



NIST Response to the World Trade Center Disaster

**Federal Building and Fire Safety Investigation
of
the World Trade Center Disaster**

August 21, 2008

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Building and Fire Research Laboratory
National Institute of Standards and Technology
U.S. Department of Commerce**

World Trade Center 7

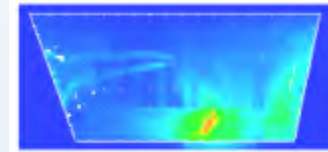


Fire Growth and Spread

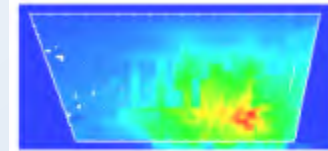


Progression of fires
on Floor 12

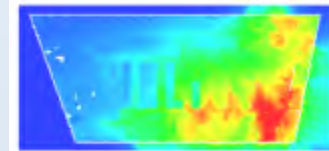
1:00 pm



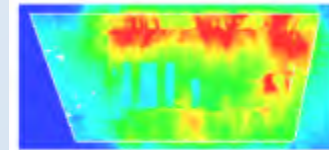
2:00 pm



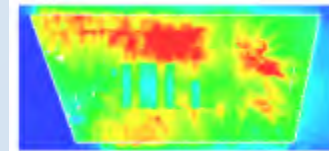
3:00 pm



4:00 pm



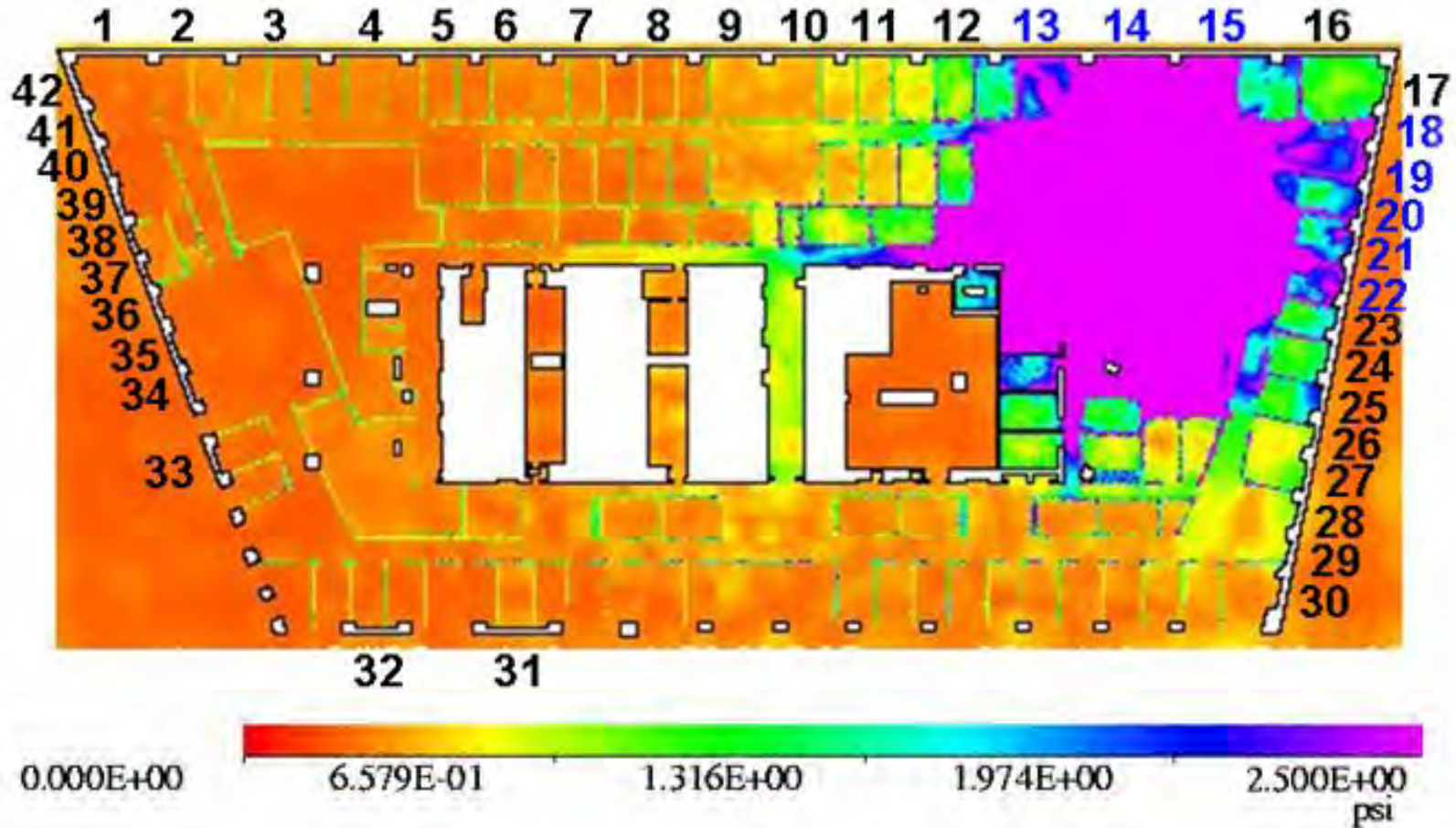
5:00 pm



Slice
temp
C

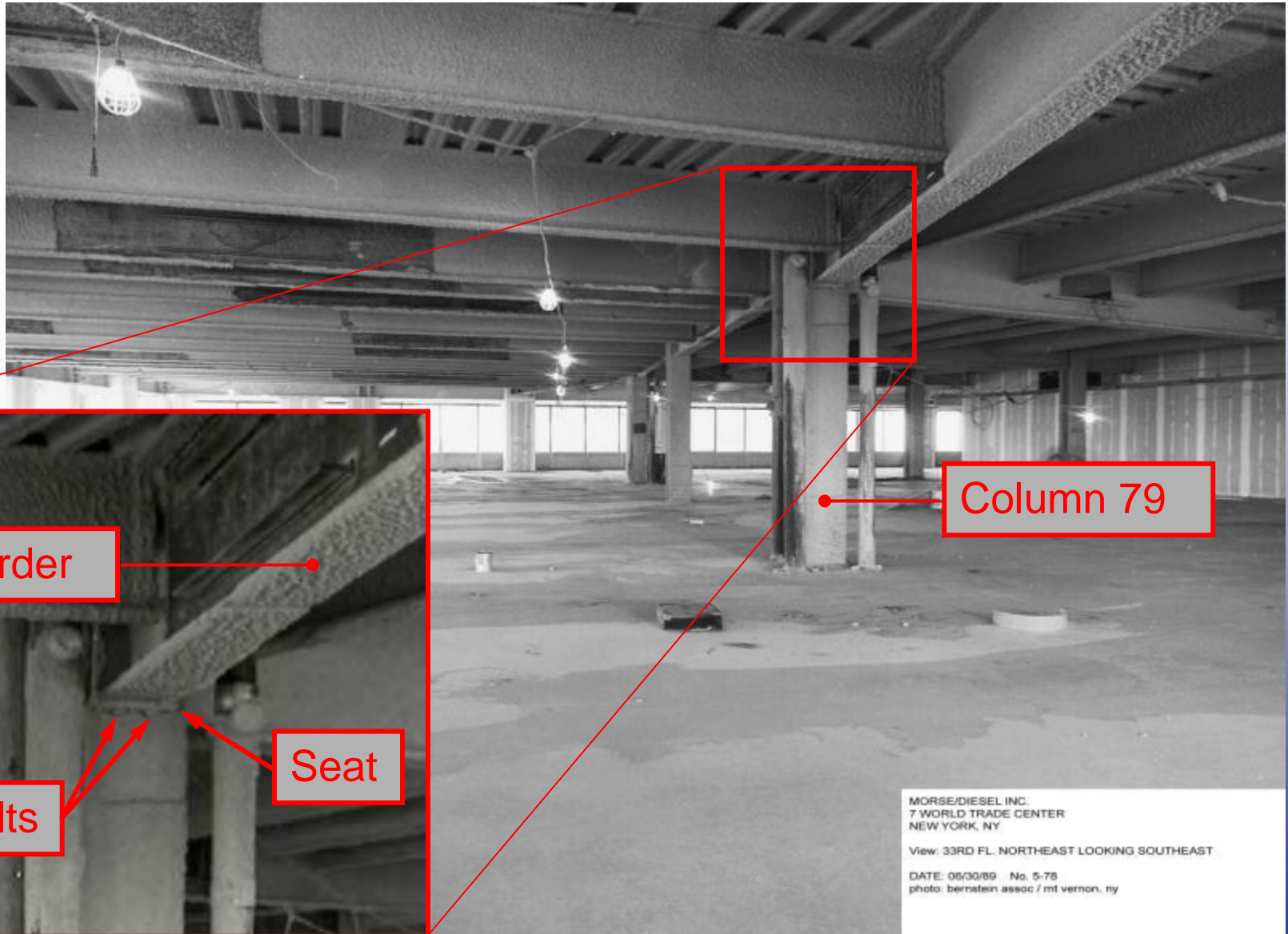


Hypothetical Blast Simulations



Peak over pressures for 9 lb shaped charge.

