

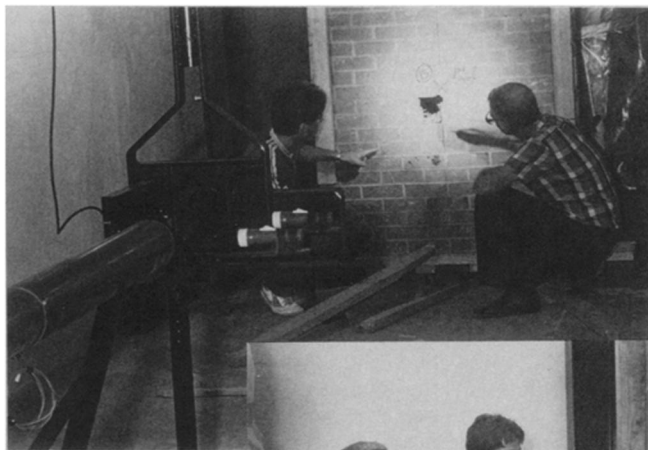
## Tornado timber: A hole in the wall

Few sights match the destructive fury of a tornado scattering debris while it sweeps a path through a row of houses. Flying chunks of wood, pieces of brick and other tornado-generated missiles crash into buildings, sometimes piercing walls and doors. During the past year, researchers at Texas Tech University in Lubbock have been simulating a small sample of this violence. Their research involves firing 12-foot lengths of lumber, using a specially designed cannon, at panels constructed from frequently used building materials such as plywood, hardboard siding, concrete blocks and brick.

The results give engineers and civil defense personnel a better idea of how various kinds of walls and doors stand up to windblown debris, says civil engineer James R. McDonald. Until now, no one had systematically studied the effect of commonly generated missiles on buildings such as homes, schools and hospitals, adds graduate student James R. Bailey, who conducted the experiments.

The chosen missiles were 12-foot "two-by-fours," pieces of wood a little less than 4 inches wide and 2 inches thick and typical of the kind of debris scattered after a tornado hits a house. Traveling at 50 to 55 miles per hour, the two-by-fours easily perforate both solid and hollow-core wooden doors and all the wooden walls. The missiles emerge completely, still in one piece, on the other side of the panels.

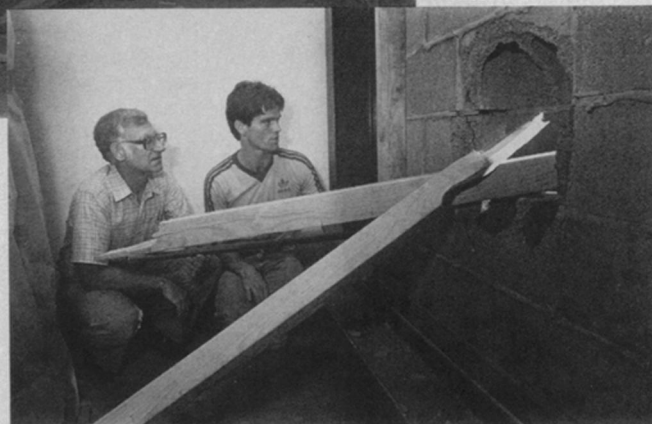
More surprising, says Bailey, are the results for the other materials with missiles moving at the high speeds achievable in a tornado. At about 120 miles per hour, a



Left: A 20-foot cannon (muzzle shown in foreground) that fires 12-foot lengths of lumber at panels (in this case, a brick wall) helps researchers study tornado-caused damage.

Photos: Texas Tech

Right: James R. McDonald (left) and Bob Bailey examine the exit point of a two-by-four fired at more than 100 miles per hour at a concrete block wall.



two-by-four goes right through a concrete block wall, shattering the block and sending fragments flying out of the exit side of the panel. In the case of a brick wall, the brick crumbles, but the two-by-four doesn't emerge from the wall. "It definitely can resist the missile impact," says Bailey, "but to what degree, we're still not real sure." The only wall that remains unscathed is one built from concrete blocks in which the hollow cells are filled with reinforcing steel and concrete.

"The cannon is designed to help us quantify what we've observed in the field in the wake of tornadoes," says McDonald.

It has a 20-foot-long muzzle, uses compressed air to fire objects at up to 150 miles per hour and can be modified easily to handle objects like pieces of pipe and wooden missiles up to 8 inches wide.

In general, it's best to have as many walls as possible between you and the outside during a tornado, says McDonald. A basement is probably still the best place to seek shelter. Earlier findings at Texas Tech's Institute for Disaster Research also show that opening windows has little value. Says McDonald, "You can best spend your time finding a safe place."

—I. Peterson

## Menstrual hiatus can prompt bone loss in female athletes

Young female runners who exercise to the point that they stop menstruating may be at increased risk for premature development of the brittle bone disease usually linked to old age, a study reports this week. But preliminary evidence from another study of a women's crew team indicates that athletes in other sports may not suffer the same degree of bone loss.

Barbara L. Drinkwater of the University of Washington in Seattle, who reported the study of 22 runners in the Aug. 2 *NEW ENGLAND JOURNAL OF MEDICINE*, calls her findings "worrisome," in light of the estimated 25 to 40 percent of highly trained female athletes who experience fewer than three menstrual cycles per year. When Drinkwater and colleagues matched non-menstruating long-distance runners with menstruating women of the same age, height, weight and training regimen, and then compared the bone density of their spines, they found "a group of young, active healthy women whose bone content is

comparable to that of a woman 52 years old," she told *SCIENCE NEWS*.

The work confirms an initial report last winter by Christopher E. Cann of the University of California at San Francisco, that a few non-menstruating athletes had bone densities as low as those found in women with malfunctioning ovaries.

It is well known that, in general, exercise strengthens bone. But for women, relatively high levels of blood-borne estrogen are also important in helping bones absorb calcium from food. Once the menstrual cycle stops, whether because of disease, normal menopause or extremely vigorous exercise, estrogen levels — and bone density — drop.

"We don't want to scare women away from exercise," Drinkwater says, stressing that amenorrhea, rather than exercise itself, seems to be causing the bone tissue loss. "The woman who runs primarily for health and pleasure is not going to cease menstruating," she says, adding that

further research may show that the bone loss in athletes can be reversed or at least stopped if caught early enough.

Specific types of exercise may, at least partially, compensate for the bone lost through amenorrhea. In a comparison of three non-menstruating crew members with their menstruating peers, Drinkwater found no significant difference in bone density. Ann Snyder, of Ball State University in Muncie, Ind., recently completed a larger study of world class oarswomen and recorded similar results.

The scientists agree that more studies of different types of athletes, such as swimmers, cyclists and ballerinas, will be needed to pin down the mechanisms and scope of the bone-loss problem. Until such evidence is compiled, they recommend that non-menstruating athletes boost their daily calcium intake to the 1.5 grams doctors recommend for post-menopausal women — the amount obtained in roughly one quart of milk.

—D. Franklin