Collapse on Adelphi Street

BY RAY DOWNEY

Where a four-story, wood frame building had stood moments before, there was only rubble and—somewhere beneath the debris—a 35-year-old construction worker named Ken Rencher.

From the tons of toppled building materials, firefighters in New York City's borough of Brooklyn had to discern information and come up with a plan of action. The delicate balance of what remained of the multifamily building this past February 10 required that the plan be carried out with strict control.

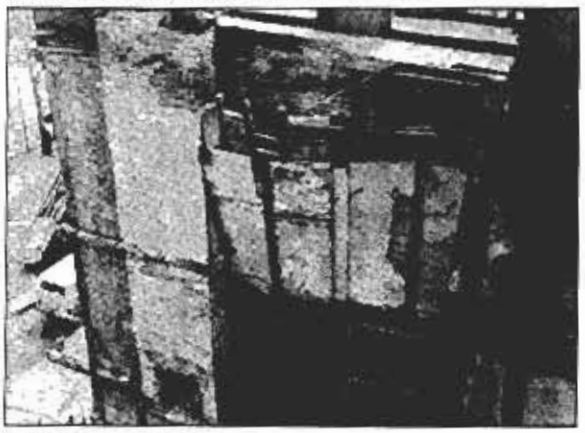
The first action of the battalion chief who arrived on the scene was to gather as much information as possible, while it was still fresh in the mind of the extremely excited construction worker who confirmed that his brother was trapped in the collapse. Where had the missing man been working just before the collapse? the chief asked. Were any other workers in the building at the time? What type of work was being done?

The building had been vacant for the past two years and had suffered structural damage from fires and exposure to the elements. Workers had only recently begun renovation. There had been none of the usual warning signs of collapse: creaking noises from beams or joists, sliding plaster, plaster dust, distortion, or any other indication that floors were pulling out of walls, or worse, walls were leaving floors.

The next stage of information-gathering called for a close-up view of the scene, and here, a large response provided a definite advantage. Because of reports of a structural

Three floors of the structure tumbled, pancake fashion, and came to rest on the first floor. All hope of rescuing the victim (center) rested on the possibility that individual voids had been formed by the unstable debris.

Among the many threats to firefighter safety in the operation was the fact that the bearing wall was now freestanding and leaning precariously in toward the rescue scene. (Photos by Richard Smiouskas)



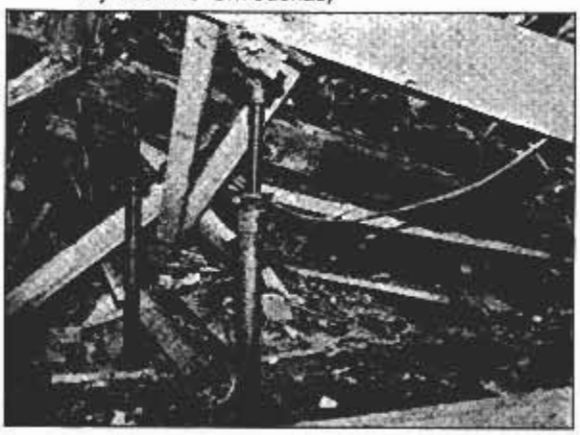
RAY DOWNEY has been a member of the Fire Department of New York City for 25 years, and has commanded the operations of Rescue Co. 2 for the past seven. Captain Downey holds an associate degree in fire science. He's a New York State certified instructor and has conducted seminars and lectures, in his own department as well as throughout the United States, on rescue-related tactics, including dive/rescue.

collapse, the response to this alarm was composed of what's known in Fire Department of New York City terminology as a "full first": three engine companies, two ladder companies, a squad company, and a rescue company. A deputy chief, and later the chief of department, also arrived on the scene to take command. And because it was the change of tours, Rescue Co. 2 had both offgoing and incoming platoons at the scene; the additional experienced firefighters from this unit proved invaluable.

Having seven companies at hand made it important to keep just the minimum number of people at the point of operation, to avoid overloading the collapse area and to maintain mandatory discipline and control. But the large response also meant there were firefighters available to assist in a variety of tasks: bringing equipment to the staging area and setting it up there; placing ladders; removing debris from the collapse area; and surveying the scene. This removed some of the burden from the rescue team and allowed frequent rotation of personnel to avoid the fatigue that comes on so quickly in a collapse rescue operation.

