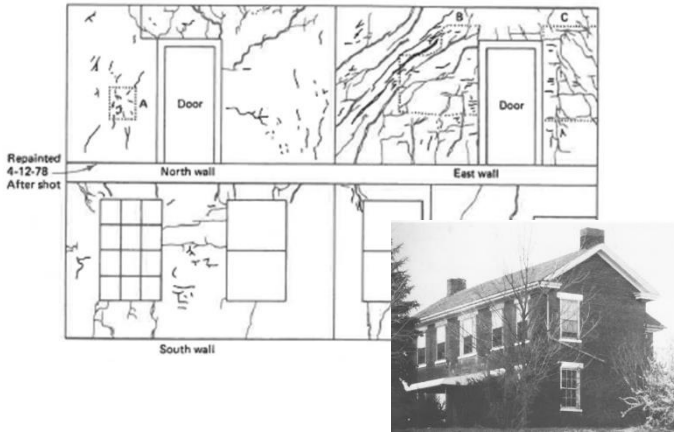


CONST-VIBRATIONS Listserve Newsletter # 2

Details of older, distressed structures whose cosmetic cracking define the lower bound of the Z curve.

Old age and distressed condition of structures associated with the lower bound of the Z curve from USBM RI 8507 is substantiated with photographs and information not contained in the original document. These important structures were identified in Newsletter #1. This new information was found in an unpublished Open File Report of Supplementary Information for USBM RI 8507 described herein.



Additional illustrations and photographs of structures not found in USBM RI 8507, whose data points are found on the lower bound of the plaster and lath "Z" curve. From top left proceeding clockwise, Str 20 (drywall, other 3 are plaster and lath), Str 27 (inset showing precarious floor support), Str 21 showing proximity to mining, Str 51's wall cracks visible after stripping wall paper.

The three plaster and lath structures were old and distressed. Structure 27 (upper right) was approximately 50 years old and in need of moderate to extensive repair. Many of the interior walls were cracked. Improper support of one of the floors by the tilted and poorly founded rock shown in the inset demonstrates the distressed condition of the structure. Structure 21 (bottom right) was some 50 to 60 years old and abandoned. Interior walls were significantly cracked to the point where some of the

plaster was dislodged. Structure 51 (lower left) was some 150 years old and located above a shallow coal mine at a depth of 250 to 300 feet. Extensive cracking of the walls is illustrated in the figure.

Unlike the other three structures, the interior walls of structure 20 (upper left) were covered with gypsum drywall. This house was about 20 years old. At the time of the appearance of the cosmetic crack, there a few other cracks in the drywall, mainly associated with the widows and doorways (Corser,1979)

All of the cosmetic cracking in these structures was documented by observation immediately before and after each blast. Such immediate before and after inspections are necessary to ensure that the observed cracking is not that induced by other effects. The onset of cosmetic cracking for structure 51 described below illustrates both the before and after inspection procedure as well as the detail of the observation and the care with which they were made.

Shots 173, 174, and 175 caused cracking, but 167 did not. Observed walls in the southwest bedroom were stripped of all wall covering and inspected carefully before and after each blast. With respect to the crack pattern in Figure 9-4, inspection after shot 173 showed

$$PPV = 25.6 \text{ mm/s} \sim 1.05 \text{ ips}$$

Nothing very significant. Test area A's few cracks (in Figure 9-4) are more evident. A few extensions and connections in area B. One new crack in B.

After shot 173 the right-half side of north wall was painted and cracks large enough to show through paint were marked. After shot 174 the inspection showed

$$PPV = 47.2 \text{ mm/s} \sim 1.85 \text{ ips}$$

New cracks in area A and preexisting ones more evident. Nothing new in other areas.

After shot 175 the inspection revealed

$$PPV = 216.9 \text{ mm/s} \sim 8.53 \text{ ips}$$

"major" cracking in north and south walls—"major" diagonal crack through new paint on north wall, connecting hairline cracks existing previously, and widening considerably. Crack over door is quite wide. Previous condition not known. Very light horizontal crack near door. Nothing significant on east wall. New and wider cracks on south wall near window. Horizontal cracks between windows. Crack below window on west wall. Quite evident crack widths measured. Cement block addition developed a vertical crack through three blocks lower northeast corner east wall through mortar and block.

Ages and condition of these structures were captured by Patrick Corser in his MS Thesis through his interaction with USBM personnel. While there may yet exist in USBM records more documentation of the observations, these records most likely have been lost during closure of the US Bureau of Mines (USBM).

Unpublished Open File Report of Supplementary Information for USBM RI 8507 (Siskind, 1981)

This unpublished Open File Report is important for two reasons. Most importantly peak ground motions and frequency (described as "raw data") for all shots statistically analyzed in RI 8507 are listed by source. Peak ground motions and frequency of the post Bulletin 656 USBM observations involving both cosmetic cracking and non-cracking are also associated with the structure that was being observed. This detailed listing of source, structure, and peak motions & frequency allows identification of structures and shots that occupy the lower boundary of the Z curve. It also clarifies age and condition of the structures that were cosmetically cracked. Implications of this information was described in Newsletter #1 & 2. Press here to be taken to the segment of the Open File Report

The Open File Report also contains answers to specific questions and comments that were received during the comment period. These questions and comments and Siskind's answers document the atmosphere surrounding the publication of RI 8507. Given that it effectively lowered the allowable peak particle velocity (PPV) by 75% (from 50.8 mm/s to 12.7 mm/s for plaster and lath structures), it is easy to understand the response that the study produced. The questions and comments reflect this atmosphere. The Open File Report can be found at <http://www.iti.northwestern.edu/acm/publications.html>

REFERENCES

Corser, P. G. (1979) Wall Cracking in Residential Structures from Surface Mining and Hard Rock Construction Blasts, Master of Science thesis, Department of Civil and Environmental Engineering, Northwestern University

Siskind, D. E. (1981), Supplementary Information for Bureau of Mines Study on Response and Damage Produced by Ground Vibrations from Blasting, RI 8507, found in CH Dowding's files and now available in at <http://www.iti.northwestern.edu/acm/publications.html> under "Unpublished USBM Documents"