Currents ranging from 5-10 amperes fall in a "no man's land" where one cannot definitely foretell the result. For example, I have never been able either to fibrillate or defibrillate a dog's heart with a current of 7½ amperes. Currents from hand to foot of 10 amperes or more will contract the heart and hold it in standstill as long as the current is flowing. They may also paralyze the respiration. When the contact is broken the heart may remain in standstill or it may resume normal beating on its own. Large currents may cause serious burns because of the heat produced by the current through the body.

FIGURE 3 shows shocks of various durations and magnitudes that cause fibrillation. A current of 1.2 amperes, flowing for 1/100th of a second, and striking the heart in the *T* phase, will produce ventricular fibrillation. As the shock increases in duration smaller currents will produce fibrillation, and when it reaches the duration of one second, the length of the heart cycle, the fibrillating current falls to around 50-60 ma's.

Resistance of the Body

The body offers resistance to the passage of an electric current and a large part of this resistance lies in the outer layer of the epidermis—the horny dead layer of the skin.

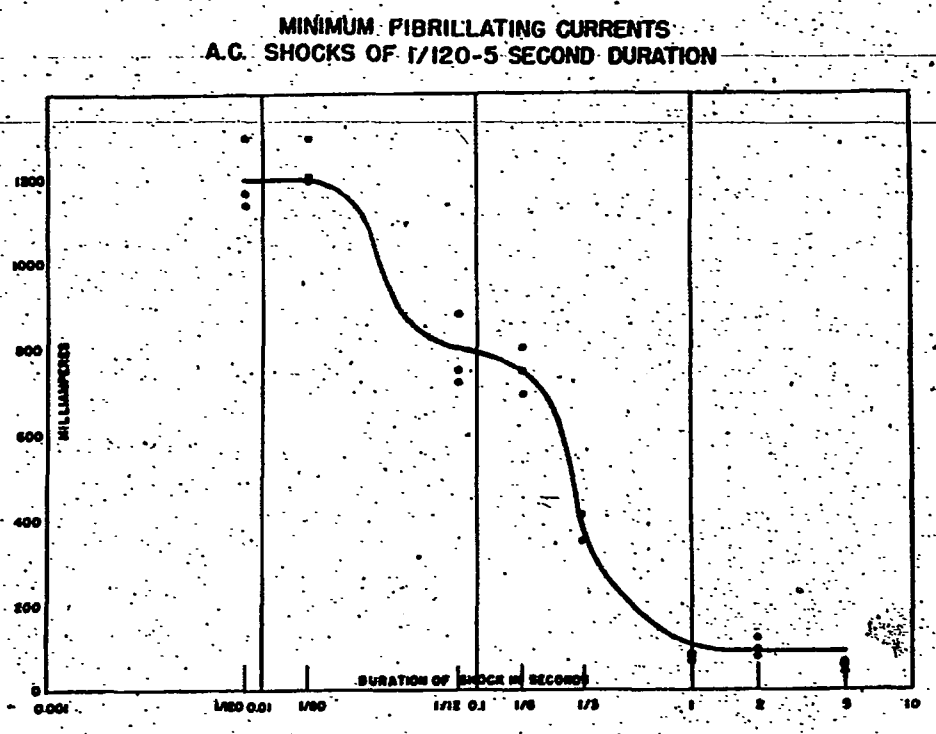


FIG. 3—Effects of shocks of varying durations on the heart.

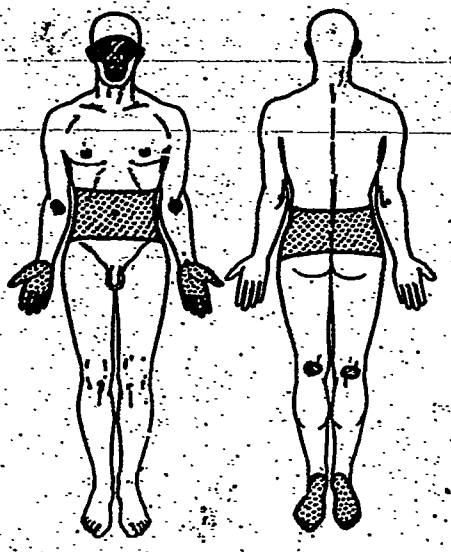
This horny layer is our best protection against the passage of electric current through the body.

The resistance of the epidermis[4] is not uniform over the body surface, as shown in FIGURE 4. It is low on the palms of the hands, the soles of the feet, the axillia, the center of the face, small spots in the crock of the elbow and back of the knees. There is a girdle of low resistance around the abdomen. The skin resistance on the back of a finger is 8-10-fold higher than it is on the underside.

Skin resistance varies with the perspiration and moisture, which may lower it to 1/100th of its dry value. The electrical resistance of an adult man, from hand to foot, may range from 10,000 to 500 ohms depending upon the voltage of the circuit, the area of the contact, and the condition of the skin. If the skin is removed from the hands and feet and contact is made with the raw flesh, the resistance is approximately 300 ohms. Abrasions and blisters destroy the protection that is offered by the epidermis.

When an electric currents gets through the high contact resistance of the epidermis, it enters the derma which is rich in blood capillaries and is a good conductor. The electrical resistance of the body tissues and muscles is practically uniform, ranging from 100 to 110 ohms per cm.[3] Blood has a resistance of 96 ohms. In its passage through the body the current spreads out in a fusiform or football shape. Live bone has a resistance of 700 to 900 ohms per cm.[3] Human fat has a high resistance, as much as several thousands ohms per unit volume.

In making resistance measurements of the body, the voltage of the circuit should be more than 50 volts. This may be clearly seen from the results in TABLE 1.



NORMAL SKIN RESISTANCE PATTERNS

☒ LOW RESISTANCE

FIG. 4

TABLE 1

Body Resistance

Voltage AC	Current Amperes	Resistance Ohms
50	0.005	10,000
500	0.42	1,200
1,000	0.97	1,100

These measurements were made on the dog, with electrodes on the foreleg and hind leg. There was a drop at the contact of approximately 49.5 volts. If this contact drop is subtracted from the applied voltage, the resistance of the body between the points of contact was of the order of 100 ohms.

I made a study of the skin resistance of the fingers of telephone operators under controlled conditions. These tests ran almost a year and were made at 2-week intervals. One day in June, one of the subjects showed very low resistance on the fingertips of her left hand. Inspection of her fingertips with a magnifying glass showed no evidence that would account for the drop. Upon questioning, she reported that the night before she had been sewing a dress for her daughter's graduation from high school, and that she had pricked her fingers with the needle.

If the current pathway through the human body involves no vital organs, the injuries are minimal except for possible burns.

In each electrical shock accident there are many factors which affect the seriousness of the results. It is evident that an electric shock may render the victim unconscious and leave him in that gray area between clinical and biological death.

Your Responsibility

When a companion, or someone whom you chance to see, falls to the ground, you should run to him and if he is unconscious place him on his back and check for breathing and pulse. The best point for checking the pulse is the carotid artery, which is just alongside the Adam's apple in the neck. You may also lift his eyelids and examine the pupils—if they are dilated there is no circulation of oxygenated blood. *He is in the gray area.* It is your responsibility to keep him from slipping beyond it.

The first thing you should do is to extend his neck, pushing with one hand on the forehead and one hand on the back of the neck, so as to open his airway. (Sometimes this is all that a victim needs.) Open the victim's mouth and remove any foreign objects such as loose dentures, tobacco, or chewing gum. You may use a handerkerchief to wipe his mouth clean. Then proceed to ventilate his lungs by giving either *mouth-to-mouth* or *mouth-to-nose air or ventilation.* Give 2 to 4 quick deep breaths; being sure that the chest rises each time, and check for the pulse and breathing. (Often this is all that the victim needs.) If the heart *is beating,* ventilate his lungs about 12 times a minute. If the heart *is not beating,* then it is up to you to not only breathe for him but you must also circulate the blood that you are oxygenating.

The exact position at which pressure is applied is important. Locate the victim's breastbone by the notch at the upper end and the ziphoid (flexible cartilage) at the lower end.

Kneel beside the victim, either side, keeping the finger that is on the ziphoid in position, and place the heel of the other hand on the breastbone immediately above the finger. This is where pressure should



FIG. 5—Position of hands applying external heart compression and extended position of neck to insure open airway.

be applied. Now place the first hand on top of the other and press down firmly, using your back muscles. (Keep the fingers of the lower hand parallel to the ribs. They should not touch the body.)

Do this once per second. This compresses the heart which lies between the breastbone and the spinal column.

After the first two or three compressions you should be able to press the breastbone downward about 1½ to 2 inches. Blows should not be used; instead the pressure should be applied firmly, and at the bottom of the stroke hold for a brief fraction of a second; then the pressure should be completely released, allowing the chest to expand.

When you press down, because of the heart valves, blood flows from the right side of the heart to the lungs, and from the left side of the heart to the body. When pressure is released and the chest expands, the right side of the heart refills with blue blood from the body, and the left side with oxygenated red blood from the lungs.

One Rescuer

If you are alone and there is neither breathing nor pulse, after you have given the victim 2 or 3 quick deep breaths, you should position your hands and give 15 compressions at the rate of 60 times per minute; then ventilate his lungs with two quick deep breaths and give 15 more compressions. You should alternate these two techniques until help arrives.

Two Rescuers

If there are two rescuers, one should ventilate the victim's lungs while the other one applies heart compression. FIGURE 5 illustrates the position of the hands of a rescuer applying external heart compression to a victim, as well as the extended position of the neck to insure an open airway. In this case, the man applying heart compression should continue to work uninterruptedly. The one ventilating the lungs should blow only when the other man is removing the pressure from the chest, and should do this after each five compressions. You must al-

ways be sure that the chest rises when you are ventilating the lungs.

Effectiveness of Resuscitative Efforts

Are your efforts effective? If so, the victim is in the *gray area*. You are oxygenating his blood and circulating it! His color should improve, his pupils—which have dilated—should constrict, and in this "clinical" death situation the victim may move his arms and legs slightly. He may even attempt to breathe.

A call should be sent for help and an ambulance. Heart compression and breathing should be continued all the time the man is on the stretcher, and after he is placed in the ambulance on the way to the hospital.

People have been maintained viable in the *gray area* for periods of one hour or longer, and your efforts may make it possible for someone to see another day.

Mechanical Resuscitators

In many ambulances, pressure cycling respirators are used. None of these ventilate the lungs while heart compression is being given.

In several reports of electrical accidents received from utilities companies, the statement has been made that when the victim was given mouth-to-mouth lung ventilation and manual heart compression, he had begun to show signs of returning life. However, when placed in the ambulance a pressure cycling device had been used and when he reached the hospital the physician reported the victim D.O.A.

The American Heart Association,[6] in the May issue of its journal, *Circulation*, published an editorial relative to these pressure cycling devices, and I quote the following excerpt:

"The use of pressure-cycled automatic breathing devices in conjunction with external cardiac compression has been ineffective."

Training

First aid personnel should be thoroughly trained in heart-lung resuscitation. They should *know what to do* and *do it* without loss of time.

If heart compression is properly applied, the chances of breaking a rib are slight. However, if nothing is done, the alternative is *death*.

Caution: Never practice heart compression on a conscious person. He will resist your efforts. However, the chest of an unconscious person is remarkably flexible. The ribs are attached to the breastbone by a cartilage and this cartilage makes it possible to effectively apply heart compression. If the victim is in ventricular fibrillation, he must be taken to a hospital where a defibrillator is available.

The report of the Baltimore City Ambulance Corps covers 153 attempted cardiopulmonary resuscitations between November 22, 1961 and March 19, 1964, and clearly reflects the effectiveness of thorough training. Of this number, a total of 52 patients were delivered to the hospitals alive, and 15 of these are living today.

SUMMARY

Steps in Resuscitation

Assume that you are the only person present when someone collapses and falls unconscious to the ground:

STEP 1—Place the individual in a supine position on a firm surface, such as the ground, as quickly as possible.

STEP 2—Kneel beside him and determine:

(a) is he breathing?

(b) has he a carotid (neck) pulse?

(c) are his pupils widely dilated?

STEP 3—Extend his neck, forcing his head back into a sniffing position. Open his mouth and remove any foreign objects. Give him 3 or 4 quick deep breaths, either mouth-to-mouth or mouth-to-nose. His chest should rise each time you blow.

STEP 4—Check again for his pulse. If it has returned, all you need to do is to ventilate his lungs about 12 times per minute until he resumes breathing.

STEP 5—If no pulse is present, begin heart compression at once. Locate his breastbone by the notch at the upper end and the cartilage at the lower end,

place the heel of the other hand on the breastbone adjacent to this finger.

Apply pressure vertically downward about once a second, using your back muscles. The fingers of the lower hand should be parellel to the ribs and no pressure should be applied by the fingers. At the end of each compression lift the hands slightly to allow the chest to expand. Give 15 compressions.

STEP 6—Stop the compressions and give two quick deep lung inflations, making sure that the chest rises with each breath.

STEP 7—Resume heart compressions.

STEP 8—Continue alternating the two techniques.

STEP 9—When help comes have someone telephone for an ambulance, and have the second rescuer take over the breathing or heart compression. The lungs should be inflated after each fifth compression, while the pressure is removed from the chest.

STEP 10—Manual lung ventilation should be continued until the victim reaches a hospital.

If you are doing an effective job, the victim's color will return, the pupils constrict, and a palpable pulse may be detected.

Remember that it is your responsibility to act promptly as *time is limited*. It is important to *know what to do* and to *do it* at once and effectively. Procrastination results in death.

ACKNOWLEDGMENTS

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SAFETY, SERVICE & SAVINGS THROUGH BAREHAND LIVE LINE WORK

By D. E. GAIENNIE
Vice Pres., Operations and Engineering, Maine Public Service Co.

How is it possible that a *small* electric utility located in the remote woods of Maine has been able to compile such a fantastic safety and production work record in 27 months operation?

How is it possible to accumulate over 7,000 unit hours of work employing what some have called a "dangerous practice", working on energized conductors heretofore reserved for *only* the metal end of a six-foot hot stick and yet these men are working with their bare hands (which are covered during extreme cold for reasons of temperature only), and month by month using the *same* purported, "hazardous technique"?

What type of men are these? Surely they *couldn't* have been linemen "tutored" under the accepted rule of, "man at ground potential". Are the voltages, construction, climatic conditions different in Maine than in California or Florida, Texas, yes, and even Illinois? Is electrical current any less severe in Maine than it is in these other localities? Are all the transmission lines located within reach of paved highways? Is continuity of service so much more important in Maine than in other parts of the United States? Surely there must be a reason for the apparent results and answers to the questions asked.

I would like to explore with you this "Never, Never Land" to which Maine Public Service Company employees have so easily adapted themselves.

Very briefly I will outline to you what we did and are doing, the safety records we have compiled and the almost unbroken record of service continuity as a direct result of Barehand Live Line Work.

We have two Holan aerial elbows which are designated as "HVLL Aerial Elbows". They are in two sizes, a 50-footer and a 57-footer. Both are equipped with current monitoring and shielding devices, special lifting booms, and the many tools required in this type of work.

This equipment is expensive, in fact, probably the most expensive aerial units manufactured today. As a matter of information, the 50-footer costs in excess of $24,000 and the 57-footer over $30,000 (this of course includes properly sized vehicles), but we in the management of Maine Public Service Company did not feel that we dared use initial unit price as the criteria when men's safety was involved, therefore purchased what we considered the best.

However, equipment alone will *not* mean that *you* could duplicate our record for without adequate training, proper tools, and a high morale factor, you're "*spinning your wheels*".

We gave a system-wide demonstration so all employees would know what Live Line Barehand work was and what the Elbow could do and shortly thereafter trained a crew from the Transmission and Distribution Department. The crew consisted of a leadman lineman, a journeyman lineman and a truck driver groundman.

Very briefly, the training of the Live Line Barehand crews involved a fairly intensive program, consisting of a full day in the classroom discussing basic theory, the principle of Live Line Barehand, safe clearances, etc., with each trainee having a classroom book which he was asked to study. After the first day a one-hour briefing session was held each morning followed by seven hours of actual work on the Elbow with the instructor. This was done for a minimum of three days.

After this intensive training the crews were assigned various simple jobs under direct supervision of the instructor and shortly after this, regular work was assigned the Live Line crews. During all or most of these sessions the Safety Director was present for two reasons: first, to become thoroughly familiar with Live Line training, and second, to incorporate within our Standard Operating Procedures (MPS safety rules) a section on Barehand Live Line work. Work practices and procedures are regularly reviewed with Live Line crews.

Effective with training completion of the first Live Line crew I issued an order cancelling all planned circuit outages that involved curtailment of service to customers and since that time we haven't had a job that couldn't be done if the unit could get to the pole or structure and reach the job point.

The climatic conditions in Maine are quite similar to the upper peninsula area of Michigan, the high Sierras and the Rockies, with a very short construction season, long and cold winters with the lowest recorded temperature of 50° below zero and snow depths up to 10 feet are not unusual. Wind velocities during the winter often range in the 40 to 50 mph bracket to make fairly uncomfortable working conditions. We do use "Swedish type" heaters within the work buckets which help to some degree.

Maine Public Service Company's system is rural in nature with the largest town slightly over 12,000 people and many smaller towns, so you might say that we are *not* a metropolitan system. We have approximately 1300 miles of distribution with voltages of 2.4 KV, 4.6 KV, 7.2 KV, 12.47 KV with conductors ranging from No. 8 copper to 336 MCM ACSR, and approximately 500 miles of transmission with voltages of 34.5

KV, 44 KV and 69 KV using conductors from No. 6 CW to 477 MCM ACSR. In analyzing our system it can be said that 22 per cent of the total system voltages are below 5 KV, 54 per cent in the 12 KV range, and 24 per cent in transmission voltages of 34.5 KV, 44 KV and 69 KV.

After 27 months of Live Line operation the crew logs indicate that slightly over 11 per cent of the work was spent on voltages below 5 KV, nearly 54 per cent of the time in the 12 KV range and almost 31 per cent in the transmission voltages. During this same period of 27 months the dispatcher's log indicates that 159 outages on the total system were prevented as a direct result of Live Line Barehand.

Since Maine Public Service Company began using Live Line Barehand over two years ago, there has only been one accident and this had *nothing* to do with the technique but was caused by the truck driver stepping from truck bed to the body and slipping.

Each crew has "back up" men in the various T & D line crews. These men fill the vacancies that are caused by vacations and the rare occasion that a regular crew member is sick.

The "esprit de corps" on the Live Line Elbow is something almost beautiful to behold, and I doubt that it could be improved upon. I think of an episode which would indicate this high morale. One of the back up men tried to promote the idea to his supervisor of having the leadman in one Elbow be made "Live Line Inspector and Coordinator", his thought being that he would automatically be assigned to the Elbow crew on a regular basis, for according to him, he wasn't getting enough "Elbow time".

Finally I would like to answer one of my first questions, "What type of men are these?" They are average journeymen linemen previously trained in all the mechanics of their trade and thoroughly indoctrinated and schooled in clearances required *from* energized conductors.

Such a lineman didn't imagine that it would ever be possible to touch any energized conductor with his bare hand but, just as soon as it was explained and demonstrated to him, *he* saw the possibilities and he quickly adapted himself to what has become the easy way to work on any voltage. He is also an outspoken advocate of Maine Public Service Live Line crew's motto, "If We Can Reach It, We Can Do It."

ECONOMICS OF SAFETY PRACTICES

By WILLARD W. ANDERS
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One of the most important elements to be considered by a water utility, in addition to the important matter of lessening the suffering of human beings by better and safer practices, is the matter of economics of safety, as this element has a direct relationship to the operating cost of the utility and is part of a cost of doing business. This statement applies to all industry and is therefore important for each manager and supervisor to study.

As stated in a previous paper on this same subject,[1] "It costs more to have accidents than to prevent them," and this is a statement often repeated by professional safety men. It is certainly safe to say that the monetary savings from reduced injury rates outweigh the cost of a well-organized safety program. Safety-minded executives know this also, but the fact that a substantial portion of industry tolerates high injury rates is strong evidence that many managers still have not accepted the idea. Probably the chief reason is their failure to see the whole cost.

It should be remembered that the two chief reasons for safety programs are: (1) to prevent pain and suffering and (2) to reduce operation costs. Although humane considerations are primary, it is also important to realize exactly how much accidents

can cost and how the cost of operations can be reduced by the institution of safety programs.

It is good business to change careless, unsafe working habits into safe, well-planned and well-organized practice. It was not until 1926 that much stress was placed on the monetary costs of accidents. In that year, a study was made by the Travelers Insurance Company. This study of several thousand accidents indicated that incidental costs of accidents, such as loss of time, damage to equipment, and spoilage of material, are four times the compensation and medical costs. This ratio has been questioned, but it does give safety people a good rule for calculating the average costs of accidents. Heinrich[2] states that this 4:1 ratio should prove a powerful stimulus to preventive action on the part of those employees who complacently accept losses as incidental to their operations or who disregard accident costs because they believe that overhead is only slightly affected by accidents.

Every effort should be made to secure reliable cost information on which management can base its decision. It must be recognized that even where management is safety-minded, some proposed recommendations must be viewed in the light of their probable effect on profits.

Most executives wish to make their plants safe places in which to work, but they also realize their responsibility for running their business profitably. They may, therefore, be reluctant to spend money for safety programs unless they can anticipate saving at least as much as they spend. Unless reliable records are kept on the cost of accidents it is nearly impossible to comprehend the savings derived from a good safety program.

It is an accepted fact that safety reports expressed in terms of dollar savings mean more to management than those that use only frequency and severity rates. An excellent plan for a pilot study to determine total costs of accidents is outlined in the Accident Prevention Manual for Industrial Operations.[3] Water utility managements can use this plan whether they are self-insured or are externally protected through an insurance company.

The cost of accidents in the United States is unbelievable. The National Safety Council[4] reports that every hour accidents kill 12 persons, injure 1,152 more, and cost $1,860,000. The total cost per year is $16,100,000,000. Every year, industrial accidents kill 14,200 persons, disable 2,000,000 others, and cost five billion dollars.

