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**Federal Highway
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The National Highway Institute

*The July-August
course fee discount
has been
discontinued until
further notice.*

1998 Course Catalog

The logo for the National Highway Institute (NHI), consisting of the letters 'NHI' in a bold, white, sans-serif font, centered within a black rectangular background. The logo is flanked by horizontal black bars above and below it.

NHI

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U.S. Department
of Transportation

**Federal Highway
Administration**

Office of Safety and System Applications

National Highway Institute
4600 N. Fairfax Dr., Suite 800
Arlington, VA 22203

Dear New and Old NHI Customers:

The past 12 months have brought many exciting changes in the National Highway Institute, and we are confident that these changes, combined with our widely-recognized and trusted expertise in a variety of transportation-related topics, will help us serve all our customers even better than before.

We have focused our efforts in the following major areas:

1. **Technical areas:** This year we have incorporated courses in two additional technical areas: Superpave and Intelligent Transportation Systems.
2. **Instructional design:** We are systematically revising all of our courses, making them learner-oriented by using instructional system design techniques that maximize students' participation, provide hands-on learning opportunities, and demonstrate the application of the newly acquired skills in the workplace. We are also developing variations of our technical courses oriented to specific audiences. For example, we now offer courses or seminars specifically designed for senior managers, local governments, and the international community.
3. **Instructional delivery:** We are implementing an instructor certification process, supported by an intensive train-the-trainer course, to augment the skills of all of our instructors with learner-oriented principles and practices. Additionally, we are seeking opportunities to increase the use of distance learning methods, ranging from satellite-based courses to CD ROMS and interactive multimedia, to improve the availability of courses and better meet the needs of our customers.
4. **Customer outreach:** As many of you already know, we have opened a home page on the World Wide Web to enable our customers to obtain reliable, up-to-date information on all our courses and other activities. You can visit our web site at <http://www.nhi.fhwa.dot.gov> to find course descriptions, dates, locations and local coordinators for all currently scheduled courses, as well as registration forms, training tips, and other newsworthy information. You can also meet our entire staff on the web page.

In addition to the above, this year we completed the development or significantly revised the content of 12 courses covering Structures, Geotechnical, Hydraulics, Pavements, Construction and Maintenance, Traffic Operations, Civil Rights, and Highway Safety.

All these changes are designed to reinforce our basic principle, which is a total commitment to our customers. We strive to provide top quality training and education to the public sector, private industry, academia, and the international community. To accomplish this mission, we need your help and feedback. Please feel free to contact me or any of our staff with questions, suggestions, or observations on how we can serve you better.

Sincerely yours,

Moges Ayele
Director, National Highway Institute

COURSE NUMBER: 15254

COURSE TITLE: Introduction to Urban Travel Demand Forecasting

COURSE FEE: \$6,500/\$13,000 (FIELD), \$300/\$600 PER PARTICIPANT (WASHINGTON, D.C.)
(See GENERAL INFORMATION section)

The sponsoring agency is responsible for providing MS-DOS microcomputers with color graphics, color monitors, and at least 10 MB hard disk space.

LENGTH: 4 Days (CEU: 2.4 Units)

CLASS SIZE: 30 or no more than three students per computer.

DESCRIPTION: This course discusses the traditional four step planning process of trip generation, trip distribution, mode choice, and traffic assignment. Lectures and workshop presentations address the information needs and the development of networks and zone structures. The course is offered both in the field and at FHWA Headquarters in Washington, D.C. The field course may be presented either (1) using the microcomputer package used by the host agency to reinforce the theory taught, (2) as a non-computerized course with hand-solved workshop problems, or (3) as an Urban Transportation Planning Systems (UTPS) course. The Headquarters course is taught with hand-solved workshop problems (as in field option 2), but additionally includes a software demonstration day which will work through problems previously solved manually in class. The headquarters course is usually presented in the first week of March and in the first week of October.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify the principles of trip generation, trip distribution, mode choice, and traffic assignment.
2. Apply the input data necessary for each of the models.
3. Illustrate the significance of the outputs and results of travel demand forecasting models.
4. Describe the role of urban transportation planning in decision making.

TARGET AUDIENCE: FHWA, State and local planners who wish to gain a better understanding of the principles and techniques of travel demand forecasting.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Michael Culp (202) 366-9229 e-mail: michael.culp@fhwa.dot.gov

COURSE NUMBER: 15134

COURSE TITLE: Development and Implementation of Travel Surveys

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section) The sponsoring agency is responsible for providing one computer for every two course participants. The minimum specifications of the computer are as follows: IBM PC compatible with Windows 3.1 or higher, 486 DX2 66 MHz CPU, 16 Mbyte RAM and 2X CD-ROM drive.

LENGTH: 3 Day (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: The course provides transportation planners with information on the development and implementation of the most common types of travel surveys, including: household travel and activity, vehicle intercept, transit on-board, commercial vehicle, work place and establishment, special generator, hotel/visitor, and parking surveys. Much of the course material includes information from "Travel Survey Manual," published by the FHWA. The course is oriented toward those responsible for survey work and those who use the data collected such as modeling practitioners, however, the course will not address travel demand modeling explicitly. In addition, the course provides guidance for avoiding common problems encountered in performing travel surveys. The goal of the course is to increase the quality of travel survey results and to promote the efficient utilization of data collection resources.

OBJECTIVES: Upon completion of the course, each participant will be able to:

1. Recognize various types of travel surveys and identify principles behind each. Define the relationship of each survey to the travel forecasting process.
2. Develop and manage a process for implementing surveys in their local area. The participant should be able to apply the principles learned during this course to develop high quality requests for proposals (RFP) for survey efforts, effectively evaluate the proposals, and oversee the survey process. (The participant may have to enlist outside help such as professional survey firms to assist in the design and implementation of surveys.)
3. Identify emerging survey techniques and new technologies related to travel surveys.

