Caltrans Highway Traffic Noise Training Modules

The following are descriptions of the Caltrans highway traffic noise training modules that have been developed by the Caltrans Noise, Air Quality, and Hazardous Waste Management Office. These training modules are taught by Caltrans staff and consultants, and are typically presented as a series of modules. Contact Keith Jones (916/653-2351) or Bala Nanjundaiah (916/653-7236) for more information. Currently, these training modules are presented as follows:

Series 1

- Module 1, "Highway Traffic Noise Fundamentals"
- Module 7, "Caltrans Traffic Noise Analysis Protocol"
- Module 8, "Noise Study Reports"

Series 2

- Module 2, "Highway Traffic Noise Measurements and Instrumentation"
- Module 5, "Traffic Noise Impact Detailed Impact Procedure"

Series 3

- Module 6, "Acoustic Design of Noise Barriers and Special Considerations"
- Module 9, "Sound32 and LeqV2"

Module 1: Highway Traffic Noise Fundamentals (4 hours)

Course description: This course covers the fundamentals of highway traffic noise. Topics discussed include:

- physics of sound,
- characteristics of sound,
- sound pressure levels and decibels,
- addition and subtraction of sound pressure levels,
- frequency spectra and bands,
- A-weighted sound levels,
- typical noise levels,
- sound propagation,
- human reaction to noise, and
- noise descriptors.

Prerequisites: This is an introductory course and assumes that students have little or no previous experience in highway traffic noise analysis. Students should have a functional knowledge of

algebra, geometry, and trigonometry. For students with experience, this course provides a comprehensive review.

Items Students Should Bring: Caltrans Traffic Noise Analysis Protocol, Technical Noise Supplement, calculator, scale

Module 2: Highway Traffic Noise Measurements and Instrumentation (16 hours)

Course description: This is a course in the methods and instrumentation used for measuring highway traffic noise as described in the Caltrans Noise Analysis Protocol Technical Noise Supplement. Topics discussed include:

- equipment used to measure traffic noise,
- fundamentals of equipment operation, and
- methods for collecting data in the field.

This course includes 1 day of classroom instruction followed by 1 day of instruction in the field with hands-on experience collecting sound level data, weather data, traffic counts, and traffic speed data, after which students return to the class and compare measured data to modeled results.

Prerequisites: Module 1, "Highway Traffic Noise Fundamentals"

Items Students Should Bring: Caltrans Traffic Noise Analysis Protocol, Technical Noise Supplement, calculator, scale, field safety equipment (hard hats and orange vests), clipboard

Module 5: Traffic Noise Impact Detailed Impact Procedure (8 hours)

Course Description: This is a course in the traffic noise impact screening and detailed impact procedures specified in the Caltrans Noise Analysis Protocol Technical Noise Supplement. The first part of this course focuses on screening procedure that is used in determining whether a Type 1 highway project has the potential to result in traffic noise impacts. Topics discussed include:

- procedures for calculating equivalent lane distance and equivalent vehicles, and
- steps in the screening procedure.

The second part of this course focuses on the detailed traffic noise impact procedure specified in the Caltrans Noise Analysis Protocol Technical Noise Supplement. This procedure is used when a project fails the screening procedure. Topics discussed include:

- determination of existing noise levels,
- calibration of the noise prediction model,
- predicting future noise levels,
- key components of the FHWA-RD-77-108 traffic noise model (TNM), and

- key components of the FHWA TNM.

Course Prerequisites: Module 1, "Highway Traffic Noise Fundamentals"

Items Students Should Bring: Caltrans Traffic Noise Analysis Protocol, Technical Noise Supplement, calculator, scale

Module 6: Acoustic Design of Noise Barriers and Special Considerations (4 hours)

Course Description: This is a course in the key design considerations associated with noise barrier design as described in the Caltrans Noise Analysis Protocol Technical Noise Supplement. Topics discussed include:

- acoustical design considerations of noise barrier design;
- noise barrier material;
- noise barrier location;
- noise barrier dimensions, height, and length;
- noise barrier insertion loss;
- nonacoustical considerations;
- single barrier reflections;
- double (parallel barrier) reflections;
- structure and canyon effects;
- methods for minimizing reflections; and
- effects of reflections on distant receivers.

