
Photo Oliver Morris, New York Newsday.

WATER TUNNEL RESCUE

BY RAY DOWNEY

Operating below grade requires compliance with all safety rules and guidelines designed to ensure worker safety. Members of the tunnel workers union, or "sandhogs," as they are known, know this better than anyone. Their job requires working below grade—sometimes down to 800 feet—and comes with a high element of danger. On the day before Thanksgiving in 1993, a 16-ton winch plummeted down a 480-foot shaft in New York City, killing one worker and injuring seven others. The eight workers were on scaffolding, which had been erected along the inside of a 55-foot-wide shaft, and were testing the cables that were to be used to lift the metal forms that shape the concrete walls inside the shaft.

The single fatality at this accident was the 20th worker death since the water tunnel project began in the 1970s. In a

■ **RAY DOWNEY**, a captain and 32-year veteran of the City of New York (NY) Fire Department, has commanded the operations of its Rescue Co. 2 for the past 14 years. He is a member of FEMA's US&R working group for equipment, Advisory Committee, and Technical Review Panel. Downey has an associate's degree in fire science and is a New York state-certified instructor. He conducts seminars and gives lectures on rescue-related tactics throughout the United States. Downey is the author of the text *The Rescue Company* and the video *Rescue Operational Planning: Factors for Success*, published by Fire Engineering Books. He is an editorial advisory board member of *Fire Engineering*.

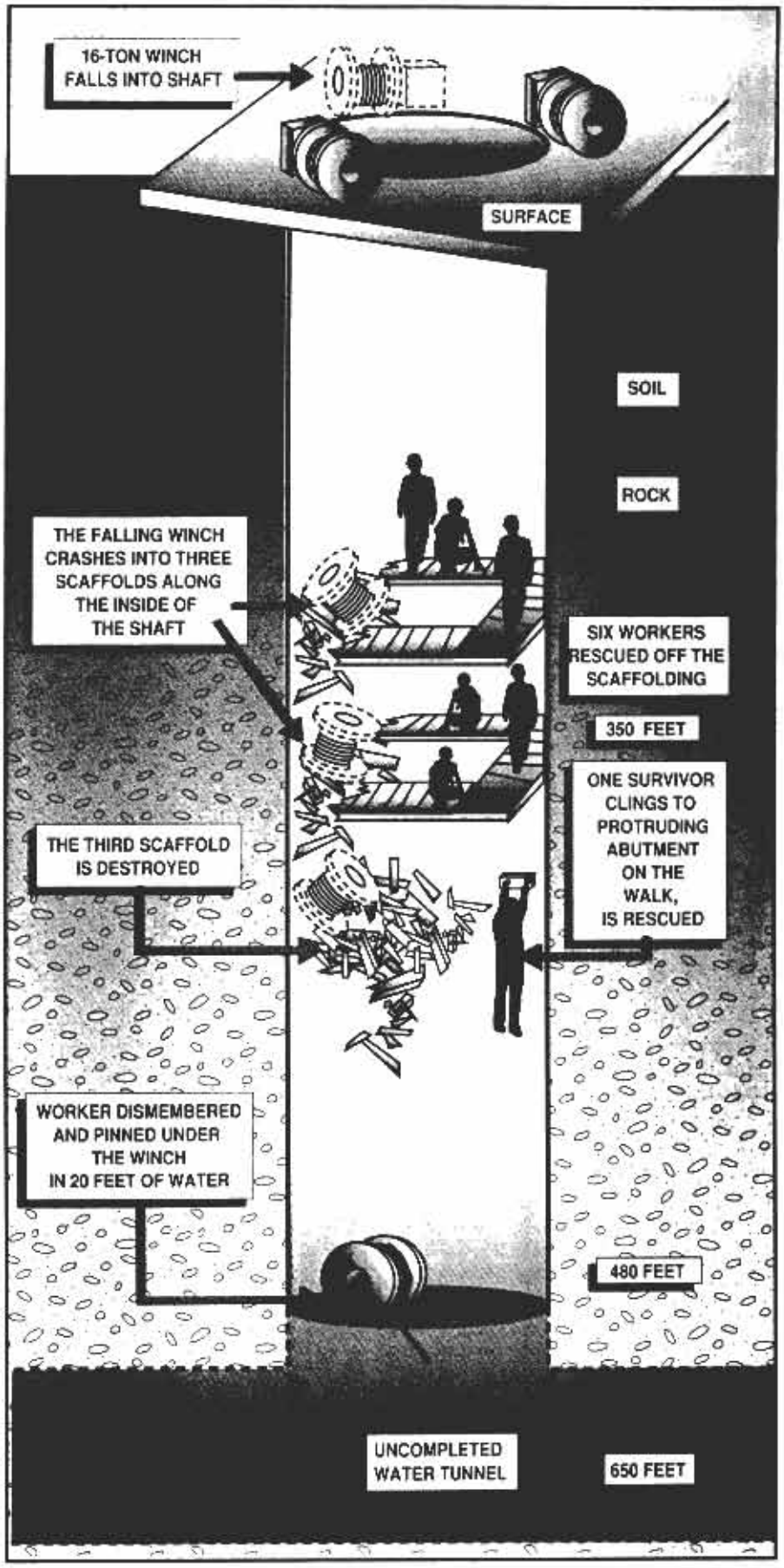
report to the mayor of New York City, this water tunnel was described as one of the most complex and intricate engineering projects to be undertaken in recent years. It is a vast network of huge pipes, many as large as 24 feet in diameter, placed as deep as 800 feet below ground. The tunnel stretches from the Kensico Reservoir in Valhalla, New York, to points throughout New York City. This 60-mile-long tunnel will cost an estimated $5 billion and is expected to be finished in the year 2000.

