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

Visual Data Collection and Analysis

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Visual Collection and Time Line Development for WTC 1, 2, and 7

Purpose: To utilize photographs, videos, and other relevant information to develop detailed time lines for the spread and growth of fires at the peripheries of World Trade Center Buildings 1, 2, and 7 and to organize the information such that it can be utilized by other investigation team members.
TASK MEMBERS

Leader: Bill Pitts

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TOPICS

- Collection and Data Basing Efforts
- Timing
- Initial Damage Patterns
- Fire Spread in Towers
Collection of Visual Material

- Material collected in a variety of ways
  - Direct contacts with individuals and organizations
  - Public appeal
  - Transfer of material from other organizations
  - Video recordings from broadcast television

- Immense amount of material collected
  - Over 6100 photographs catalogued (in excess of 185 photographers represented)
  - Approximately 150 hour of videotape digitized and clipped (5726 clips) from more than twenty individuals, news organizations, and documentaries
Video clips used with permission of Scott Myers.
TIMING

- Digital Photographs and Video (EXIF and meta data)
- Comparison of details (e.g., shadows, smoke and fire patterns)
- Goal has been one second accuracy relative to second plane strike time defined to be 9:02:54 am
- Timed to ± 3 seconds: photos (2552 of 6194); videos (2197 of 5726)

TIMES FOR MAJOR EVENTS

Tower 1 Plane Strike: 8:46:31 am
Tower 2 Plane Strike: 9:02:59 am
Tower 2 Collapse: 9:58:59 am
Tower 1 Collapse: 10:28:25 am
Tower 7 Collapse: 5:20:52 pm
East Face of WTC 2, 9:26:15 am
KEY FOR TEST ANALYSIS

Sheet #1:  Fire Visible

0   No fire
1   Spot fire
2   Fire visible inside
3   External flaming
9   Can’t see

Sheet #2:  Smoke

0   No smoke evident
1   “Light smoke”
2   “Heavy smoke”
9   Can’t see

Sheet #3:  Windows

0   Window open
1   Window in place
9   Can’t see
Plane Wing and Tail Marks on the North Face of Tower 1
Left Wing: 94th, Tail: 98th, Right Wing: 99th
Plane Wing and Tail Marks on the South Face of Tower 2
Left Wing: 77th, Tail: 83rd, Right Wing: 85th
WTC 1 Initial Windows Missing

North

East

Windows intact
Windows missing
Hidden

South

West
WTC 2 Initial Windows Missing

- Windows intact
- Windows missing
- Hidden

North

South

East

West
SOME RELEVANT VISUAL OBSERVATIONS FOR TOWER 1
(Part 1)

- Initial damage and subsequent fire development is highly asymmetric (plane strike centered on north face)
- Fireballs following plane strike on north, east, and south
- Fires “damped down” shortly after initial fireballs
- Significant damage and early fire growth on north face, center of east face, and western side of south face
- Fires on east side of south face are not observed until after 10:00 am

- Rapid and extensive fire spread on 97th floor of west face starting at 8:56:08 am; by 9:00 am large fires on 96th and 97th floors on north face, center of east face on 94th and 97th floors, and west side of south face on 96th floor

- Fires develop and start to spread across east face of 92nd floor after 9:00 am
SOME RELEVANT VISUAL OBSERVATIONS FOR TOWER 1
(Part 2)

- Areas of “typical” fire spread observed
  - Fires moving south on east face of 92nd, 94th, 96th, and 97th floors

- Areas of sudden fire development observed
  - Some associated with flashover in offices (e.g., northeast corner on 96th floor around 9:19 am)
  - Some occur in open areas (west side of 96th floor on north face around 9:54 am)
  - Fires burning on 98th floor on all four faces at 10:00 am
  - Large fire appeared suddenly on 104th floor of south side of west face shortly after 10:00 am
  - Large fires grew on multiple floors of east side of south face after 10:10 am
  - Sudden release of smoke from 92nd floor of north face at 10:18:48 am followed by rapid appearance of flame over much of floor
SOME RELEVANT VISUAL OBSERVATIONS FOR TOWER 2
(Part 1)

- Initial damage and fire locations are highly asymmetric (plane strike off center to the east)
- Fireballs following plane strike on north, east, and south
- Large sections of curtain wall removed on north and east faces, broken column on north face
- No visible damage to west face
- Fires don’t “damp” down to low levels of Tower 1 after fireballs
- Large debris piles seen in northeast corners of 80th and 81st floors and close to center of north face on 79th floor
- Small fires only on south face, extensive fires on 81st, 82nd, and 83rd floors of east face
- Fires located on debris piles on east and north faces burn for long periods
- There is a “cold” area between the debris piles on the north face that is roughly 45 feet wide and covers the 80th, 81st, and 82nd floors
SOME RELEVANT VISUAL OBSERVATIONS FOR TOWER 2
(Part 2)

- Fires are less active than observed for Tower 1, but there are changes

- Heavy flames erupt on 83rd floor of north face just to the right of the “cold” area at 9:29:10 am, at 9:35:45 am flames suddenly appear on this floor near the center of the face.

- Heavy smoke and flames suddenly appear on east face over large extent of 79th and 80th floors around 9:35:45 am and decrease abruptly around 9:36:30 am, fires then slowly grow back.

- Flames appear on the 82nd floor just to right of the cold spot on the north face around 9:54 am.

- Flames spread across most of the 79th floor on north face prior to collapse.

- Release of heavy smoke and rapid growth of fire over the western half of the 80th floor occurs on the south face starting at 9:56:37 am.
SOME RELEVANT VISUAL OBSERVATIONS FOR TOWER 2 (Part 3)

- Visual evidence for collapsed floors
  - Photos and videos show a hanging object that appears to be the 83rd floor draped across windows on the 82nd floor, this object sinks lower at later times
  - Similar objects, likely localized portions of the 81st, 82nd, and 83rd floors, are visible through windows on the east side of the north face
  - Molten material pours from the upper region of window 80-255 starting at 9:51:52 am