Standard Practice for

Evaluation of Transportation-Related Earthborne Vibrations

AASHTO Designation: R 8-96 (2019)¹

Tech Subcommittee: 5c, Quality Assurance and Environmental

Release: Group 1 (April)



American Association of State Highway and Transportation Officials 444 North Capitol Street N.W., Suite 249 Washington, D.C. 20001

This is a preview. Click here to purchase the full publication.

Evaluation of Transportation-Related Earthborne Vibrations

AASHTO Designation: R 8-96 (2019)¹

Tech Subcommittee: 5c, Quality Assurance and Environmental

Release: Group 1 (April)

1. SCOPE

1.1. This standard practice is to provide guidance for the assessment of potential or alleged structural damage due to earthborne vibrations related to transportation facility construction, maintenance, or operation.

2. INTRODUCTION

- 2.1. The construction, maintenance, and operation of transportation facilities generate vibrations, which are transmitted through the air and earth and are subsequently received or "sensed" by structures or inhabitants. Only earthborne vibrations are addressed in this standard practice (see Section X2.8, Appendix X2).
- 2.2. Currently accepted practice in monitoring earthborne vibrations considers two parameters—earth particle velocity and wave frequency—determined at the site of concern (Siskind et al., 1980; see Figure 1). Sensing instruments are usually set out on the ground adjacent to the subject structure. For determination of safe vibration control limits, special concerns may dictate placement of sensors directly on specific parts of a structure such as the foundation, a supporting column, or a wall.



Figure 1—Safe Vibration Limit Recommendations for Residential Structures (USBM RI 8507)

- 2.3. Much of the data concerning structural damage have been determined from blasting activities. Blasting is a commonly used construction-related procedure that produces vibrations characterized by a wide frequency range and potentially high intensities but of very short duration. Transportation-related activities, such as vehicular or rail traffic, may be the source of repetitive, cyclical vibrations of much lower intensity than those caused by blasting. There may be concern in this regard because of potential for fatigue of structural components. Documentation of specific damage due to such transportation-related vibrations is scarce (Whiffin and Leonard, 1971; Ames et al., 1976).
- 2.4. People "sense" or respond to a much broader range of vibration frequencies and intensities than do structures. Intrusive vibration levels can annoy humans at much lower intensities than levels considered critical for structures (see Figure 2). Such sensitivity causes concern for structural damage potential even at the extremely low levels of vibration that are a recognized nuisance to people. Various threshold limits have been recommended in standards aimed at minimizing damage to various structures. Recommended safe vibration limits are based upon the appearance of "threshold cracks" or cosmetic cracking. Such cracks appear at lower vibration levels than do architectural or minor damage. The applicability of specific limitations is often the subject of litigation requiring expert witness opinion.

| TS-5c | R 8-2 | AASHTO |
|-------|---|--------|
| | This is a preview. Click here to purchase the full publication. | |