TARGET AUDIENCE: Metropolitan Planning Organization, State DOT and FHWA planning practitioners.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Jerry Everett (202) 366-4079 e-mail: jerry.everett@fhwa.dot.gov

COURSE NUMBER: 15130

COURSE TITLE: Corridor Preservation for Technical Staff

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 30

DESCRIPTION: This course covers the objectives of corridor preservation and presents case studies illustrating the application of corridor preservation efforts. The course covers the following issues: 1) the nature and magnitude of the problem corridor preservation is intended to address; 2) the impact of the National Environmental Policy Act (NEPA) on corridor preservation; 3) use of the products from the transportation planning process; 4) land use controls; and, 5) public/private partnerships. The case studies identify various approaches to corridor preservation including different levels of corridor analysis (i.e., planning studies, feasibility analyses, and phased environmental documents) and various types of land use controls.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the roles and contributions that the planning, project development/environment, and right-of-way disciplines can make to a corridor preservation program.
2. Identify the potential transportation corridors that are good candidates for preservation actions.
3. Understand the advantages and disadvantages of various corridor preservation techniques.
4. Determine the appropriate corridor preservation technique that applies under various conditions.

TARGET AUDIENCE: Technical staff involved in project development, planning, project development, and right-of-way functions at the Federal, State, and local levels.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Robert Wheeler (202) 366-2029 e-mail: robert.wheeler@fhwa.dot.gov

COURSE NUMBER: 15129

COURSE TITLE: Applications of Geographic Information Systems for Transportation

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides an overview of Geographic Information Systems for Transportation (GIS-T) and current state of practice at the Federal, State, and local levels. The course covers fundamentals of GIS-T, costs and benefits of GIS-T, implementation of GIS-T, street network files, data layering and cartographic, spatial database management, Linear Referencing System, and developmental framework for GIS. The course modules are punctuated by examples and demonstrations of best practices for local agencies.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the current state of practice by DOTs and MPOs in GIS-T.
2. Discuss the components of building a GIS-T.
3. Discuss the information management components of GIS-T.

TARGET AUDIENCE: FHWA, State, and local transportation professionals involved in GIS-T and information management.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Aung Gye (202) 366-2167 e-mail: aung.gye@fhwa.dot.gov

COURSE NUMBER: 15121

COURSE TITLE: Administration of FHWA Planning Grants

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: The course covers the responsibilities and relationships among Federal, State, and local agencies involved in administration of FHWA planning grants to States and State subgrants to MPOs and local governments.

The course provides a forum for FHWA planning and financial staff, State, Metropolitan Planning Organization, and other local agency staff to discuss the Federal requirements associated with highway planning program grant administration.

The course covers current changes to relevant administrative regulations and directives including: OMB Circular A-102; 49 CFR Part 18, Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments (US DOT's regulations implementing Circular A-102); and 23 CFR Part 420 FHWA's regulations for highway planning and research funds). Limited coverage of allowable costs, cost allocation plans, and audit requirements is also included.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Apply FHWA's regulations for administration of highway planning program grants and subgrants and the relationships among these regulations and 49 CFR Part 18 and applicable OMB Circulars.
2. Identify the relationships among the FHWA regulations and 49 CFR Part 18 and applicable OMB Circulars.
3. Discuss the administrative responsibilities of each agency involved in administration of FHWA highway planning program grants and subgrants.

TARGET AUDIENCE: FHWA, State, Metropolitan Planning Organizations, and local planning agencies who are involved with the use and administration of FHWA planning and research funds. Involvement in the use and administration of FHWA planning and research funds would be beneficial.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Tony Solury (202) 366-5003 e-mail: tony.solury@fhwa.dot.gov

COURSE NUMBER: 15118

COURSE TITLE: **Application of the FHWA Traffic Monitoring Guide**

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 30

DESCRIPTION: This course covers the application of procedures used as published in the FHWA's Traffic Monitoring Guide (TMG) and other recent developments in traffic monitoring, including:

- An overview of the application of the TMG procedures to develop data and information needed to support State and National programs including the Highway Performance Monitoring System (HPMS), pavement management, safety management, congestion management, and environmental management.
- Discussion with attendees on specific issues that impact the application of the TMG procedure in traffic counting, vehicle weighing, etc.
- Discussion of automated procedures for data collection and analysis and presentation of examples.
- Discussion of the AASHTO guidelines for traffic monitoring and the coordination of data collection to other Federal and national programs.
- Discussion of Traffic Monitoring System required in ISTEA.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the purpose and appropriate use of the TMG procedures.
2. Use the procedures for obtaining data for Federal and State programs.
3. Apply the data obtained to answer specific questions on Federal and State issues regarding traffic monitoring.

TARGET AUDIENCE: FHWA field office planners, and State personnel responsible for or interested in traffic counting, vehicle classification, or truck weight data programs.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Antonio Esteve (202) 366-5051 e-mail: antonio.esteve@fhwa.dot.gov

COURSE NUMBER: 14228

COURSE TITLE: Environmental Training Center (ETC): Managing the Environmental Process

COURSE ANNOUNCEMENT: New Announcement Issued Annually For Nominations
(Six Sessions Per Year)

COURSE FEE: \$1,500/\$3,000 per person (See GENERAL INFORMATION section)

LENGTH: 3 weeks (CEU: 9.0 Units)

CLASS SIZE: 35

DESCRIPTION: This program provides participants with the tools needed to manage the environmental process for transportation agencies. The FHWA Environmental Policy Statement and the Intermodal Surface Transportation Efficiency Act (ISTEA) have mandated that land use, environmental, and transportation planning be integrated. The ETC focuses on methods to fully integrate environmental considerations into agency policies, procedures, and the decision making process. The course emphasizes early and continuous involvement of Federal, State, and local governments and the increased decision making role of environmental agencies such as the Environmental Protection Agency and the Army Corps of Engineers resulting from the Clean Air Act Amendments and the Clean Water Act. Technical requirements for environmental documents using the FHWA/NEPA framework are addressed in light of the organizational and functional relationships that identify the importance and interrelation-ship of the various environmental requirements. The goal is to manage the project development process in such a way that good project decisions are made and that environmental commitments are accomplished.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Apply the environmental ethic articulated in the FHWA Environmental Policy Statement.
2. Identify the interrelationship of the various environmental requirements that must be applied to transportation planning and project development.
3. Develop organizational structures and consensus building techniques to facilitate the cooperative achievement of land use, environmental and transportation goals.
4. Coordinate with other Federal, State, and local agencies as well as groups representing community, environmental, and business interests.