The Bureau of Labor Statistics, U. S. Department of Labor, reports that in 1963 the 2,000,000 disabling injuries produced approximately 42,000,000 man-days of disability. The report further states that when future losses of potential working time resulting from these injuries are taken into account, the ultimate total will be approximately 171,000,000 man-days of disability. This is equivalent to a year's full-time employment for about 551,000 workers.

According to the latest AWWA survey,[5] water utilities experience an average of 3,165 disabling injuries per year with over 70,000 days of work lost as a result. Using the 4:1 ratio, a very conservative estimate of the cost to the utilities would be in excess of $5,500,000 per year.

According to a U. S. Bureau of Labor Statistics report,[6] the total economic loss to water utilities due to injuries, including direct and indirect costs, is estimated at 408,000 man-days or $12,500,000. Whatever data are used, it is evident that accidents are costing the utility huge sums of money and that many small water plants or miles of distribution lines could be constructed with the money thus wasted each year.

The "frequency rate" or lost-time injuries per million man-hours worked in the water utility is about 22.0. This compares with a frequency rate of 1.03 for the communications industry; 5.77 for the electric utilities; 5.87 for the gas industry; and an average for all types of industry of 6.12. The safety records for the communications, electric and gas utilities usually show improvement from year to year, whereas the water utilities have shown little or no safety progress since records were first collected and tabulated for this field.

The "severity rate" or days of work lost per million man-hours worked is the standard by which the costs of accidents are appraised. The average severity rate in the water utility industry (534) is about the same as that for industry as a whole (682), but very high as compared with that for other utilities.

A safety program instituted in the Richmond, Va., Department of Public Utilities, demonstrates the economics of planned safety. Until 1952, the accident rate and losses therefrom were extremely high. In September 1952, the writer was appointed safety coordinator for this organization, a combination water, electric and gas utility. A safety program was begun, and progress was apparent during the first year of operation. After the safety program had been in effect for 12 years, disabling injuries decreased from three or four per month to two per year. Accidents are now the exception rather than the rule.

This utility fully comprehends the cost of every injury, as it is self-insured and an injured employee who loses time from work receives full salary while on injury leave.

It has been found that even what appears to be a minor injury often develops into a very costly matter. In 1952, a worker was burned and suffered a 60 per cent facial disfigurement. He lost 273 days from work and the accident cost this organization $42,200.

Back injuries are very hard to handle and a slight sprain can become very costly. This utility experienced an example of this type when a worker's apparently slight back injury resulted in a total cost to the utility of $7,700.

To reduce the costs of accidents is to reduce the number of accidents. With the complete backing of management, Richmond has shown marked improvement in its safety record over a 12-year period. In the 3-year period prior to the initiation of a safety program, the average frequency rate was 46.0 and the severity rate was 3,880. These abnormally high rates represented an annual cost in excess of $100,000 to this utility. In 1964, an all-time low of 1.84 was realized.

The severity rate also declined during the 1952-64 period from 3,880 to 18 or a 214-fold reduction. This reduction represents an annual saving of more than $100,000 to this organization. During the period 1950-52, prior to the safety program, accidents cost $222 per employee per year. After the safety program was well established, during the years 1961-64, the cost of accidents declined to an average of $2,511 per year or $5.30 per employee. These costs were determined by applying the 4:1 ratio to medical expenses for all injuries, major and minor, plus compensation paid to the injured worker.

The discussion so far has dealt with a combination of water, gas and electric utilities. It is especially important to see how costs derived from accidents may be reduced in water utilities, specifically.

A gradual decrease in Richmond water utility frequency rates from 44.2 in 1952 to 2.3 in 1964 is noted. In studying severity rates during the same period, special note should be taken of the year 1958. The rate for this year was 671 and represented a cost of $137,500 to this utility. This was a disappointing year with regard to safety, but the 5-year period following 1958 has proved that the utility employees are becoming more safety conscious and the safety program has begun to pay dividends.

The frequency rate for this organization during 1964 was about one-sixth of the national average for water utilities and the severity rate was about 70 per cent below the national figure. The water purification plant has now operated for more than eight and one-half years without a lost-time injury. The majority of injuries in the water utility occur in the distribution system where digging ditches, handling heavy pipe, and working in inclement weather present special hazards.

Men working in the customer service division are also vulnerable to injuries from dogs and other hazards on and around customers' homes.

If a safety program is to be successful, various means must be found to create and maintain the workers' interest. Accordingly, weekly safety talks are distributed to all first-line supervisors of the Richmond Department of Public Utilities; this means of communication is thought to be one of the best in helping to reduce the number of accidents. The consensus among the employees is that the weekly safety talks have been instrumental in reducing accidents by at least 40 per cent.

Safety plaques are awarded the various divisions in the department upon completion of a predetermined number of days or man-hours without a lost-time injury. Pens, pencils, tie clasps and playing cards obtainable from the National Safety Council and bearing appropriate safety slogans are presented

to employees for outstanding records. Safety dash cards and seat belts are used on all vehicles.

The annual cost of operating the safety program is, on the average, less than $1,000 —or $2 per employee per year. Certain factors must, however, be taken into account. The organization does not employ a full-time safety director and the writer devotes approximately one-quarter of his working time to administering and coordinating the safety program. The figure of $1,000 does not take into consideration the purchase of safety equipment, salaries of personnel attending departmental safety meetings, or safeguarding machinery and housing facilities. It does include printing the weekly safety talks, awards to employees, safety material purchased from the National Safety Council, and expenses of personnel attending safety schools and conferences.

Working in the field of safety and striving for the utmost in accident prevention can be very rewarding—but also disappointing—to the safety director or supervisor. Through concentrated efforts, improvements in safety records may be apparent in two or three years, but most safety experts coicede that it usually takes at least 10 years to formulate, adopt and put a good safety program into operation.

At Richmond, eight years elapsed before definite progress could be substantiated. This long period was attributed to difficulty encountered in converting the working habits of older employees into safer and better organized practices. In Richmond's safety program, it is now felt that a pretty good job of "selling" safety to the employees has been accomplished.

In the weekly safety talks, subjects of current importance are discussed. Not all subjects presented are geared to on-the-job safety. Many are related to home and highway safety—also vacation safety.

Accident prevention must be a continuous process and the secret of a good program is repetition. Being motivated once a year or so, whether it concerns religion, sales, safety, or anything else, is not going to have the same impact on a person as it would if the exposure were more frequent.

A noted philosopher once said these words which seem to hit the nail right on the head:

> "What the mind attends to, it considers.
> What it does not attend to, it dismisses.
> But what the mind attends to continuously, it believes.
> And what it believes in, it does."

From past experience, the reduction in injuries which has resulted in lowered operating costs, indicate the importance of keeping safety foremost in the minds of all employees at all times. It is now apparent that they are more safety conscious than ever.

In conclusion, I should like to say that a well-organized and properly conducted safety program will lower the cost of operation in nearly every branch of industry. It is seldom possible to determine the exact cost of accidents, but by keeping records of medical expenses and compensation payments, and applying the 4:1 ratio, management can obtain accurate estimates of these costs and the extent to which accidents increase the cost of operation. The cost of maintaining a good safety program is low when compared to the many benefits derived.

Managements of most large organizations realize that accidents are expensive. That is why they supply full-time safety staffs and spend substantial sums to maintain vigorous safety programs. A big problem today is to persuade the management of smaller plants to take the trouble to find out what their accident costs really amount to over a period of time.

The Safety Practices Committee of the American Water Works Association realizes that the water works industry is not doing a good job in safety and plans are now under way to revamp the AWWA's safety program.

Considering the savings achieved over a 12-year period, the Richmond Department of Public Utilities feels confident that, as stated before, "it costs more to have accidents than to prevent them." It has proved to be good business to save $100,000 each year by spending about $1,000 on a safety program.

Credit for portions of this paper and the adaptations of the charts is given to a copyrighted article in the JOURNAL of the American Water Works Association, Vol. 56, No. 8, August 1964, entitled "Economics of Safety Programs" by Willard W. Anders.

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THE FOREMEN'S ANSWER: PERSONALIZED SAFETY!

By E. M. O'NEILL
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We of the City of San Diego Water Distribution Division were having serious safety problems a few years back. In 1963 it culminated with 20 lost-time injuries . . . a poor-enough record for any locality, but worse in San Diego, where climate makes its own distinct contribution to good working conditions.

What were the causes? Slackness of supervision?—poor morale?—budgetary limitations?—lack of safety devices on equipment? Had it anything to do with lack of incentive?—lack of communication?—failure to instruct in the correct method of handling material? Frankly, all of these considerations played a part.

But, in addition, and possibly quite basically, accidents reflect the attitude-action pattern of each individual. Some people are accident prone. Analysis reveals that many innate capacities are of great significance. Some of us have unconventional judgment. Some of us are stubborn, aggressive, while others are naturally careless or unusually indifferent to details.

In certain situations some of these qualities can be life-saving qualities. In other circumstances, they may be life-destroying. In any case, our degree of divergence from a norm does determine the degree of our casualty syndrome, our likelihood of being involved in accidents. Our basic problem, then, was, and always will be, the *attitude-action pattern of each individual!*

The ideal solution for the hazards attending a person with a casualty syndrome is a complete understanding of his own nature, particularly with reference to ways in which his own reactions may be different from the average, or norm. Given this understanding, he can adjust his actions to conform to the needs of his environment—he can take steps to bring himself closer to the norm.

This would be the ideal solution . . . but we aren't living in a world of ideals. This is a world of "make-do." This is a world where our safety is in the hands of others, even as others' safety rests with us. Clearly, there must be controls, rules and regulations. And individuals, you and I, must be subject to them—must operate within that framework, if your safety, and mine, is to be protected.

How did a large facility like our Water Distribution Division implement an effective safety program? How does the safety message reach all those whom it is designed to protect? How is the cooperation of the individual enlisted? These are the questions we asked and continue to ask. These are the questions we answered and continue to answer.

The cost of the 20 lost-time accidents in 1963 was prohibitive. It was measured in lessened efficiency of operation, increased production costs, dislocation of personnel with resultant slow-down of normal operations. Far more costly was the human suffering and personal discomfort of those involved.

A review of our safety record between 1949 to 1959 revealed that it had not always been bad. Adherence to the principles

of safety layed down by the then Safety Officer James Gleason had paid off over those years . . . We had completed five *perfect* years without a lost-time injury. Each of these years San Diego's City Manager had sponsored a steak dinner for the entire division with each employee invited to share in the recognition of his part in the year's record of achievement.

But, after 1959 something had happened. By 1963, contact had been totally lost. A new start had to be made. The urgency of the situation became manifest when a worker sustained a back injury while performing his work to quote him, "In the same manner as he had always done it!" This was the "shocker." This was the circumstance that galvanized our foremen into action! They awoke with concern—the same concern that had plagued and frustrated me since 1959!

It was recalled by the foremen that in previous years the division had provided adequate accommodation for bi-monthly division meetings which brought all the workers into close informal contact with each other and with division supervision. It was at these meetings that impetus had been provided for open discussion of common problems—for suggestions, reminders, and, perhaps most importantly, for inter-departmental and divisional competitive achievement. The necessity of freeway development had required the destruction of some of the buildings, including the auditorium at our old station. The meetings were discontinued.

It was almost two years later, on the day after Thanksgiving, 1962, before the great move to a new home was completed. In the turmoil of the move, months passed before meetings began again.

In retrospect we see that this gap was the crucial period. It was during this time of reorganization and reorientation that our safety effort was sacrificed to expediency —to our detriment. The seed of the 20 lost-time injuries of 1963 had been sown!

Now it was early 1964, and already ten lost-time injuries had occurred. It looked as if an all-time high were again in the cards for us. The General Foreman and the Division Senior Foremen huddled together for action. It was decided that a re-vitalized force of competition was what was needed to reverse the trend—that, and a real goal, *immediate and personal* . . . One that would *"help us saturate ourselves with the concept of personalized safety."*

And so, the "Accident Control Group" was born, with the General Foreman as Chairman and, to work with him in close association, the four Senior Foremen. They chose the name!

Here, then, were five top supervisors, bound together by common goals, prepared to work out the mechanics of a safety program which would: 1) Do something about safety awareness; 2) Create a means of augmenting the city's safety program; 3) Bring "Active Safety" home to their division and, 4) *Personalize Safety.*

The "Go Ahead" was theirs for the asking . . . With my blessings!! After all my previous fruitless efforts, I couldn't have been happier when they came to me and my assistant superintendent to ask our "permission" to go ahead on their own. This was, indeed, the key to the door!

The Division by the way, is composed of the Superintendent, Assistant Superintendent, General Foreman and four major sections each headed by a Senior Foreman, with three groups each in turn headed by a Foreman II. Each group consists of several crews of from one to four employees to each crew. The total divisional complement is 250 employees.

With the effectiveness of a team of public relations experts, the "Accident Control Group" developed a program, established rules, guidelines and a scoring system. Not least of all they established personalized awards. This is what they set up:

Number One was a grading system providing a varying scale of demerits applicable to the following items based on individual performance:

Failure to Attend Tailgate Session	—15
Each Traffic Accident	— 10
Each Traffic Citation	— 5
Equipment Job Site Housecleaning	— 10
Sick Leave	— 5
Safety Rule Violation	— 5 to 15

It was felt that no demerits should be given to one individual in event of a lost-time injury. In that event, the entire Divi-

sion has had it! A new start has to be made in that case.

The penalty for failure to attend a Tail-gate Session is greatest of all because this is the indispensable requisite for success of the Safety Program "Accident Control Group" envisioned. This is the 15-minute weekly individual crew safety meeting at which a different subject, suggested by the employees themselves, is discussed. Attendance is mandatory and written opinions and/or comments on the subject of the day are expected to be turned in.

Within this grading system the crews in each group compete with all the crews within the other two groups of that section for the minimum number of demerits. The winning group and section are given recognition on a bi-monthly basis at the Division All-Hands Safety Meeting. This was the Number Two item, the Accident Control Group set up—*Personal Awards*!

First, a bi-monthly award is given to the group in each of the four sections with the lowest number of demerits. This award is "Little Willie", a 6" statuette of "Willing Water". It is a replica of the "Willing Water" figure designed by the American Water Works Association and is comparable to "Reddy Kilowatt".

Second, a bi-monthly award, "Big Willie" (he's 12" tall!), goes to one of the four sections for the best performance of the past two months.

Third, in addition to the "Willies", a pennant with the words "Safety Award" printed on face and reverse sides is awarded to each field crew in the winning sections. These flags are mounted in a conspicuous place on their motive equipment calling public attention to their safety effort and accomplishments.

Fourth, additional and special recognition goes to every individual who works one or more years without sustaining a lost-time injury. This is in the form of a decal about 2" in diameter which he applies to his hard hat. Incorporated in the attractive design of the decal is the number of years he has worked without losing time as a result of injury.

In order to evaluate performance and do the grading, each member of the Accident Control Group, as part of regular field supervision, keeps on the alert for unsafe practices and safety rule violations. Preventive measures are proposed, and if practical, put into effect to preclude the possibility of a recurrence of accidents of a similar kind. Because each minor injury is a potential major injury all are reported. Monthly reviews of minor injury cases and traffic accidents are held by Accident Control Group with the persons involved present for these considerations. In some cases their foreman and/or supervisor must be present to give a further accounting of the circumstances.

What happened as a result of all these efforts? A remarkable "turn about"! By creating a better safety climate through personalized competition, the Division worked 363 days in 1964 without a lost-time injury. This was a great victory . . . not in the sense of trophies won, nor award dinners. It was a victory for individual responsibility, for *Personalized Safety* . . . for all those who had been able, through competition, to improve their chances of getting through one moment to the next without getting hurt. This had been the goal and the achievement. . . . We rejoiced in it. . .

Now, what has happened since? Well, like so many important undertakings, once established and working effectively, people tend to sit back, take things for granted, and admire their creative efforts. They lose sight of certain symptoms which would ordinarily be signals of new distress. By late 1964 a little of this started to happen! Ideally, one would hope for a good safety program in operation; one that is simple, thought provoking, and which would automatically and constantly perpetuate itself with a minimum of effort.

Here again, we must avoid being overly hypnotized by a world of ideals. Experience tells us that no matter how ideal or successful a new program may be, as long as people are involved, constant effort, review, and corrective measures or adjustments are necessary.

When should a good Safety Program be subject to review and innovation? The Accident Control Group asked themselves this question several times. But, all of us procrastinate and they were no exception. In December 1964, we appeared to be starting a series of very minor injuries. This

time the Accident Control Group was right on top of it.

They met, brainstormed, reviewed and firmed up their ideas. The bi-monthly awards of the "Little Willie" and "Big Willie", the pennants, etc., would be continued. But, they did feel that the present bi-monthly award program should be supplemented with more frequent and more personalized recognition and participation . . . more and more emphaon ***personalized safety*** through individual competition!

They decided to add:

1. More personal and individual awards. This could best be accomplished by awarding wallets, cigarette lighters, tie clips, and pen and pencil sets to the "individual" or crew making the greatest contribution to the safety program on a monthly basis;

2. A Certificate of Recognition would be given to each individual who had made some contribution not sufficient to win the other types of awards;

3. It was decided that each crew would have a "safety engineer", with the assignment rotated among the crew members each week. He would make critical notes relative to adherence by the crew to safety rules, procedures, and practices. He would "blow the whistle" on infractions only if the violator displayed complete disregard for safety rules. With this kind of self-analysis, it is hoped that each crew member will make a greater effort to work safely. The "safety engineer" would also report any and all recommendations to top level supervision indicating where management could improve the safety effort. All reporting by the "safety engineer" would first be reviewed by the Accident Control Group.

4. Although original plans specified that the Accident Control Group would consist of the four Senior Foremen and the General Foreman, it was decided that one of the three Foremen II from each section would alternate and be invited to attend each scheduled monthly Accident Control Group Meeting. This would place each first level supervisor closer to the safety picture, also giving them a part in the running and operation of the Accident Control Group.

5. Last but not least, it was decided that three attractive, individual trophies would be presented at the final safety meeting of each year for first, second, and third place "Safe Worker of the Year" winners. Each of these winners would sit at the head table with the Councilmen, City Manager and distinguished guests at our "hoped for" annual safety dinner.

Because of these innovations and additions to our safety program, 126 days without a lost-time injury were completed as of August 15, 1965. We are now on our way to a second good year!

I would like to leave you with one final thought: Our goal is based on making safety a personal matter through individual competition. This is certainly one of the greatest motivating factors in our program, a greater degree of participation, effort, and recognition for the individual worker.

But, the whole key to our efforts in San Diego and the success so far achieved was the awakened sense of responsibility on the part of our top Foremen—without their motivating force, their dedication and constant vigilance, no safety program, no matter how sophisticated, would succeed!

MANHOLE FIRE AND EXPLOSION HAZARDS

By G. L. CHILBERG
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Over the years, there have been too many manhole fires and explosions, both major and minor. Too many because with the techniques and devices that have been existent since the turn of the century, the great majority of these accidents could and should have been avoided. Under the circumstances and with the knowledge that has existed for about the last decade, there has been no excuse for any human injury from manhole fires or explosions.

Since there has been such a transition

during recent years in the circumstances, techniques and devices surrounding manhole fires and accidents, it is in order to provide some background to today's situation.

MANUFACTURED GAS

Characteristics

From the inception of illuminating gas until about 1930, manufactured gas was generally supplied for household and industrial purposes. Natural gas was provided in only a few cities.

Manufactured gas is extremely toxic and highly explosive. Its toxic constituent is carbon monoxide which is persent in large quantity and is highly combustible. The other major constituents of manufactured gas are hydrogen and methane. Hydrogen is present in large quantity and is also highly combustible.

From the viewpoint of personnel hazards, however, the toxic element in manufactured gas, carbon monoxide, is the chief concern, as its presence, even in minute concentrations, can produce severe illness or even death depending upon the quantity present and the duration of exposure.

Detection

The ratio of hydrogen to carbon monoxide in natural gas is relatively consistent. Since the toxic hazard of small concentrations of carbon monoxide in manufactured gas constitutes a severe human hazard, it is only logical that a test for carbon monoxide became the standard test for the presence of manufactured gas. Several devices have been developed for this purpose, but all of them employ a palladium chloride compound which discolors in the presence of carbon monoxide.

These devices will detect the presence of carbon monoxide in concentrations as low as six parts in 10,000 parts of air. As carbon monoxide is a major constituent of manufactured gas, and since monoxide detectors will reveal the presence of very low concentrations, such a test will automatically indicate whether manufactured gas is present in either toxic or combustible quantities.

NATURAL GAS

Since the late 1920's and particularly since World War II, natural gas has progressively displaced manufactured gas for both industrial and domestic purposes. The American Gas Association has informally stated that less than five per cent of the household gas now supplied is of the manufactured type and that even that small amount is generally mixed with natural gas before it is fed into the mains. The Association further states that the per cent of manufactured gas supplied is decreasing each year.

Characteristics

Natural gas consists primarily of methane. It contains no carbon monoxide or any other toxic gas. Natural gas is highly combustible and from this standpoint its presence presents a hazard. There is no need, however, to test for the presence of natural gas in minute quantities for health reasons. Up to five per cent natural gas in an air gas mixture is neither injurious nor combustible. An individual can breathe relatively high quantities of air—natural gas mixtures over a prolonged period without ill effects.

Detection

In 1816, in England, Sir Humphrey Davey invented a safety lamp that could be used in a combustible atmosphere. It consisted essentially of enclosing the flame within a wire screen. Several variations of this safety lamp principal have been applied over the years and are available on the open market today to detect the presence of natural gas.

These indicators work on the principal that when operated in a combustible atmosphere the flame will burn higher; but when in an environment of oxygen deficiency, the flame will burn lower or go out entirely. Although these gas indicators are reliable instruments if properly maintained and used, they are vulnerable to human judgment and error on the part of the operator.

