

ROOFTOP SAFETY

by Paul Hanke



Common sense and good equipment go a long way toward making roofs a safe place to work

I once read that roofing is the most dangerous of all the building trades, except for estimating. When I was learning to build, I made many mistakes—one of them could have been my last. We were just about to start work on the roof of an 1840s farmhouse renovation. I decided I would put up a few roof jacks to make it safer to begin shingling the next day. Everyone else had gone home, and I was alone at the site. The nearest neighbor was $\frac{1}{2}$ mile away. I put up a ladder and climbed to the eaves with an armload of jacks. As I stepped onto the roof the ladder shot sideways. I fell. Fortunately, I was only one story up and I landed on all fours in soft, recently backfilled earth. I was shaken up, but not injured.

Statistics

I was lucky, but every year thousands of others aren't. The Bureau of Labor Statistics' 1983 figures show there were 6,409 injuries to roofing and sheet-metal workers, including 1,987 sprains and strains, 883 fractures, 859 cuts and lacerations, and 798 burns.

There were 31.9 deaths per 100,000 for roofers and slaters—ranking them 18th in fatality rates among blue-collar workers. Roofing accidents cost employers money too. Workers' Comp is 50 percent higher for roofers than for carpenters.

All construction work entails risks, but these can be greatly reduced by a good job-site safety program that includes attention to housekeeping, lifting techniques, proper use of tools, and roof-top safety gear. Proper ladder use, fire prevention, and dressing for safety should be covered as well.

A Clean Work Area

Up on the roof, housekeeping measures are very important. Put your scrap into the trash pile or dumpster. Don't leave it lying around, especially near the roof edge. If you throw debris, look and give a warning before you throw. OSHA regs require enclosed chutes for depositing waste outside the building from a height greater than 20 feet. OSHA specifies chute construction, and requires barricades at top and bottom.

Can I Give You a Lift?

Strains or over-exertion, often from improper lifting, are the most common construction injury. For reasons that remain a mystery to me, people package bundles of shingles and buckets of tar in weights that are almost impossible to lift. Many other materials, like long rafters and 4x8 sheets of plywood, are heavy as well, or awkward, and require careful lifting. Large sheet goods like plywood or waferboard can act as sails, catching the wind and straining back muscles.

When lifting, keep your legs together and your back straight; keep the load as close to your body as possible, bend your knees, and lift with your legs. Your back or arms aren't nearly as strong as your legs. Don't jerk the load, but lift slowly and steadily (see Figure 1). When carrying heavy objects (or long ones like 18-foot 2x12s) don't try to swing the load by twisting your body and waiting for the load to catch up to you. Instead, change position by shifting your feet and rotating your whole body.

Heads Up

I didn't used to wear a hardhat on job sites. Even after I took a 2x4 with nails sticking out of it across the back of my neck, I left my hardhat in the car. But, I've wised up. Now I wear it whenever someone is working above me. I'd advise this for everyone.

Don't put tools, materials, and scrap near the edges of roofs, floor openings, or on scaffold planking where they can accidentally be knocked overboard.

When you get materials (bundles of shingles, rolls of felt, buckets of tar, etc.) up on the deck, distribute the load evenly to avoid a break-through. On tear-offs, inspect below for weak areas. Always avoid working in wet, slippery weather.

Safety Equipment

For roofers, dressing for safety means wearing a long-sleeved shirt (buttoned up), cuffless pants (not shorts), hightop boots with rubber soles, gloves, hardhats, and leaving your "Walkman" on the dashboard.

Other safety gear for roofers may include eye protection and respirators. Wear goggles whenever you're working around hot stuff, chemicals, flying nails, or in tear-off operations. Kettle operators need full-face shields (with goggles underneath for the ultra cautious). Wear gloves—rubber where appropriate—when working with chemicals, such as solvents or adhesives, or with hot materials.

Good ventilation is a good defense against fumes and vapors from solvents and adhesives. If natural ventilation isn't adequate, use a fan. Take only enough vaporous material onto the roof for one day's use. For fire safety, store the rest in closed containers at least 50 feet from a building in a locked trailer. Clearly mark off no-smoking areas.