TARGET AUDIENCE: Federal, State and local transportation agency personnel responsible for managing environmental or planning programs. Participants should have a basic knowledge of Federal environmental regulations.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Robert Wheeler (202) 366-2029 e-mail: robert.wheeler@fhwa.dot.gov

TARGET AUDIENCE: State DOT personnel who have professional/technical responsibilities relating to highway design, construction, operation, or maintenance activities affecting wetlands. Other Federal, State, local government, and industry personnel with related responsibilities may be permitted to attend on a space available basis. A basic understanding of Federal regulations concerning wetlands will be helpful. In addition, participants need at least one of the following: (1) experience in the highway project development process; (2) experience in highway project planning and design; (3) experience in natural resources regulation and management; or (4) experience in ecological assessment and mitigation design.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov
TECHNICAL INFORMATION: Paul Garrett (202) 366-2067 e-mail: paul.garrett@fhwa.dot.gov

COURSE NUMBER: 14218

COURSE TITLE: Functional Assessment of Wetlands (WET II)

COURSE FEE: \$3,500/\$7,000 - 2 Days (See GENERAL INFORMATION section)
\$5,000/\$10,000 - 3 Days (See GENERAL INFORMATION section)
\$6,500/\$13,000 - 4 Days (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)
3 Days (CEU: 1.8 Units)
4 Days (CEU: 2.4 Units)

CLASS SIZE: 30

DESCRIPTION: This course provides an overview of wetland regulations and ecology, impact of highways on wetlands, mitigation projects, and methods of assessing wetland functional values. The course is available in three versions, either totally classroom or classroom and field exercises. The classroom only version is a two day presentation, with the emphasize on the HGM (hydrogeomorphic), WET II (Wetland Evaluation Technique), and EPW (Evaluation of Planned Wetland) functional assessment techniques. The classroom and field exercise option is used to demonstrate the wetlands assessment and analysis techniques presented in the course, including wetland regulations, wetland ecology, and mitigation planning. The classroom and field option is available in three and four day versions.

SPECIAL NOTE: Selection of the 2, 3, or 4-day course version should be determined after discussion with the TECHNICAL INFORMATION contact named below.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize requirements and basic principles for regulatory compliance, wetlands impact assessment, and mitigation under NEPA and Section 404, Clean Water Act, including the 404 b (1) guidelines.
2. Identify wetlands definitions, delineation, and classification, including the USFWS and HGM functional classifications.
3. Describe the common ecological functions and values of wetlands.
4. Identify the essentials of functional assessment of wetlands and characteristics of a wetland associated with various functions. Interpret field observations of wetland conditions relative to functions and societal values.
5. Review Wetlands Assessments for NEPA compliance and 404 permit applications; perform a wetlands assessment at WET Level 1 or equivalent. Perform (for Biologists) Wetlands Assessments for NEPA compliance, 404 permit applications, and mitigation projects.
6. Recognize the Hydrogeomorphic Functional (HGM) Assessment methodology, the Evaluation Technique (WET). Biologists demonstrate functional assessments of wetlands for alternatives analysis and selection for impact assessment according to principles of HGM, EPW, and WET.
7. Apply (for Biologists) HGM, WET, EPW methods to planning and development of wetland mitigation projects.
8. Identify principles, approaches, and policies for compensatory mitigation, including wetland banking and in lieu fee plans.

COURSE NUMBER: 14217 (Under development for late 1998)

COURSE TITLE: Fundamentals of Air Quality for Highway Planning and Project Development

COURSE FEE: \$8,000/\$16,000 (See GENERAL INFORMATION section)

LENGTH: 5 Days (CEU: 3.0 Units)

CLASS SIZE: 40

DESCRIPTION: This course covers transportation and air quality considerations at both the systems planning and project development stages of analysis. Through a combination of lecture, workshops, case studies, and computer exercises the following topics are addressed: 1) Federal legal and regulatory requirements; 2) atmospheric and meteorologic conditions of concern; 3) emission trends and characteristics of transportation activities; 4) analysis techniques at both regional and project levels of concern; and 5) documentation and reporting.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the air quality impacts of transportation along with trends and control options.
2. Interpret transportation-related air quality legislation and regulatory requirements.
3. Identify appropriate traffic, emission, and dispersion analysis approaches for both system planning and project development activities.
4. Select the appropriate analysis technique for assessing the air pollution impacts of transportation actions at the system, corridor, individual roadway, intersection, parking structure, or other factors related to the movement of people or goods.
5. Develop appropriate transportation/air quality reports.

TARGET AUDIENCE: Federal, State, and local transportation agency employees and other air quality personnel.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov
TECHNICAL INFORMATION: Richard Schoeneberg (202) 366-2076
e-mail: richard.schoeneberg@fhwa.dot.gov

COURSE NUMBER: 14213 (Under revision for late 1998)

COURSE TITLE: **Public Involvement During the Transportation Decision Making Process**

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 30 (minimum class size: 20)

DESCRIPTION: This workshop provides information and practical application of required and recommended public involvement processes and techniques. With the FHWA/National Environmental Policy Act (NEPA) process, other laws, regulations and policies as a foundation, the exercises provide opportunities to design public education, public involvement, advisory and joint planning activities, interagency coordination, decision making forums, and implementation and evaluation plans. The tools used include consensus building, conflict resolution, problem solving, and process improvement, among others.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify key points where public involvement is required by law, regulation or policy, as well as other opportunities to include public input.
2. Select appropriate strategies or techniques for interagency and community participation.
3. Create a public involvement plan for a model project and apply some of the involvement techniques in a laboratory setting.