In recent years, however, a gas indicator working on an entirely different principal has come into general use. This is the so-called hot wire type combustible gas tester. In this instrument a platinum filament surrounded by wire gauze is connected in one segment of a balanced wheatstone bridge circuit. When the filament is heated by an electric current, it ignites any combustible gas around it. This added heat changes the resistance of the filament significantly, and the resulting unbalance can either be read on a meter or used to actuate an alarm. The wire screen around the filament prevents any flame from spreading.

These hot wire indicators are much more sensitive than the safety lamp type, require essentially no warm-up period, and are much less vulnerable to human error on the part of the operator.

EXPLOSION LIMITS OF NATURAL GAS-AIR MIXTURES

A natural gas-air mixture is only combustible if the proportion of natural gas is between 5 and 12 per cent of the total by volume. If the mixture has more than 12 per cent natural gas, it will not burn due to the shortage of oxygen. If it has less than 5 per cent natural gas, it will not burn because of an insufficiency of methane.

The safety lamp type of combustible gas indicator will only measure down to about 20 to 35 per cent of the lower explosion limit. This range depends upon the condition of the wick, the cleanliness of the wire screen, the care with which the lamp is brought up to temperature, the flame adjustment, as well as the care of the workman using the lamp.

The hot wire type meter will indicate the presence of combustible gas when the concentration of natural gas in the air-gas mixture is as low as 10 per cent of the lower explosion limit (LEL). Furthermore, since the device reads on a simple meter, it is much less vulnerable to human error on the part of the user. For these reasons, industry in general has largely swung over to the hot wire indicator type of device in checking for a combustible mixture of gases in underground structures.

DEMONSTRATION OF EXPLOSIVE LIMITS OF AIR-NATURAL GAS MIXTURES

Upper Explosion Limit

To illustrate the fact that too high a proportion of natural gas (over 12 per cent) in an air-gas mixture will not ignite, I'll fill a coffee can with a high concentration of pure gas. There is a hole in the top through which the gas can escape. I'll now light the escaping gas. The escaping gas burns quietly, and the air gas mixture in the coffee can does not explode.

As the flame continues to burn, however, the proportion of gas in the mixture remaining in the can decreases. When it gets down to the upper explosion limit the remaining air-gas mixture in the can finally explodes and blows the top off the coffee can. The reason that the flame burns as the gas escapes from the can is because it mixes with the atmosphere sufficiently to produce a mixture between the upper (12 per cent) and lower (five per cent) explosion limits.

Lower Explosion Limit

A natural gas-air mixture below the lower explosion limits (five per cent natural gas) will not explode whereas a mixture between the two explosive limits (five per cent to 12 per cent) will explode. We have a chamber which simulates a typical underground utility manhole. It has a transparent lucite front to permit visibility of the interior. It also has spark plugs in the bottom and the top of the far wall. There is a means of injecting explosive gas and access tubes, so that the combustibility of the air-gas mixture can be measured at either the top or the bottom of the chamber.

I will inject an explosive gas until the mixture in the top of the chamber reads to be between the upper and lower explosive limits while the mixture at the bottom is below the lower explosive limit. I will now ignite the spark plugs in the bottom of the chamber and the mixture does not explode. By igniting the spark plugs in the top of the chamber, however, the mixture does explode. This is merely to demonstrate the sensitivity that exists with reference to the proportion of natural gas in an air-gas mixture.

POWER AND VENTILATION

The presently available hot wire explosion meters are capable of giving precise and easily read measurements of the explosive gas concentrations in any manhole. From detailed observations under controlled conditions, however, it has been determined that pockets of explosive concentrations of natural gas can remain in isolated locations within a manhole even though it tests safe in the majority of the space. Furthermore, removing a manhole cover can permit the flow into a manhole from connecting duct runs of explosive gases which have been lying dormant in those conduits. There is a third possibility that a leak in adjacent gas supply pipe lines may develop while work is being conducted in a manhole and cause the development of explosive gas concentra-

tions in that manhole even though it tested safe at the start of the job.

For these reasons, the Bell Telephone Laboratories conducted an extensive series of tests to determine the factors involved in purging a manhole of accumulated explosive gases and in providing forced ventilation in sufficient quantities to maintain a safe working environment even when a substantial amount of natural gas was entering the manhole.

A standard telephone manhole contains approximately 150 cubic feet of space. A 500 cubic foot a minute blower, which is the standard capacity, working at its capacity will completely purge such a manhole if contaminated by explosive gas in two minutes. A larger manhole would require proportionately longer.

Furthermore, in the event that a gas source in the vicinity causes natural gas to enter such a manhole, a 500 cubic foot per minute blower will hold the atmosphere at 40 per cent LEL for an 11.1 cubic foot a minute gas entry rate, at 23 per cent LEL for a 5.4 cubic foot per minute gas entry rate, at 15 per cent LEL for a 4.3 cubic foot per minute gas entry rate, and at 10 per cent LEL for a 2.5 cubic foot per minute gas entry rate.

To put this in proper perspective, it should be pointed out that a gas fired home heating furnace of 120,000 BTU's output, which is a rather large unit, burns approximately two cubic feet per minute of natural gas. Obviously a 2.5 cubic feet per minute entry rate of gas into such a manhole represents a leak of major proportions. The atmosphere of the manhole under those conditions can still be maintained below 10 per cent of the lower explosive limit which is considered completely safe.

CURRENTLY RECOMMENDED PROCEDURES

The Bell System recommendations to protect against the possibility of manhole explosions or fires include the following:

1. Equip or make available to all employees who have occasion to enter manholes a standard hot wire type gas indicator.
2. Require that all manholes be tested with this explosion device before it is entered for any purpose and regardless for how short a period.
3. Power ventilate the manhole for at least two minutes before it is entered and continue the ventilation for the entire period that the manhole is occupied using a standard blower with at least 500 cubic feet per minute capacity.
4. Retest the manhole atmosphere with the hot wire indicator at two hour intervals during the entire period that it is being occupied.

Our experience warrants our confidence that if the above procedures are applied, a manhole explosion or fire is essentially impossible during periods that the manhole is occupied.

HUMAN FACTORS BLOCK COMMUNICATIONS

By JOHN COST
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Two men meet on the pitcher's mound, which is the center of the workshop for baseball players, and exchange information. Seeing and hearing facilities are activated for the action which is planned.

In the next few minutes the effectiveness of this interplay of mental motivation results in action. When the results of the action follow the plan, we know the exchange of information was effective because it was acceptable and the desired result was achieved—the batter struck out.

Two other men meet in their workshop and exchange information. Seeing and hearing facilities are activated for the action planned but the end result of this sequence is *not* a happy one because what was planned did not happen. In this latter instance, as in

the first, the men involved desired effective and acceptable results.

The reason why success does not always result is not easy to determine and I will not say that I have the answer—but I will attempt to justify a direction to take because in dealing with humans there is no one preset panacea. Since there are 360 degrees available in setting direction, it is more important than it seems. When you are lost knowing only the direction quadrant can be vital.

From the two situations, I used, the ballplayers and the plant workers, we can perhaps start in the direction by defining our terms. "Communication" might be said to be the effective transfer of acceptable information. First, we need a message—something that is important; second, we need a channel to make the transfer—which can be sight, sound or action facilities. Then we need a responder—to accept the information, process it and finally produce effective action.

We had all this with the baseball players —the message—"he is a sucker for an inside curve"—the talents of the batters as the channel and both were responders. When the transfer of information registered, effective action was taken and the desired result occurred.

With the worker in the shop the message was "work safely—wear your goggles." The channel was the normal operation procedure —discussing job operations in the usual manner; but the end result was failure because the message did not register and there was no responder. The man *heard*, but he was *not listening*—it did not register—he was not a responder, because he chose not to accept the information.

These two situations are typical and any analysis of them applies pretty generally to any we might meet. The talents of all principals were involved here; the information or facts themselves, how they were acquired and remembered and the effective reactions to situations all demonstrate the utilization of complex background networks. Myriad factors or components comprise complicated networks to produce messages such as we transfer among ourselves daily.

When certain components complement each other you might say they are "in tune" or "on the beam," and are favorable conditions in which it is easy to accept transfer. These personal networks have their branches in many different areas and are subject to many and varied influences. This makes each of us an individual, and our personality pattern is as characteristic as our fingerprints.

If you will conceive of a person as being the result of network influences originating in heredity and being affected by background, training, education, social status, affluence and influence of the parents on both maternal and paternal side and by contacts with people along life's path, you are aware that each person is different and shows a distinct and individual *critical personality factor.*

From experience, either by remembering what they had seen the batter do before or by reading his record, the pitcher and catcher knew that the man at the plate had a weakness. The talent the catcher had to remember and to remind the pitcher; the talent the pitcher had to deliver it, as well as his willingness to accept the information and tune it with his own in addition to his capability to go along with the decision. He could have been stubborn and uncooperative and despite the agreement, could have picked that time in his own mind to try another pitch.

What happened in the shop? The boss had experience; he had a message, he thought his pattern of operation was accepted and he reminded the man what he should do. The man had experience, job knowledge and knew what was required of him. He heard, but in refusing to accept the instruction, he didn't listen—in other words, it didn't register and he didn't respond.

The old question comes to mind about whether a tree makes a noise when it falls in the woods when no one is around. But sounds *are* made even though not registered. How many times this happens with people and how difficult it is to determine the reason for not registering.

Some reasons are: they "don't know," "don't care" or "don't want to." The area of "don't want to" should be explored since it concerns the *critical personality factor* in the personal network that activates people. "Don't know" can be corrected by education and, with programmed learning, processes a determination of learning registrations, is possible, so that it can be determined whether they know what they should. "Don't care" is a matter of motivation and the effect of an

accident on a person's economic and family life can be impressed strongly enough to insure acceptance.

An electrical analog condition using Ohm's law is a good example. Since communication is the flow of the driving force, it is necessary to keep the stimulus effective and at a high level, while keeping the resistance or negative responses (*don't want to*) at low levels.

Can this be done primarily by physical correction—making everything fool-proof or by spending unlimited amounts for safety equipment of the safest kind? We should know from experience that a fool and his good health are soon parted by his own actions, and efforts and expenditures by others to protect him will have little more than slight attenuation. Most people who don't care will ultimately find a way to fool around your fool-proof controls.

It is oversimplification to say that accidents have their base in only two components, people and things—the human factor and the physical—but it is true that people are responsible for 92 per cent of the accidents and things are responsible for 8 per cent. Our biggest and most important problem is to communicate motivation to people to get them instinctively to think and do in safe manner—to develop habits of care and thoughtfulness.

People are creatures of habit, and the habits that make for safe and happy living should be encouraged. This can be done by constantly repeating several small but basic warnings by key people. Develop more key people by formal training, then follow up to have them constantly set a good example and constantly remind others to use necessary care and observe instructions. This will be more effective than physical improvements.

Currently, car manufacturers are getting blasted to make a safe automobile. Do you know what a safe car would look like and cost in order to be sure no one could get hurt in it? It would look like a padded cell, with a speed of 5 miles per hour and the occupants would have to wear space suits that would put astronauts to shame. That doesn't look like progress to me.

Certain motor vehicle groups having the progress of motor vehicle advancement and public safety seriously in mind have been crusading for driver improvement, starting with periodic physical and mental testing of drivers. Do you know how far they get? Not very far, because public feeling is against abrogating the right to drive.

People who hold driver's licenses should not feel that they have a right to do as they please behind the wheel. A car is a lethal weapon—a guided missile so to speak—and controls must originate with the operator. We should communicate these feelings by acts and deeds to local and state legislators, to prevent being driven to ridiculous economic extravagance.

Free flow of information can also be likened to pouring liquid from one container to another and when all parts of the operation are clear and open, we obtain what is desired—acceptable transfer from one point to another.

In the second instance, everything looks the same and we assume it is and start the transfer. But the receptacle is not responding and is not accepting the transfer for reasons we cannot see. The receptacle has an invisible cover of clear plastic and so no transfer is possible. So many people are like this cellophane covered container. They look all right, they act all right, and it looks like a transfer of information is being made. But for some unseen or unknown reason, nothing is registering and your message doesn't get through.

An electronic comparison might be easily understood by this group. We stall start with the boss who has the responsibility for all operations. For best results he knows safety should emanate from the top, because it is sound business and good human relations. The boss provides the message or stimulus by emphasizing the plant policy regarding safety, "It must be a safe place to work." So, the message goes down and around the network of the plant organization. This network is not unlike the personal network that makes us all individuals.

From the executive operating office the message takes shape in two directions—line and staff. Which is more important depends upon another complicated set of circumstances primarily concerned with the type of operation. Usually, safety is predominately a line function, since workers will follow the boss' orders because he has more direct effect on their activities.

The message is processed by the line organization of the plant which amplifies or repeats the message. Here it can be said for best results, and since the organization frequently acts as a filter or attenuation pad, the message from the front office should be so hot that when it goes through the organization line filter, it still has enough heat to melt the lead in the feet of the reluctant dragons.

So, the message is filtered, choked, varistored, bypassed or beefed up as it goes through the foreman to the worker.

While back at the staff organization, things are happening, too. Depending on its size, the plant has a safety organization which has several strata depending on the size of the plant. In the staff line the message is scanned, modulated, verbalized or given high gain amplification in the form of posters, meetings, movies, etc.

If the staff is smart, it will be putting its modest budget to work on producing forward looking motivation and not backward looking voluminous statistics, which is much like the Killyloo bird that flies backward to look at where it has been, giving little thought to seeing where it is going. Statistics are yesterday's work and should consume only a small part of the safety effort. While the staff is showing that Thursday afternoon at 4:00 p.m. is prime time for slipping accidents, someone is falling into a hot vat on Monday morning due to the lack of handrails. Keeping extensive statistics is an expensive witch hunt.

The most effective components of the line organization are engineering planning, where the faults are corrected on the original prints, and education by adequate and continuous training of craft and management people.

In the staff organization, observation and inspection along with meetings for discussion with the force, are effective features.

The message, duly processed, heads for its ultimate destination, the responder, who is no less than any one of us—or keeping to the electrical analogy, a high resistance load on the network.

Management makes its wants known by two senses—the visual and the audible. Man hears and sees the message and is capable of responding by action through locomotory appendages. Before a man puts his heart into his work and follows instructions, he hears or sees the stimulus message, evaluates it by processes difficult to determine at a switching point just ahead of what we will call a flip flop, or gate switch. This can operate like the cellophane cover of the liquid receptacle and is the key to the problem of communication. A person can turn this on or off in an unpredictable manner and his acceptance or rejection of the stimulus is in his power to control. Acceptance or rejection at this switchpoint has its basis in the critical personality factor that is a key component of his personality network.

The CPF (Critical personality factor) is a form of network, too. Human relations experts tell us we have personality patterns because we want to:

belong
be wanted
be recognized as an individual
be treated fairly
operate in a friendly atmosphere
be rewarded

Connect this network to the large network where it belongs and you have a complex system in human values that makes looking for the needle in a haystack a picnic.

You stand on the pitcher's mound, or in the shop, and you transfer information—most likely in the nature of a request to get things done. Wheels turn, lights light and memory drums spin. An answer comes to mind which is a decision based on all the components of this complex human factor's network and a button in CPF control is pushed. The flip flop switch opens or closes—your request for an open mind flips or flops. Why? Well, here's where I should stop like a Hitchcock drama and leave the solution for you to ponder—or like the beverage ad says "Why do they buy so much of our product? We don't know, but we must be doing something right."

We say at this point we won't know what is causing accidents or why we are not communicating—but we must be doing something *wrong*, and it is about time to find out what it is. An expert said that successful marketing is the effective application of marketing principles. Can't we therefore say that successful communication is the effective application of communication principles?

This is implying much in a few words—but there are many things needing to be done to activate the right CPF button for the results you want. You won't get it by wishing for it, or by buying yourself broke with gimmicks. You can do it—or get a higher percentage of acceptance by instituting training programs for supervisors in the essence of human relations, and follow up with skip level or shirt sleeve type meetings where the second level meets for informal discussions of the operations minus the first level. People will talk when their immediate bosses are not present, and what bothers people is what we want to find out so we do what brings results.

Why do people push the flop button on that critical switch in their complex makeup? Why can't they do what they are told? They see and they listen, but it doesn't always register. Are your demands unreasonable and unrealistic? It is very easy to be unreasonable with safety demands and put effective operations out of reach or out of orbit of operation that people feel it should be in. You are the boss, to be sure, but be a fair and reasonable boss. Safety and communication need reasonableness as a basis for acceptance under all conditions.

There is a brief ground rule worth repeating here; it is called the three F's of administration:

be friendly
be fair
be firm

These you can impress easily and in a hurry, while you are searching for other more complicated reasons. It is the basis for a good crash program for supervisors. Encourage supervisors to do more "asking" and less "telling." "Please" and "thank you" still carry tremendous electromotive force. Employees know they have to obey orders, so why not butter them up a little—it is the least expensive secret weapon you can employ—and by using it supervisors will need less sleeping pills. Supervisors are human, too, and are not expendable.

Two-way communication is accepted as the most effective, but we have been overworking one-way channels. We motivate down, or think we do, we appraise and apprise down and become complacent that this is the natural gravitational flow or supervisory blanket control and there is no other way. Most of our modern circuitry has a basic characteristic called "feedback" where the stimulus goes round and round and gets stronger and stronger because it regenerates back into the network again, building up strength at is goes.

Since we have been talking analogies, who is going to be the bright-eyed, brave guy to produce effective methods of feedback from grass roots so that certain bosses become aware of their subordinate's appraisal of them and their methods? I venture a guess that walking the line, as we say, having sincere face-to-face interchanges with tolerance and understanding are going to be important components.

People are not complete machines yet, although a recent news story told of the "beast" that has been invented, which acts almost human and even panics under certain conditions. It is expected to be used for explorations where humans would be in serious danger, to record important data. A great accident saver. Maybe they will be better than people, but I don't think so.

There is nothing better than good warm people who are on your side—who listen—who register—who respond—who communicate—Gold bless 'em—we need more of them and more good communicators.

How do you energize a responder? Make him flip and not flop? It is a smart boss who realizes that there is maliciousness in all of us that comes out at the darndest times. The milk of human kindness is a good antidote for the poisoned mind that "doesn't want to."

That is my message: if you are a good responder you will carefully search each individual for that critical activating button which is his own personality factor and pour your message right into his heart. Only by so doing can you be sure of results.

MANAGEMENT'S RESPONSIBILITY FOR SAFETY TRAINING

By G. W. HATHWAY
President, Central Illinois Light Company, Peoria, Ill.

We must begin with management as a focal point of our attack on accidents—the time and production lost as a result of accidents—the hardship, pain and suffering that result from accidents.

In approaching this subject it seems pertinent that we look at the job of management—and I would like to think of management as—"the act of directing the use of manpower, materials, machinery and energy to produce goods or services to meet an existing need." Management has other responsibilities—the responsibility to secure capital and manage that capital to build and acquire its physical plant. But the management I am speaking of is that of day-to-day dealing with people and things, and I am sure you men are representative of that type of management in your respective companies. You either are responsible directly for accident prevention programs, or you are charged with the responsibility of producing goods or services and rendering services to people.

Let us look at the size of the problem. According to the 1965 edition of "Accident Facts," we find there was a total time loss in 1964 because of work injuries of 235-million man-days. Now I know we are used to talking in terms of hundreds of millions of dollars, and billions and hundreds of billions of dollars—but when we talk about 235-million man-days, this is something to tax our imagination, and certainly should appall us with the magnitude of the loss. This is six days less than a full year's labor of one million men. And mind you—these are just days lost from work injuries. This does not take into account the time lost as a result of automobile accidents. We in the United States have seemingly become increasingly short-sighted to this appalling loss.

We have a small war going on in Viet Nam and everyone is concerned about what is happening over there to people. But the losses there placed alongside of the losses that we are talking about here are insignificant. With respect to losses to the individuals involved, any loss, regardless of where it happens, is a calamity—the most serious thing that could happen to people.

I want to hold your attention to that 235-million man-days' figure. Can we say that management does not have the responsibility for doing something to provide training and any other means at its command to alleviate this waste of manpower? Certainly not.

Again, when I think of management, I think of all levels of management—from what we normally think of as top management down through each line of supervision until we get to that supervision which is directly involved with the actual execution of the work. Each level of management should have spelled out in capital letters—SAFETY TRAINING and ACCIDENT PREVENTION as a most important function of management.

A general superintendent of a machine shop, tool room, or production line would certainly not think of buying a piece of machinery costing 50 or 100 thousand dollars, installing it in the plant and assigning someone to operate that machine without careful training, without an opportunity to become completely familiar with the operation of the machine.

We are concerned about *things* that we work with, but we need to be equally concerned about the *people* we work with, and make sure that we are discharging our responsibilities in providing proper training for them to safely perform the job that we expect them to perform, so that reasonable production standards and schedules can be maintained. Anything that interferes with maintaining reasonable production standards and schedules is a breakdown of management.

Every morning as you look at that guy in the mirror as you shave, you'd better think about what you are going to do this day in meeting that responsibility.

It's a responsibility and it's a frustrating situation in many instances, particularly in the industry that is represented here today. I can say for our own company that our accident prevention program dates back to 1930, and we have participated in every National Safety Council contest for combined gas and electric companies of our size over that period of years, and have been recognized for innumerable outstanding safety achievements. We have had some years in which our performance was not as good. About the time that you begin to feel you are doing a pretty good job, this is a warning that you should begin to look around and see where your next accident is coming from, because one is getting ripe.

Employees in our Gas Department experienced a most regrettable and serious accident on the 15th of March in which we suffered a fatality, and had six or seven men suffering from oxygen starvation lying in the bottom of a ditch—just because we suffered a breakdown in management, which failed to provide on the job site, the proper tools and equipment which were available and required when performing work in excavations. We did not provide on the job the necessary safety hand lines and harnesses that our men are instructed to wear when they engage in this type of work. All this happened because the work to be performed was routine work, something that has been done thousands of times and was a simple job—but in this particular case something went wrong, and when something goes wrong, it is too late to get the things that you failed to provide.

