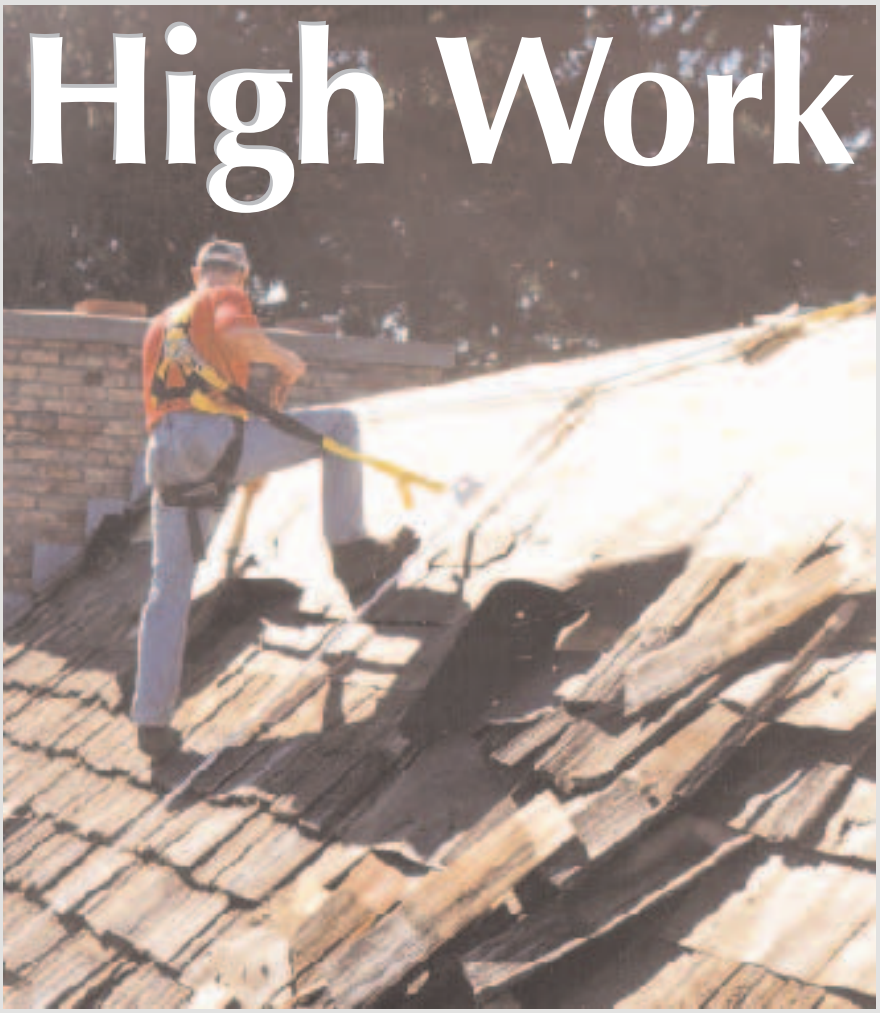
# STAGING High Work

## Take the time to set up safely, and productivity will increase



Despite a recent focus on safety, nearly 10,000 fall-related injuries and 100 deaths occur annually in the construction industry. It's unclear how many of those accidents take place on residential job sites — the figures include all kinds of commercial work, from bridge construction to work on water towers — but the actual number, whatever it is, is certainly too high.

**by Joe Stoddard**

Fortunately, a variety of products on the market today make it easier than ever before to perform high work safely. And while most builders remain skeptical of OSHA, the agency has been showing some flexibility lately. It recently backed down from a highly restrictive series of fall-protection regulations (issued in 1996) that were widely perceived as unworkable. Today, the agency permits residential builders to use a system of alternative fall protection that combines a high level of safety with reasonable regard for job-site realities (see "Fall Protection Update," 5/01). The most recent guidelines, for example, permit builders to use roof jacks and slide guards as the primary fall-protection system on most roofs with a pitch of 8:12 or less and a distance of 25 feet or less from the eaves to the ground.

### Personal Fall Protection

But if your crew (or any crew on your job site, for that matter) is working on a roof that exceeds those limits, they'd better be using an OSHA-approved Personal Fall Arrest System, or PFAS. A PFAS is also required for workers on any scaffolding where OSHA-approved guardrails are impossible or impractical.