TARGET AUDIENCE: Project development and design staff who will participate in any of the public involvement activities.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Florence Mills (202) 366-2062 e-mail: florence.mills@fhwa.dot.gov

COURSE NUMBER: 14211

COURSE TITLE: Historic and Archeological Preservation

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: The course provides instruction on the application of historic preservation procedures to locate and identify resources. This includes information on how to determine the effect of proposed highways on significant historic and archeological resources, and how to resolve the effects.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the objectives of the historic and archeological legislation for preservation of worthy sites.
2. Identify potential historic and archeological problems ahead of time through knowledge of what decisions must be made, when they should be made, who must make them, and what the ingredients of a sound decision are.
3. Describe the procedures and the coordination with other government agencies which are required by legislation and regulations for historic and archeological preservation.
4. Minimize historic and archeological problems by integrating mitigation measures into the planning and design of highway improvements in such a way as to maximize the project's benefits and minimize the detrimental effects.

TARGET AUDIENCE: State highway, local transportation agency, and FHWA personnel who coordinate environmental and preservation actions with respect to Federally funded highway projects which affect historic, archeological, and architectural resources. A working knowledge of Federal regulations concerning historic and archeological preservation is beneficial.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Bruce Eberle (202) 366-2060 e-mail: bruce.eberle@fhwa.dot.gov

COURSE NUMBER: 14207

COURSE TITLE: **Fundamentals and Abatement of Highway Traffic Noise**

COURSE FEE: \$6,500/\$13,000 (See GENERAL INFORMATION section)

LENGTH: 3 ½ Days (CEU: 2.1 Units)

CLASS SIZE: 30

DESCRIPTION: This course covers the requirements of 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, and the noise requirements of the National Environmental Policy Act of 1969. The course provides both technical and policy training.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Perform existing noise measurements with a sound level meter.
2. Utilize noise fundamentals to accomplish highway traffic noise prediction.
3. Identify highway traffic noise impacts.
4. Conduct analyses of noise abatement measures, including preliminary noise barrier analyses.
5. Prepare all necessary documentation to fulfill FHWA noise requirements.
6. Communicate the results of highway traffic noise analyses in meetings, correspondence, phone calls, conversations, etc.

TARGET AUDIENCE: Federal, State, and local personnel responsible for the analyses and abatement of highway traffic noise impacts.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Bob Armstrong (202) 366-2073 e-mail: robert.armstrong@fhwa.dot.gov

COURSE NUMBER: 14205

COURSE TITLE: Documenting NEPA and Transportation Decision Making

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 37

DESCRIPTION: This course covers the application of the FHWA/National Environmental Policy Act (NEPA) project development and decision making process, including the integration of social, environmental and economic factors for achieving decisions that are in the best overall public interest. The course examines the evolution of environmental policy by building on a framework of laws, regulations, policies, and guidance such as the NEPA, Council of Environmental Quality (CEQ) regulations, agency implementing regulations, and Section 4(f) of the Department of Transportation Act.

This course also covers initiatives such as the merger of environmental and permitting requirements; public involvement; interagency coordination; project streamlining and flexibility; corridor preservation; FHWA's mitigation and enhancement policy, and the role of transportation in achieving sustainable development.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Manage the NEPA and the transportation decision making process to address social, economic, and environmental (SEE) concerns in solving transportation problems.
2. Foster shared transportation decision making beginning in the early project development phase (scoping) and continuing through completion of a project. This includes using collaborative and consensus building techniques when working with stakeholders to identify major project issues and develop strategies to address those issues.
3. Organize and write well-designed, consistent, and analytical environmental documents that help public officials make project decisions based on understanding of environmental consequences, and that promote actions that protect, restore, and enhance the environment.

TARGET AUDIENCE: FHWA, other Federal agencies, States, Consultants acting for the States, local government, and MPO's who participate in the transportation environmental decision making process. A mix of personnel from these agencies is strongly encouraged.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Leland Dong (202) 366-2054 e-mail: leland.dong@fhwa.dot.gov

COURSE NUMBER: 14135

COURSE TITLE: **Fundamentals of Rural Appraisal (American Society of Farm Managers and Rural Appraisers Course A-10: Fundamentals of Rural Appraisal)**

COURSE FEE: \$8,000/\$16,000 plus textbooks (See GENERAL INFORMATION section)

Many participants may already have copies of the required texts for this course from having attended previous courses presented by the Appraisal Institute. In most instances only one copy of the dictionary is necessary per office. To avoid unnecessary costs, the Appraisal Institute will contact the local coordinator for the sponsoring agency prior to the course to determine how many more textbooks are required. Participants already in possession of a copy of the required text should bring the book to class. The instructors will advise FHWA of the number of additional books needed for participants. The following costs will be added to the course fee:

REQUIRED TEXT: *The Appraisal of Real Estate*, 10th edition = \$30 per copy

REQUIRED TEXT: *Rural Appraisal Manual*, 8th edition = \$50 per copy

LENGTH: 5 Days (CEU: 3.0 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides an introduction to rural appraising and discusses the basic concepts, principles, procedures, and valuation processes. In addition, this course will help participants develop an understanding of depreciation, income capitalization, sales analysis, and comparison processes as they relate to farms and rural properties. Topics include:

- Appraisal Concepts
- Foundations of Appraisal
- Valuation Process
- Legal Descriptions
- Area Descriptions
- Mathematics of Finance
- Cost Approach
- Sales Comparison Approach
- Income Approach

OBJECTIVES: Upon completion of the course, participants will be able to identify the basic concepts, principles, procedures, and techniques of rural real estate appraisal.