I wish I could explain to you why this happened. It is impossible to get all the facts. This job of cutting a main and inserting a new fitting had been performed by this crew at another location immediately prior to this particular situation, using similar methods—and yet at another location a situation developed where things got out of control. One man lost his life. Now, these were not green men—they were not new men—they were experienced men.

In my opinion, the supervisor overlooked the one axiom of accident prevention that is—always be prepared for the very worst. In a very short time one can acquire the necessary safety equipment to provide that protection, but the memory certainly lasts a very, very long time when the protection has not been provided and something of this nature happens. These are some of the tolls of management.

Regular programs of meetings in which the first level of management discusses with the workmen the accidents which have taken place are extremely beneficial. The results of investigations of minor accidents which could have been serious or lost-time are important as a means of pointing out unforeseen hazards on the job. Minor accidents may be the source of lost-time accidents and need to be discussed thoroughly with the men involved. Reviews of this type cannot be carried on too frequently. In a small work group of 15 or 20 men, once a week would seem to be the proper frequency.

Reports of these meetings should be made to upper levels of management so that they, too, can see the problems confronting the men on the job, and draw on their experience to overcome some of the situations that are particularly vexing. Inspection of the work area is extremely important.

I could name specific items of management action with respect to production that apply equally to safety training. In fact, it is most difficult to separate safe performance on the job from good production performance on the job.

Management's responsibility for safety training is all-inclusive. It is inescapable, and it is a measure of your effectiveness as a manager.

USE OF TRAINING AIDS IN SAFETY TRAINING

By H. E. WEDGE
Area Personnel Safety Administrator, Northern Natural Gas Co., Minneapolis, Minn.

I am sure there are few in this group who would argue against the need for safety training. Not only because, for many of us, this activity constitutes a large part of our jobs, hence our paychecks, but rather because we carry the conviction that training of this type pays off in terms of accident reduction.

Yes, we carry the conviction and we act upon it, despite the fact that we are often rather hard-pressed to comply with requests for economic justification of our safety training activities. Strange thing about these requests, they most often come when the safety record is *good*. This would lend understanding to a statement I once heard an old safety man make to the effect that—"At least one good thing comes from every accident."

I don't mean to dwell on this economic justification business but if there be one among you who has developed a simple formula which proves beyond doubt that money spent on safety training is returned even in like amount through accident reduction, please contact me later. I dare say I am not alone in my need for your words of enlightment.

Despite these continuing and often unsuccessful attempts to justify safety training in terms of economics, most of management today concedes the need for and wholeheartedly supports this activity. Indeed, most industries today have active, on-going safety programs which their respective managements point to with pride. In point of fact, as safety records reach sizeable proportions, one can be sure the general public will be made aware of them. No one questions the benefits in terms of consumer reaction which favorable publicity for the safety activity can produce.

Our own public utility field is no exception here. Although we are classified by some of the older heads in this field as "Johnny-Come-Latelies" to the safety scene, we have, nonetheless, posted and publicized some impressive accident reduction records of our own. There is every reason to believe we will continue to do so.

We find ourselves as safety trainers, therefore, justified to some extent at least, in our safety training efforts. Our goal is clearly set; the reduction in accidents. Our means, the instillation of what has been wisely called and widely publicized as the "Safety Attitude". Being aware that an accident is an accident regardless of where it occurs, we will promote the idea that "the safe way is the best way" in all we do.

It follows, then, that we will dun and plead, use reason or emotional appeal, try logic or threat—all in an attempt to impress upon our people that safety isn't a now-and-then consideration but a continuing day-to-day way of life. To borrow a term from the field of the professional educator, we resort to "overtraining" in an attempt to assure retention of our message.

It may be well to digress a bit at this point and explore very briefly the teaching method this term describes. It is both the root of our training attempts and the seed of one problem we face. The overtraining method of instruction has been known and understood for some time. Simply stated, it means that a basic message repeated and repeated with or without variety in its presentation eventually will become a part of the basic learned actions or reactions of the person or persons at whom it is directed. No one has determined the optimum amount of presentation this requires, so to be sure that it is firmly implanted, excesses are knowingly resorted to and hence the term "overtraining".

Its origin is lost in antiquity, but the Socratic dialogues from which much of today's programed learning springs, the Roman catechism and the totalitarian propaganda "big lie" technique are all classic illustrations of overtraining in action. Its effectiveness over the years has been proven but to achieve full effect with it today has become extremely difficult.

Undoubtedly part of the reason for this is the growing sophistication of our audience. The rapid improvement in transportation and communication has made it difficult to keep ahead of that audience in terms of novelty and innovation. Each member of that audience today is either vicariously or in actual fact a well informed world traveler.

As safety trainers, we have continued the effort, however. Faced with the problems peculiar to our calling, we could do no other. The need for novelty, variety, innovation constantly with us, we quickly realized the value of and pressed into use a wide variety of training aids to help us in our work. We have used movies, slides, records, strip films, posters, handouts, billfold cards, flip charts, flannel boards, skits, buttons, awards, certificates, tapes, dummies—and each has produced good to excellent results—for awhile. If a training aid proves effective, why not use it and use it—to the point where its novelty palls and its impact is lost.

In the recent past, audience participation has been widely advocated as the key to training retention. As many of you know, my company, Northern Natural Gas, has utilized the participation method of training for some time now. The idea of personally involving the audience in the program presentation, having them intimately involved in the learning process, if you will, has been quite successful.

We can and do point to some of our recent safety records with pride and hold the firm conviction that at least parts of those records owe their being to our safety program presentation method. Used in conjunction with appropriate training aids, audience participation has produced a higher percentage of important safety message retention than ever before.

Those of you who have used this so called "conferencing method", however, know that it does involve one big problem in the form of the tremendous preparation burden it imposes on the program presentor or conference leader. At Northern as at many of your companies, the size of the group to be trained will not permit one man to do all the training, especially if that man has accountabilities other than safety, the performance of which he must answer to management.

At Northern, therefore, circumstances have dictated that the safety man become a trainer of trainers. At each District headquarters within a designated area of operations, one man is appointed as Safety Chairman. That appointment is for a two-year period. Each of these individuals is prepared for his position by being thoroughly trained in the skills and techniques which characterize the conferencing method of instruction. He it is who presents the program prepared by and forwarded from our general office at specified intervals. To do even a passable job of presentation of these programs, our Safety Chairman must spend some time in preparation for each, and quite frankly there is little inducement for him to spend this time.

Once the novelty of actually being a leader of a conference has worn off, our Safety Chairman finds himself hard pressed for strong inducements to spend time in practicing a program for presentation. This, in part, at least, is because those charged with writing these programs find themselves equally hard-pressed to introduce new and novel approaches to their oft-repeated material. The very repetitive nature of the material to be presented leads to an equally repetitive presentation mode.

In short, there seems to be just so many ways that a given thought, idea or point can be expressed in words. The key to the success of the conference method is the conference leader and circumstances force that key into a stiff and rusty lock.

At Northern, we have become increasingly aware of this and much time has been spent in attempting to find a solution to the problem. We find ourselves faced with a situation where the over-all method of presentation is good, but the material itself is so repetitive that the presentor finds it impossible to work up enthusiasm for it. His lack of enthusiasm and resultant disinterest in preparation are sure to be apparent to his audience, and they will react accordingly. The message to be communicated is lost and there remains only the memory of wasted time and, even that for only a short period. Many of us who have given the problem some thought have come to the conclusion that its solution lies in the aids to training which can be utilized in the program's presentation.

I refer not only to the standard training aids, a number of which I mentioned earlier,

but to the gimmicks, the novelties, the unusual which our at least pseudo-sophisticated audience would seem to require. For lack of a better word, I'll call this the introduction of "pazazz" into our training programs.

This is the use of gimmicks with a purpose and the real reason for my subtitle to this talk. ("Never Underestimate the Power of the Dancing Girl.") Remember, the building and the retention of the safety attitude in each member of our audience is still our aim. In view of what can occur, should we fail, almost any method of achieving it can be considered legitimate. With that in mind, we at Northern have begun our attempts to introduce into our training programs the "Pazazz" I mentioned earlier. Results are far from conclusive at this point, but are enough to indicate we're headed in the right direction.

First, there has been an increase in interest on the part of our program presentors. A number of the gimmicks used force the presentor to polish off his latent acting ability. I say latent because there is some "ham" in all of us and our Safety Chairmen are no exception.

Second, there has been a corresponding increase in the interest of our audience. They are still hearing and participating in programs where basic content remains unchanged but where presentation has been enhanced, made new and hence more palatable by the introduction of something different. Greater retention of the message, hopefully, will result.

Third, and this may not be entirely on the plus side, the task of the program writing group has become more difficult; the search for new gimmicks is not always easy and once uncovered, their incorporation into a safety training program can often be a bit of a problem. The results at the presentation point, however, should act as a very strong incentive to this hard-pressed group.

Inconclusive results, to be sure, but to those who would demand something more concrete, I can only answer as I answer those who press for economic justification of safety training; I can't prove conclusively that what I'm doing is the best, but I do know what the situation was before *anything* was done. Would you return to that?

In the belief that there may be interest in some of the specific gimmicks used or proposed for use to date, allow me to describe a few:

1. We have used and continue to use on a review basis what we have come to call our "gear board". This consists of a large, somewhat stylized map of our transmission system. Mounted on the board and located on the pipeline depicted on the map at strategic points are pegs. Gears fit on these pegs; gears which are appropriately labeled to make a specific safety point and which, when all are mounted, mesh and move as one. We have found this to be a very effective method of presenting a safety story.

2. We have used a shadow-play technique where a back-lighted screen and the silhouettes of two players cast upon it from behind converse with a third player seated in front of it ala the late Ed Morrow and his "Person to Person" show. The interview these three play out is carefully structured to bring out safety attitude lapses and the consequences which resulted.

3. We are planning the use of hand-puppets, the "Punch" and counter-"Punch" of safety, if you will, where these two ancient actors will play out the theme of the results that always occur when safety principles are ignored.

4. We are in the thinking stage on a child's game approach to getting across the safety message where a misplay by a player will produce a loud but harmless explosion to emphasize the results of such misplays should they occur on the job.

5. The poet's license may be used also, remembering that it provides the means of individually condemning as long as the condemnation is cleverly rhymed. The thought of some of our personnel participating in an activity of this type is cause for laughter, but laughter can be used as a vehicle for the safety message as well as the all-too-deadly serious method we often use.

Now, with certain exceptions, none of the gimmick ideas I have outlined for you here are new. In fact, they have existed for years and have been used for a variety of purposes time and again. I'm not sure that this fact in itself is too important. What is important is that their use in the safety training field is producing results. They may even have been used in safety work before,

but if this be so, I would question whether their former use was quite as extensive as that to which they are presently being put.

There is one unexpected result which has occurred from their use also: each gimmick idea put forth at a field location seems to produce a number of others. From this, I have concluded that a lack of such ideas should never be a problem. Their incorporation into safety training programs will undoubtedly remain difficult, but with all due respect, I leave that problem to our program writers.

The other results I mentioned previously, the increases in interest on the part of both presentor and audience and the resultant increase in the retention of the safety messages we are striving to implant must make the effort worthwhile.

This then is what I call the gimmick or "dancing girl" approach to safety training. The impact of any training aid used must be aimed at the building and retention of a safety attitude in those being trained. Whether the safe way of doing something springs into the mind of an employee immediately following a mental picture of an automobile wreck or a semi-clad female is of no real importance. At this point, I can only say that it appears easier to first remember the semi-clad female rather than an automobile wreck.

There may be others in this group who may have entertained, even acted upon similar gimmick ideas to use in safety training. There may even be the feeling that a "gimmick idea pool" of some kind might be of value. I am sure that Northern would be more than pleased to contribute any such ideas we have developed to such a pool should it come into existence. I merely leave the thought, plus any detail work it may entail, in your capable hands.

I am sure that each of us in the field of safety training has but one real goal. That goal is to impress indelibly upon the minds of each person who comes in contact with us or our designated lieutenants in the safety training effort, the fact that Safety Pays Always.

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MODERN HIRING OF EMPLOYEES AS RELATED TO SAFETY

By FRED J. MEYER
Director of Personnel, Chicago, Rock Island & Pacific Railroad, Chicago

All of us might very well ask, "Can my company afford a safety superintendent, or a personnel manager?" I say if you have not been able to make safety the responsibility of everybody on your road, your company cannot afford to keep you on the payroll. If I have not made good personnel practices the responsibility of every supervisor on my railroad, I have failed to earn my salary and my company cannot afford to maintain my position in the organization.

So, first off, we recognize that you safety men and I have very much in common. It is from this point that I wish to talk to you for a short while about an effective safety program for the next 50 years.

The past actually has been prologue. Your meeting today marks the 50th anniversary of your first meeting. During the 50 years which have passed tremendous improvements have been made in railroad safety. Your Newsletter calls attention to some of the important milestones in our section's progress.

Each of you can cite from your own experience case after case where improved materials and methods have resulted in vastly improved safety records. Each of us would like to take some credit for this improvement.

Each improvement in the safety record has resulted from improved methods of operation and utilization of materials and equipment, and have, in turn produced better methods of operation and more economical utilization of materials and equipment. The results have made or saved our companies money.

It is inescapable that efficiency and safety go hand in hand. Safety and efficient railroad operations are money makers. Safe operations do not cost railroads a red cent, but actually are the only operations which make money. This can be accomplished, however, only if we make safety the responsibility of every employee.

But after 50 years there remains a vast amount of unfinished business. The preponderance of unfinished business, so far as railroad safety is concerned, is in the area where you and I are both vitally concerned and where you and I must be successful in the days ahead to justify our existence as railroad officers. This is in the area of employment and employee relations. This is the new frontier for progress in safety. This is the new frontier for successful, efficient and profitable railroad operations.

Let's begin by saying that safety records for a company are merely the composite safety records of all employees of that road. We've got to quit talking in generalities and get specific with individuals if we are to successfully promote safety.

The safety record of a man begins the day he is placed on the payroll, and at that time we may have already made several mistakes which will lead to that individual ending up as a statistic in a poor safety record.

The key to safety could well rest with selection and placement of employees in their initial job. The personnel department must assume the responsibility for accepting for employment only those persons who appear to be good "risks." For that reason most progressive companies today have developed intensive programs of interviewing, testing, examination and investigation to weed out undesirable, unstable, incompetent help in all job classifications.

I urge you when you return to your properties to sit down with your personnel officer and discuss his efforts to find and place employees who appear to be the best qualified. What you will probably discover is that your employment manager has a job description of every position on the railroad and a list of minimum specifications for employing new men for those jobs. Review these job descriptions with him. They must be out of date, due to the speed with which modern technology moves.

One thing I know your employment manager will appreciate is the opportunity to discuss job content with you and from your experience gain valuable insight into your findings where poor selection or placement has resulted in injuries and possibly even death that could have been avoided.

Accurate job descriptions are the first step in placing the right man in the job. Next, talk to your personnel man about what he is doing in testing, interviewing and investigating applicants for employment. This is a very important step in a good safety program and can help your company produce a good safety record.

It is of little effect to try to close the barn after the horse has been stolen. An inept, incompetent employee, once admitted to the service, is well nigh impossible to remove, even after the fact of unsafe habits which show up in his work. The place to reduce the exposure of unstable, mentally slow or unthinking, awkward or psychologically unfitted employees is at the hiring gate to the extent possible. Your employment manager will welcome your help in getting this point across to all our supervisors.

In some instances management and supervisors have belittled and even opposed employment practices because these personnel procedures either were new and their purpose not thoroughly understood, or they were restrictive in some manner. The supervisor may desire to hire for short term necessity without regard to the long range effect which improper personnel placement may have on the long range operations of a department or company. On our carriers today most of our operational necessities are forecast and planned. So should our personnel requirements be forecast and planned, so as to give personnel departments time to recruit and select qualified, safe personnel.

I wish to emphasize what I have just said because your safety superintendents can help the personnel man and help you to compile a successful safety record by talking about this point to all supervisors with whom you work. You can be the most effective support a personnel man has because, as safety supervisors, you come into contact with all departments and all levels of supervision and management in your firm.

Now I would be naive if I left you at this point, thinking that proper placement of employees was the factor that would eliminate human safety problems in the future. While these procedures may substantially reduce safety risks, they are not a cure-all.

We still have many problems in the human area for two reasons, (1) the bulk of our employees were hired before serious efforts at selection and placement were initiated in our companies and, (2) even the new employees selected by the most sophisticated personnel techniques must be constantly alerted to the hazards that surround the jobs, either because of change in method or technology, or simply because of the nature of human beings to suffer lapses of awareness of the power of habits, particularly bad ones, in carrying out the job.

In retrospect, we have made only limited progress in safety education. In prospect, the area of safety education looms as the greatest challenge for railroad management.

One cannot place enough emphasis on this challenge of the future. Your organization is alert to the demands for safety education. Just look around at your program, the titles of addresses and workshops in this and other sections, the exhibitors who are here with products which, used by trained employees, will produce safe operations, the safety films which are made available to us for education and training—all are most impressive.

The skill with which we handle safety education will determine the success we have as safety and personnel officers. I say, *we* handle safety education, because we are all responsible for safety.

There are several areas where we must be willing to stick our necks out if we are to earn our way—if we succeed in making safety everybody's business—and some of these things will be most difficult to do, difficult for top railroad managers to do and difficult for the safety superintendent to do.

First of these concerns selection of safety supervisors based on a job description that sets standards of performance. This may be a bitter pill for some of us personnel men and I suspect a few safety superintendents to swallow, but in the future we will have to do a better job of selecting our successors.

Just ask yourself: "How many personnel or safety men were placed on their job be-

cause they were really the best qualified for the job? Or how many do you know who were placed on the job simply because management decided to put them in personnel work because they were nice fellows, not particularly successful in another job, but could be charitably placed in personnel or safety work?"

Let's make no mistake. Employees and fellow officers are keen to catch on to things like this and when they do the whole safety or personnel program will limp along without any real force or effect or success.

In the future we cannot be satisfied with other than the best qualified personnel and safety supervisors. The functions of these departments will be as strong as top management wants them to be and as strong as the men who are responsible for heading up the activities laid down by management in these areas.

In too many cases there is no understanding of company objectives on safety and almost no statement of company safety policy regarding safety responsibilities. In our companies, I'm afraid, few managements have done little about safety except to assume that everybody was "for it" and then every supervisor set out to develop a set of statistics to show that he was for it, too.

Of course, all of us will have to really search our souls in this whole area of company policy and consistency of company practice with that policy. As badly as we need to state our policy and communicate it to all employees, we need to be even more certain that that policy is not a sham, and that our day-to-day management practices are actually supporting it. Even the best statement of safety policy is no earthly good if the lowest ranked supervisor, or, for that matter, the most menial employee does not put it into practice in all areas of his work.

Too often we have failed to follow through to see that company policy is actually put into practice all the way down the line. If it isn't, we have committed a greater management sin than if we had never formulated a company policy. Poor management by default cannot be tolerated.

In the years ahead we are going to have to take a good look at how to improve our communications of safety policy to employees and to obtain compliance with policy and rules. This is the vast area of education and will require intelligent and creative imagination by all of us.

Fortunately, there have been signs of improvement in this area. Gone, in most cases, is the use of discipline as the first and only method of obtaining compliance with safety policy, rules and instructions. Discipline should be used only when all other methods to obtain this end have failed because use of employees discipline is an admission of failure for the supervisor to lead, communicate, instruct or motivate. While discipline may be necessary, it must be justified as action of last resort and, to be effective, it must result in improvement of performance in the future. Unless this is the result, the discipline has been more detrimental than effective.

The responsibilities of our respective positions will become more and more similar in the years ahead. And, as those responsibilities develop, so do our problems, and out of these problems come opportunities to make a significant contribution to our firm's success.

There is near unanimous agreement among railroad chief officers that the most critical problem of their roads is the development of competent leadership. In most cases this has resulted in crash programs to develop officers who can step into positions of responsibility in all departments. Some of these officers will come from a corps of highly select college graduates in engineering, business administrations and related fields. These men will, most often, be without previous railroad experience and with very limited business exposure. They will have to be trained. All their training on the job will have to include extensive training in safety, in operations, in rules.

By no means will the college recruitment activities of our railroads produce enough officer potential to meet our needs. The bulk of our officers of the future will still come from the ranks—section foremen will continue to become track supervisors and roadmasters, trainmen will be promoted to trainmasters, machinists and electricians will become diesel supervisors and master mechanics.

Selection of these supervisors is of key concern to the future of the railroad company and the industry. Good training in

safety does not begin after this man is selected to be an officer. His training began while in the ranks. His effectiveness as an officer will be determined by the effectiveness of training he had as a rank and filer. The amount of help you can get from this man as an officer will be in proportion to effectiveness with which he has been trained in safety on the job by his supervisor.

Training, like safety, is everybody's business. We cannot do it alone. As a result we must, more than anything else, carry this important message to supervisors in all jobs on the railroad for the very existence of railroad industry as we know it could very well depend on the success which we have in developing dedicated supervisory leadership who in turn can also teach, lead, instruct, motivate and inspire by good example.

The techniques of training and education whether it be in technology, method, human leadership or safety are being better defined and developed. The "how" of training is an area where personnel directors, trainees, and safety supervisors will, if successful, meet and work together. We shall have to ask for and receive help from experts in education and experienced trainers in distribution, manufacturing, and transportation. In this respect the National Safety Council will play an increasingly important role in helping us do the job.

If there is any hope for the human race in this day of swift and constant change, it lies in the success of education. Our world problems will engulf us unless we learn to live with one another and unless each of us accepts the responsibility that is ours at home and in the local community, as well as those which we have as world citizens. More laws, more rules, more military power is not the solution. Hopes for the future in industrial safety will not come from more rules, or strict military type of enforcement of them.