***How they work.*** A typical PFAS consists of an adjustable webbing body harness, lanyard, lifeline, rope grab, and approved roof anchor. In use, the anchor is nailed or screwed to the roof (some anchors are designed to be removed and reused, while others are bent flat and shingled over when no longer needed), and the rope lifeline is clipped to the anchor. The lanyard is a shorter length of rope or heavy webbing that acts as an intermediate link between the worker's body harness, to which it connects with a locking snaphook. A snaphook at the other end of the lanyard is connected to a rope grab — a metal device that slides up and down the lifeline to allow the worker to move freely but locks in position in the event of a fall. Some lanyards also incorporate an energy-absorbing device — something like a one-way bungee cord, which stretches but doesn't snap back — to soften the impact of a severe fall. (To reduce the risk that the worker will strike something on the way down, the stretch in such energy-absorbing lanyards is limited to a maximum of $3^1/_2$ feet.)

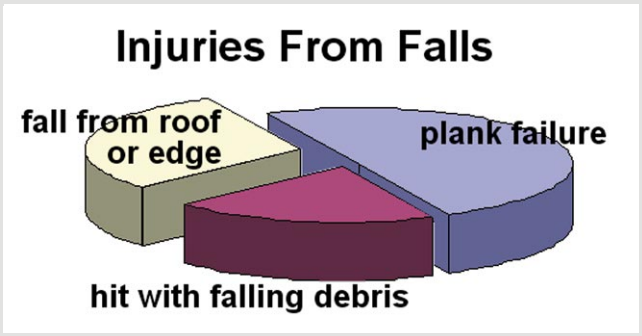
***One-stop shopping.*** That may sound complicated, but it's

easy and fairly inexpensive to outfit all your workers with their own PFAS. Protecta Corporation offers Compliance in a Can — everything you need bundled in a handy 5-gallon pail for $163 (see Figure 1). Guardian Fall Products, Inc., has the Bag of Safety kit for $206 to $250, depending on type of anchor and length of rope, and Gemtor, Inc., offers a similar rig.

These companies also offer a wide variety of both permanent anchors (starting at around $20), and one-time-use anchors (around $3) for hooking to rafters, trusses, and sidewalls. Another option for roofing work is to secure the worker's body harness to a self-retracting lifeline (Figure 2). This rooftop-mounted device automatically feeds out line as needed to a worker moving about normally but locks when subjected to a sharp pull. In any case, be aware that while employees and subs can provide their own PFAS equipment, it's still the GC's job to make sure it's OSHA compliant.

Personal fall protection does cost a few bucks, but it can also increase productivity, because a worker who isn't constantly worried about taking a bad fall will probably get a lot more done than one who is. Leave permanent attachments at the peak of a roof you're building, or set one-time-use ones when you start that re-roof, skylight installation, or dormer retrofit, and you'll have a place for your workers to tie off for the rest of the job.

***Information and training.*** Fall arrest systems won't do any good if your employees don't know how to use them, or use incorrect fasteners or anchors. Manufacturers provide training in print, on videotape, in person, and on their websites, and organizations like the National Association of Home Builders also offer guidelines through their bookstore (see the "Resources" box at the end of this section).




According to the U.S. Bureau of Labor Statistics, half of fall-related injuries occur when scaffold planks fail, followed by workers falling from roofs (no fall arrest system or guardrails), and, finally, injuries sustained from falling debris hitting workers below.

## Pump Jacks and Wall Jacks

Standard wood-pole pump jacks have long been an industry standby, although many builders can tell of some hair-raising experiences with them. "There's nothing like swaying back and forth on a set of pump jacks all day, then climbing onto the roof to remove the brackets and finding that you were only a couple of sways away from pulling the nails completely out," says veteran remodeler Patrick Deem. It doesn't have to be that way. Several companies make slick aluminum pump-jack systems that hit the safety and set-up issues head on.

***Strength and stiffness.*** Contractors we talked to gave high praise to the Alum-A-Pole scaffolding system, with its 50-foot working height and an integrated "saf-t-net" and guardrail (Figure 3). In place of spliced 2x4s, the system uses 3-inch-square aluminum tubing that is much stiffer than wood. Only one brace is needed to reach up to 24 feet, and heights of up to 50 feet are possible with additional bracing.