Before any rescue operation can begin, the team must survey the entire structure.

Versatile use of trench jacks gave some stability to the shifting structure. A collapse rescue is a slow process which mandates precise bracing and shoring as firefighters probe deeper and deeper into the tangled, unstable pile of construction materials. (Photos by Richard Smiouskas)



Rescue Co. 2 split into two units supervised by two lieutenants. Each unit's six members paired off into survey teams. The additional manpower thus provided enough firefighters to perform a *six-sided survey* of the structure.

By deploying one team each at the building's front, rear, top, bottom, and two sides, the rescue leader checked the stability of the remaining pile of rubble—the collapse area—and the surrounding and adjoining structures.

The information from every side funneled in to the rescue leader. This one fact demonstrated early on the need for control in both communications and command.

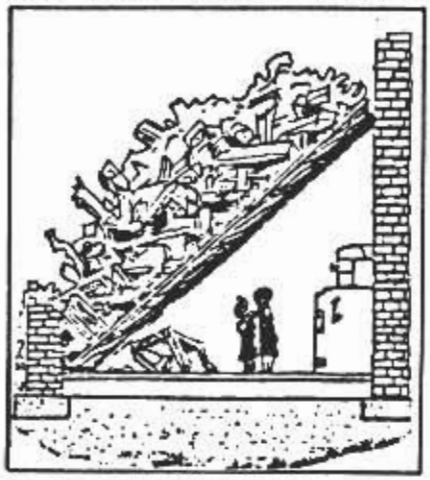
At a full first-alarm assignment, as many as 25 to 30 Handie-Talkies may be in operation. The members of the rescue team were ordered to switch to a secondary channel to avoid radio interference with their orders and the information that had a direct impact on their operation.

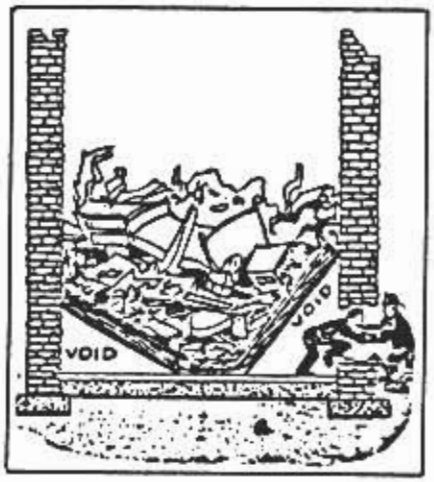
A firefighter working with the rescue leader would stay on the primary channel to keep the command post informed of the progress being made and to monitor the primary channel for messages from the other units.

Although the information comes in from many sources, orders must go out to the rescue team from its leader

The Three Types of Collapse

Lean-to collapses (left) are caused by walls falling away from floors or floors sagging and stretching beyond their supports. V-shaped collapses (center) are caused by overloading floors during occupancy changes or firefighting efforts. Pancake collapses (right) occur when a collapsing upper floor hits floors beneath and causes them to fail in turn. (Drawings used with permission of *WNYF Magazine*, Fire Department of New York City.)





alone. During the initial stages of a collapse operation and before control is established, all members are trying to do the most they can. But lack of experience or just plain overenthusiasm can have tragic results in the fragile conditions of a collapsed building. During this stage, *lack* of action by the uninformed may be a lifesaver.

The rescue leader must be in control of his own procedures, as well—always staying one step ahead by knowing the status of the operation, the readiness at the staging area of tools and equipment, and the readiness of medical personnel.

Now the rescue leader decided the effort would proceed from the top and front—from the top because the quickest access is gained that way in pancake collapse situations; from the front because, on that side, access to the victim was aided by the existence of voids formed by small, individual lean-to configurations (see drawing). Fortunately, supporting beams and columns in the building's full cellar had been completely replaced in the early stages of renovation. This kept the building from collapsing all the way into the basement, and allowed the rescuers' tunneling to begin at the first-floor level.

One team had made voice contact with Rencher and began tunneling from the front of the building. Coordinating that team's knowledge of the victim's location with another team working down from the top gave the rescuers a specific point to work toward.

The tunneling continued after I arrived on the scene and took command of the rescue teams. At the same time, using various sizes of trench jacks, we shored the cellar beams and columns and the first-floor area where the tunneling operation had begun.