Likewise the future of railroad safety depends upon the success which those of us in this room have today in leadership, in communication and in education of all employees in our respective companies. When we reach the point where each individual accepts his responsibility for safety and makes the safety of each of his fellow workers his responsibility as well, then we can say that we have succeeded in our efforts. Until that day comes, each of us must work and work and work toward this end.

THE NATIONAL SAFETY COUNCIL AND YOU

By L. W. DUTTON
Staff Representative, Railroad Section, National Safety Council

A recent check shows that 97 per cent of all the railroad employees in the United States and Canada work for companies which are members of the Railroad Section of the National Safety Council. We take some pride in this fact and challenge any other Section of the National Safety Council to show almost 100 per cent coverage in any given industry.

The Railroad Section is one of 27 industrial sections of the National Safety Council. The Railroad Section and all the others are represented on the Council's Industrial Conference, which is a sort of parliament of all sections. Through the Conference, all the sections work together to carry forward the combined objectives of all the sections and of the National Safety Council as a whole.

The Railroad Section has always been very active in the work of the Industrial Conference, and there is a further point of pride in the fact that a railroad man (our good friend Roy P. Hamilton of the Frisco Railway, now retired) has served as Vice President for Industry of the National Safety Council and General Chairman of the Industrial Conference. Roy Hamilton, incidentally, has served as General Chairman both of the NSC Railroad Section and the AAR Safety Section.

The Industrial Conference in turn is directly responsible to the Council's Board of Directors.

The other program departments and divisions have their own conferences, each responsible to the Board of Directors: Traffic, School and College, Home, Farm, etc. Each is primarily concerned with activities in its own area, but they, and the corresponding Council staff departments, all work together toward the common goal expressed in the Council's current theme, "Safety Everywhere . . . all the time."

This fits in neatly with the objectives of the Railroad Section of the Council, for the section is deeply concerned not only with the safety of the railroad employee on the job, but also with his safety off the job, and with the public safety everywhere. This concern finds its strongest expression in the Signs of Life Program, sponsored by the railroads and conducted by the National Safety Council staff. This program is intended to educate the public in the observance of traffic signs, including railroad highway crossing signs and advance railroad warning signs. Public officials, traffic safety officials, and volunteer organizations of all sorts cooperate in the program, and through it educational material reaches the public from many different directions.

The foregoing is a general description of the way the National Safety Council functions, with particular emphasis on the industrial safety phases. But what does this mean to you as individuals? I would hazard a guess that almost all of you are employed by railroads which are members of the National Safety Council. All of you who are in this situation can consider yourselves members of the Council, entitled to all membership privileges. These privileges include the purchase of all Council materials—posters, data sheets, films, etc., at the member discount of 20 per cent off that price.

Your membership means help in solving your safety problems. The Council staff welcomes requests for information from any employee of a member company, whether he is an operating official, a safety officer, a supervisor, or a rank and file employee. The staff will do its best to find the answer to your problem, and make a practice of sending a copy of their reply to your company's safety officer in order to let him know of your interest in safety.

The value of your membership in the National Safety Council is in how much you use it.

The Council staff doesn't claim to know all the answers, but headquarters has an extensive safety library and a great amount of published material on industrial safety. In addition, the Council has access to publications and standards issued by other organizations, which can be of help to you.

There is a tendency for people working in any given industry to feel that their problems are unique and that nobody else outside of their industry understands them. The fact is, however, that the basic safety problems are the same in all industries. Whatever your fields of endeavor, if you will analyze your injury experience, I predict confidently that you will find that 20 to 25 per cent of your injuries are caused by falls and another 20 to 25 per cent are caused by mishaps in connection with the handling of materials.

From the very beginning of the atomic energy industry some 20 years ago, the special hazards of radiation were recognized and extreme precautions were taken every step of the way to guard against these particular hazards. The result is that injuries caused directly by radiation are almost nonexistent, and a very substantial proportion of the injuries that do occur in plants manufacturing and using radioactive materials are caused by—you can guess it—falls and material handling.

In our Railroad Section, our experience has been the same, notwithstanding the specialized hazards that certainly do apply to the movement of rolling equipment. I am advised that the same is true in the marine shipping and electric public utility industries, each of which has its own special hazards.

Furthermore, problems specific to certain industries very often also exist in many other fields of operation. For example, the Chemical Section of the Council has published a long list of data sheets dealing with specific chemical compounds. Some years ago, the safety superintendent of a railroad company wrote the Council and asked for information with regard to the safeguards required for the location of an anhydrous

ammonia plant along its main line. The NSC Chemical Data Sheet on the subject of this particular material very satisfactorily answered all the questions which this railroad company had.

Recently, a questionnaire was circulated by an outside group in a particular industry having to do with problems encountered in the use of powder actuated hand tools (commonly known as "stud guns."). It is our feeling that this group could have saved itself a good deal of trouble by referring the question to the Council staff, which has published a Data Sheet on this subject and is also now actively promoting the completion of an American Safety Standard covering these implements.

Perhaps the most important function of the National Safety Council is that of a clearing house for safety information. We commend to your attention the *National Safety News* and particularly, the data sheets, one of which is published in the NEWS each month, articles dealing with various subjects, the "Ideas That Worked" department, and the "Consultation Corner."

More and more attention is being given to the production of Data sheets dealing with special sectional problems. In the Railroad Section, for example, several data sheets are in the mill, two of which will deal with maintenance of way machines, on-track and off-track.

A very worthwhile medium for the exchange of information is the newsletter of the section with which you happen to be connected. We feel that our Railroad Section has done a good job in gathering information on particular problems and publishing it for the benefit of all the members of the section. However, newsletter editors always have difficulty in getting members to contribute good factual information, and this is one way in which each member can contribute to the cause by making his solution to problems available to others who may be plagued by the same problems.

The Council offers a total of ten one-week training courses at Headquarters in Chicago each year. Five of these courses cover the fundamentals of industrial safety; three deal with safety training and management techniques; one is on industrial hygiene, and one is especially set up for public utilities employees. The Council also offers a home study course for foremen, and has various other aids to assist your training programs.

The Council's awards for good industrial safety records (Awards of Honor and of Merit, Certificates of Commendation) are much sought after by railroad companies. The Railroad Section also has its own Railroad Employees National Safety Award plan. Our Railroad Passenger Safety Award program just got under way this year. The Railroad Public Safety Activities Award program is now in its 12th year. Those railroads which participate in these award plans find them to be an excellent stimulus to employee interest in safety, and also great public relations material.

To you as individuals, one of the great values of Council membership is the opportunity provided to associate with people in your own field of work and exchange problems and solutions. The feeling of fellowship is also very worth-while. Sailors, miners, railroaders, steelmen, construction workers, all like to get together with their own kind.

Membership in the National Safety Council in no way conflicts with the work of local safety councils, ASSE Chapters, and other local organizations; rather, what the Council has to offer supplements and reinforces this type of local activity.

The mere act of joining the National Safety Council will not work any miracles for you. Unless you have, or intend to set up, a solid safety program based upon sound management policy, the National Safety Council cannot help you very much, nor can any other organization. But the Council can be your invaluable helper if you have the determination and the program to achieve a safe operation.

Since this month marks the 50th anniversary of the Railroad Section, you may be interested in the following historical outline, which appears in the October Railroad Section Newsletter:

Milestones in Section's Progress

1915—Fifty years ago this month, in Philadelphia, at the fourth annual National Safety Congress, 85 railroad safety men, representing 35 roads, met and organized the Steam Railroad Section of the National Safety Council. This event followed the

organization of the Council by only two years.

The first General Chairman of the Section was Marcus A. Dow of the New York Central. Others active in the organization of the section—and previously of the National Safety Council—were Commissioner Charles C. McChord, ICC; L. R. Palmer, Association of Iron and Steel Electrical Engineers; and R. C. Richards, Chicago & North Western Railway.

1916—Publication of "Bulletins" (posters) started—a series which continued for many years.

1917—Publication of Newsletter began. Newsletter editor having trouble getting contributions.

1918—Activities greatly stimulated by the participation of the United States in the first World War and by the active support of the United States Railroad Administration.

1923—First annual Railroad Green Book; a reprint of an address by L. R. Palmer made before the section session at the 12th Annual Congress.

1928—First Annual Award in the Railroad Employees' National Safety Contest, reported in the fifth annual Green Book.

1931—Consolidation of Steam Railroad Section, National Safety Council, and Safety Section, American Railway Association because of economic conditions.

1935—Consolidation dissolved. The Steam Railroad Section continued to hold annual sessions at the National Safety Congress.

1938—Steam Railroad Section formally reorganized.

1941—Activities accelerated by the encouragement of safety effort by the Government. Aided by money from the War Fund to Conserve Manpower, the section produced safety films and other educational material, and generally stepped up activity.

1946—Signs of Life program launched. This program is sponsored by the National Safety Council with the cooperation of the Association of American Railroads. Its purpose is to educate the motoring public in the observance of grade crossing signs and signals in the same manner as all other traffic signs and signals.

1947—Name changed to "Railroad Section" in place of "Steam Railroad Section"—for obvious reasons.

1948—SAFE RAILROADER, a pocket-sized magazinette for distribution to railway employees, started publication with an initial circulation of 100,000 copies. Started as a bi-monthly publication, later issued monthly. Publication continued for 11 years.

1952—NSC "Award Plan for Recognizing Good Industrial Safety Records" inaugurated. Railroad Section Special Committee prepared special rules to apply the plan to railroads.

1954—Railroad Public Safety Activities Award Plan (the Golden Spike Awards) inaugurated.

1960—Committee on Motor Vehicle Traffic Safety at Railroad Grade Crossings of NSC Traffic Conference created. Purposes, to promote: uniformity of state laws at highway railroad crossings; safer operation of commercial vehicles at railroad crossing; safer operation of school buses at crossings; improved enforcement of traffic laws at railroad crossings; improved traffic engineering at railroad grade crossings; to help promote the Signs of Life Program nationally.

1965—Railroad Passenger Safety Award Plan inaugurated.

And Future Plans—During its 50 years of existence the Railroad Section has produced hundreds of posters, a number of films, and many other materials for safety education. The members of the section have also made extensive use of the Council's industrial safety materials.

Plans for the immediate future include the production of more railroad safety posters and railroad data sheets. The development of safety training programs and, in general, greater emphasis on supervisor safety training, are in prospect. Off-the-job safety will receive increasing attention. Under the new Traffic Conference Committee, grade crossing accident prevention and traffic safety generally will be pursued with vigor.

The pioneers of the Railroad Section have left us a great heritage; a whole new generation of railroad people who have been constantly exposed to safety education. There are few railroad employees today who have not served throughout their entire career in the era of organized railroad safety.

MAINSPRING OF SAFETY

By J. N. LANDRETH
General Mgr., Atchison, Topeka & Santa Fe Ry. System, Los Angeles, Calif.

You and I consider ourselves professionals in safety, and we continually seek ways of helping others to understand and practice this important facet of life. Safety has never meant so much since the dawn of civilization or the beginning of human history. It is a privilege and an obligaton for us to vigorously push to successful ends the safety programs. Higher speeds, greater force and weight, importance of time, and the tremendous value we now place on life, makes it all the more important.

The objectives of a safety program are mainly to assist the balance of the organization to promote the welfare of each individual, prevent injuries and accidents, and assist the company in achieving its basic objectives; i.e., reduce costs, make a profit and perpetuate the organization. Some departments do not participate in safety programs but the objectives should be broadly understood.

Safety is an excellent vehicle for promoting good employee relations—to give employees more than wages and to keep the railroad running smoothly, but unless the whole program moves smoothly and forcefully at every instance, the safety efforts will fall short of desires. It may not fail, but it will not be the desired success.

Safety is a fringe benefit of the first order. We want more than the mere work men are appointed to do. We want all to enjoy satisfaction in their work, just as the employees need more from the company than their money on pay day. If we do not put more into a safety program than a mere desire to avoid the messy trouble of accidents, the program will not be a complete success.

Speaking of professionals, there are many people in strategic positions in our lives that had better believe in excellence. There are many, I hope, who are excellent in their work and not just average. I'd like for them to be masters and to love their jobs and be happy while doing them.

In my opinion the main spring of a safety program is *enthusiasm*. There can be safety meetings, bulletins, posters, cliches, drawings, all of which have been used to an advantage, but there must be enthusiasm from the bottom to the top of an organization. We cannot write a letter and say "I'm for safety" and get the best results. Safety programs are tiresome, unending jobs and need all of the promotion and enthusiasm we can pump into them.

The foreman must be enthusiastic; also, the general foreman, the conductor, the engine foreman, the trainmasters, the superintendents, and the higher the reading the better the results.

You've got to live it and breathe it and inject it into everything and everyone that moves. Now there are those who would slow down, or stand still and consume unnecessary time in the claim of safety, but a safety program must be mixed in where speed is involved and must have a part in earning a profit for the company in moving freight and the few passengers that are left—we must meet our competition at service and do it safely. The faster we move the greater the need for safety and we are moving faster every day.

Safety is as if we were climbing a high and precarious mountain, whose top has never been seen, because as long as there is one injury we must keep climbing. Not all railroads, or departments of railroads, climb at the same rate or along the same route. Some spring forward for awhile and then fall back. Some come to rest on a ledge and go no farther. We see new and better records from time to time, when someone does a good job, creates enthusiasm, and their programs flourish.

Everything has been done to make safety popular and attractive except to declare it unlawful, but at the core and center of a good safety program is enthusiasm and a sincere desire to do better.

Check the fellow who has a good safety record—I mean the supervisor or head of a department, and you will find a fellow with unending enthusiasm and one who won't quit. If he has trouble today, he re-

news his efforts tomorrow. It's not easy when things go bad and one clumsy fellow after another proceeds to louse things up, but accident prevention allows no place for relaxing.

Safety is *not* an exact science any more than is law or golf, but as in the practice of those arts we have learned some essentials. We cannot legislate against human nature; however, it has been tried. We can only try to educate it which is a slow process. A prize fight is not won by the final KO but by long training, track and other work that must be done to develop the hard punch long before time for the KO.

In a safety program we must be concerned about the little person and sympathize with his shortcomings. If he slips, help him up and dust him off. If he continues to slip, it might be necessary to dust a little more firmly. There are many ways to do this, and telling the story once is not enough.

It seems that this simple story would be universally understood, but it has taken a long time to make progress. We learn from each other, and were each person left solely to his own perceptive resources, he would perish. Life would be impossible unless each of us were able to draw on an enormous store of perceptive discoveries, inventions, human creations and experience that has gone before. Only now and then does one have an original thought of his own.

We spend fabulous sums to improve health, to immunize us from disease, for surgery and to patch up injuries, but it is hard to induce people to practice safety. It can only be because they do not realize how bad it is to be hurt!

At no other time in history has so much been said and done to obtain financial security for later life. There are constant demands for more security in all labor contracts. There is no greater security than well being, and nothing more insecure than *indifference* to safe conduct. Security and safety mean the same thing. We have just assumed a fabulous national ogligation to extend health and welfare to all we can induce to subscribe to it. Personal safety is just as essential as financial security.

Safety warnings by the nation's radios and other news media start well in advance of a holiday season and extend through the period, and then give the record which runs from 500 to 600 deaths plus thousands of injuries each holiday weekend. The recent Labor Day weekend totaled nearly 600 deaths. Certainly the national campaign helps to make people mindful of the hazards of speed and carelessness, but they do not stop the tremendous destruction of life inflicted by the group as a whole; nevertheless, the campaigns are worthwhile and must be continued.

Many diseases such as pneumonia, tuberculosis, and polio have been brought under control. There are many others to be considered, but one of the worst inflictors of pain and death is our own carelessness.

Our advance in the medical and those fields associated with life and health, have extended the life expectancy by several years, while our accidental death rate, left in the hands of individuals, has not done so well.

There is one bright spot, however, the industrial world, where we can call on the individual to account for his actions. This is your charge and mine and where we can do our best for safety. A man will not hesitate to do an act or take a chance which could cost him his life, as well as the life of others.

The pages of history, literature and holy writings, all emphasize the good life—designate between life and death—blessings and curses. Our job is to induce our people to choose life, the better in a whole and sound body. Again, it's the job of an enthusiastic team—not a one-man show—everyone must get into the act—everyone must participate.

Industry has made more improvement in safety than public agencies because of industry's better control systems. Improved highways and facilities for public use have done much, but the great strides in safety have been in industry. The public has spent much on their programs—tax money—while industry spent their money for taxes and ran their business and supported safety programs in addition.

It is essential that all injuries or accidents be fully investigated. Get the facts and place the responsibility. When it becomes known that everybody is going to be "called on the carpet" following an accident, it serves as a good reminder for a fellow to keep out

of trouble. An accident may be explained in many ways, but an experienced supervisor can just about tell what happened before he hears the stories.

Safety is a state of mind and the way some live. I am convinced that the man who gets hurt or killed, whether on the railroad, highway, or at home, simply is not thinking about what he is doing. Many men work a lifetime on the railroad without an accident or injury. These men are alert and safety-minded, while the lazy-minded, indifferent, or maybe just thoughtless, stumble into trouble. I've found, too, that to give him a little trouble afterwards is helpful as a reminder.

After all of our programs and schemes, it is necessary to drive it down the last six inches—that can't be emphasized too much or too often. The roots of accidents, or better said, unsafe practices, are often grounded in thoughtlessness. To avoid injury people must be mindful of what is going on.

We do much of our work by habit and most of our actions take place through force of habit, but we must continually press for people to keep in mind the job at hand to prevent injury. In our business there are certain things that must be done right the first time—before we have time to form habits. The engineers and mechanical people build cars that run full speed the first trip. The first time an engineman runs an engine 100 MPH he must do it right, or he *might* not get a chance to form habits. Many run locomotives, drive automobiles, fly airplanes, successfully, the first trip. Experience and practice improve our work and makes it easier, but not if we lapse into bad habits.

So-called accidents are not an ill fate hanging over railroad men, nor any people for that matter, as an inevitable result of action. They are a natural consequence of carelessness or thoughtlessness and the ignoring of realities.

Accidents, for the want of a better name, are in the hands of people and can be done away with. A positive proof of this claim is the record of improvements in industry. We are here celebrating the 50th anniversary of the Railroad Safety Section. We are now experiencing one fourth of the deaths and injuries per million man-hours that we did 40 years ago. We are having less than half of the deaths and injuries that we were having 20 years ago. There continues a steady decline in deaths and personal injuries since advent of the safety programs. We have reached and saved many lives, or prevented, many personal injuries in the last 50 years and have made our business a safe one. Undoubtedly, there are men here who have avoided injury by the lessons learned from safety programs.

At one time railroading was considered a hazardous occupation, but the good work of safety minded, or just smart men, has changed that.

The past, and the record of those who have gone before, these 50 years, we have for a guide. I'm sure they did the best they could and that none really neglected this important part of the great railroad world. The present volume of business would have brought the railroads to a halt, even in my time, but we handle it now with ease and at many times the speed. We will do even better and we will learn to do it with fewer accidents.

Safety and a program to progress is not just a matter of popularity or a selling point, it is a survival issue and, we need to say it in words to make it real to those who do not understand. While it has been said that there is often an ulterior motive behind safety programs—I never knew of a case where the basis of such a program was to save money; however, who can deny that accidents do cost a lot of money. I'd rather spend my money for something besides blood and bones—those come high, as do lawyer's fees.

There will never be a time when we have no problems or when we will have experienced all problems.

We should try to get some exercise every day. We can't sit at a desk a week or two and then spend a day and night on the road, or worse, at a derailment, with impunity. I read an interesting item recently which said, in the absence of physical work, to walk an hour every day is the best insurance against a heart attack.

According to Alexander Hamilton Institute, in the last 30 years deaths from coronary heart disease has increased 2000%. due in part at least, to lack of some form of regular exercises.

This is a close parallel to the killed and injured we are actually here to talk about.

The entire front is not a warning of what may happen—it's a stern report of what is happening.

Historians and archaeologists tell us that for centuries man had no time for anything but to search for food—then he discovered storeable grain which allowed him to store some food and gave him time to start improving the way he lived—probably the beginning of the arts and sciences. Certainly a part of safety is living in such a way to extend our lives to the utmost, in keeping with a fair balance. The medical profession has said that there is a direct relation between strength and the amount of sleep we have. A tired railroad officer is not an asset.

Health and well-being are just as important to officers as anyone else. Safety is not aimed at any one group. It is universal—it applies to all and takes different forms.

There are many forces in motion with which we will eventually collide unless we are alert and steer to clear them. Half-hearted men give half-hearted response, even to this vital part of life. Plant your safety programs in high places, and fill them with enthusiasm and have it come down through the forces, and then you will have to drive it down the last six inches. Then tomorrow, we begin again.

What will the ultimate result of our efforts be in this most worthwhile endeavor? Satisfaction that follows doing a good job, increased productivity, higher standards of living, a better way of life, and a chance to live and enjoy it.

A MANAGEMENT GUIDE FOR ACCIDENT PREVENTION

By RALPH J. CROSBY
Marsh & McLennan, Inc., New York, N. Y.

Understand the Fundamentals

1. The prevention of accidents, unwanted and unplanned occurrences, is an important factor in the efficient performance of each department of the company.

2. The responsibility for the prevention of accidents is a line function and must be shared by all supervisory personnel in the same manner as they share the responsibility for performance in other activities.

3. Accident prevention does not involve an additional work load on supervisors. It is the responsibility of supervisors to anticipate and take action to avoid any occurrence that will interfere with or add to the normal operating cost of a department. Accidents do interfere and do increase overhead expenses.

4. The prevention of accidents is practical because very few accidents are from unforeseen or unexpected circumstances. The great majority are the result of employees deviating from accepted right working methods. A small percentage are the result of unsafe conditions that can also be detected by controlled inspection techniques.

5. The reasons why workers engage in practices that cause accidents are the same reasons why they make mistakes in the performance of their technical skills.

6. Workers can be supervised as respects adherence to safe working habits in the same manner as they are supervised in the performance of their job requirements.