While wood pump-jack poles should be spaced no more than 10 feet apart, Alum-A-Pole tubes can be spaced up to 24 feet apart, thanks to the use of sturdy aluminum scaffold planks of the same length. The planks themselves lock together securely without overlapping. A basic two-pole

**Figure 1.** A Personal Fall Arrest System typically consists of an approved building anchor, a body harness, a lifeline, a connecting device, and a lanyard. Many manufacturers bundle the necessary components in a kit like the $163 Compliance in a Can from Protecta Corp. (left). A body belt may be used for restraint or positioning — to prevent a worker from approaching the edge of a flat or low-slope roof, for example — but must never be used where there's a chance that a vertical fall may occur (right).

**Figure 2.** A wide variety of fixed anchors are approved for use as part of a Personal Fall Arrest System, clockwise from top left: Protecta Reusable Roof Anchor, Gemtor Multiple-Use Roof Anchor, Guardian Snappy, and Guardian Ridge-It. Another option is a self-retracting lifeline like the one from DBI/SALA above.

Alum-A-Pole rig with an aluminum-staging plank will run about $2,500, but it's a long-term investment: The system carries a lifetime warranty, and company president Carl Anderson notes that Alum-A-Pole has a policy of providing free replacement parts.

***Pump-jack pointers.*** Aluminum pump-jack systems are generally very safe if set up properly, but they can be deadly around electrical entrances and other high-voltage wiring. Take extra care to maintain safe clearances, especially when tipping up the long aluminum poles. It's worth noting that a short in a power tool cord can energize an aluminum pump-jack system. All electrical service on the scaffold must be ground-fault (GFCI) protected.

Especially if you're working with wooden planks, remember that plank failure is the number one cause of pump-jack accidents. Use only OSHA-approved planks and never put more than two workers between any two supports. The maximum load permitted between supports is 500 pounds. (See "Guardrails and Planking," next page.) OSHA requires that workers on pump-jack systems be protected by either approved guardrails or a PFAS.

**Figure 3.** The Alum-A-Pole system provides up to 50 feet of working height, a sturdy aluminum staging plank, and an integrated "saf-t-net" and guardrail. Options include an overhead canopy and a cart to move the system around the job site.

Wood poles can't exceed 30 feet in height and should be braced to the building at each floor. Don't use brittle drywall screws to splice 2x4 poles. Instead, use 10d common nails no more than 12 inches on center and staggered uniformly from the opposite outside edges of the pole. Finally, don't neglect to restrain the bases of pump-jack poles so they can't kick out.

***Wall jacks*** bear directly on the sheathing, so they're no good for staging plastering, siding, or any other finishing operation. On the other hand, they're great for quickly creating a continuous platform around a building to set rafters, trusses, or joists.

Unfortunately, the design of conventional wall jacks leaves a lot to be desired. Some require punching holes in the sheathing so the jack can hook around studs on the inside; others require

**Figure 4.** WallWalkers overcome many of the limitations of conventional wall jacks. The unique design can be used on the inside or outside of a wall, and the height can be adjusted without removing staging planks.

lag bolts that have to be carefully driven into the narrow face of the studs, making it difficult to adjust the working height.

An innovative wall-jack system by WallWalker LLC (Figure 4) can hang on either side of a stud or masonry wall, or even a beam (up to 12 inches thick with optional hooks). WallWalkers support a 38-inch-wide staging, adjustable from 6 feet to 1 foot below the top plates in 6-inch increments without moving the jack or removing the planks, and they can accommodate an optional OSHA-approved handrail. The top hook also detaches from the rest of the jack so they can be removed from the wall even after the roof is on and dried in. WallWalkers are rated for 500 pounds a pair and cost $400 to $450 a pair.

No matter what brand of wall jacks you use, the standards for planking and guardrail installation are generally the same as for pump jacks. Also as with pump jacks, workers who are more than 6 feet above a lower surface must be protected by an approved guardrail system or PFAS.

## Prefabricated Frame Scaffolding

If the job is going to last longer than a couple of days, or if you need to load up the scaffolding with heavy material or lots of manpower, then rigid prefab frame (pipe) scaffold panels are the way to go. Prefab frame scaffolding is available in many sizes and configurations, sets up and tears down quickly, and provides a solid work platform several stories high if necessary (Figure 5).

***Plan ahead.*** Of course, the bigger the staging job, the bigger the potential problems. Vienna, Va., builder Dave Winslow recommends developing a complete scaffolding plan for every job. "First, do a thorough analysis of the site: slopes, soil bearing conditions (especially when wet), property boundaries, underground utilities, overhead hazards, egress windows or doors you might be blocking, landscape elements that could be damaged. What provisions are needed to protect the scaffold from equipment or vehicles passing by, or to protect people from falling debris?"