North East Floor System Near Column 79



Column 79

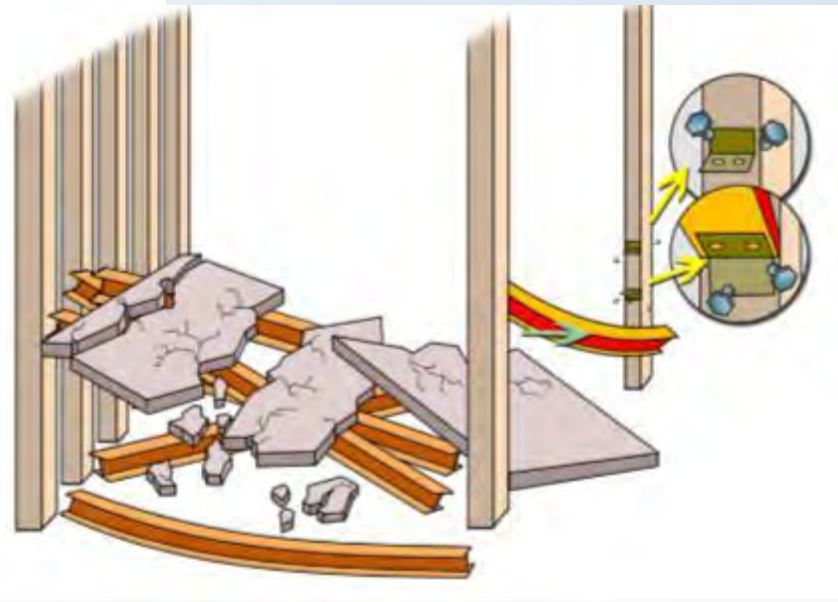
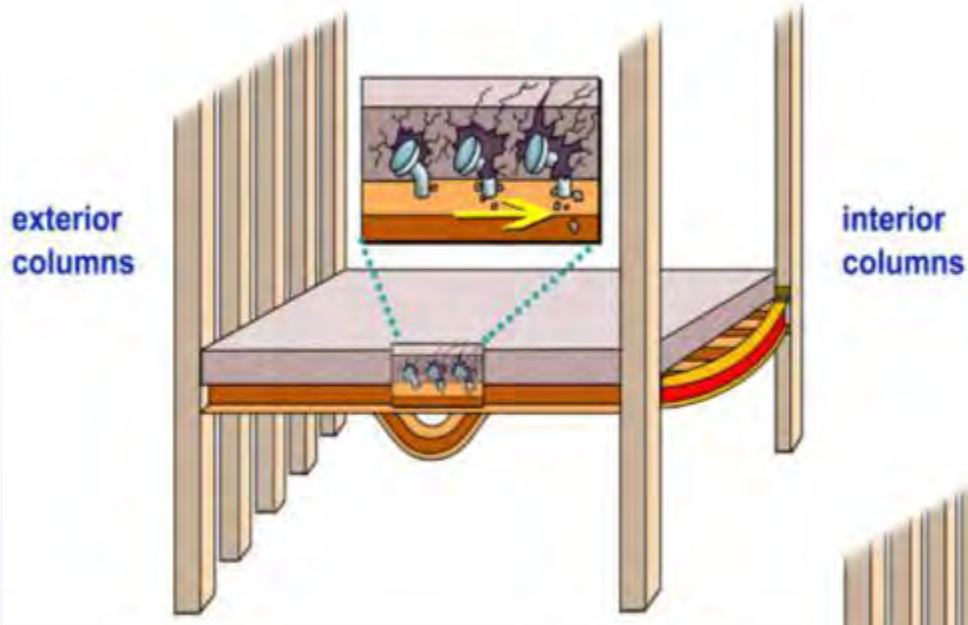
Girder