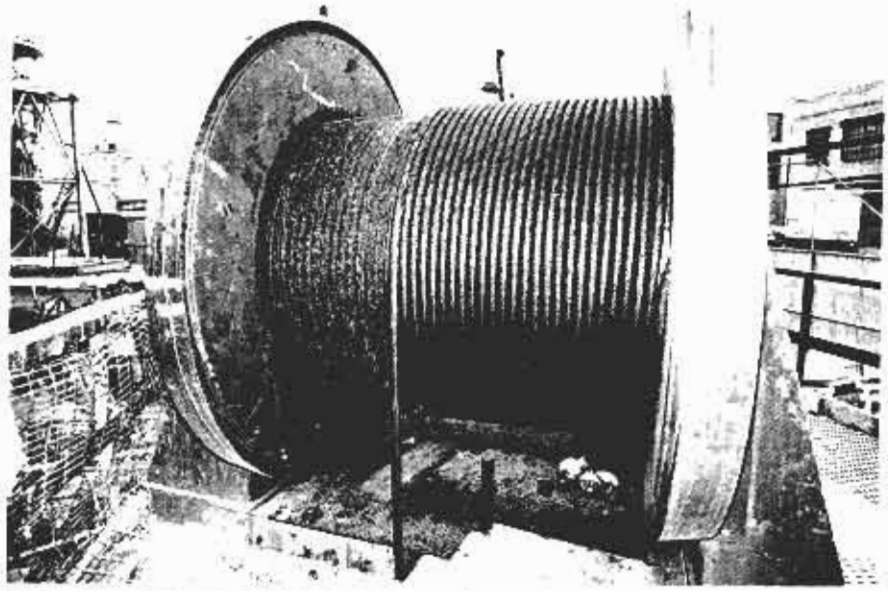
On this particular Wednesday, workers had begun what they thought would be a normal workday by being lowered in a bucket via a crane to the scaffolding, which was about 100 feet from the bottom of the shaft. Cables used to lift the 106,000-pound steel form used to mold concrete into a 35-foot ring were being tested when, without warning, the 16-ton winch came down the shaft.