A frame scaffolding setup can be a fairly substantial structure in itself. Frame scaffolding can be heavy enough to poke holes in asphalt driveways and sidewalks, causing towers to topple. Live and dead loads should be calculated like any other construction and the scaffolding footings designed accordingly. Scaffolding erection services and bigger equipment rental yards are useful sources of expertise, but don't hesitate to hire an engineer if there's any question.

***Buy or rent?*** There are frame scaffold fabricators in most major cities, and while their products might look similar, they usually aren't interchangeable. A good strategy is to purchase enough panels to do a small job and rent additional panels or hire a qualified erector for larger projects — so it makes sense to buy the same brand of scaffolding that your favorite scaffolding erector or rental yard carries. Erectors rotate their stock every couple of years, and you can pick up used panels that are just as serviceable as brand new for a fraction of the price — typically $50 or so per panel, as opposed to $100 or $150 new.

***Tips and tricks.*** For more information on OSHA regulations about scaffolding, watch the online slide show at the OSHA

## Guardrails and Planking

A minimum OSHA-approved guardrail consists of four parts: the 2x4 guardrail itself, which should be approximately 42 inches high; a 4-inch-high toeboard; a 2x4 midrail halfway between the first two; and as many vertical supports as needed to resist the impact of a person falling against it. Like the other guardrail parts, the supports can be made from 2x4 lumber, but even if heavier material is used, the supports must not be more than 8 feet apart.

OSHA also requires the use of "scaffold-grade or equivalent" planks. What does the "or equivalent" clause mean? OSHA has never made that clear. Practically speaking, it means scaffold-grade planks only. "Be careful," says Paul Fisette, of the University of Massachusetts Building Materials and Wood Technology program. "Sometimes if you ask for scaffold planks, the guy at the lumberyard will just give you rough-sawn 2x10s. But if they aren't clearly stamped 'Scaffold Grade,' you shouldn't use them."

Even then, Fisette cautions, scaffold planks should be handled as if your life depended on them, as it does. Don't use them as ramps for wheelbarrows loaded with concrete or throw them to the ground when dismantling scaffolding when a job is finished. To prevent rot, scaffold planks should be stored indoors, stickered to allow air to circulate around them.

eCAT link listed in the "Resources" box at the end of this article. Some additional points to keep in mind:

- Never use hollow concrete blocks as a footing for frame scaffolding, because they can fracture unexpectedly.
- When scaffolding is over 10 feet high, OSHA's fall protection standards — requiring guardrails and PFAS gear — kick in. The height requirement is measured for the surface below the scaffolding, not the original grade. If you're erecting scaffold over a hole, count the hole in the total height.
- We've all seen it done often enough, but don't climb x-bracing or end panels to gain access to frame scaffolding. Instead, use OSHA-approved interior or exterior ladders designed to work with the system.
- Unless they're strictly used as walkways, each working platform must completely fill the opening between the scaffold uprights. If you're using 48-inch-wide scaffold, for example, you need two 24-inch prefab planks, or four 12-inch wooden planks, cleated together.
- Remember the 4:1 rule. The distance between ties connecting a scaffold tower to the wall must not exceed four times the narrowest dimension of its base. In other words, 4-foot-wide scaffolding requires a tie every 16 feet vertically. Use solid wood blocks to maintain spacing from the building and strong wire or strapping to pull the scaffold tower in.

**Figure 5.** This scaffolding setup looks pretty good, but the planking is an accident waiting to happen. OSHA requires that only approved planking be used (not #2 framing lumber), which must totally fill the space between uprights (1-inch maximum gap). To prevent them from being accidentally dislodged, the individual planks must also be cleated together.

## Motorized Lifts

One of the most versatile tools for reaching high work is a self-propelled platform lift (Figure 6). Stu Thies of Stu Thies Builder, Inc., in Freeburg, Ill., recently rented a 60-foot two-person lift while working two stories above a 9-foot walk-out basement — a total elevation of about 30 feet. The work platform he chose was large enough to accept two squares of shingles, a box of vinyl siding, saws, and other essentials. "We drove that thing all around the house and installed windows, hung siding, fascia boards and soffit, and started the roofing," he recalls. "We were able to reach across foundation over-digs and other places that would have taken more time to scaffold than I want to think about." Although the rental cost $800 a week, Thies notes that he also saved money by eliminating the need for an extra cut man and another helper on the ground.