7. The cost of accidents which is added to the overhead cost of operation, is not limited to the amount of money paid for compensation and medical bills. This may be the chief factor influencing the insurance cost, but overhead costs include the down time, delay, waste, damage, loss of use and other incidental expense which in the aggregate are substantially more than the claim payments.

8. There is a basic philosophy that cannot be ignored and which is the foundation for practical accident prevention. This philosophy establishes certain truths which properly comprehended provides the necessary information to approach the control of accident causes.

9. Certain procedures constitute the framework upon which a program is built. These are similar to the procedures established to carry out any function affecting efficient operation.

10. The responsibility for accident prevention also involves accountability. Not only is it necessary to carry out the mechanics of a program but performance should be measured by the results that have been accomplished.

11. The cost of administration of an accident prevention program can be credited with a marked improvement in supervision and more efficient employee performance.

Apply the Fundamentals

1. Express your attitude as respects company interest in accident prevention.

2. Show supervisory personnel the economic value of accident prevention.

3. Identify your objective of maintaining a safe working environment and attaining continued safe performance of employees.

4. Outline your policy by establishing the procedures that will be followed to attain your objective.

5. Designate the responsibility of accident prevention as an integral part of the daily performance of all supervisory personnel.

6. Appoint an administrator of the program who will keep you informed of progress or need for executive action.

Essential Procedures of the Program

(1) *The Indoctrination of Employees*—Employees should be indoctrinated on all phases of their participation in the program. They should understand the interest management has in their safety. They should be told what management has done to make their job and working environment safe. They should be shown that accidents do not occur from unexpected or unforeseen circumstances, but are the result of employees deviating from standard "right ways" of doing a job. They should be told no job anticipates that a person will have an accident or be injured. Each job has been thought out so there are no unusual physical demands on an individual.

(2) *Development of Operating Rules*—Accident prevention is primarily the process of checking for the existence of unsafe conditions or unsafe work performances. There should be no reservation in any supervisor's mind as to what are the important instructions as related to the people under his or her direction.

Each job should be studied and specific rules developed that reflect the experience of individuals plus the knowledge gained from past accidents. Studies made with the standard list of accident types in mind will bring to light many serious potential causes that can be made the subjects of rules or instructions.

(3) *Instructions of Supervisors*—We cannot expect that supervisors will automatically assume a full share of responsibility for their part in an accident prevention program. They frequently have mental reservations about any statement that says that they are responsible for the accidents occurring in their departments.

For example, supervisors often fail to understand the close relationship of accident prevention and performance efficiency. They labor under the false impression that accidents are bound to happen and not much can be done about it. They ask "what more can I do than to tell a person how to do his work." They do not appreciate the opportunities they have to see accidents in the making.

In order to overcome these obstructions, supervisors should receive instructions that specifically explain the importance and practical approach to each part of the program as it affects their daily activities. If supervisors are to inspire their men to a higher concept of working safely, the first step is to build their conviction that it can be done. The biggest roadblock to improving the attitude of the worker is the foreman's disbelief that it can be done.

(4) *Inspections and Observations*—Checking for the detection of accident causes is a prime requisite for effective accident prevention. A procedure must be established for

making such inspections not only by the safety administrator but by someone within each department. The inspections should not be limited to physical or mechanical hazards but observations should be made of employee performance to assure that instructions are being followed. The operating rules and the causes of past accidents offer an excellent guide for the supervisor who is sincere in his efforts.

(5) *Reporting of Accidents*—A procedure must be established for the reporting of all accidents regardless of the severity of the resulting injury or loss.

But insofar as injuries are concerned, when they require only first aid treatment, sufficient information should be recorded in the daily log to enable a qualified person to review the data and determine whether or not the occurrence warranted a more thorough investigation. It is the severity potential represented in the accident cause rather than the extent of injury that should influence our action. Often, the causes of major and minor injuries are the same.

(6) *Investigation of Accidents*—A definite procedure must be established for the investigation of all accidents. This is something more than the reporting of the occurrence. Our objective is to learn what we can from the accident so effective corrective measures can be taken to prevent a recurrence from the same cause.

Since we depend upon the supervisor to control employee performance or conditions under his charge, he should be the one to make the investigation. An accident is evidence that something has gone wrong and it is rightfully a supervisor's responsibility to control any occurrence that interferes with planned operations.

(7) *Correlation of Accident Data*—A procedure should be established that will require the safety administrator to correlate the accident data required from the investigation reports in a manner that will focus attention on unfavorable trends or outstanding accident causes.

A simple means of accomplishing this objective is to tabulate accidents by agency and cause for each department. The agency can be interpreted as being the object, equipment, job, or area that best identifies where to look for evidence of the same cause that has already produced accidents.

Such a tabulation is a perfect guide when making check inspections or for recognizing the repetition of a cause especially when the severity of injury or loss is not great enough to attract much attention or to make much of an impression.

It can also be used to advantage when a department head has occasion to talk to a supervisor about his performance or lack of performance in controlling unsafe work methods.

(8) *The Control Unit*—Management should establish a procedure that will enable the safety administrator to make direct contact at a level where executive action can be taken when the need arises. This control could be an individual or a group but in any case it should have the authority to make decisions and to act when facts are presented.

The control unit should be the place that a progress report would be considered.

When weaknesses in the program are recognized, they should be evaluated from the point of view of how much an improvement should affect the over-all performance.

This report of progress prepared periodically by the safety administrator should submit not only statistical data on accident frequency trends but should provide a continuing evaluation of the effectiveness of existing procedures which will identify the outstanding problems that deserve preferential treatment. The report should indicate the action that is being taken and the progress or reasons for lack of progress in solving the problem. This will give management the opportunity of supplementing the action if necessary.

Check the Performance

1. *Divisional Managements Participation*—
   a. Has the program been properly interpreted at division levels?
   b. Have all supervisors been told that they will be held responsible for results?
   c. Has the administrator recognized any weaknesses in carrying out a procedure?
   d. Are you provided with progress information to supplement statistical data?

2. *Instructions of Supervisors—*
   a. Are supervisors given instructions in the basics of accident prevention?
   b. What do they do individually as respects instruction of employees, checking performances, job studies, accident investigation?

3. *Instruction of non-Supervisory personnel—*
   a. Are employees indoctrinated as respects their participation in the company program?
   b. Do they receive supplementary instruction on the job?
   c. Does the supervisor talk with them individually to detect any wrong attitudes and correct any erroneous concepts?

4. *Operating Performance Rules—*
   a. Have specific rules been developed for each job?
   b. Have so called "safety rules" been made an integral part of normal operating procedures?
   c. Are existing rules modified in the light of experience?

5. *Check Inspections and Observations—*
   a. Are regular check inspections made for the detection of unsafe physical conditions?
   b. Are observations made by supervisors to detect deviations from standard practices?
   c. Are standing rules checked periodically for compliance regardless of any lack of accidents?
   d. Are special checks made to verify the effectiveness of any corrective action initiated to control some accident cause?

6. *Reporting of Accidents—*
   a. Are all accidents reported regardless of the severity of resulting injury?
   b. Does the record of minor cases contain sufficient information to evaluate the potential probability in event of a recurrence?
   c. Does the supervisor have knowledge of the minor cases?

7. *Investigation of Accidents—*
   a. Are accidents investigated and the probable cause determined?
   b. Is the immediate supervisor required to submit his investigation?
   c. Is the supervisor's investigation verified by his superior?

8. *Accident Study—*
   a. Is the information available from investigation reports correlated in a manner readily directing attention as to where to look and what to look for to detect probable accident causes?
   b. Do supervisors have this kind of record for their department to guide their checking?
   c. Are potentially serious accident causes selected for special attention?
   d. Is any attempt made to secure incidental accident cost data?

WHAT'S NEW IN THE GRADE CROSSING PROGRAM?

By GEORGE M. DEMPSEY
Asst. Supt. of Safety, Chicago, Milwaukee, St. Paul & Pacific Railroad, Chicago

Before turning over this portion of the program to my fellow participants, I would like to discuss briefly a few of the items that were brought up at the meeting of the Committee on Motor Vehicle Traffic Safety at Railroad Grade Crossings held on the morning of October 26, 1965.

It was pointed out that there had been

a fairly consistent decline in the number of fatalities at highway-railroad grade crossings since 1935 reaching a low figure of 1,055 for the year 1959. During the following four years, 1960 thru 1963, the average number of deaths was 1,188 but a very sharp increase to a figure of 1,418 occurred in 1964.

The "near miss" program was reviewed and emphasis was placed on the need for more reports by a greater number of railroads. With 15 lines reporting these experiences of "near miss" and violations of the law by school buses and trucks transporting flammables or explosives, actually only 185 reports were received at the office of the National Safety Council so that there is a need for more reports in order to establish a more complete picture of the overall situation. The cooperation of President Daniel P. Loomis of the Association of American Railroads in writing the executives of member roads encouraging greater activity in this field should be effective.

The dash board stickers produced by the National Safety Council covering the signs at grade crossings will shortly undergo a slight revision to make it conform with arrangements in all states, California in particular. At present about 70,000 of these stickers have been distributed, mainly by State railroad associations and by individual railroads, and it is hoped that even greater use will be made of these stickers, principally on school buses.

The National Safety Council will soon release a very informative booklet on the Signs of Life, dealing with all traffic signs and signals. Copies will be distributed to all Railroad Section members. Watch for it.

At this time I would like to have Mr. Daulton tell about the Kentucky plan.

THE KENTUCKY PLAN

By H. C. DAULTON
Director of Safety, The Louisville & Nashville Railroad, Louisville, Ky.

The chairman of the Ohio Railroad Safety Officers' Association has kept me informed of the activities of that organization. I had the opportunity to attend one of their meetings in Columbus, Ohio, and there, at first hand, I saw the cooperation given to the railroads by the agencies of the State of Ohio.

That gave me the needed impetus to start a campaign for a similar program on our own railroad. Propitiously, at about the same time, the Regional Manager of the Chesapeake & Ohio Railway wrote the chief operating officers of the Kentucky railroads, proposing a "near miss" program in the Commonwealth of Kentucky. That was all that was needed to give me the green light to go ahead.

Before embarking on a formal program, we felt it advisable to lay a foundation to show visually the need for it. To start off, we invited the Director of the Kentucky State Police to ride the locomotive of one of our passenger trains. He saw six specific and definite violations in 100 miles. Next, we invited one of the staff instructors of the State Police Academy to ride the locomotive of a train. Newspaper publicity was given these trips and we also publicized them in our own company magazine.

We felt we now had sufficient background to ask the safety representatives of the major railroads to join us in an organizational meeting. All but one railroad was represented and, of those attending, only one road's representative stated he could not obtain managerial permission to participate. As a result of that meeting, the Kentucky Railroad Safety Officers Association was formed. A chairman and vice-chairman were elected and objectives established.

Subsequently the short-line railroads in Kentucky were approached to cooperate in the "near miss" program and the majority of them responded enthusiastically. At their

request, the L. & N. has furnished to several of them supplies of the observation-report form.

We now were ready to approach state officials and the chairman and vice-chairman were directed to proceed accordingly. With this trip on the locomotive of an L. & N. passenger train still fresh in his mind, the Director of the Kentucky State Police received us graciously and assured us of his full cooperation. He suggested that we hold a subsequent meeting at the Kentucky Police Academy and offered the use of their library as a meeting room.

About a month later, the Kentucky Railroad Safety Officers Association held a meeting at the Academy and acquainted the Director of the Academy and the Director of the Governor's Action Committee for Traffic Safety with the details of the "near miss" program.

The Commonwealth of Kentucky is retraining every state policeman as well as the driver of every state-owned motor vehicle. At the time of our meeting at the Academy, one of the training schools for state police was in progress and H. C. Ekstam, of the New York Central, was asked to address them on our program.

Previously the L. & N. had furnished to the Director of Pupil Transportation of the Kentucky Department of Education sufficient National Safety Council dash stickers for every school bus in Kentucky. When the "near miss" program was explained to the director, he, too, assured us of his department's full cooperation. As evidence of that cooperation, we know of two school bus drivers who were relieved because of their failure to stop at crossings.

The L. & N. had printed a postal-card-size observation report form, similar to that used by the Ohio Railroad Safety Officers Association, and distributed them to all employes in Kentucky. When reports of violations are received from employees, our division superintendents are instructed to write the vehicle owner a friendly letter, citing the place, date and time of the violation, and asking that the hazards involved be pointed out to the driver. A copy of such letters is sent to the Secretary of the Committee on Motor Vehicle Traffic Safety at Railroad Grade Crossings of the National Safety Council.

All of the report forms then are sent to the Safety Department where they are processed, and a photostatic copy is sent to the Director of the State Police. After review in that office, the reports are sent to the appropriate state police post for selective education and enforcement. In incorporated areas where the state police do not have jurisdiction, the reports are turned over to the appropriate police authority.

In the event a school bus is involved, the report is sent to the Director of Pupil Transportation who takes prompt and positive action.

The plan has been in effect in Kentucky for less than a year and no comparison can yet be made. We are convinced, however, of the value of the program and have extended it over our entire system. We are also making out the observation-report form on actual grade crossing accidents and submitting them to the appropriate authorities. We are continuing to invite police officials, judges, newspaper reporters, and other public figures to ride the locomotives of our trains. And practically every month we carry in our L. & N. Magazine a feature article concerning these observation trips.

If your Safety Department is understaffed, you will take on a good bit of work in organizing and carrying out a "near miss" program, but if one life is saved, it is all worthwhile.

WORKSHOP SESSION

Presiding: L. C. McDowell, Superintendent of Safety, Chicago and Northwestern Railway, Chicago, Illinois.

Operating Workshop—Gold Group

Moderator: B. L. Schoech, Assistant General Manager, Chicago, Rock Island and Pacific Railroad, Des Moines, Iowa.

Railroads continue to experience a large number of injuries to the train, engine and yard service employees. In addition to the responsibility of management, it appears that an increasing number of employees are failing to accept their responsibility for accident prevention.

1. Q. In what ways do train, engine and yard service employees fail to accept their responsibility for accident prevention?

   A. (Summary of group discussion): Carelessness—caused by permitting work to become routine, leading to a false sense of security about safety. Also, the employees began taking safety rule short-cuts.

2. Q. Why do train, engine and yard service employees fail to accept their responsibility?

   A. Failure to know and understand safety rules, lack of proper instructions and lack of personal pride.

3. Q. How can this situation be corrected and maintained?

   A. By the use of proper training, building better morale, use of incentives and disciplines and proper on-ground supervision.

Operating Workshop—Blue Group

Moderator: D. R. Freyer, Superintendent, Chicago and Northwestern Railway, Chicago, Ill.

Railroads continue to experience a large number of injuries to train, engine and yard service employees. In addition to the responsibility of the employees it would appear that there is a weak link in the supervisory chain of command's accident prevention efforts.

1. Q. At what point in the supervisory chain of command does the weak link exist?

   A. At the point of immediate supervisor—be it a trainmaster, traveling engineer, yardmaster or other person in charge. These supervisors must demand and receive acceptance of responsibility from conductors and foremen.

2. Q. Why is the supervisory chain of command weak at this point?

   A. The immediate supervisor may not be properly trained. The superintendent may fail to emphasize that accident prevention is the most important part of the supervisor's work, and that he desires safety as well as efficiency. The supervisor does not spend enough time with on-the-ground observation of employees for various reasons unless he is properly instructed to do so. Some supervisors have large territories and a lot of paper work and may not have time enough with their employees.

3. Q. How can this situation be corrected and maintained?

   A. By proper training of supervisors for safety and by having sufficient number of supervisors to cover the territory properly. Having the new supervisor spend some time with an experienced officer will help him to become aware of hazards that may not be just common sense. The supervisor must be told that he is responsible for safety supervision.

Engineering Workshop—Gold Group

Moderator: B. J. Worley, Engineer of Maintenance of Way, Milwaukee Road, Chicago, Ill.

Railroads continue to experience foot injuries that could have been prevented with the use of safety footwear.

1. Q. What is the best way to encourage employees to purchase and use protective footwear without making the requirement a condition of

employment and without the company bearing the cost?

A. Supervisors must set the example and wear safety shoes. Supervisors should stress the hazards and the necessity of wearing safety shoes. Safety shoes should be made readily available to employees.

2. Q. New styles of protective footwear, such as wedgies, Wellingtons, etc., are now available. What are the merits or faults of establishing standards for protective footwear for the various types of work?

A. Supervisors should advise but not dictate the proper style of safety shoes to be worn for the particular job.

3. Q. What are the merits or faults of providing payroll deduction privileges and the merits or faults of permitting a representative of a shoe company having such privileges available to the employees?

A. Payroll deduction seems preferable because safety shoes can be obtained at any time by an employee with proper credentials. No objection to a representative of the shoe company explaining shoes and proper fitting.

Engineering Workshop—Blue Group

Moderator: R. W. Bailey, Engineer of Scales and Work Equipment, Chicago and Northwestern Railway, Chicago, Ill.

Railroads are experiencing new accident prevention problems with increased use of on-track and off-track maintenance equipment. Several railroads are experiencing serious accidents and fatal injuries with the use of such machines.

1. Q. What is the major cause or causes of accidents resulting from the operation of such machines?

A. (1) Inadequate training, (2) Inexperience, (3) Complicated controls and (4) Poor maintenance procedures.

2. Q. How can we provide the proper safety training for operators of such machines and other employees working around the machines?

A. Have manufacturer train engineers and supervisors and then have supervisors train employees. Following up of proper operating procedures by supervisors. Safety department must distribute accident investigation reports to all points on the railroad so that everyone will become aware of dangers. Supervisors must have re-training and advanced instructions for all new machines.

3. Q. What should be the safety department's role in the purchase of such machines?

A. Must witness machine demonstrations with eyes open to discover hazards and participate in supervisory training. Safety Departments should receive history of machine operators from other railroads and furnish such reports to the Engineering Department.

Mechanical—Car Workshop—Gold Group

Moderator: J. D. O'Neill, Assistant Superintendent Car Department, Chicago and Northwestern Railway, Chicago, Ill.

Railroad safety representatives and other officers observe employees committing unsafe acts and/or working without protective equipment in the presence of their immediate supervisor or foreman. Some of these foremen and supervisors feel that they are responsible for production supervision and that the safety man is responsible for safety supervision.

1. Q. What are the best methods of training railroad foremen and supervisors in accident prevention?

A. State company policy and teach just what the supervisor must do in regard to accident prevention and to protective equipment. Supervisors must be invited to periodic meetings with safety representatives to keep up-to-date.

2. Q. How can we convince foremen and supervisors that they must be responsible for both production and safety?

A. Show them the triangle of produc-

tion consisting of efficiency, quality and safety and that it is impossible to have a separate supervisor for each. The same supervisor must control the three angles as production will fall apart if any one of them is missing.

3. Q. What are the best methods of obtaining and maintaining the proper attitude of foremen and supervisors?

   A. By personal contact with all supervisors. By appealing to the personal pride of supervisors and by enforcing the company policy.

Mechanical—Car Workshop—Blue Group

Moderator: J. T. Fritchman, General Supervisor, Car Inspection and Repair, Atchison, Topeka and Santa Fe Railway, Topeka, Kansas.

Slipping, tripping, falling and alighting from or getting on equipment account for a great number of shop injuries.

1. Q. What can be done to prevent such injuries?

   A. Proper instruction must be provided. Stress the necessity of good housekeeping and the wearing of proper shoes and clothing. Insist on compliance with rules pertaining to such hazards.

2. Q. What can be done to encourage employees to assist in keeping their own work area clear of tools not in use—scrap, oil, grease and other obstacles?

   A. It is necessary to establish and maintain a policy of cleanliness and orderly arrangement of tools. Proper containers must be provided for scrap. Educate the employee to the effect that it is for his benefit. Supervisors must make daily inspections, requiring compliance with the policy and pointing out the hazards involved.

3. Q. Torn or baggy clothing may contribute to such injuries. What can be done to encourage employees to use proper clothing?

   A. The supervisor must set the example by his own use of proper clothing. He must point out the hazards and state the policy on improper clothing, using diplomacy and tact. Appeal to the personal pride of individuals if necessary.

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NSC Vice President for Homes—J. H. TYLER MCCONNELL, Secretary and Member of Finance Committee, Hercles Powder Company, Wilmington, Del.

NEW CONCEPTS IN DRIVER EDUCATION

Presiding: Robert Semonisck, Campus High School, Wichita, Kans.

Recorder: Harold Schultz, Central High School, Bay City, Mich.

Discussion Leader: J. C. Angelo Crowe, Consultant, Driver Educ., State Dept. of Educ., Atlanta, Ga.

The first speaker was Dr. Norman Key, Executive Secretary, National Commission on Safety Education, National Education Association, Washington, D. C. His topic was "Implications of the Conference on Driver and Traffic Safety Teacher Preparation and Certification."

Dr. Key stated he was certainly encouraged by the project. The project identified what has to be taught regarding safety in the schools, why it has to be taught in schools and colleges, and what should be taught.

Dr. Key told of the implications of Public Law 89-10 regarding safety education. He gave two suppositions. First, suppose all the proposals coming in from local school districts do not have anything to do with safety education. Second, what if all were for safety education?

It would be impossible for the Department of Education to ignore all the proposals that have something to do with safety education. Dr. Key stated that the answer is in our hands, and we now have the opportunity to include safety education in the proposals being submitted. Certainly, we have to provide all the elements of education a child needs. Safety education is necessary so that children can enjoy the general education they are offered in our schools.

According to Dr. Key, the project was timely considering the changes taking place in public education today.

One of the benefits of the six regional workshops set up following the Conference itself, was the determination of a sequence to be followed to receive a major in the field of safety education. Undergraduates do their student teaching in their major field. If a major is provided in the area of safety education, they can now do their student teaching in this area.

The purpose of the project was to acquaint us with the competencies needed and the preparation necessary for Driver Education teachers, safety supervisors, and college safety personnel. Dr. Key stated competencies are important. Teachers must have a mastery of the known material in the field. They must know the instructional strategy that will be effective.