OSHA sets requirements for particulate and vapor respirators. Respirators are the employer's responsibility to supply. When deciding what type of respirator to use, you must first identify the substance you must protect yourself and your crew against, and cross reference it with the OSHA Permissible Exposure Limits (PEL) in OSHA

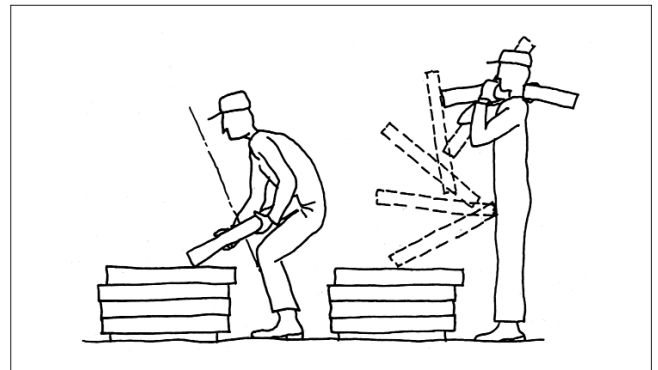


Figure 1. A bundle of shingles is best carried on your shoulder. When lifting heavy loads like these, don't jerk the load, but lift slowly and steadily.

sections 1910.1000 through 1910.1048.

It is also the employer's responsibility to see that the crew actually uses their safety equipment.

Fire!

Fire is particularly a problem where torch-applied bitumens are in use, or where welders are at work. In general, keep the site clean, make sure propane containers are secure – clearly marked “flammable” – and in good operating condition. Train your crew in fire prevention and fire-control techniques as part of your safety program. Your local fire department may be able to provide a speaker for this purpose.

Learn the correct procedures for filling and firing asphalt kettles. If a tar-kettle fire occurs, stay calm, close the lid, shut off the fuel supply, and call for help – in that order.

You should learn correct procedures for filling and firing asphalt kettles. If a tar-kettle fire occurs, stay calm, close the lid, shut off the fuel supply, and call for help – in that order. Closing the lid will control most kettle fires, but if it spreads outside, use an extinguisher. Make the location of the extinguishers and hoses known to your crew.

OSHA specifies the types and locations of extinguishers. There are four classes of fire extinguishers, though some can cover two classes of fire: Type A is appropriate for paper and wood fires, B is for hazardous liquids; C is for electrical fires; D is for burning metals. A number precedes the letter rating. This number is the square-footage the extinguisher can cover. For tar-kettle fires, a dry chemical extinguisher rated at least 20BC should be kept nearby.

Tool Safety

I'll never forget the dramatic X-ray photo that appeared in Fine Homebuilding some time ago showing a nail that was driven into some poor guy's skull when someone up above accidentally discharged a pneumatic nailer by bumping it against a ladder. Fortunately, the victim survived. Tool safety can't be overemphasized.

Watch where you point power staplers/nailers, know their safe operating pressure, and be sure that nobody is on the back side of the sheathing before you fire. Keep tools clean and in good repair. Be sure guards are in place and functional. Shut off the power when making adjustments or repairs, or when not in use. Tag defective equipment for repair and prohibit its use.

Ladders

OSHA has a great deal to say about ladders. Here are a few things to

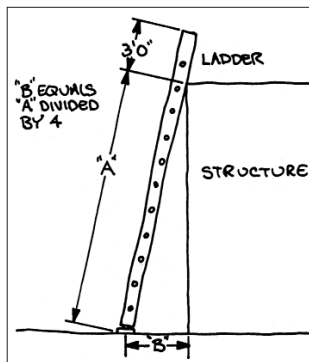


Figure 2. Slope the ladder away from the building so that its base is a distance away from the wall equal to about 1/4 of the height.

remember about them.

1. Inspect ladders for splits, knots, damaged rungs, functional locking devices, mud, grease, etc. before each use. If a ladder is defective, report it to your supervisor and don't use it.

2. A ladder needs a level base strong enough to support the expected load. Keep the areas around the top and bottom of the ladder clean.

3. Slope the ladder away from the building so that its base is a distance away from the wall equal to about 1/4 of the height (see Figure 2).

4. Rooftop siderails should extend past the edge of the roof by at least 3 feet to give you a balanced grip as you step on and off the ladder.