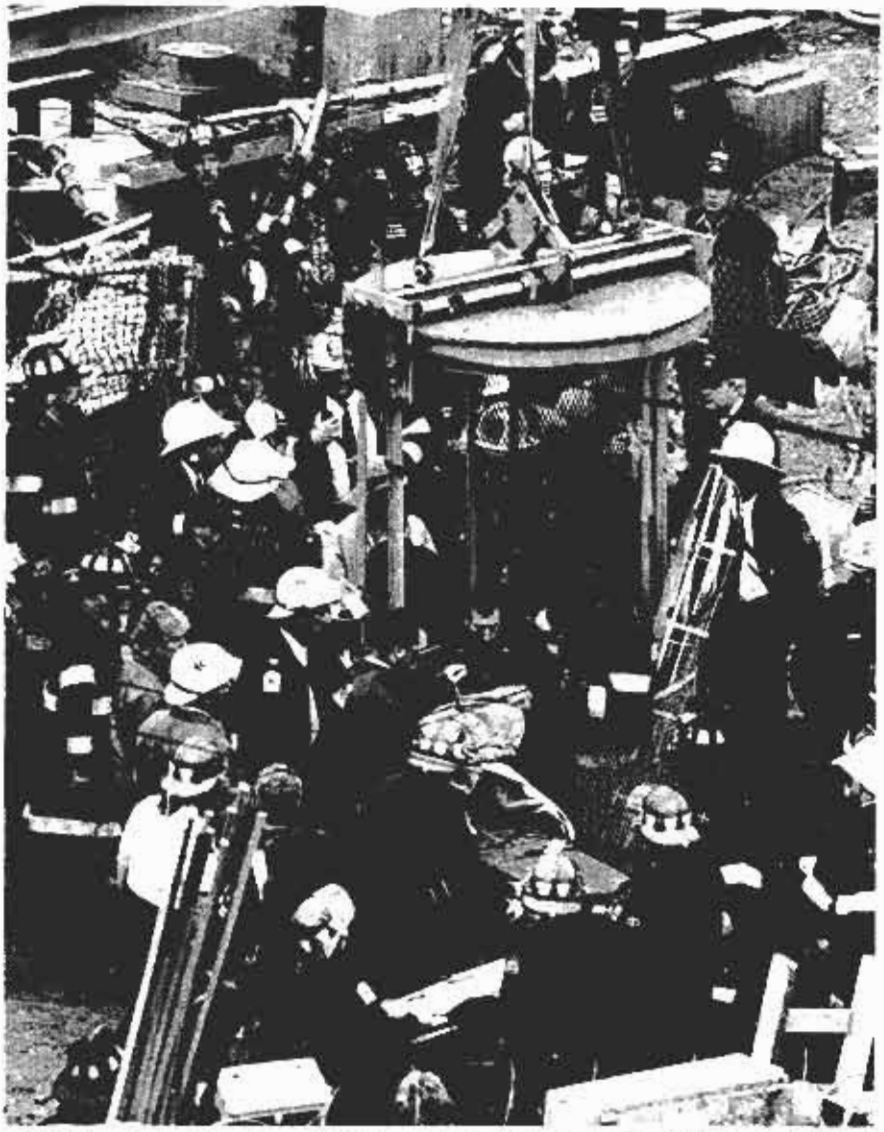
The winch smashed into the scaffolding, leaving six workers clinging to its remaining sections. One worker was knocked off the scaffolding and grabbed onto a protruding abutment on the wall. He had to hold on until he was rescued.

The first rescue bucket (a square, metal bucket, lowered from a crane by cables, in which rescuers could stand and be lowered to the shaft's bottom), operated by coworkers, rescued some of the injured workers. Fire, police, and emergency medical personnel then arrived at the scene. One of the first-arriving fire department units, after being told of the 20-foot water level at the base of the shaft, immediately requested the services of a dive team. Emergency personnel then were lowered by the bucket into the shaft to look for other trapped workers.

One of the initial problems the first emergency responders encountered as they descended into the shaft was that of communications with street-level personnel. Also, the bucket almost tipped over (as the crane operator lowered the bucket, he could not see it; so if the bucket were to swing or if rescuers inside moved suddenly, the danger of tipping was a real possibility), requiring rescuers to hold on securely so as not to become victims themselves. As they descended, they found the worker who was clinging to an abutment. Carefully maneuvering the bucket to the victim, they successfully rescued him from this most precarious position. In the meantime, dive team members arrived and were lowered in dive gear into the shaft, in the hope that anyone who might have fallen into the







(Top) A 16-ton winch at the entrance to the tunnel. (Photo © Stan Honda, *New York Newsday.*) (Bottom) Emergency workers perform the gruesome task of body recovery. (Photo © Mitsu Yasukawa, *New York Newsday.*)

water at the base of the shaft could be rescued.