TARGET AUDIENCE: This course is suitable for individuals with some real estate background and practitioners in other real estate fields such as finance, sales, and government who want a broader knowledge of the rural appraisal process in addition to reinforcing their understanding of appraisal fundamentals.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Reginald Bessmer (202) 366-2037 e-mail: reginald.bessmer@fhwa.dot.gov

COURSE NUMBER: 14134

COURSE TITLE: Standards of Professional Practice, Part A (USPAP) [Appraisal Institute Course 410: Standards of Professional Practice, Part A (USPAP)]

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.6 Units)

CLASS SIZE: 40

DESCRIPTION: This course focuses on the Uniform Standard of Professional Appraisal Practice (USPAP), and is designed to comply with the requirements of State certified and licensed appraisers. The following topics include:

- Overview of Standards and Standards Rules 1-10 of the USPAP.
- Overview of Statements and Advisory Opinions on appraisal standards.
- Role of the appraiser and compliance with USPAP.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the standards of appraisal practice and the importance of ethical behavior and competent performance in the appraisal profession.
2. Identify the circumstances under which an appraiser may depart from accepted appraisal guidelines and recognize the applicability of the Jurisdictional Exception.
3. Define the terms as set forth in the Uniform Standards.
4. Analyze examples to determine if a specific behavior violates a specific standard, and suggest how a violation might have been avoided.

TARGET AUDIENCE: Individuals interested in real estate appraisal. The USPAP have been endorsed and adopted by the major appraisal organizations of the United States and Canada. Federal law requires that these standards be used as the basis for State appraiser certification programs.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Reginald Bessmer (202) 366-2037 e-mail: reginald.bessmer@fhwa.dot.gov

3. Identify the components of direct costs and indirect costs and explain the distinctions between them.
4. Demonstrate familiarity with the way cost indexes are used to analyze and predict trends in building cost estimates.
5. Demonstrate familiarity with the items that must be addressed in Self-Contained, Summary, and Restricted Appraisal Reports, and recognize the major components in a narrative appraisal report.
6. Recognize the definition of easement, and demonstrate familiarity with four kinds of easements.

TARGET AUDIENCE: Individuals interested in real estate appraisal may attend, but they should have previously attended NHI Course 14132 - Appraisal Principles (Appraisal Institute Course 110 or equivalent)

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Reginald Bessmer (202) 366-2037 e-mail: reginald.bessmer@fhwa.dot.gov

COURSE NUMBER: 14133

COURSE TITLE: Appraisal Procedures (Appraisal Institute Course 120: Appraisal Procedures)

COURSE FEE: \$8,000/\$16,000 plus textbooks (See GENERAL INFORMATION section)

Participants may already have copies of the required texts for this course from having attended previous courses by the Appraisal Institute. In most cases, only one copy of the dictionary is necessary per office. To avoid unnecessary costs, the Appraisal Institute will contact the local coordinator of the sponsoring agency prior to the course to determine how many more textbooks are required. Participants already in possession of a copy of the required text should bring the book to class. The instructors will advise FHWA of the number of additional books needed for participants. The following costs will be added to the course fee:

REQUIRED TEXT: *The Appraisal of Real Estate*, 10th edition = \$30 per copy
OPTIONAL TEXT: *The Dictionary of Real Estate Appraisal*, 3rd edition = \$20 per copy

LENGTH: 5 Days (CEU: 3.0 Units)

CLASS SIZE: 40

DESCRIPTION: This lecture and problem-solving course addresses the entire valuation process. Statistical concepts, compounding, discounting, and financial calculators are reviewed. The sales comparison and cost approaches are treated in depth. Fundamentals of the income capitalization approach are introduced and direct income capitalization techniques are demonstrated. Participants can explore a full range of valuation techniques and procedures, such as:

- Review of the Valuation Process
- Appraisal Mathematics
- Case Problems
- Land/Site Valuation
- Cost Approach
- Sales Comparison Approach
- Introduction to Income Capitalization Approach
- Reconciliation and Estimating Final Value
- Appraisal Reporting
- Valuation of Partial Interests.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the basic valuation formula and its variations, and the formulas and procedures used to calculate a mean, median, mode, and standard deviation. Then, given a set of numbers, calculate a mean, median, mode, and standard deviation on an HP calculator.
2. Demonstrate ability to apply the sales comparison approach, allocation, extraction and land residual technique, to estimate land or site value.

3. Demonstrate familiarity with the geographic, legal, social, and economic concepts of land and state the relationships between them.
4. Recognize the definitions of the following appraisal principles and be able to cite some practical demonstrations for the use of each: anticipation, change, supply and demand, competition, substitution, opportunity cost, balance, increasing and decreasing returns, contribution, surplus productivity, conformity, and externalities.
5. Calculate a remaining balance and the percentage paid off on a mortgage loan with a Hewlett Packard calculator, given the initial amount of the mortgage, the interest rate, the term, and the remaining term.
6. Recognize: typical characteristics of apartment, commercial, industrial, and agricultural districts, as well as speciality districts such as medical, research and development, high technology, education, and historic districts; and special problems in functional utility of commercial, industrial, storage, agricultural, and special-purpose properties.
7. Recognize the four criteria used in highs and best use analysis, and discern the criteria an appraiser should apply in a described situation.

TARGET AUDIENCE: Individuals interested in real estate appraisal.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Reginald Bessmer (202) 366-2037 e-mail: reginald.bessmer@fhwa.dot.gov

COURSE NUMBER: 14132

COURSE TITLE: Appraisal Principles (Appraisal Institute Course 110: Appraisal Principles)

COURSE FEE: \$8,000/\$16,000 plus textbooks (See GENERAL INFORMATION section)

Participants may already have copies of the required texts for this course from having attended previous courses presented by the Appraisal Institute. In most cases, only one copy of the dictionary is necessary per office. To avoid unnecessary costs, the Appraisal Institute will contact the local coordinator of the sponsoring agency prior to the course to determine the approximate number of participants that will be attending the course and the approximate number of textbooks that will be required. Participants already in possession of a copy of the required text should bring the book to class. The instructors will advise FHWA of the number of additional books needed for participants. The following costs will be added to the course fee:

REQUIRED TEXT: *The Appraisal of Real Estate*, 10th edition = \$30 per copy
OPTIONAL TEXT: *The Dictionary of Real Estate Appraisal*, 3rd edition = \$20 per copy

LENGTH: 5 Days (CEU: 3.0 Units)

CLASS SIZE: 40

DESCRIPTION: Participants are introduced to basic valuation principles that are consistent with current appraisal policy. The course material addresses the level of performance required in appraisal analysis and reports. This course is designed to establish an understanding of the basis for appraisal judgement and the context in which this judgement is applied, which includes topics such as:

- Nature of Appraisals
- Real Estate Markets
- Nature of Value
- Valuation Process
- Money Capital Markets
- Data Collection
- Neighborhoods and Districts
- Land and Site Description
- Improvements Description
- Highest and Best Use.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Demonstrate familiarity with, and recognize the applicability of, the Uniform Standards of Professional Appraisal Practice.
2. Recognize the definitions of appraisal, valuation, and evaluation and be able to explain the differences between them.