5. Secure the ladder at the top to keep it from slipping sideways. Secure it to the building, never to equipment.

6. One person at a time on a ladder.

7. Keep away from powerlines.

8. Don't lean off the ladder to reach your work. Move the ladder instead.

9. Hang on as you climb.

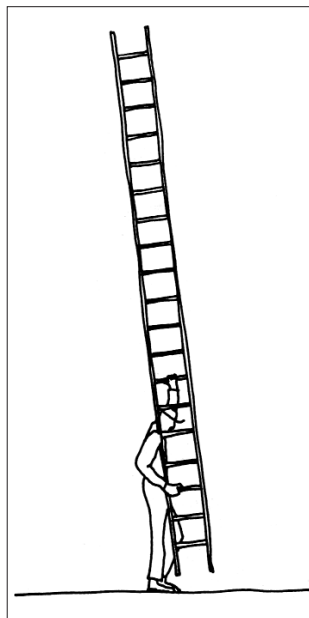


Figure 3. When moving a ladder, hold the ladder up high with one hand, for balance, and carry the ladder's weight with the other hand, placed lower. Keep the foot of the ladder close to the ground.

10. When moving a ladder, hold the ladder up high with one hand, for balance, and carry the ladder's weight with the other hand, placed lower. Keep the ladder foot close to the ground (see Figure 3).

When moving on steep roofs, skip-sheathing strips can be used as a “ladder,” but climb near a rafter since 1-by's can break in midspan.

The Hoist

Materials should be transported by hoist whenever possible. Inspect your hoist and rigging; check the counter balance. Don't use building materials for counterweights. Use proper slings and safety hooks, erect guardrails, don't

Planks must be 2x10s minimum, overlapping by at least 12 inches at the ends. Free ends must extend at least 6 inches beyond their point of support, but not more than 12 inches.

exceed the rated capacity of your hoist, and keep personnel out from under the hoist when not in use.

Scaffold and Roof Brackets

OSHA has regulations covering metal-tube scaffolds, wood-pole scaffolds, ladder jacks, window jacks, roofing brackets, and crawlboards. Here are a few important points.

Both wood-pole and metal-tube scaffolding must rest on firm footings that will not allow settling. Guardrails (2x4 or equal) set 42 inches above the planking and toeboards are required for platform heights greater than 10 inches above the ground. You may also need a 1x6 midrail.

Planks must be 2x10s minimum, overlapping by at least 12 inches at the ends. Free ends must extend at least 6 inches beyond their point of support, but not more than 12 inches. All planks must be laid right, that is, no gaps between boards.

Vertical wood posts have to butt square where they meet, with wood-splice plates of the same cross-sectional area required on two adjacent sides (at least 4 feet long and overlapping each post section equally). Incidentally, all load-bearing members must be stiff, with a high “fiberstress in bending” rating of $f=1,500$, which is much higher than your ordinary construction grade. All lumber must be clear and straightgrained. Diagonal bracing is required to prevent racking, and all scaffolds must be secured to the building. Scaffolding in general must be capable of supporting four times the maximum load it will carry.

Only use ladder jacks designed to bear on the side rails. They are for light duty, at 20-foot heights, maximum. Window jacks need guardrails or

lifelines, and are limited to use at the window opening only.

Adjustable roof brackets (see Figure 4), used with 2x10 planking, are convenient and offer considerable safety on sloped roofs. Locate them over rafters for secure nailing. Note that they must be nailed and not attached merely by pointed metal projections. A catch platform extending 2 feet beyond the eaves (with a guardrail, midrail, and toeboard) is required for slopes over 4:12 and heights above 16 feet, unless there is a

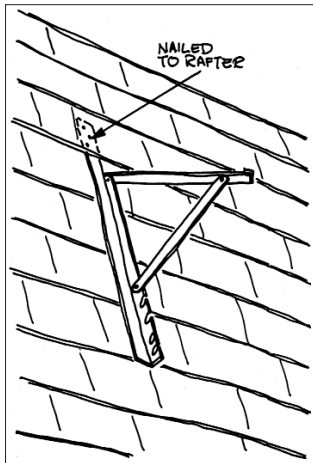


Figure 4. Adjustable roof brackets used with 2x10 planking are convenient and safe on sloped roofs. Locate them over rafters for secure nailing.

safety belt and lifeline system.

Crawlboards (or "chicken ladders") must be at least 10 inches wide and 1 inch thick with 1x1 1/2-inch cleats. Space cleats no more than 24 inches apart. A 3/4-inch-diameter rope lifeline must be strung next to each crawlboard for a handhold, according to OSHA – but when's the last time you saw that?