Bolts

Seat

MORSE/DIESEL INC.
7 WORLD TRADE CENTER
NEW YORK, NY
View: 33RD FL. NORTHEAST LOOKING SOUTHEAST
DATE: 06/00/89 No. 5-78
photo: bernstein assoc / ml vernon, ny

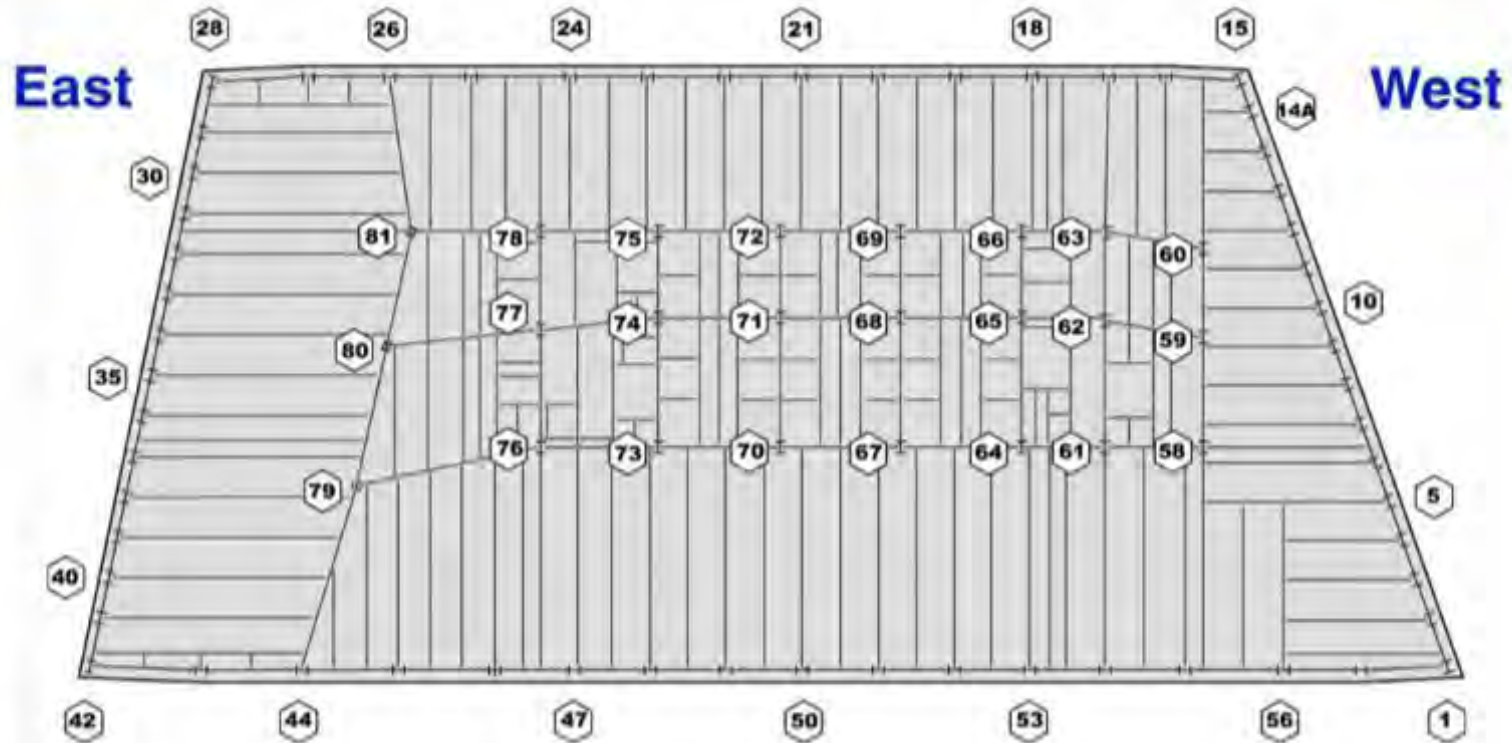
Thermal Expansion Causes Floor Failures



Collapse Initiation– Physics-Based Model



Cascading Buckling of Interior Columns



**Columns and Floor Framing
Typical Floor**



Comparison of Visualization and Video



Collapse Initiation Observations

Exterior Observations