COURSE NUMBER: 14131

COURSE TITLE: Business Relocation

COURSE FEE: \$5,000/\$10,000 (See General Information section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 35

DESCRIPTION: This course provides all information dealing with the various aspects of business relocation. The course is designed to increase the knowledge of personnel engaged in the relocation of businesses, farms, and non-profit organizations. The main topics will include: (1) Eligibility; (2) Moving Payments and Benefits; (3) Advisory Services; (4) Actual Direct Loss of Tangible Personal Property; (5) Searching Expenses; (6) Fixed Payments (ILO); and (7) Reestablishment Expense.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Demonstrate an understanding of the factors involved in difficult subject areas such as move cost estimating, farms, nonprofit organizations, fixed payments (ILO), and reestablishment payments.
2. Provide directly or assist others in providing advisory assistance in relocating businesses, farms, and non-profit organizations.
3. Identify the sources of moving cost data and the assemblage of data including inventories, specifications, profit and loss relationships, bids and estimates.

TARGET AUDIENCE: State Departments of Transportation, Local Public Agencies, FHWA personnel, and other Federal Agency personnel. Participants must have knowledge of the relocation program.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Ron Fannin (202) 366-2042 e-mail: ronald.fannin@fhwa.dot.gov

COURSE NUMBER: 14130

COURSE TITLE: Advanced Relocation Workshop

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 35

DESCRIPTION: The course will go beyond the basic functional areas of relocation assistance and concentrate on areas of specific concern, such as: comparability, mortgage interest differential payments, last resort housing, multiple use, tenants, farms, and non-residential moves. The course has been modularized to allow flexibility in adjusting the subject material to meet the needs of the requesting agency.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Demonstrate an understanding of the principles underlying provisions of the Uniform Relocation Act and implementing regulations.
2. Demonstrate an understanding of the factors involved in difficult subject areas such as mortgage interest differential payments, settlement costs, last resort housing, mobile homes, farms, and other non-residential moving payments.
3. Provide directly or assist others in providing advisory assistance in difficult cases.
4. Determine directly or assist others in determining eligibility for certain relocation payments in difficult cases.
5. Demonstrate an understanding of complex non-residential moving costs.

TARGET AUDIENCE: Federal, State, and local public agencies, FHWA personnel, and other interested persons. Broad knowledge of the requirements of the Uniform Relocation Act and the implementing regulations of 49 CFR Part 24, or have attended course 14129 - Basic Relocation, or approximately one year of experience working in the relocation program is recommended.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Ron Fannin (202) 366-2042 e-mail: ronald.fannin@fhwa.dot.gov

COURSE NUMBER: 14129

COURSE TITLE: Basic Relocation

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 35

DESCRIPTION: The course is designed for the beginning relocation agent or for those persons interested in a basic knowledge of the Uniform Relocation Act. The purpose is to answer questions, meet the need, and broaden the knowledge of those engaged in the relocation of persons as a result of the acquisition of real property required for a Federal or Federally funded project. The course covers all functional areas of the relocation assistance program with emphasis on residential displaces.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Demonstrate an understanding of the principles underlying provisions of the Uniform Act and implementing regulations.
2. Provide advisory services within his/her area of expertise.
3. Identify services available from other agencies.
4. Explain requirements for comparability to include decent, safe and sanitary housing.
5. Compute moving costs and replacement housing payments.
6. Explain the basic concept of last resort housing.
7. Explain the appeal procedure for displaces.

TARGET AUDIENCE: Federal, State, and local public agencies, FHWA personnel, and other interested persons.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Ron Fannin (202) 366-2042 e-mail: ronald.fannin@fhwa.dot.gov

COURSE NUMBER: 14128

COURSE TITLE: Highway/Utility Coordination Issues

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course is based on the "Highway/Utility Guide," providing training in the efficient usage of crowded rights-of-way for highway and utility purposes. Two instructors will conduct this presentation, one experienced in highway matters; the other instructor in utility matters. The course will address the following topics:

- Historical Perspective
- Planning and Coordination
- Design
- Permits
- Information Management
- Mapping
- Notification
- Legal Issues
- Safety
- Construction
- Maintenance
- Reimbursement

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the problems counterparts in highway/utility relations face.
2. List coordination activities performed by innovative agencies.
3. Identify highway/utility facilities in need of safety treatments.
4. Explain "credits" to highway agencies during reimbursable utility relocations.

TARGET AUDIENCE: Federal, State, and local agencies, including public/private utility companies who are responsible for highway/utility coordination matters and have knowledge of joint use issues.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Paul Scott (202) 366-4104 e-mail: paul.scott@fhwa.dot.gov

COURSE NUMBER: 14126

COURSE TITLE: Appraisal and Appraisal Review for Federal-Aid Highway Programs

COURSE FEE: \$6,500/\$13,000 (See GENERAL INFORMATION section)

LENGTH: 4 Days (CEU: 2.4 Units)

CLASS SIZE: 40

DESCRIPTION: The course will address the following topics:

- Appraisal Standards
- Appraisal Program Management
- Appraisal Process
- Partial Acquisitions
- Appraisal Content
- Special Appraisal Problems
- Appraisal Review: Responsibility, Litigation and Testimony

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify the appraisal process for eminent domain acquisition programs.
2. Apply current appraisal standards and enhance their understanding of the appraisal process.
3. Manage appraisal programs.
4. Demonstrate the appraisal of partial acquisitions and appraisal reviewer responsibility.
5. Recognize special appraisal problems.
6. Describe the actions and duties of appraisers in litigation and testimony for eminent domain condemnation.

