

Data were collected for every other frame for approximately the final 13.5 s, and for every tenth frame preceding that point. The vertical pixel position of the marker point on the vertical axis was higher for movement downward (indicating northwest corner motion toward the east). The red lines at each data point showed estimated uncertainties of ± 7 pixels. This was a rough estimation, reflecting an inherent risk of error due to the brighter pixels to the right of pixel column 519 and darker pixels to the left of pixel column 517, as well as to the fluctuation of intensity levels along pixel columns 517 and 519. Despite this, the capability of this method to amplify sideways building vibrations was clear. With this near vertical orientation of the northwest edge of WTC 7 relative to the pixel columns, the marker point of equal intensity moved up and down by a total of more than a hundred pixels.

The point at which pixels to either side of the central dark pixel were equal in intensity was not the only point that could have been selected for tracking. A second, easily identifiable marker point was one at which two adjacent pixels had the same intensity, e.g., for pixel columns 518 and 519. However, in order for the selected marker point to be tracked over the course of the video, it had to remain along the northwest edge of WTC 7. Because of the large extent of building motion, the marker point that was chosen was the only one that did not fall off either the top or bottom of the northwest edge during the duration of the video.

As presented in the timeline in Table 5-3 of Chapter 5, the video frame in which the east edge of the east penthouse started to move downward was assigned time $t = 0$ s. The time at which the initial motion of the main collapse of WTC 7 was detected was found to be $t = 6.9$ s.

Of particular interest in the initial results from this analysis was the observation that the onset of vibrations preceding the final collapse of WTC 7 occurred several seconds before the east penthouse began to fall, as shown in Figure C-6.

C.1.4 Conversion of Magnitude from Vertical Pixels to Distance

The magnitude of the motion was estimated using the number of vertical pixels that equated to a single horizontal pixel and a conversion factor between horizontal pixels and actual distance.

The vertical motion of the marker point that equated to a single horizontal pixel width was determined by counting the number of vertical pixels between the studied marker point and the next point along the northeast edge of WTC 7 at which pixel values were equal on each side of the central dark column. The marker point used in the analysis was the intersection of intensities along pixel columns 517 and 519; the marker point one horizontal pixel to the left was the intersection of intensities along pixel columns 516 and 518. Where this marker was available and had not dropped off the top of the northeast edge, the difference between these two points one horizontal pixel apart was found to be 100 ± 10 vertical pixels.

The conversion factor between horizontal pixels and distance along the north face of WTC 7 was obtained by determining the width of this face in both horizontal pixels and in feet. Due to the camera location, points on the north face near the northwest edge were closer to the camera than points near the northeast edge. However, this distortion was small, since the width of the north face was much smaller than the distance of WTC 7 from the camera. The perspective view of the camera looking up at WTC 7 also introduced some error into the measurement of the number of pixels for the width, as did the uncertainty of a couple of pixels in the exact location of the edges defining the north face. Given these sources of error, an estimate for this video of the width of the north face of WTC was 301 ± 4 horizontal pixels.