FHWA Roadway Construction Noise Model (RCNM)

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Roadway Construction Noise

- Construction is often conducted in close proximity to residences and businesses
- Should be controlled and monitored to avoid excessive noise impacts

Examples of Existing Guidance

- FHWA 1977 handbook
  Highway Construction Noise: Measurement, Prediction and Mitigation
  - Manual method for prediction

- FHWA 1982 prediction tool
  HICNOM, a highway construction noise computer program
  - Data-intensive and comprehensive method
  - Primarily used for highly complex or controversial major urban projects
Time for Guidance Updates

- Updated construction equipment
- Extensive highway construction projects in the U.S. and Canada
  - Lessons learned
  - Simple prediction tools available

Central Artery/Tunnel Project in Boston ("Big Dig")

- Largest urban construction project ever conducted in the U.S.
  - 7.5 miles (161 lane miles)
  - Includes underground expressway, river bridge, harbor tunnel, elevated highway demolition, park creation
  - 24 hours/day
  - Thousands of residential and commercial abutters
Big Dig Noise Control Program

- Construction Noise Control Specification 721.560
  - Most comprehensive in the U.S.
  - Includes proactive mitigation based on predictions

- Construction noise prediction spreadsheet developed by Erich Thalheimer of Parsons Brinckerhoff Quade & Douglas, Inc.
  - RCNM is based on the Big Dig prediction spreadsheet

RCNM

- Windows-based program
  - Incorporates noise calculations and equipment database from Big Dig spreadsheet

- Screening tool
  - Enables calculations of construction noise levels in more detail than manual methods while avoiding extensive input data collection
  - Two main uses:
    - Easily predict construction noise levels
    - Determine compliance with noise limits

- Applicable to a variety of construction noise projects of varying complexities
RCNM Screen

- Allows multiple receptors
- Land use (residential, commercial, industrial)
- Baseline sound levels (Leq or L10, A-weighted)

RCNM Input

- Receptor
  - Allows multiple receptors
  - Land use (residential, commercial, industrial)
  - Baseline sound levels (Leq or L10, A-weighted)

- Equipment
  - Up to 15 types of equipment
  - Distance to receptor
  - Estimated shielding between equipment and receptor
RCNM Construction Equipment Database

- Big Dig database
  - Over 50 types of equipment
  - $L_{max}$ dBA @ 15m (50 ft), slow
  - Includes spec and measured levels

RCNM Input (continued)

- Equipment database can be modified
  - Equipment can be added or deleted
  - Default values can be restored
RCNM Input (continued)

- Choice of Leq or L10 (A-weighted) for display

- Noise limit criteria
  - Can use Big Dig default values or enter new criteria based on local ordinances
  - Entry is achieved through a pull-down menu with conditional options

RCNM Calculations

- Calculations account for spherical spreading and can adjust for shielding (guidance given for estimating shielding)

- Calculates Lmax, Leq, L10 (A-weighted) for each equipment type and as totals
  - Leq calculations based on Lmax
  - $L_{10} = L_{eq} + 3 \text{ dBA}$
    - Based on extensive Big Dig data
    - Offset can be modified by user

- Calculates noise limit exceedances based on baseline noise levels and lot-line noise limits
RCNM Output

- Calculated Lmax and Leq or L10 levels
  - By equipment type
  - As totals
- If noise limit criteria defined, will display ...
  - Lot-line noise limits
  - Noise limit exceedances

RCNM Case and Files

- User's can save ...
  - Case with all receptors, equipment, results
  - Modified equipment database
- User's can export case to ...
  - Comma-delimited file
  - Text file
### RCNM Availability

- In final stages of testing
- Will be available without cost or obligation
- **Distribution**
  - Will be downloadable from the web
  - Will be included on upcoming construction noise CD-ROM

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### Side Topic: Construction Noise Handbook and CD-ROM

- Soren Pedersen & Harvey Knauer
Purpose

- Update the 1977 FHWA document
- Incorporate experiences related to construction noise since 1977
- Include up-to-date references
  - Equipment levels
  - Mitigation techniques
  - Contacts
- Incorporate latest modeling techniques

Handbook/CD-ROM Organization

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Use of the Handbook/CD-ROM

- Handbook will serve as a summary document
- CD-ROM will contain more details, photos, and “clickable” links to data sources and references