TARGET AUDIENCE: Local Public Agencies, State and FHWA personnel involved in appraisal and appraisal review activities. Previous appraisal knowledge and experience under Federal-aid programs or at least one professional appraisal course is required.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Reginald Bessmer (202) 366-2037 e-mail: reginald.bessmer@fhwa.dot.gov

COURSE NUMBER: 13605 (Available Late Summer 1998)

COURSE TITLE: Intelligent Transportation Systems (ITS) Telecommunications Overview

COURSE FEE: To be determined. Check the NHI web site at <http://www.nhi.fhwa.dot.gov>

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 30

DESCRIPTION: This course is designed to introduce ITS telecommunications to those who have little or no previous exposure to the issues surrounding the deployment and use of telecommunications infrastructure. It introduces participants to the fundamentals of wireline and wireless telecommunications systems. The course concludes with a brief discussion of the telecommunications technology acquisition process.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Distinguish between the uses of different telecommunications technologies for traffic management applications.
2. Determine which technologies to use.
3. Explore ownership and leasing options.
4. Describe uses for the Global Positioning System (GPS).
5. List issues relating to the availability of radio frequencies for public radio applications and data exchange standards.
6. Describe how Dedicated Short Range Communications (DSRC) are used in ITS applications.
7. Describe how different telecommunication technologies are used to convey travel information.

TARGET AUDIENCE: This course is for transportation managers and engineers involved in policy making, procurement, planning, program development, and legal aspects of ITS infrastructure deployment.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Lisa Dignazio (202) 366-2160 e-mail: lisa.dignazio@fhwa.dot.gov

COURSE NUMBER: 13604 (Available Late Summer 1998)

COURSE TITLE: Intelligent Transportation Systems (ITS) and the Transportation Planning Process

COURSE FEE: To be determined. Check the NHI web site at <http://www.nhi.fhwa.dot.gov>

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 30

DESCRIPTION: This course provides participants with information on how ITS strategies, individually or as a component of other transportation improvements, can assist in meeting needs identified through the transportation planning process. It acquaints participants with information needed to advance ITS strategies for implementation within the context of typical transportation planning processes. The course identifies key success factors for implementing ITS over time. The course covers topics such as transportation plans and programs, system performance criteria, benefit cost analysis, financial planning, and working with the private sector. Case study information on the development of ITS in specific areas of the U.S. is included.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Explain how to incorporate ITS into the transportation planning and programming decision making process.
2. Recognize the value of operational and management strategies, including ITS, to address transportation needs.
3. Identify key planning process elements/products where ITS should be addressed.
4. Identify key players and their roles and responsibilities in the transportation planning and ITS development processes.

TARGET AUDIENCE: This course is for transportation staff involved in planning, systems engineering, project development, and finance.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Sheldon Edner (202) 366-4066 e-mail: sheldon.edner@fhwa.dot.gov

COURSE NUMBER: 13603 (Available Late Summer 1998)

COURSE TITLE: Intelligent Transportation Systems (ITS) Public/Private Partnerships

COURSE FEE: To be determined. Check the NHI web site at <http://www.nhi.fhwa.dot.gov>

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 30

DESCRIPTION: This course describes various types of cooperative public/private partnerships. It presents public/private partnership models for cost sharing, shared deployment, and franchising. It also identifies institutional impediments, discusses sharing in ITS partnering, and presents successful case studies.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Define sectorial collaboration and partnerships and explain the importance and necessity of partnerships to ITS.
2. Identify opportunities for contributions by various components of both the public and private sectors.
3. Outline the roles and responsibilities of key players -- public and private -- in terms of "models."
4. Identify barriers to partnering at the institutional, program and project level, and approaches to overcoming barriers at each level.

TARGET AUDIENCE: This seminar is for transportation staff involved in planning, funding, program development, organizational, institutional, and legal aspects of ITS infrastructure deployment.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Barry Zimmer (202) 366-4082 e-mail: barry.zimmer@fhwa.dot.gov

COURSE NUMBER: 13602 (Available Late Summer 1998)

COURSE TITLE: Deploying Integrated Intelligent Transportation Systems (ITS)

COURSE FEE: To be determined. Check the NHI web site at <http://www.nhi.fhwa.dot.gov>

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course supports integrated intelligent transportation system infrastructure deployment with consideration of the National ITS Architecture. The regional context in which the public components of ITS infrastructure will be implemented and integrated is emphasized. The course combines the technical and institutional components of integrated ITS infrastructure. The importance of each component is discussed and placed in context with the regional decision that must be made by State and local agencies. Transportation program managers will obtain an understanding of the technical and institutional implications, deploying integrated infrastructure within the framework of the National ITS Architecture.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify the benefits provided by integrated, intermodal ITS.
2. Identify the agencies with whom information should be shared in integrating ITS.
3. Describe the various "types" of information sharing that exist in today's transportation environment.
4. Describe the National ITS Architecture and how it can be used as a time saving tool to implement integrated ITS.
5. Explain the technical challenges that must be addressed to successfully deploy an integrated ITS.
6. Recognize procurement alternatives.

TARGET AUDIENCE: Transportation program managers currently involved in ITS or expected to be involved in ITS planning, implementation, operation, or maintenance.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Larry Swartzlander (202) 366-6066
e-mail: larry.swartzlander@fhwa.dot.gov

COURSE NUMBER: 13601 (Available Late Summer 1998)

COURSE TITLE: Intelligent Transportation Systems (ITS) Awareness Seminar

COURSE FEE: To be determined. Check the NHI web site at <http://www.nhi.fhwa.dot.gov>

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 30

DESCRIPTION: This provides an overall understanding of ITS and ITS infrastructure. The course illustrates the nine ITS infrastructure components by showcasing those systems that are deployed around the country. Institutional and technical elements in deploying ITS infrastructure are presented. This course includes planning, design, architecture, standards, procurement, installation and construction, operation and maintenance, and funding. The course emphasizes for participants benefit cost issues related to ITS and ITS infrastructure implementation. Qualitative and quantitative benefits of ITS are presented through examples of systems deployed around the country.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Discuss the benefits of ITS components and support technology.
2. Recognize the components and supporting technology for Intelligent Vehicle and Commercial Vehicle Operations.
3. Explain the importance of bringing stakeholders together.
4. Describe how ITS can be incrementally applied.
5. Identify sources of information on ITS subjects.
6. Explain the role of planning in identifying needed transportation improvements.
7. Recognize the need to include ITS into the Planning Program.