Steep Roof Protection

The NRCA's book, *Passport to Safety*, calls for eave guards for roofs with pitches in the 4:12 to 8:12 range. Steeper roofs should have a safety line or a 42-inch-high barrier at the eaves. Eave guards consist of either a 2x6 plank (for wood or asphalt shingles) or a 2x10 plank (for slate, etc.), set perpendicular to the roof slope, supported by at least three brackets, spaced at 7 feet.

OSHA regulations govern safety belts, which may be leather- or nylon-web type with a D-ring to attach the belt (and you) to a lifeline (called a

lanyard). The lanyard is secured to the building and must limit your fall to a maximum of 6 feet. Rope must be 3/4-inch manila or 1/2-inch nylon, capable of supporting a 5,400-pound dead load. These ropes are "one-fall" ropes. If the rope has sustained a fall, it cannot be reused.

A more convenient system is to snap the end of the lanyard to a rope grab system. A rope grab system uses a rope, attached at the top of the building, that runs up and down the roof. Workers wear belts or harnesses and individually clip into clamps on the rope. The clamps (sometimes called ascenders) allow you to freely move upwards, but act as "one-way valves" and tightly grab the rope whenever there is downward tension. Clamps can be easily released by hand to descend. Where use of lifelines is "impractical," you have to use a safety net. (If you're working over water, special rules apply.)

Roofers must protect openings and roof perimeters. According to *Roofer* magazine, any opening (for skylights or chimneys, etc.) with a diagonal measurement of 3 feet or less may be protected by a 3/4-inch plywood cover. Larger openings require a regulation OSHA guardrail, with a toeboard (similar to scaffold railing).

A warning-line system at the perimeter of flat roofs is quick and inexpensive to set up. Set 8 to 10 feet back from the roof edge, stanchions should be rigged with flagged, 500-pound-strength rope, 45 inches high.

Asbestos

Asbestos products may be a hazard during tear-offs. When broken or sawed, they can release carcinogenic asbestos fibers into the air where they may be breathed by workers. In 1984, a National Institute for Occupational Safety (NIOSH) field test on workers tearing off asbestos-cement shingles showed asbestos concentrations ranging from 0.03 to 0.16 fibers per cubic centimeter (f/cc), with the highest concentration among the clean-up crew. NIOSH considers 0.1 f/cc of airborne asbestos hazardous. Half-face respirators are required for workers engaged in such work. (Also, you may be required to seal the structure against dust and to wet the roof to keep down dust.)

Contact your local Dept. of Health and Occupational Safety, or NIOSH, if you have questions.

Some Accidents are Impossible To Prevent

Your first line of defense is a good safety program. But accidents will

happen. So, make sure your crew has first-aid training. A well-stocked, weatherproof first-aid kit should be available on site. Post the numbers of doctor, ambulance, and rescue unit next to the site phone. Ward Smyth, a Connecticut contractor, has a Red Cross representative give a standard first-aid course to his crews. The first hour of each two-hour session is paid, the second is on the employee's time. You might consider starting a similar program.

Who Is Responsible?

Government agencies are charged with inspecting job sites and enforcing safety, but they can't do it all. OSHA regs make many safety practices – safety training, equipment maintenance, and job site procedures – the responsibility of employers. The boss is also responsible for seeing to it that the crew actually uses their safety equipment. And ultimately, it's in the employer's best interest to do so, because shortcuts on safety will come back to haunt you sooner or later.

For more information...

Passport to Safety – an informative 47-page pocket-sized booklet available from the National Roofing Contractors Association (NRCA), One O'Hare Centre, 6250 River Road, Rosemont, IL 60018; 312/318-6722. \$1.50 for members, \$2.00 for nonmembers. (Cheaper in bulk).

NRCA also has a number of Roof-Safety Training Programs. These programs include a workbook, instructor's guide, and video or slide presentation. A variety of programs is available, including "Application of Modified Bitumen Membrane" and "Kettles, Tankers, and Bitumen Heating." Contact NRCA.

OSHA *Safety and Health Standards for Construction* (29 CFR 1926) available from regional OSHA offices. For more information, call OSHA's publication office in Washington, D.C.; 202/523-8615. Single copies are free.

Duofast Safety Seminar – a package of videotapes, posters, and pamphlets on safety is available for free from Duofast Corp., a manufacturer of pneumatic nailers and staplers. For more information, contact Art Jansen at Duofast Corporation, 3702 River Road, Franklin Park, IL 60131-2176; 312/678-0100.

For OSHA and State Dept. of Occupational Health & Safety regulations, check your local directory for location or the nearest office. ■

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