## SafeTcrete™ With Ogden Long Fibers (OLF)

Maxam's SafeTcrete™ blast-resistant concrete is developed with chopped synthetic fibers treated by a proprietary process that permits 3" fibers to be added to concrete mixed with commercial equipment. Chopped fibers have been used for many years in the attempt to increase the strength of concrete and reduce the propagation of cracks. The longer and flatter the fibers, and more uniformly distributed and randomly oriented they are throughout the concrete, the stronger and more crack resistant is the concrete. Historically, chopped fibers (mainly fiberglass) have been limited to only 1/2" to 3/4" lengths to reduce clumping and curling/balling of the fibers in the concrete during mixing, and thus have provided only marginal benefits. The fibers used to make SafeTcrete™ remain flat and are uniformly distributed and oriented randomly throughout the concrete. These treated synthetic fibers make concrete highly blast-resistant for military, other government and commercial and industrial construction applications in high terrorist threat environments, and for bridges, airport runways, highways, levees and other infrastructure applications where very high strength, impact resistance, durability and reliability is required. Blast-resistant concrete panels were tested in independent laboratory impact tests and in field blast tests at a U.S. military facility.

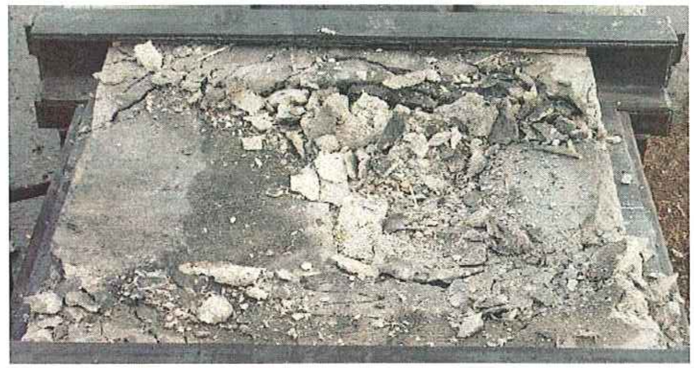
Following are the results of some tests performed at the Civil Engineering Department at Penn State University comparing steel-mesh to SafeTcrete™ carbon-fiber reinforced concrete. While the Compressive Strength essentially is unchanged in these cases, the Flexural Strength and Toughness increase dramatically. As indicated, the toughness of the SafeTcrete™ fiber reinforced concrete is ten times greater than the control concrete containing only the steel mesh. By adding the fibers to the mixture the ultimate flexural strength increases, as well as the deflection at failure and the load carrying capacity of the slab strip after cracking occurs. These combined to give the large increase in toughness of the fiber reinforced concrete. The tests consisted of 2 slabs each (composed as indicated below) that were 4 inches thick, 12.5 inches wide, and had a clear span of 9.5 feet. The 2 control slabs had 6-gauge welded steel wire mesh with 6-inch square openings and located in the center of the slab. Locating the wire mesh off-center or perhaps using 2 smaller gauge wire meshes located right and left off-center and/or re-configuring the size or shape of the openings in the mesh, should increase both the Flexural Strength and Toughness further.

| | Compressive Strength (psi) | Flexural Strength (psi) | Toughness (lbs-in) |
|---|---|---|---|
| Average w/ Steel Mesh Only | 6151 | 750 | 186 |
| Average w/ SafeTcrete™ Fiber Only | 6652 | 1904 | 1834 |
| Average w/ SafeTcrete™Fiber & Steel Mesh | 6619 | 2116 | 2691 |

The fibers are added to the concrete mix generally in the amount of 1.0% to 1.5% by weight (e.g., 40 to 60 pounds per yard of concrete) for high impact and blast resistant applications (e.g., secure facilities, barrier walls, bridge decks, dams, etc.).

## SafeTcrete™ With Ogden Long Fibers (OLF)

Bottom of Slab



Top of Slab

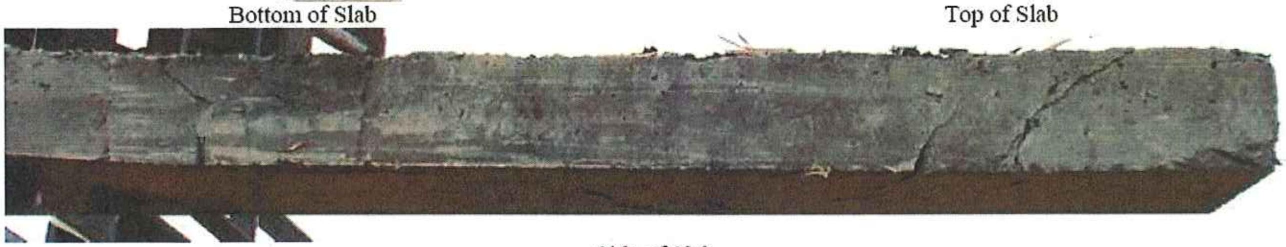
Side of Slab

Figure 5-13: Specimen C2 Subjected to 75lbs of TNT at 3.2 Feet (Scaled Distance = 0.76)

Standard, steel-reinforced concrete after blast

Bottom of Slab

Top of Slab



Side of Slab

Figure 5-15: Specimen T2-15B Subjected to 75lbs of TNT at 3.2 Feet (Scaled Distance =0.76)

Fiber and steel-reinforced concrete after blast