Realms of responsibility were suggested. On the college and university level it is important to designate a single person to coordinate activities to maintain an effective program. The college and universities should provide the budget from within the institution. Outside help can be accepted, but the main source should be from within the institution. Status of safety education should be commensurate with that of other programs provided by colleges and universities. It is also important on the college and university level to have a graduate program that will lead to a Masters or Doctorate Degree.

On the level of the State Education Department, a person should be designated responsible for safety education. The State Department should insure that each boy and girl receives safety education on all levels.

Dr. Key concluded that the project is a break through. Where do we go from here?

Dr. Edwin Belzer of the University of New Mexico reported on a study made at the University of Illinois on the advantages and disadvantages of left foot braking. The topic of the study was "The Quickness of Selected Right Foot and Left Foot Braking Techniques."

Dr. Belzar gave two reasons why the study was made. (1) Because of the differences in opinions regarding which is best—left or right foot braking and (2) to illustrate the quandary that teachers are in regard braking procedure.

The following are findings and conclusions of the study.

1. Left-foot braking with the left foot poised on the brake pedal is superior to the right-foot braking in the "usual" manner

from the standpoint of quick-braking but not as superior as would be expected from a consideration of brake response time alone, and certainly not as superior as has sometimes been claimed.

2. Right-foot braking in the "usual" manner is superior to the left-foot braking unless the left foot is already poised on the brake pedal when a demand for quick braking occurs.

3. A "power-type" brake pedal can be expected to result in brake response times which average approximately .04 seconds faster than those obtainable under similar right-foot braking conditions with a standard-type brake pedal—more or less depending on the differences between brake pedals in the cars being compared.

4. Users of "automatic pilots" ought to disengage the device when in a situation where demand for braking is not unlikely, or perhaps poise their braking foot over the brake pedal.

For those persons who advocate the adoption of left-foot braking, they should be aware of the following points:

1. The potential savings are not as great as sometimes have been claimed.

2. Unless the left-foot braker already has his left foot poised on the brake pedal when the situation demands quick braking, he is apt to actually be at a slight disadvantage.

3. The question of whether or not there is an "appreciable" danger of the left-foot braker's failing to release the accelerator, and hence possibly causing or intensifying an accident, does not appear to have been studied.

An application was made for and a grant was received from the Department of Health, Education and Welfare through the Vocational Rehabilitation Administration to compare the driving skills of physically disabled high school students with those of non-disabled students in the same school system and to demonstrate the practicability and methodology of teaching the disabled to drive.

Under the present program, training is given during the regular school year and during Summer school. Students are divided into groups according to the type of disability. Two teachers, using one mobile classroom and two driver training cars, will train four students during a class period during a regular school day.

Two types of assistant devices (hand and foot controls) are being used and each type is available in the automobile as well as in the simulators. Also used are foot accelerators, brake and accelerator pedal extensions, steering knobs, electric seats and windows, power steering brakes, and adjustable steering wheels.

Teaching procedures are the same as provided other students and driver education classes.

For the duration of the grant, license examiners come to the school to administer examinations for instruction permit to prospective driver education students. Upon completion of the course, students are taken to the Department of Motor Vehicles for their driving test.

As of October, 1965, 49 students had been trained under this program.

Dr. Harry Fletcher of the Institute of Public Safety, Pennsylvania State University, spoke on "Teaching Basic Driving Skills and the 8mm Loop Film."

There is a definite need to increase the quality and quantity of high school driver education when you consider the number of students who are not now receiving the course, the number of students receiving the minimum "30 and 6" requirement, the attempts being made to lower costs, and the coming population explosion.

A study was made by Dr. Fletcher at McCaskey High School in Lancaster, Pennsylvania to investigate the possibilities of using 8mm continuous film loop cartridges projected in daylight for individual instruction in teaching a particular driving skill.

One-hundred and twelve 11th grade students were selected largely on the basis of no or negligible experience in driving skills. They were screened, pretested and assigned by a random method to four groups.

Each group was scheduled for four consecutive days to receive the following treatment each day:

Group 1—No instruction

Group 2—Film-self instruction

Group 3—Live instruction

Group 4—Film instruction and live instruction

Teaching outlines were prepared which followed the step-by-step procedure outlined in Sportsmanlike Driving.

The exercises which were scheduled each day for four days were as follows: 1) First day, starting the engine. 2) Second day, putting the car in motion and stopping. 3) Third day, backing the car. 4) Fourth day, turning around on a narrow street. Data obtained by pre and post written tests and performance tests were used to compare the four groups in the mastery of technical information and performance of selected driving skills.

The following conclusions were made:

1. Naive students who were substantially equal at the start of the study learned technical information regarding selected driving skills equally well under these teaching methods: film demonstrations, live demonstrations, and a combination of film and live demonstrations.

2. Students' initial performances of selected driving skills were not significantly different when taught by film demonstrations, live demonstrations, and a combination of film and live demonstrations.

3. The number of practice trials needed by students to correctly perform selected driving skills initially showed no significant difference when taught by film demonstrations, live demonstrations, and a combination of film and live demonstrations.

4. Students' total performance of selected driving skills were not significantly different when taught by film demonstrations, live demonstrations and a combination of film and live demonstrations.

5. Those students who were taught by film demonstrations, live demonstrations, and the combination of film and live demonstrations learned technical information and performed driving skills at a statistically significant level over (or better than) those who received no instructions at all.

Dr. Fletcher stated that the findings of this study indicated that film loops can be used in the development of selected driving skills. Therefore, filmed demonstrations seem to offer certain advantages such as a saving of the instructor's demonstration time in the automobile can be realized because it would not be necessary for him to personally demonstrate each lesson; the value of the student's actual driving time in the automobile could be increased as he would perform the task immediately instead of watching in-car demonstrations and then performing the task; and when repeating a demonstration, an instructor sometimes make changes in his presentation while the filmed demonstration never overlooks an explanation or forgets a step.

Mr. J. B. Angelo Crowe, Consultant, Driver Education, State Department of Education, Atlanta, Georgia, served as discussion leader. Questions were submitted from the floor and answers were given to those questions.

The following questions were answered by Dr. Belzer.

Question: Were the following factors considered regarding left foot braking: the fluttering taillights and the increased possibility for brake fade?

Answer: Cars could have a built-in tension control for the brake pedal. The left foot area could have a treadle instead of a pedal so a person would not have to hold his foot over the pedal at all times. For those who forget to take their foot off the accelerator, a device could be built in to make the engine idle automatically when the brake pedal is depressed.

Question: Richard Shook, Department of Public Safety, Iowa. Wouldn't the tension adjustment for each driver have to be different?

Answer: Certainly you would have different tension adjustments for wife and husband, but it would be the savings in stopping distance warrant this?

Question: Leslie Silvernale, Michigan State University. Didn't the Chrysler Corporation find that with the left foot poised over the brake pedal, they saved thirteen feet at 30 MPH?

Answer: The Ford Motor Company had five professional drivers in 1959 Thunderbirds. They had a saving of .06 of a second with power brake at 30 miles per hour and .12 of a second with standard brake pedal.

Question: Dr. Silvernale. Would it be a good idea to use stopping distances in your research?

Answer: The objections to that would be that most drivers are more experienced with one foot rather than the other, and many

more subjects would be needed. To be accurate you would have to train new drivers—in just one method. In a laboratory you can control the variable more easily.

Question: Dick Simpson, Western, Illinois. What was the time lapse between tests, and does this mean each student took 120 tests?

Answer: The time lapse was only a few seconds and each student took a total of 120 tests.

Question: Were the left-footed individuals eliminated?

Answer: We determined that three of the boys and three of the girls were left footed. They tended to be slower with both feet, but there were not enough subjects to draw any conclusions.

The following questions were answered by Mr. Valentine.

Question: George Mathes, Springfield, Illinois. What is the basis for accepting handicapped students in Los Angeles?

Answer: It is the subjective opinion of the driver education teacher and also the Motor Vehicle Bureau which has to issue them a learners permit.

Question: Walter Luisford. How many handicapped students do you need before it is feasible to adapt a program for these students? Why are many of the students so young.

Answer: How many are in specially designated schools for the handicapped? This program should be no different than other programs for these students. Many of these students are in regular schools. The students want the course right now. The course is offered in three schools each semester so those students who take the course at the beginning of the semester are younger.

Question: Mr. Silvernale. Could the handicapped students take the course in a regular Driver Education class?

Answer: The equipment is in regular Driver Education cars, so I can see no objection.

Question: John White, Jackson, Mississippi. What is the behavior pattern during the training period?

Answer: The students are very motivated. They have been faced with a life of immobility and now they have a chance to get wheels. They are well disciplined, well behaved, and very cooperative.

Question: Gary Anderson. Are these students more of a road hazard because of their disability?

Answer: As long as they have the same equipment in their own cars, they are just as familiar with their cars as you are with yours. They have learned to adjust to their disability.

Question: With hand controls, can a normal student still operate the car?

Answer: Yes, I have operated the cars with controls to make sure they were working properly. The cars can be used first period for the handicapped and second period with a regular student, just tell them, "Don't touch the controls."

SCHOOL TRANSPORTATION SECTION

INSURE ALL-AROUND SAFETY—IMPROVE ATTITUDE

Presiding: C. B. LEMON
Dir., School Bus Safety, School Transportation Div., State Department of Education, Santa Fe, N.M.

One of the highlights of school transportation's section activities is the project, "Crunchie Goes to School," the school-bus seat belt research project, representing a joint venture of the National Safety Council and UCLA to determine the feasibility of using seat belts and other restraining devices on school buses.

This research marks the first direct participation of the Council in such activities. The project is supported by a grant of funds by the Allied Chemical Co. and is matched by funds from UCLA. A bus chassis was donated for the project by General Motors and a school bus (conventional 60 passenger meeting NEA specifications) was donated by Superior Coach Inc. The research is scheduled for completion sometime in 1966.

The Section has also reviewed National Safety Council's *Traffic Safety Inventory*, particularly the section on school transportation. The recommendations were submitted and the new forms will be used as corrected.

The film, "School Bus Safety With Strings Attached," is being well received by school transportation officials throughout the country. The state of Pennsylvania, for example, purchased 22 copies to be shown to school bus passengers throughout the state. It was voted Safety Film of the Year—by the National Committee on Films for Safety.

A booklet, "Here Comes The School Bus," is being developed and will be available for schools to furnish to school bus passengers. It contains the rules as set forth in the film above mentioned.

The School Transportation Section is using the Driver Improvement Program as one of the tools to promote school bus driver training.

HOME ENVIRONMENT AFFECTS ATTITUDE

By REV. CARL T. UEHLING
Pastor, Christ the King Lutheran Church in the Loop, Chicago, Illinois

I've had the feeling that this whole speech is condensable into the four words that form its title—Home Environment Affects Attitude. Home environment does affect attitude, of course. What could be more obvious?

But other factors also are influenced by home environment. Judgment, for example. Some years ago a hurricane struck a town with such force that trees were uprooted, roofs blown off, windows shattered and houses moved off their foundations. When the storm eased, people ran from their homes and gathered in small groups in the street, and in one such group a man was telling everyone not to get excited, to be calm, to determine the damage and then decide what to do. A woman in the crowd agreed that he had a good idea, "But," she said, "if I were you, I'd go into the house and put on my pants!"

What happens in one area of life has its influence upon what happens in another area, and what happens to one person has its influence upon what happens to another

person. The tensions build up, the aggravations multiply, and our life today shows the results.

It's enough to make you worry; in fact, worry itself is a product of the time. What worry can do was illustrated by some statistics a few years ago showing that in one large company nine out of ten cases of worker inefficiency were caused by worry. A life insurance company found that four out of five nervous breakdowns began not in actual events, but in worry. A medical clinic's analysis of its patients showed that 35 per cent of all illnesses started with worry! No wonder Peter Marshall once prayed, "Save us from the sin of worrying lest stomach ulcers be the badge of our lack of faith."

We'll return to "lack of faith" after a bit, but first it might be useful to compare what is with what used to be years ago.

Grandfather, or maybe great-grandfather, was an essentially independent person. If he himself hadn't carved out the piece of land that was his, he at least kept it carved out, and he made it do what he wanted it to do, without much help from anyone else. He saw it as himself against the world, and he liked it that way for the most part, and for the most part he survived. He didn't have the shiny appliances that clutter our homes, nor did he need them. He didn't have a car, but then he had no place to go. Nor did he have life insurance, or social security, or unemployment compensation, or minimum wages. And, of course, he didn't have regional schools, and his children, when they went, walked to the school house.

Yet those good old days were not very good, for all of the sentimentality with which we surround them. The schools of today produce brighter youngsters by far than did the old ones, and in the so-called welfare legislation we've passed you find laws that prohibit child labor, and others that relate to job safety, and still others that have to do with compensation for the injured. Not one of us could honestly hope for a return to what was. People today live longer and more comfortably, but they also live far less independently than did their grandfathers.

This is not to say that we live in some form of slavery; the better way might be to describe it as interdependence. In the old agrarian society each man's home and property were his world, and he sustained himself within that world. Today, almost no one, the farmer included, sustains himself. Instead, we live in profound dependence upon one another. Not many of us produce anything all by ourselves; those who do production work receive parts already manufactured from someone else and make other things that go to others for further assembly. Huge percentages of us produce nothing whatsoever. What, after all, do secretaries produce? Or executives? Or accountants?

Our interdependence is further emphasized by the fact that more and more of us choose to live in communities, where we receive the utilities out of the community, as well as the securities. We don't dig wells for our water; we get it out of the town's water system. Nor do we carry sidearms for our defense; instead, we hire a police force. In dozens of ways, we have become interdependent, and need hosts of other people, most of them anonymous, in order to live as we choose to live.

Years ago, the sanctity of a man's own place and work and home was never disturbed. If his wife happened to burn the toast, he might have taken out his displeasure on the cows, but no one else. Only acts of God could reach in from the outside and cause him distress. But now man faces all the world and is faced by it; he distresses all of the world and is distressed by it. His home is ingredient in a vast and confused arena—an ingredient an that if anything, has suffered terribly from this change. George Buttrick once put it this way: "Our mechanistic, urban and warring world has wreaked its worst havoc on the home, which for many people nowadays is only the place to which they go from the garage." No longer is it their castle, their place of refuge, their chief joy. Since what happens in the world can have such irritating effect, a man's home can turn out to be the most irritating of all the ingredients in his life.

And to this point in the history of our culture the imitations irritations have prevailed. Should we probe deeply enough into our collective id, we may discover to be nothing other than our tensions between independence and interdependence. John Donne insisted that "no man is an island," but he lived a long time ago, and the truth

of his statement never fully blossomed until this century in which we not only have responsibilities for what happens around us, but are unavoidably entangled in what happens around us. In fighting the entanglements and their implications, we get punchy. We want to stand straight and tall on our own two feet, but we cannot stand at all without leaning on a million others who also are leaning on us.

Each angry reaction only gives us more distress. We are not independent, for all of our struggles, nor will we be. We need an acceptance of what we are. If we could but reach such an acceptance of interdependence, we might also reach a degree of maturity that would have its beneficial effect in dozens of directions.

"All right," we might say to ourselves, and to anyone else who might listen, "we do not stand alone; we cannot make it alone. We need what others have. Maybe what they have will be good for us, and maybe what we have will be good for them."

Coming back to where we were when we began, if the home environment can influence attitudes, and if what happens out in the world can influence the home environment, why must we presume that the net results will be ulcers all around? Granted, the results so far have been one mess of ulcers, but need it always be this way? Cannot there be a change in the vicious routine somewhere, sometime? Thurston, the famous magician, used to stand in the wings just before a performance and say, "I love this audience. I'm going to give my best to them and they are going to respond splendidly." The audiences, of course, always did just that. And maybe the results of interdependence in any area are no more magical than that: you start with the one factor you know you can control—yourself.

Therefore, it might be very well for us to mention the factors that influence a man's performance, and to say that if his home life is bad he is liable to carry a grudge to work that could affect his judgment.

Interdependence not only creates the problem, it also supplies the answer. There is a circle of influence that starts in this room and radiates to the highways of the nation where thousands of young lives are being entrusted to the steady eyes, firm hands and calm judgments of the drivers of school buses.

There isn't a whole lot that you can do about the homes from which those drivers come, other than through the drivers themselves, but there is at least that wedge and the chance that it might reach behind locked doors and into human hearts.

This suggests a need to know people and to know them well. A friend of mine who has a small industrial concern testifies to the value of knowing his employees, and on a more than casual basis. He knows where they live and how they live, the circumstances of their family life, their interests, their ambitions. They, in turn, are aware of his interest in them. He tells me that times have come when by invitation he has stepped into the middle of a family's division in order to bring healing and peace.

No one has the right to interfere with another's life. Yet, the world today is such that other people's lives are doing their own brand of interfering. It may be none of my business if a man fights with his wife, but what if he then drives my child to school? Be that as it may, there is this need for interest and concern and for more than surface acquaintance with others.

H. A. Overstreet once claimed that "the most dangerous members of our society are those grownups whose powers of influence are adult, but whose motives and responses are infantile." What do we do about infantile adults, if not to guide them, by our own example, into maturity?

If we know others well enough, we will know their needs, and with the knowledge of need there must come the willingness to reach to that need, in kindness and concern. You can't be content to let a man drink himself into isolation from his loved ones, to let a tragedy in a man's home grind his life into utter despair, or to let the tensions of our day become aggravated by the tensions of a household to the point of explosion.

Again, what you are able to do might be limited indeed, and there is nothing more wrong than the effort to help where no help is wanted, but the danger of making that kind of a mistake is hardly to be compared to the danger to human life such an unresolved situation might produce around three o'clock some afternoon.

However, there may still be a prior point of influence. If what happens at home is as important as we think it is, and if those who drive school buses ought have pleasant homes for the sake of their safe driving habits, and if you have a contact or two through your work which might have influence upon them, use it.

And so, since we're getting personal, it might be time to talk about faith. It was Peter Marshall who said that our ulcers might be a badge of our lack of faith, even as, I suspect, the divisiveness of the modern American home is an indication of the same lamentable condition. There is a need for faith, which could be most simply and inoffensively defined as an acknowledgement of a greater power. This acknowledgement, then, has its determinitive effect upon our lives.

Our homes need to be places of love and peace, enriching and fulfilling our lives, not only for what we might get out of them, but also for the sake of those powers or factors that are above and beyond them.

For those who transport the children of America to their schools, there is the responsibility of discharging their duties safely. A man can believe in such a cause and live for it.

Our lives are marked by the purpose we give to them, and the faith in which we live them, day by day. And it all begins, does it not, with you—your life, your work and your family? There was One who said, long ago, that faith might be something as small as a mustard seed, but it could move mountains. We know that it also can save lives!

JOB ENVIRONMENT AFFECTS ATTITUDE

By JOHN JENKINS
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It is an accepted fact today that, "Job environment—affects—the attitude of any worker." The same is definitely true of our school bus drivers. It is the supervisor's obligation to provide a suitable environment for employees which enables them to grow in dignity and stature.

What then do workers want? Davis polled a random sample and came up with the following basic employment wants:

1. Good Leadership
2. Good information and communications, regarding goals, policy
3. Dignity and respect
4. Incentive and opportunity to grow and progress, requiring effort and competition
5. Relative independence and freedom
6. Relative degree of security and safety
7. Working conditions, comforts and salaries comparable to community standards
8. Pride of accomplishment in useful work that contributes to social needs

In order to better understand my topic, I would like to give the picture of my environment with the Jefferson County School District, Colorado.

We had 143 school buses last year. Today we have 153 buses in our fleet.

Our part-time school bus drivers number 194 of which about 160 drive each day. Fifty per cent of these drivers are women.

We had 707 bus routes last year, with a count of 879 for this year.

We service nine high schools, 18 junior highs, and 49 elementary schools. A total of 75 schools serviced, approximately 21,000 students hauled, with approximately 30 per cent of our schools being walk-in-schools.

We average 22 special trips per day: planetarium, out-door educational school, athletic events, music, and field trips. During the summer months we have taken students to New York City, Canada, and Chicago for departure to Europe. During the summer we have taken students to Mexico for a period of 30 days.

We give special educational opportunities to our mental and physical handicapped children, which involves special education bus routes, door to door, wheel-chair cab, a total of 86 such bus routes.

We operated 26 summer school bus routes for our summer school program last summer. This was our first service to summer school although our school district has maintained a summer school program for over six years.

Last year we traveled on an average of 10,000 miles each day on regular bus routes. This was done with a fleet of 143 buses. This year it will be greater with 153 buses. In my six years with the school district, I have seen our fleet grow from 81 buses to 153 buses.

Our county is 680 sq. mi. It includes suburbs (flat lands) at the foot of the Rockies, East Slope, and many miles of winding snow-covered roads in the Rockies. Our County system of Transportation is built geographically around locations, which we call terminals. These terminals operate under the direct supervision of a coordinator, and a mechanic for minor repairs. We have our central office (Service Center), the Bear Creek Terminal, the Evergreen Terminal, and the West Jefferson Terminal, a total of four terminals in Jefferson County.

Our coordinators (foremen) supervise approximately 35 to 40 bus drivers. Through these coordinators we function as a county unit, following the same procedures and policies throughout our county system.

