



**DARG, BOLGREAN, MENK, INC.**  
CONSULTING STRUCTURAL ENGINEERS

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**A Publication For Our Clients & Friends**

**Winter 2001-02**

**THANK  
YOU**

**For Your Business!**

As we approach the holidays, the season of giving, we want to give thanks to all of our clients and friends for your business and/or support.

Because of you, we are looking forward to our 36th year in business!!

**ANNOUNCING**

**DBM Welcomes New Staff**

We are proud to announce the addition of Scott Hafemeyer, E.I.T.

Scott obtained his Agricultural Engineering degree from Iowa State University in 1985 and graduated from the Architectural/Structural CAD Design program at Herzing College in 2000. Formerly with Cargill Inc., Scott has over eight years of facility engineering experience.

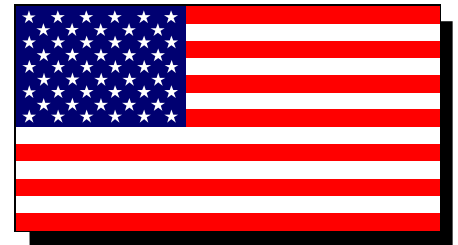


**How the World Trade Center Towers Collapsed**

We were sickened as we watched the TV in disbelief the morning of September 11, 2001. Both of the WTC Twin Towers had collapsed within a half hour of each other, and the Pentagon was ablaze. It was incomprehensible. Many people have inquired why the towers collapsed so quickly, when it appeared that only the upper stories were initially damaged.

Both towers, each 110 stories, were struck by hijacked commercial jets at about the 90th floors. The jets were carrying large amounts of fuel for cross country flights, and intense fires within the building followed the initial collision. Building Two (which was struck second) collapsed first about an hour after impact and Building One took about an hour and forty minutes. There were about 4,000 fatalities and 7,000 injured.

**GOD BLESS AMERICA!**



So how did these two skyscrapers, testaments to American ingenuity and symbols of commerce, the sixth tallest buildings in the world, suddenly collapse? Although both towers were designed for and withstood the initial impact from the commercial jets, it was the resulting fire in the upper stories that actually started a progressive collapse. It is estimated that, fueled with thousands of gallons of jet fuel, temperatures within the inferno may have been as high as 2,000 degrees Fahrenheit. Steel loses its strength fast at those high temperatures, and the impact damaged upper stories were further weakened. As the upper floors eventually failed, they collapsed onto the floor immediately below the fire. That floor failed and fell to the floor below, which set off a chain reaction until the whole building was down on the ground. If you were watching the TV footage of the collapse very closely, you could actually see that it was a series of small failures, happening one story at a time, starting from near the top and working it's way down. Similar to dominoes but on a vertical scale. This is called a progressive failure.

Another way to look at it is to imagine a 20 story building collapsing onto the top of a 90 story building. The 90th floor is designed to only support one story. With the factors of safety used in design, it may be able to actually support two stories, but certainly not 20 stories.

So you may be wondering, "Can buildings be designed to survive terrorist attacks?" Unfortunately, probably not if the attack was comparable in magnitude to the WTC. But Structural Engineers and their associations are already discussing ways to design structures to be more blast resistant... at least delaying a structural failure long enough for a successful evacuation.

## CAD Corner

By Dale Urevig, CAD Operator

If you need to rename an entire project or a set of drawing files, use the free utility "Renamer v2.0". Here are two examples.

**Example 1:** Rename all project files "1998-08" to "2001-23". Search the entire sub directory for 1998-08-SX.dwg / and then replace the entire sub directory with 2001-23-SX.dwg.

**Example 2:** Add a date to a set of drawings for archiving. Search the entire directory for 2000-05-SX.dwg / and then replace the entire directory with "date" 12-09-01-2000-05-SX.dwg.

You can also rename multiple files with change, search/replace, insert, uppercase / lowercase and many other batch operations. "Renamer v2.0" does not require program installation. Just unzip the file and run the Renamer.exe program file.

"Renamer v2.0" works with all file types and can be found at the link: <http://www.sweweb.net/KSH/Abbe/Programs/Renamer/all.html>. Or you can contact me at [dale@dbm-inc.com](mailto:dale@dbm-inc.com) and I will email the zip file to you.

## History of Structural Engineering

Structural Engineering emerged as a specialized branch of Civil Engineering. Although there are many different branches of Engineers today, there were originally only two types: civilian and military. Over the years, the title Civilian Engineer was shortened to the current abbreviated form, Civil Engineer.

## Cracked Basement Walls

Occasionally, we are asked to go out and look at cracks in existing basement walls. There are a number of reasons why basement walls crack, but the most common is overstress from lateral earth pressure.

If the crack is serious and the strength of the wall has been compromised, then reinforcement is required, usually placed on the interior side of the wall. One reinforcing solution is vertical steel beam/columns located at about four to eight feet on center and kwik bolted to the walls and floor. One disadvantage

**The most common reason why basement walls crack is overstress from lateral earth pressure.**

to this method is the loss of some interior space adjacent to the wall. For walls that are "bowed" inboard, earth anchors can be used for strengthening and straightening. Yet another approach is to use thin steel plates bolted to the wall with flush flat head sleeve anchors. There is also a new non-intrusive, very high strength product called carbon fiber reinforced polymer (CFRP). Carbon fiber, which has been used extensively in the aerospace, marine and automobile industries for years, is rolled out and embedded into thin strips of epoxy placed at regular intervals of about four to eight feet on center. CFRP is also being used to reinforce or strengthen existing concrete floors and roofs.

Prior to adding any reinforcement, all cracks should be routed open to about one eighth to one fourth of an inch and caulked. Repairing the cracks and reinforcing the wall will restore the strength, but will probably not eliminate water infiltration. We will cover solutions for wet basement problems in our next newsletter. If you have any questions before then, please call us.

## DBM Projects

These are some of our projects that are in design or under construction:

- ◆ Retail/Housing mixed use project in Savage, MN
- ◆ Public Schools in Wisconsin
- ◆ Townhouse and Condominium Projects Metro Wide
- ◆ County and Municipal Buildings, Metro Area
- ◆ Apartment Building in Plymouth and Owatonna, MN
- ◆ YMCA Addition in Eagan, MN
- ◆ Golf Clubhouses in Twin Cities

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