



# Loss Avoidance Study: Southwestern Community College Tornado Safe Room

**Study Area** – City of Creston, Union County, IA

**Hazard Type** – Tornado wind

**Project Type** – Southwestern Community College (SWCC) implemented tornado safe room mitigation measures in constructing two student dormitories. These rooms were completed independent of Hazard Mitigation Assistance (HMA) program funding.

- In August of 2007, SWCC completed Spartan Suites, a 48-person dormitory. The two-story building contained a 503-square-foot tornado safe room built to the FEMA 361, *Design and Construction Guidance for Community Shelters*, First Edition (2000) criteria. With an occupancy of 99 people, the safe room, located in the first floor hallway, consisted of 8-inch reinforced concrete masonry unit walls and a 12-inch-thick concrete ceiling.
- In August of 2010, SWCC completed Spartan Hall, a 75-person dormitory. The three-story building contained a 605-square-foot tornado safe room built to the FEMA 361, *Design and Construction Guidance for Community Safe Rooms*, Second Edition (2008) criteria as a portion of the first floor hallway. With an occupancy of 119 people, the safe room, located in the first floor hallway, consisted of 8-inch reinforced concrete masonry unit walls, and a 12-inch-thick concrete ceiling.

**Total Project Cost** – \$242,700 (two projects)

**Total Losses Avoided** – \$16,108,000 (in 2012 dollars)

**Return on Investment** – 66.37

## Pre- and Post-Mitigation Events

On Saturday, April 14, 2012, at approximately 7:00 pm, an EF2 tornado struck the Southwest Community College (SWCC) campus in the City of Creston, Union County, IA. During this event, the tornado reached a peak wind speed of 130 miles per hour, with an average path width of 600 yards.

Despite no advance warning, approximately 70 students sought refuge in the safe rooms. No injuries or deaths were reported from those that utilized the safe rooms. However, three students, who were unable to utilize the safe rooms, sustained injuries.



**Spartan Hall Safe Room**

Iowa Homeland Security and Emergency Management Division

The tornado caused severe damage to the Spartan Suites and Spartan Hall; yet, the safe rooms remained intact and largely undamaged. The structural design and materials used in constructing the safe rooms were effective in withstanding EF2 tornado winds and associated debris.

## Loss Avoidance Methodology

In the aftermath of the event, the Iowa Homeland Security and Emergency Management Division (HSEMD) completed a loss avoidance study. HSEMD determined potential losses without the safe rooms in place, Mitigation Project Absent (MPA), using data and tools provided by the Federal Emergency Management Agency (FEMA). The values used in estimating the MPA dollar amount were based on the FEMA Benefit-Cost Analysis (BCA) 5.0 software and are known as the Willingness To Pay (WTP) values. The WTP values are based on actuarial estimates for the costs related to various types of injuries and fatalities.

The number of people that may be killed or injured by a tornado is based on the number of occupants of the safe room, taking into account the probability of potential fatalities and injuries. HSEMD determined a Mitigation in Place (MIP) value using the estimated costs for construction of the safe rooms and the estimated costs of potential fatalities and injuries.

## Return on Investment

Estimated potential losses as a result of the April 14, 2012 tornado if the safe rooms did not exist were calculated according to the values in Table 1.

If the safe rooms had not been in place, roughly half of the students that sought refuge in the safe rooms may have been injured or killed by the tornado, with estimated potential losses in excess of \$16 million according to FEMA's BCA methodology.

A Loss Avoidance Ratio, or return on investment, of 66.37 was calculated by dividing the MPA (\$16,108,000) by the total construction cost (\$242,700).



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**Table 1. Estimated Potential Losses**

Project	#	WTP Value	Subtotal
Self-Treat Injuries	17	\$ 13,000	\$221,000
Self-Treat Injuries	14	\$ 102,000	\$1,428,000
Hospitalization Injuries	7	\$ 1,237,000	\$8,659,000
Fatalities	1	\$ 5,800,000	\$5,800,000
		<b>MPA</b>	<b>\$16,108,000</b>