Course Prerequisites: Module 1, "Highway Traffic Noise Fundamentals"
Module 2, "Highway Traffic Noise Measurements and Instrumentation"
Module 5, "Traffic Noise Impact Detailed Procedure"
Module 7, "Caltrans Traffic Noise Analysis Protocol"

Items Students Should Bring: Caltrans Traffic Noise Analysis Protocol, Technical Noise Supplement, calculator, scale

Module 7: Caltrans Traffic Noise Analysis Protocol (4 hours)

Course Description: This is an introductory course in the Caltrans Traffic Noise Analysis Protocol. Topics discussed include:

- affected projects, requirements, and analysis;
- preliminary noise abatement decision (FHWA and CEQA process);
- final noise abatement decision; and
- noise abatement objectives and goals.

Course Prerequisites: Module 1, "Highway Traffic Noise Fundamentals"

Items Students Should Bring: Caltrans Traffic Noise Analysis Protocol, Technical Noise Supplement, calculator, scale

Module 8: Noise Study Reports (4 hours)

Course Description: This is a course in the preparation of noise study reports for highway projects. Topics discussed include:

- purpose and use of noise study reports,
- data and information to be included in noise study reports, and
- ways to present information clearly and effectively.

Course Prerequisites: Module 1, "Highway Traffic Noise Fundamentals"
Module 7, "Caltrans Traffic Noise Analysis Protocol"

Items Students Should Bring: Caltrans Traffic Noise Analysis Protocol, Technical Noise Supplement, calculator, scale

Module 9: Sound32 and LeqV2 (16 hours)

Course Description: This is a course in the mechanics of using Sound32 and LeqV2, the Caltrans computer implementations of the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108). Sound2000, the new Windows-based version of Sound32, is also discussed. Topics discussed include:

- factors that affect the generation and transmission of traffic noise,
- methods for setting up basic modeling scenarios,
- procedures for inputting modeling scenario data,
- interpretation of modeling results,
- basic sound barrier design procedures.

Course Prerequisites: Module 1, "Highway Traffic Noise Fundamentals"
Module 2, "Highway Traffic Noise Measurements and Instrumentation"
Module 5, "Traffic Noise Impact Detailed Procedure"
Module 7, "Caltrans Traffic Noise Analysis Protocol"
Module 8, "Noise Study Reports and Documentation"

Items Students Should Bring: Caltrans Traffic Noise Analysis Protocol, Technical Noise Supplement, calculator, scale (computers to be provided by the trainers)

Module 10 - Traffic Noise Model (TNM) Basic Course (24 hours)

Course Description: This is an introductory course in the use of the new FHWA TNM. Topics discussed include:

- key basic components and functions of the TNM,
- guidelines for input approximation,
- basic input and analysis demonstrated with exercises.

Course Prerequisites: Module 1, "Highway Traffic Noise Fundamentals"
Module 2, "Highway Traffic Noise Measurements and Instrumentation"
Module 5, "Traffic Noise Impact Detailed Procedure"
Module 7, "Caltrans Traffic Noise Analysis Protocol"
Module 8, "Noise Study Reports and Documentation"
Module 9, "Sound32 and LeqV2"

Items Students Should Bring: Caltrans Traffic Noise Analysis Protocol, Technical Noise Supplement, calculator, scale (computers to be provided by the trainers)

Module 11 - Traffic Noise Model (TNM) Advanced Course (32 hours)

Course Description: This is an advanced course in the use of the new FHWA TNM. Topics discussed include:

- key advanced components and functions of TNM,
- advanced for input approximation, and
- advanced input and analysis demonstrated with exercises.

Course Prerequisites: Module 1, "Highway Traffic Noise Fundamentals"
Module 2, "Highway Traffic Noise Measurements and Instrumentation"
Module 5, "Traffic Noise Impact Detailed Procedure"
Module 7, "Caltrans Traffic Noise Analysis Protocol"
Module 8, "Noise Study Reports and Documentation"
Module 9, "Sound32 and LeqV2"
Module 10, "Traffic Noise Model (TNM) Basic Course"

Items Students Should Bring: Caltrans Traffic Noise Analysis Protocol, Technical Noise Supplement, calculator, scale (computers to be provided by the trainers)