

The minimum charge scenario and was used in the Phase II blast analyses. This scenario proposed a linear shaped charge blast consisting of 9 lb of RDX. The Phase II analysis centered on Column 79, as the observations in Section 5.7 indicated that the collapse initiated at this location. The recommended column preparation for use of this shape charge required at least 30 min, plus additional time for preparations required to clear the column for cutting, such as removing walls or other coverings that might have restricted access to bare steel at a column section.

In Phase II, 2-D SHAMRC (Crepeau et al. 2001) blast propagation calculations were performed for the minimum explosive case identified in Phase I. Calculations were performed for a lesser charge size of 2 lb to evaluate threshold explosive requirements for the windows. There were four blast analyses performed in total, consisting of two different charge sizes (2 lb or 9 lb of RDX) and two floor layouts with differing partition layouts in the tenant areas. The primary conclusion from the Phase II analyses was that windows were expected to fail on the north and east faces for even the most conservative blast loading case considered (the densely-partitioned layout with a 2 lb charge). Other scenario and charge size combinations resulted in greater predicted window damage.

In Phase III, an acoustic analysis was performed to assess the distance from the building that the blast would have been audible. Adjacent buildings and their effect on the sound propagation was not considered in this analysis. Analyses were performed for both layout scenarios, using the pressure history and window failure locations from Phase II. For all four scenarios, significant audible sound was predicted from all building faces. If propagation were unobstructed (e.g., up Greenwich Street from the north face), the sound level from all building perimeter openings at 1 km would be approximately 130 dB to 140 dB. For comparison, sound levels generated by various sources of noise are shown in Table 8–3 (Bearden 2000).

Table 8–3 Sound Levels Generated by Various Sources of Noise.

Noise Source	Sound Level (dB)
Quiet library, soft whispers	30
Living room, refrigerator	40
Light traffic, normal conversation, quiet office	50
Air conditioner at 20 ft, sewing machine	60
Vacuum cleaner, hair dryer, noisy restaurant	70
Average city traffic, garbage disposals, alarm clock at 2 ft	80
Constant exposure to the following sound levels can lead to hearing loss	
Subway, motorcycle, truck traffic, lawn mower	90
Garbage truck, chain saw, pneumatic drill	100
Rock band concert in front of speakers, thunderclap	120
Gunshot blast, jet plane	140
Rocket launching pad	180

Source: Bearden (2000).