Many platform lifts can be moved from place to place with controls located on the platform itself, minimizing wasted time. Thies recommends renting an all-terrain model but notes that they are best used in new construction, where there's no need to worry about running over a client's lawn or flowerbeds. Finally, he notes, it's a good idea to keep an eye on the fuel gauge. "Once we ran out of gas while we were 30 feet in the air," he recalls. "Thank God for cell phones!"

***Bucket trucks.*** Platform lifts are much too expensive for

**Figure 6.** A motorized aerial lift can make quick work out of many overhead jobs. Units rent for $800 to $1,200 a week — possibly less than the cost of the extra manpower required to rig a job manually.

most builders to consider purchasing outright, but bucket trucks, like those used by utility companies, can sometimes be found for a reasonable price. Pete Miller — a remodeling contractor in Nelson, Pa., for over 40 years — has long relied on a bucket truck for reaching exterior work. "I bought mine probably 25 years ago from a dealer who specialized in used utility company trucks," he says. "That's a good place to find good used equipment because utility companies take good care of their rigs and trade them often."

Unlike platform lifts, though — which are designed to crawl forward at very low speed with workers on the platform — bucket trucks should be operated only when empty. Workers in any sort of aerial lift must wear a body belt or harness, attached to the boom or basket. And while you may be tempted to use a front-end loader or Bobcat as a makeshift lift, that's both unsafe and a violation of OSHA rules.

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## Resources

**The Fall Protection Compliance Kit**
2nd edition, published by NAHB: $60 NAHB member, $75 nonmember

**Scaffold Safety Manual** published by NAHB: $14.40 NAHB member, $18 nonmember

**National Association of Home Builders Bookstore**
800/223-2665
www.builderbooks.com

### OSHA

Full text of all OSHA standards for the construction industry:
**U.S. Government Printing Office Superintendent of Documents**
P.O. Box 371954
Pittsburgh, PA 15250-7954
202/512-1800
www.bookstore.gpo.gov

To its credit, OSHA is finally doing a good job of presenting relevant safety information for home builders on the Internet:
**OSHA Construction Scaffolding eCAT (electronic Compliance Assistance Tools)**
www.osha-slc.gov/SLTC/scaffolding_ecat/

***Selected Construction Regulations for the Home Building Industry***
www.osha-slc.gov/Publications/Homebuilders/Homebuilders.html

**Plain Language Revision of OSHA Instruction STD 3.1, Interim Fall Protection Compliance Guidelines for Residential Construction**
www.osha-slc.gov/OshDoc/Directive_data/STD_3-0_1A.html

**PART 1926 Safety and Health Regulations for Construction**
www.osha-slc.gov/OshStd_toc/OSHA_Std_toc_1926.html

## Sources of Supply

### Personal Fall Arrest Systems

**DBI/SALA**
Red Wing, MN
800/328-6146
www.dbisala.com

**Elk River**
Cullman, AL
800/633-3954
www.elkriver.com

**Gemtor, Inc.**
Matawan, NJ
800/405-9048
www.gemtor.com

**Guardian Fall Protection**
Auburn, WA
800/466-6385
www.guardianfall.com

**Protecta International**
Houston, TX
800/856-2442
www.protectausa.com

### Pump-Jack Systems

**Alu-Marine Corporation (Alum-A-Pole)**
Scranton, PA
800/421-2586
www.alum-a-pole.com

**Qual-Craft Industries**
Stoughton, MA
800/231-5647
www.qualcraft.com

### Wall- and Roof-Jack and Railing Systems

**Fall Protection Systems, Inc.**
Cary, NC
800/582-0533
www.bodyguardrail.com

**WallWalker LLC**
Lehi, UT
877/844-9255
801/766-6622 Utah only
www.wallwalker.com

### Prefab Frame Scaffolding

**Bouwman Scaffold Sales, Inc.**
Orange, CA
800/771-9071
www.bouwmanscaffold.com

**E-Z Scaffold Corp.**
Lewisburg, TN
800/699-6831

**Safway Steel Products, Inc.**
Waukesha, WI
800/558-4772
www.safway.com

**Universal Manufacturing Corp.**
Zelienople, PA
724/452-8300
www.universalscaffold.com

### Aerial Lifts

**Gehl Company**
West Bend, WI
262/334-9461
www.gehl.com

**Genie North America**
Redmond, WA
425/881-1800
www.genielift.com