The rescue chauffer had set up an air bottle with extension hoses and a mask, in case the trapped worker needed air. As the team working from the front approached Rencher, it was possible to get the air line to him as an important psychological support. But structural beams blocking the way

Collapse Lessons

Size-up:

Check stability of remaining structure.

Choose equipment and techniques necessary to ensure stability.

Determine number of victims, probable locations, and chance of survival.

Use six-sided approach—over, under, in front of, in back of, and at each side of collapse area.

Develop a *dynamic* action plan based on ongoing evaluation of the above steps.

Control:

All orders and directions concerning the immediate rescue team or teams must be channeled through the rescue leader.

Subordinate team leaders must maintain control of teams and communicate through the rescue leader.

Command post should be used as a staging area for equipment and provide strict control over standby manpower.

Operations:

Use minimum manpower at operations point, to avoid overloading the collapse area.

Prohibit freelancing and uncoordinated tactics and procedures, which can lead to additional injuries, unnecessary risk, and breakdown of the fragile stability of the structure.

Strict supervision and discipline must be maintained by team leaders, rescue leader, and command post.

Keep constant communication with the "eyes and ears" of the operation—members assigned to the six sides of the area.

Rescue leader must stay one step ahead—proact, not react.

Rotate personnel frequently to prevent injury or fatigue.

Prepare for safe removal of victims.

Perform an immediate critique: What did we do? What were the results? What did we learn? What will we do next time?

made it impossible to remove the victim along that route.

After contacting each of the survey teams, I decided to start removing debris from the top. During this operation, every step must be thought out in advance. Before cutting a beam or column, we ask what it's supporting, how much should be cut, whether it's properly shored or braced, and whether it might cause the remaining structure to shift. Any structural beams or columns that might be supporting the pile deserve particular attention.

Garbage pails had been made ready, and as debris was loaded into them, team members were instructed to keep eyes and ears open to signs that structural members, loose plaster, or the like was shifting. If any team member reported that debris was moving, all operations would cease until a survey indicated stability had been maintained or regained.

The firefighters in the hole passed pails full of debris to team members stationed above, who then passed it by hand out to the street. Dumping it there prevented the need to place additional weight on the collapsed pile.

An entrenching tool was used to remove difficult sections, but as a precaution against a second collapse, most of the digging was done by hand. Half an hour of digging uncovered the victim's head.

A paramedic from the rescue team was able to talk to Rencher; the trapped man said he was feeling fine and had no visible traumatic injuries. He was unable to move his arms and legs, but only because they were trapped in the rubble. Protection was provided for Rencher's head as debris removal continued.

As team members cleared the debris from his upper torso, the victim, too, became an element of the operation that needed to be kept under control. Rencher became restless and wanted to try pulling himself out. Firefighters had to instruct him to keep as still as possible so his movements wouldn't trigger another collapse.

The lower half of the victim's body was wedged beneath two structural beams, which had to be cut away. Shoring—cut outside the collapse area to keep vibrations away from the debris—was placed under the beams as small sections were cut away. Inside the pile of rubble, vibration was an even greater concern, so we used a reciprocating saw instead of a circular power saw.

As that effort continued, other team members reported that they'd finished shoring the cellar and the first floor. This gave the members working from the top a new assurance of safety.

The need for control didn't diminish as the operation entered its final stages. With the goal within reach, overenthusiasm has a way of setting in. As the final debris was removed, Rencher wanted to try to get up and leave on his own. But because of his position and location, it was time for experienced rescue workers to put to use some of the first aid equipment that had been made ready.

Two team members lashed Rencher into a Stokes Basket, and removal efforts were started. Although a tower ladder had been used to secure a leaning wall at the collapse site, neither a crane nor a tower ladder aided in the victim's removal; either one would have caused vibrations.

Instead, the Stokes Basket was gently passed up a portable ladder to firefighters positioned along the removal route. They then had to lower Rencher down to the street. Emergency medical personnel were waiting there to take him to a major trauma center. The only injuries Rencher had suffered were a mild case of hypothermia and the shock of this most trying experience.

For the firefighters still at the scene, all that remained was to pick up. The trench jacks couldn't be retrieved until the building was demolished, which happened within 24 hours. But the team members took with them the reciprocating saw, the entrenching shovel, the air hookup, and the first aid equipment—simple tools that, when combined with information and control, effected a delicate rescue. ■