While the initial rescue operation was taking place below grade, City of New York (NY) Fire Department Chief of Department Anthony Fusco arrived on the scene and assumed command. With the implementation of the incident command system, one of his first priorities was to request that the construction supervisor report to the command post. Fusco then requested that the supervisor take a roll call of his workers so as to ascertain the actual number of missing workers. It is usually during this period of time (the onset of the incident) that confusion reigns, making it extremely important that correct information regarding workers, their locations (prior to and after the accident), and any other pertinent details regarding the site location be gathered as quickly as possible. This information will have a direct impact on the rescue operation.

Communication difficulties caused members being lowered by bucket into the shaft to experience some frightening moments as the buckets maneuvered past each other. Despite this, the buckets proved to be an extremely important part of the rescue operation.

The bucket with the dive team members was lowered to the base of the shaft, and members surveying the water found broken pieces of the scaffolding, tools, equipment, cables, and machinery parts. At this point the decision was made to not put divers into the water. Due to both the uncertainty of what else might have been in the water (building materials, wires, etc.) and the time elapsed since the accident, which rendered the chances of anyone surviving in the water extremely remote, it was considered a wise decision.

The roll call of workers accounted for all but one worker who had been working on the scaffolding just prior to the accident. Based on some remaining evidence (the worker had been dismembered), it was assumed that the worker had not survived the accident. The water would have to be pumped out of the shaft if the base of the shaft were to be reached. To perform this task, rescuers obtained heavy-duty pumps from the New York City Transit Authority. Twenty-four hours later, on Thanksgiving morning, rescuers found the body of the missing worker trapped under the winch at the base of the pumped-out shaft. Using a torch, rescuers freed the worker's body from under the machinery.

Below-grade operations should always be approached with extreme caution. In this incident, after the water was pumped out of the shaft, rescuers found broken machinery parts that indeed could have easily and severely injured rescuers had a water search and rescue been attempted.

KEY CONSIDERATIONS

Rescuers must take numerous considerations into account when working in a hazardous area. They include the following.

Electrical power. Lighting for and electrical power supplying the shaft must be shut down during rescue operations. The consideration in this case was that the falling machinery could have damaged or shorted out some of the electrical cables, making it possible for a rescuer who came in contact with a cable or wire to be electrocuted. It may be necessary to post a member at the shutoff, to ensure that power isn't accidentally restored.

Atmospheric monitoring. Testing the atmosphere should be one of the first actions rescuers take. In this incident, workers had been working in a hazard-free environment. However, after the accident, rescuers did find an acetylene cylinder that had been dislodged by the falling winch and that was leaking. The leak was plugged and rescuers were able to continue their operations.

Communications. Communications in shafts and tunnels can be a problem; construction features may interfere with signals. It is a good idea to back up your standard portable radio communications with a hard-wired system.

Entry and egress. In this incident, the system was limited to a single means of entry and egress—by bucket. At times, the use of the two buckets at the same time in the shaft created some safety problems. It is mandatory to maintain good communications during such operations. If possible, safety lines should be attached to rescuers and controlled by other rescuers from above.

Information gathering. Ascertain from a supervisor or foreman the number of workers who were at the accident location prior to the incident. Have they all been accounted for? Had anyone been removed from the scene prior to the fire department's arrival? Can any of the survivors be interviewed? If so, get as much information as soon as possible regarding the accident. Ascertain the size, width, depth, and construction of the shaft as well as the type of work being performed and any other information that could be helpful to the rescue operation. Obtain plans or blueprints, if possible. If hazards such as pipelines, high voltage, or fuel are present in the shaft or tunnel, ask what actions have been taken to address them.

Emergency medical services. Emergency medical personnel must be standing by to provide emergency care to victims or injured personnel. Before victims are removed from entrapment, crush syndrome injuries must be treated by medical personnel.

Safety. Safety of both victims and rescuers is a primary consideration during all rescue operations. A safety officer should always be assigned for any rescue operation.

Incident command system. The ICS provides guidelines for managing an incident in an efficient and organized manner. It is especially relevant to rescue operations. The incident commander at this operation was able to utilize his resources to control, direct, manage, and coordinate an effective rescue.

Combining all of the above key elements will ensure that your rescue operation will come to a safe and successful conclusion. ■