Supervisor's Attitude Toward the Safety Program for Which He is Responsible:

The supervisor's attitude toward the safety program, for which he is responsible is a definite factor in the type of environment created for the bus drivers on the job. Supervisors and personnel must be united in mutual interest if they exepct to meet their individual goals. We must continue to work at this job, by:

1. Providing a safety manual where the policy is spelled out
2. In-Service Meetings
3. Insurance Accident Reports
4. Accident Hearings
5. Safety Charts in the Bus Driver's Room
   a. Miles since last accident
   b. Days since last accident
   c. Safety Stickers placed on buses
   d. Safety Bulletin Boards in Driver's Room
6. Safety Award Pins
7. Local and state school bus driver's roadeos
8. Recognizing the individual driver on the bulletin board when a parent or P.T.A. writes a letter of thanks for some service beyond the regular call of duty.
9. Operation Policies and Safety Manual has throughout it two quotations, which we remind our drivers to remember and practice:

"Safety is No Accident"
"Keep 'Em Rolling Safely"

We believe that the Bus Driver's Environment on the job is created by other factors of equal importance:

1. Bus Driver's Flower Fund (Friendly relationship, Hospital)
2. Concession Fund (Coffee, candy bars, cigarettes)
3. Employees Council (School District Organization)

Ability of Supervisor to Communicate With the Driver

Little or nothing can be accomplished with our drivers unless we have the ability and the means to communicate with our drivers. He who solves the communication problem today is worth his weight in gold. We attempt to work at this problem by:

1. Operating Policies, spelling out in layman language what is expected of each driver, when and how to do it, and why it must be done.
2. Memos covering a specific situation that has developed.
3. Private conferences, from the bottom to the top, verbal and personal.
4. In-Service Meetings where (Organization Meetings) drivers receive one hour pay.
5. Annual Work Shop; just before school starts, assignments are made, new and old drivers operate their bus routes.

6. Fair treatment: this is equity, which means that the supervisor's action is consistent and in accord with the total situation, not just the, "Letter of the Law."

Attitude of Maintenance Personnel Toward the Bus Drivers

Our system used in Jefferson County makes these two sections separate and distinct.

1. Bus drivers write up anything needing repair or attention.
2. Our operation policies tell the driver that he is responsible for his bus being in good mechanical condition when he drives it off the bus lot to make his runs.
3. Shop personnel check the driver's problem lists, make the necessary repairs, complete the report—showing date of work, parts used, labor involved, and cost. These reports become a part of each vehicle's record and during the summer months, each bus is given a "C" check, complete over-haul, re-conditioning the vehicle for next year's operation.
4. Any vehicle showing mis-treatment, such as side walls of tires rubbed against the curb, is investigated by the supervisor and the district foreman at a conference held with the driver and a decision is given, with recommendations of how to stop this action. Termination of the driver may be the result of final action.

Our maintenance personnel are not bus drivers. We attempt to keep personal contact between mechanics (maintenance personnel) and bus drivers at a low level. Our experience shows that this helps to eliminate friction between the two groups. But our maintenance personnel are fully qualified as bus drivers, and they do drive whenever we have an emergency.

Quality of Equipment and Facilities

A poor school bus with a good school bus driver will somehow get by for a short period of time. A good school bus with a poor school bus driver is unsafe and in a short period of time becomes a poor school bus. Proper driving skills are important factors as related to the safety of our human cargos, to the life and function of the vehicle, and to the cost.

School buses should be replaced whenever they are unsafe, or the repair and up-keep cost is greater than the replacement cost spread out over a period of years. Years of service, miles traveled, type of repair and maintenance service received during the service span are all factors to be considered in replacing buses in the fleet. Parts and cost of parts, some out-dated, are to be taken into consideration. New buses often are cheaper than maintaining some "Old Dogs." "Old Dogs" are costly in parts and labor to keep running. Proper cost records show this fact, which is what often gets the approval for new buses.

Garage facilities, equipment to do the repair work required, trained and skilled mechanics all are a big factor in holding down the cost of maintenance and creating the ability to *"Keep 'Em Rolling Safely."* The bus driver's room, the mechanics shop facilities, these are a part of the total environment that makes for better results in a school transportation system. We have on the drawing board, our new transportation garage, office, parking lot, paint shop, body shop, upholstering shop, glass shop, and wash rack. We believe that the location and relationship of each section to the other sections of our division is a great factor in securing better operation and efficiency. This job environment will affect the attitude of our drivers, mechanics, and our office personnel.

Support of Transportation Program from School Personnel Administration Teaching, Maintenance, and Custodial

This brings the supervisor into full focus. If this man, in charge of transportation, sells his program to all school personnel, he then can sell these same influential people, the need for tools (personnel and equipment) that are needed to do the job. Supervisors must plan, they must dream a little, and they must never stop trying to sell their program to "the powers that be." It is essential that they have a program.

School bus transportation is the tail of the school system they represent. But keep in mind that the tail can get attention from the head, if that tail (the supervisor) keeps biting away at the problem. Litle fleas on a

dog's tail often get the attention of the dog's head and demand that the head do something about the tail that the dog wags.

Supervisors must wake up. They must keep records; develop a system to build an organization; read current magazines covering modern school transportation; show items of cost; show wise spending of money. Supervisors must keep records and data that the superintendent, the board of education, and the press can use and understand in selling the transportation program in their school district to the parents, the voters, and the tax payers. The supervisor must understand production engineering.

The motivation process must be used by supervisors:

1. Determine objectives
2. Emphasize
3. Communicate
4. Integrate Interest
5. Auxiliary Conditions (Training, Equipment and Environment)
6. Develop Teamwork
7. Efforts to Motivate

Selling your program involves, Where are you today? Where do you want to go next year? How are you going to accomplish this goal?

1. Continue to improve your transportation division. Improve your bus service to schools and parents. Improve your public relations.
2. Cooperate with all service groups or divisions, discuss bus problems with drivers, teachers, (Bus Rider's Rules), and principals. In our system the principal has the authority at his respective school, therefore, we take great care in keeping all principals happy.
3. Use your local newspaper, radio, Operation Policies Manual, the State Department of Education, Highway Patrol or State Police, local police, State and National Pupil Transportation Associations, and the National Safety Council to communicate ideas about safety and operation services for the tax payers.
4. Make reports, about every three months, showing the number of buses in your fleet, the total capacity of the fleet, the age of the buses, the total number of routes traveled, the number of miles traveled daily, the number of children hauled daily, the total number of special trips per day, the number of accidents (major and minor), the total number of children hauled on special education routes, and the number of bus drivers involved. This report is good for the superintendent to use at board meetings when the budget is being discussed as related to transportation and new buses. This report helps the supervisor sell his program—to all his superiors in the school district.

Providing Drivers with Tools

1. Give specific instructions concerning the authority of the bus driver.
2. Give instructions in human relationship as related to children.
3. All buses must be equipped with flares, markers, first aid boxes, a blanket, and fire extinguishers. Give demonstrations of how to use this equipment.
4. If good equipment is purchased, properly maintained, and carefully used, it will give service for a predictable length of time. It is a source of aggravation to many supervisors that people do not operate in the same way.
5. Instruction in safe driving techniques:
   a. Test all applicants
   b. Train new drivers under the wheel
   c. Give over the road test, and written examination covering the "Operation Policies and Safety Manual"
   d. Re-train and test whenever the need arises
   e. Keep personnel card, file folder, data of license, accidents, situations involving demerits
   f. Keep driver's bus route folder with typed bus routes showing time and stops and schools serviced
   g. Have weekly report count card made daily and turned in each Friday, or the last school day of the week

We advocate that if a driver is to drive his school bus safely, he must first control his students riding behind him, before he can operate the vehicle properly.

Automation of Transportation Program

Automation is here, it's progress, we will all have to deal with it to some extent in time. Many transportation systems are already moving forward now; the University of Mississippi is making a pilot study of a bus transportation system in the state of California. This California system is said to be the largest school bus transportation system in the world. The study will consider automation of all bus routes, carding the entire transportation system, the data on these cards being placed into computers, added to, deducted from, as the need arises, and always ready to give out the necessary information by pushing a button.

In our Jefferson County School System, our staff of supervisors, coordinators, district foremen, and office secretaries attended an introductory computer course once a week for two hours for 12 weeks. This course, simple as it was, opened our eyes to the many things that could be done with automation in our transportation division.

Any system you as supervisors operate today in school bus transportation can be done by automation, quicker and better than you are now doing the job. If your school district has I.B.M. or some other automation machinery, it is a certainty that you will soon be on automation, if your fleet numbers 40 or more buses.

Whatever you are doing now can be set on a card or a disk or a film, and fed into a computer and stored. This memory storage can be added to, deducted from, or partly replaced as your data changes and your personnel feeds this information to the card punch operator.

Let us not be like the old man and woman who were watching their first steam engine. The old man said to his wife, "They'll never get that Iron Horse started." Soon the old wood burner let off steam and started to move away from the station. The old man then said to his wife, "They'll never get that thing stopped."

One of the most important factors as related to school bus drivers is the moral or spiritual side of the driver. Bus drivers must be interested in children, and the welfare of children. We recognize this in Jefferson County, and on the last page of our Operation Policy and Safety Manual, we state the following:

"It is far better that we light one little candle than that we curse the darkness."

"If a man is to successfully secure his rights and privileges, he must assume the full responsibility that is related to these rights and privileges."

"Don't say the thing's impossible—
Chances are you'll rue it,
For some darned fool who doesn't know,
Will come along and do it!"

ENVIRONMENT CAN CREATE AN ATTITUDE OF SAFETY

By ROY GROSSMAN
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The community environment can and does affect the attitude of employees of a school bus transportation system, and, therefore, the working relationship between the school and community. As a representative of the school system, a school bus driver can do much to develop favorable attitudes in the community in its relationship with the school system. The most influential element of the environment is people.

Environment has been defined as the sum total of conditions and influences which affect the life and development of a person.

An environment can be changed, and in so doing, attitudes will be affected. Statistically it has been said each individual will affect the lives of seven people a day. However, in the interaction between school bus drivers, students, and parents, a great influ-

ence is exerted by the bus driver on the lives of others.

Parents or members of the community seldom see teachers at work in the classroom as frequently as they see the school bus driver maneuvering his school bus down the roadway. This is a good reason for using the best selection procedures and training methods to obtain a capable individual who is safe as a driver as well as a credit to the basic principles of education.

By proper utilization of school buses during the day, the school bus driver should be included in the complete school system. A school bus driver may be considered as a teacher on wheels, because he is constantly being observed by the students on the school bus and by the members of the community as he or she operates the school bus. As observations are made by others, attitudes are created. One attitude that can be taught is safety, and safety habits can be formed in students as they observe the bus driver.

A great percentage of school bus drivers have lived in the community for some time, whereas many teachers may not live in the school district, or are relatively new in the area. As a result, the drivers may have a better feeling of the pulse of the community, and if they are enthusiastic about their work and proud of their schools, this pride can be transmitted to the community.

When trying to understand community environment and attitudes, questions should be asked regarding the entire school district such as:

1. What is the community attitude toward operating levies and bond issues? Do property owners feel taxes are too high?
2. What is the community attitude toward the educational programs? Are more schools, better programs, more qualified personnel needed?
3. Are school bus routes and schedules satisfactory for parents, students, and officials? School time schedules may have to be altered to obtain bus service if additional students are to be transported to school without necessitating the purchase of additional equipment.
4. Are parents, students and administrators satisfied with the drivers? The selection and training of bus drivers is very important, since a school bus is only as safe as its driver. If members of the community are to respect the drivers, the driver should be of the quality and type deserving respect. In order to upgrade the bus driver we could use the following steps:
   a. In recruitment, try to obtain the best. Use all media to obtain them. Ask present drivers for references.
   b. Application forms should be prepared, completed, and checked. Establish a personal history form for each applicant.
   c. A personal interview is a necessity between the supervisor and applicant.
   d. Testing of driver should include a medical history and a means to evaluate their performance as drivers.
   e. Proper training procedures should included pre-driver training before employment, and an in-service training program with constant observation of the school bus driver during time of employment.
   f. Evaluation of bus drivers should be based on the quality of performance.
      1. Service and safety awards should be given on the basis of criteria used for safe driver awards from A.A.A., N.S.C., and independent insurance companies.
      2. A merit rating should be used in connection with salary scales, and the rating permanently recorded in his personal file.
5. Does the community think the buses are in safe condition? If drivers are to care for them and students are to be proud to ride them, school buses should be kept in top mechanical condition and appearance. The buses should leave a favorable impression as they proceed down the road. Remember, new school buses are replaced by capital expenditures and cost of operations from operating funds, both supplied by taxpayers in the local community. If new buses are to be purchased, older equipment should be properly main-

tained if people are to vote additional money in the future. Spend wisely, take advantage of lowest costs for the highest quality repairs. The public is very much aware of foolish spending. Frequently this requires the construction of a maintenance facility to properly care for the school district's equipment.

6. Are members of the community properly informed about rules, regulations, and local transportation policy? The transportation supervisor should establish lines of communication within the community. The community will be informed of the relationship of the transportation system between community and school by the following means:
   a. Local newspapers. The use of pictures is a must. These could include pictures of the complete fleet, safety award winners, or special occasions such as bus inspections.
   b. Television. Plan the use of movies or action pictures of school bus activity during the school year, such as emergency evacuation procedures, or loading and unloading students at school, in connection with the total school programs.
   c. Radio. This is an effective means of informing a large number of people in a short time of sudden or unexpected events, such as cancellation of schools or early dismissal.
   d. School districts annual report. An annual report is a means of distributing statistical information to show the public how transportation is a part of the school system.
   e. School newspapers. This medium affords an opportunity to use personal interest stories for the school publishing the paper.
   f. Brochures. "Tips for Safer School Bus Trips" is an example of a way to inform students and parents on a more personal and direct basis.
   g. Service clubs and organizations. As transportation supervisor, make yourself available to these groups as a speaker and promote the quality of services afforded by the school system.

Three major elements affect the pupil transportation environment: manpower, machinery and motivation. The transportation supervisor must know his community, its desires and expectations. To succeed with people we must work hard. It has been said that 90 per cent of the success of any venture depends upon your success with people. If the transportation supervisor is to be a success and carry out his duties, decisions should be reached only after developing the following personal attributes:

1. Self awareness. Know how to motivate yourself before you try to motivate others.
2. Empathy. Look at things as others would.
3. Objectivity. Be fair and consistent in dealing with subordinates and superiors.

The creativity of new programs may be limited, but they must be implemented and executed by the transportation supervisor. Remembering the expectations and capabilities of the local community, a program for safe school bus transportation should be undertaken by first forming the goals to be reached and working backward to establish programs or projects to reach the goals. When programs are established definite policies should be developed to cover specific problems in the local area. Alternate courses of action should be established if the program should change. A method of evaluating and selecting programs or projects should be established so any well-reasoned alternate program could be used, if necessary, to reach the desired goal.

The following projects can be worked into a program whereby all members of the community are able to work together toward a common goal:

1. Set up school bus shelters at pick-up points. Establish shelters in a safe area.
2. Designate permanent bus stops so students know exactly where to be and when, thereby reducing the need for last minute hustle and bustle.
3. Create walkways for pedestrians so if transportation is not provided, students will still have a safe route to school.
4. Provide for safety equipment at crosswalks.
5. Carry on a safety training program for

students in the local school, using slides or movies taken of the school district's buses and students. Have transportation supervisor and drivers show the proper method to ride a school bus. Furnish the classroom teacher with information to continue instruction in a unit on safety at a later date.

6. Cooperate in safety training programs of P.T.A.'s and service organizations where parents can receive the same instruction as the students in the classroom.
7. Make routing and scheduling information available to answer inquiries from parents, students and teachers.

Through the cooperation of all members of the school bus transportation section, working with school administrators, guided by the transportation supervisor, the environment can be changed to create a favorable attitude in the community toward the school system. Safety can be taught by example by school bus drivers until it becomes a habit for students, parents and all members of the community. Remember, actions speak louder than words, and are the foundation upon which attitudes are formed.

ENLIST COMMUNITY ORGANIZATIONS

By WALTER MORRIS

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This topic, using a guideline established by the dictionary definition of the title, would be "to secure the support or aid of a body of people having common interest in an association."

I can't think of a common interest more important to any person than the safety and well being of their children. This is even more true when the safety of a child is given into the hands of a person who drives a vehicle. For the first time, in the school experiences of my children, I have a school bus rider in the family. It has been interesting to hear all about the new classes and teachers.

It's amazing how detailed the explanations are about the looks and personalities of these adults. But, when the child was asked about the school bus driver, the answer was, "Oh, it's just some lady."

The important point is that he did bring home an attractive leaflet outlining the bus safety rules for riders and a message to parents signed by the superintendent of schools. I hope that all 16 million or more school bus passengers and their parents received a printed message similar to this.

I'd like to share a little story with you. "A lifeboat loaded with survivors from a ship lost on the high seas of the stormy Atlantic, having drifted many days without seeing any rescue ships, discovered its water supply had been depleted. A few more days went by and the survivors became quite desperate. Suddenly they sighted a ship and began to signal frantically. A great sigh of relief was given by all when they saw it alter its course and head toward them. As the ship drew near, they called to the officer who asked what their need was, "we have no drinking water." His answer was, "Throw a bucket over the side and drink all you need, you're in the estuary of the Amazon River, just off the coast of South America. The water is fresh, not salty."

The point of this little episode is that almost every one of us is so close to the many details of our jobs that we often forget to experiment, explore or investigate the aids available to us right in our own back yard. Today, it is my hope to explain what local community organizations are willing and ready to offer and to suggest some materials and publications that are available to you. Although only one copy of a worthwhile publication may be provided, if it contains something that can be adapted to your program to help make your drivers, pupil passengers and their parents more safety-

minded, it is worth your time to request additional copies.

All of you know the saying, "You can't judge a book by its cover." Here's what one person reported on his reviewing of reading materials: "We read it all . . . spit some of it in the waste basket . . . digest for personal knowledge about 80 per cent, and about 10 per cent sifts back to you." If your drivers can show a 10 per cent improvement and you can derive an increase of 80 per cent in personal knowledge, I'd say the reading time is worth while, even though the cover illustration didn't tempt you to open it.

Your most important goal as a school transportation supervisor is to reach three groups of people: First, and foremost, is the school bus driver. However, your pupil passengers and the public, both as parents and motorists, must be part of the safety team. Educating these groups about safety measures that they should practice is a task. The principal road block in getting through to people, as most teachers, parents, and others in responsible positions will agree, is communications.

This field of dealing with people is competitive. Having individuals develop greater understanding of any subject is a tough assignment. In your position of leadership, look for the following qualities in persons with whom you work.

1. *Ideas*—to develop a workable program.

2. *Energy*—to give leadership in committee work.

3. *Money*—to supply financial backing.

When using the aids, materials and services of community organizations that are available, for improved training of your drivers, consider the formula for learning and remembering. Eighty-seven per cent of learning is accomplished through our sense of sight. The other four senses . . . taste, touch, smell and hearing account for the remaining 13 per cent. However, remembering is best when a person sees and hears. About one-fifth is remembered when you tell something; one-third when you show a person something, but one-half when you both show and tell your audience.

My reason for calling this formula to your attention is to emphasize the need for preparing your training program to make certain that you make the best use of materials and personal services that are available from the many community organizations willing to help you. This brings us to the community organizations which I believe you can call on for help. I have divided them into two groups, one I will refer to as the "do" group, and the other as the "do have" group.

First, the "do" group is so designated because their value to you is their "people power." Members of these organizations can help you tell your story, support you on problem programs and, where money might be involved, help raise the finances needed.

The second, the "do have" group, is so named because organizations in this category may have local and national strength. For the most part, organizations listed in this group have publications, films and other materials appropriate for teaching. Where copies in quantity are not provided gratis, sample copies of the leaflets, booklets, posters and other such aids are usually provided and arrangements can be made to fill orders at production costs.

In the "do" group, I would suggest the following for Group I:

Civic and Service Clubs.

1. Lions
2. Optimist
3. Kiwanis
4. Rotarians
5. Federation of Women's Clubs
6. Community Civic Association
7. Volunteer Fire and Rescue Units
8. Church Clubs

Group 11. News Media

1. Local newspapers
2. Radio and TV Stations
3. Local business publications
4. School papers

In the "do have" group:

Group I—Safety Councils and Automobile Clubs

Group II—Insurance Companies

Group III—Truck Associations—local, state and national

Group IV—Automobile Dealers Associations

Group V—Medical Association and Red Cross

Group VI—Public Utilities—Telephone company; gas and electric company. Metropolitan transit—Public Service units.

During the workshop sessions, you are all welcome to review the items that I have brought along. Most of these may fit in that area where 80 per cent is digested for personal knowledge, but there are others that, in my opinion, should be presented to every driver whether behind the wheel of an automobile or a school bus.

Since organizations have been named as sources of assistance, you are probably thinking how one should go about enlisting their aid. My own feeling is based on the premise that people like to feel that they are needed. For this reason, here are some enlisting suggestions:

Personal request

Go directly to the person you feel can help. Present your problem or plan and indicate the manner in which you feel the person or organization he represents can be of assistance. If you are aware of one item or service that is available, ask for that specific item. The person will usually respond and follow up with helpful suggestions.

Telephone request

The phone is the next best medium, particularly if the person you want to contact does not live in your immediate area. Again, the specific request will more often than not get an affirmative answer. You also have the advantage of giving a verbal description of an item or program about which you are seeking ideas or suggestions.

Letter request

A letter asking assistance is the least desirable type of request. It is difficult to compose and usually results in a request similar to many you have all received at one time or another. "Please send me anything and everything on the subject of safe driving and traffic safety education." The advantage, however, is if the letter contains an invitation to a person to participate on a program, it gives him something to show his superiors, if an approval is needed. You also have confirmation of your request, as well as the acceptance of the person to appear. This is also true if published items are to be furnished, because between the time the letter has been written and mailed the time it gets, someone has forgotten to prepare a shipping label.

Success or failure depends to a great extent on two small items that many of us often forget: The first is recognition or credit to those that have offered assistance; the second is a thank you for the time and effort a person has taken to contribute something. If you use a page or adopt an idea from some source, a credit line or acknowledgement is good insurance. Where a copyright is in effect, permission will usually be granted for reproduction of illustrations and printed text with no obligation to you other than the credit line. When writing a letter of thanks, enclose a marked copy of your finished item. You can count on future assistance when you share your pride with those who have contributed.

In conclusion, may I close with a definition. It is humorous, but very true, and seems appropriate for every job we do:

We have two ends with a common link;
With one we sit—with one we think.
SUCCESS depends on which we use,
Heads we win.— Tails we lose.