- East Penthouse Kinks

- Windows break on East Side of North Face

East Penthouse

Window Breakage



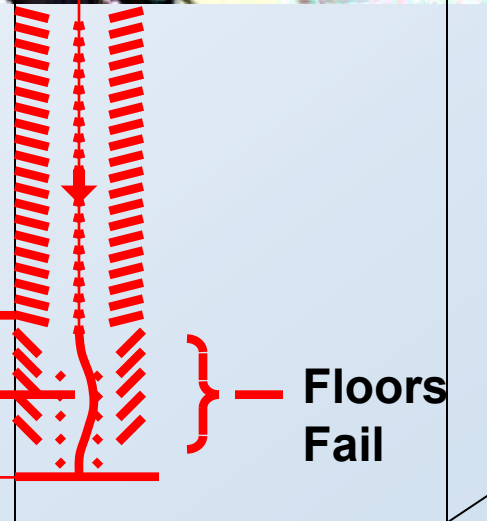
Vertical Collapse Progression

14th Floor

Column Buckles

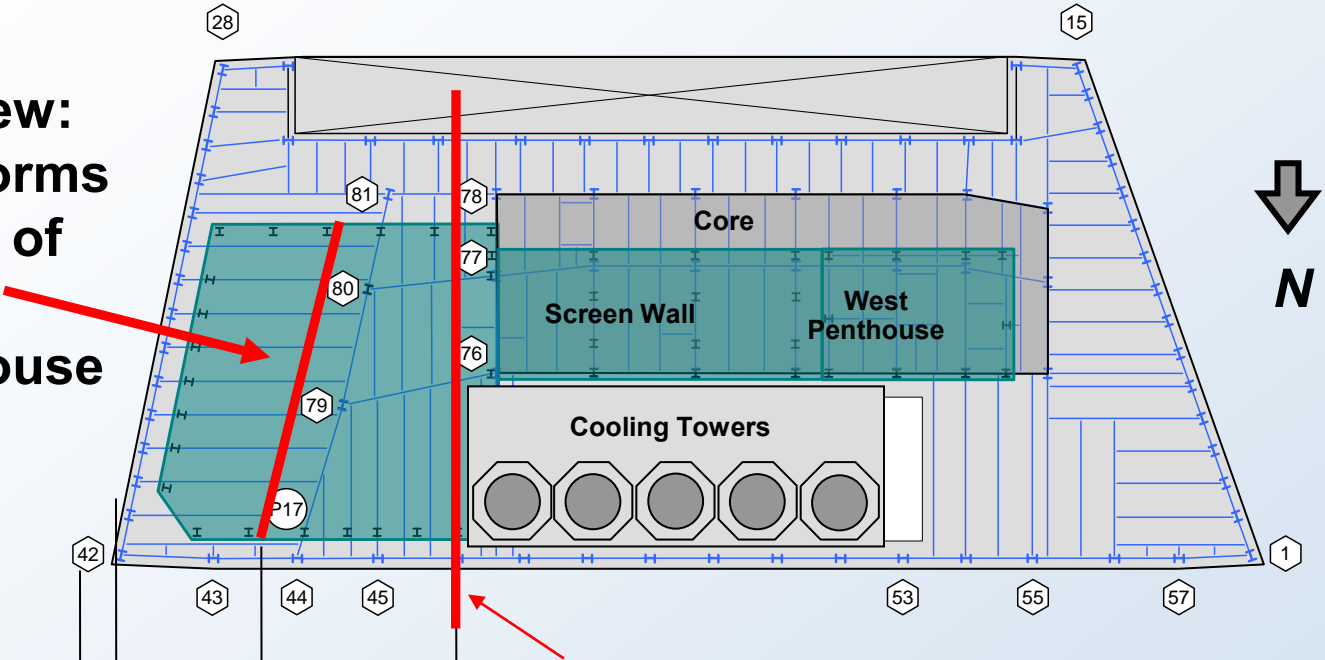
7th Floor

Floors Fail

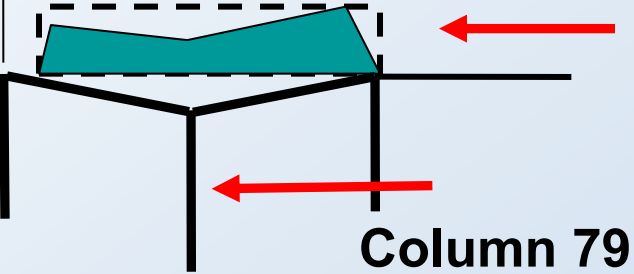


Penthouse Layout Overlaid on Floor Framing

Top view:
Kink forms
in roof of
East
Penthouse



Side view:
Kink in penthouse
directly below
column 79



Column 79