TARGET AUDIENCE: This course is for transportation professionals who are currently not involved in ITS, but expect to be involved in ITS planning, implementation, operations, or maintenance.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Wayne Berman (202) 366-4069 e-mail: wayne.berman@fhwa.dot.gov

COURSE NUMBER: 13446 (Under development for Summer 1998)

COURSE TITLE: Identifying and Controlling Erosion and Sedimentation

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: Target of 30, maximum of 60

DESCRIPTION: This course addresses management techniques for controlling erosion and sedimentation on highway construction projects during planning, design, construction, and maintenance. Methods to identify the source of the erosion and sedimentation are presented, including best management practices to insure the current legislative and regulatory requirements of FHWA, EPA, and local governments are met. This course includes the following topics:

- Project planning and site selection
- Erosion and sediment control devices and their uses
- Basic mechanism of erosion and sedimentation
- Development of an erosion and sediment control plan
- Stormwater and non-point source control
- Construction operations and erosion and sediment control plan implementation
- Maintenance and inspection of erosion and sediment control devices
- Regulatory requirements

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the mechanics of erosion, sedimentation, and non point source pollution in highway runoff.
2. Identify the basic uses, effectiveness, and limitations of best management practices.
3. Identify and plan for potential erosion, sediment and non point source pollution control problems during project location and design.
4. Develop, implement, maintain, and modify an erosion and sediment control plan.
5. Apply basic requirements for operation, inspection and maintenance of structural and non-structural best management practices.

TARGET AUDIENCE: Federal, State, local, and private contractor managers, designers, engineers, technicians, and inspectors who are involved with the basic selection, design, construction, and maintenance of erosion and sediment control plans. A knowledge of hydrology and drainage, and a basic understanding of design, construction, and maintenance of erosion and sediment control practices would be beneficial.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Bill Dowd (202) 366-1580 e-mail: william.dowd@fhwa.dot.gov

COURSE NUMBER: **13445** (Under development for Summer 1998)

COURSE TITLE: **Identifying and Controlling Runoff Pollution from Roads, Highways and Bridges**

COURSE FEE: **\$2,500/\$5,000** (See GENERAL INFORMATION section)

LENGTH: **1 Day (CEU: 0.6 Units)**

CLASS SIZE: **Target of 30, Maximum of 60**

DESCRIPTION: This elementary course teaches management practices to control erosion and sedimentation on highway construction and maintenance projects. Basic methods to identify erosion and sedimentation sources are shown, and then techniques are presented to plan, select, and install the appropriate controls. This course includes the following topics:

- Project planning and site selection
- Erosion and sediment control devices and their uses
- Basic mechanism of erosion and sedimentation
- Development of an erosion and sediment control plan
- Stormwater and non-point source control
- Construction operations and erosion and sediment control plan implementation
- Maintenance and inspection of erosion and sediment control devices
- Regulatory requirements

OBJECTIVES: Upon completion of, course participants will be able to:

1. Design, develop, install, and maintain an erosion and sediment control plan.
2. Describe the mechanics of erosion, sedimentation, and non point source pollution in highway runoff.
3. Identify the basic uses, operations, effectiveness, and limitations of best management practices.

TARGET AUDIENCE: Personnel of Federal agencies, contractors, and other individuals who manage erosion control devices on local projects that require basic site selection, design, construction, and maintenance of erosion and sediment control plans. Basic knowledge of design, construction, and maintenance of erosion and sediment control practices would be beneficial.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Bill Dowd (202) 366-1580 e-mail: william.dowd@fhwa.dot.gov

TARGET AUDIENCE: State transportation personnel involved with writing and administering contracts related to transportation construction and maintenance.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov
TECHNICAL INFORMATION: Gerald Yakowenko (202) 366-1562
e-mail: gerald.yakowenko@fhwa.dot.gov

COURSE NUMBER: 13444

COURSE TITLE: **Partnering Concepts**

COURSE FEE: \$2,500/\$5,000 - 1 Day Summary Course (See GENERAL INFORMATION sect.)
\$3,500/\$7,000 - 2 Day Workshop (See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)
2 Days (CEU: 1.2 Units)

CLASS SIZE: 30

DESCRIPTION: The goal of the course is to provide skills and knowledge in the following areas:

Developing a positive attitude toward Partnering.

This is done by first explaining what Partnering is and how it works. Next, the rewards of Partnering will be discussed. Finally, the concept of team building on the construction project will be covered.

Educating the participants on the Partnering workshop.

This area covers the initial project Partnering workshop and a subsequent workshop that may be required on a job. Since this is the actual start of the process on the project, it is vitally important to the success of the program.

Explaining and drafting a sample Partnering charter.

Since Partnering is a formalization of a communication process, the charter forces all members of the project team to identify what they must do. It serves not only as a guideline for the process, but as a constant reminder of what duties must be performed for Partnering to be successful.

Describing the purpose and use of Partnering meeting and evaluations.

This area is the actual implementation of the Partnering process. The participants need to recognize that Partnering must be practiced throughout the project. It cannot just be a half-hearted attempt at the beginning of the job. It must be utilized, reviewed, and evaluated throughout the project so that it will continue to function throughout the duration of the job.

As each topic is discussed during the training session, the appropriate corresponding practical exercises will be performed by the participants. For instance, the trainees will be given background information on a project and then be required to draft a Partnering charter to be used as a guideline for the job. Similarly, when attitude is discussed, the participants will have an exercise in identifying the biases and stereotypes that the various parties to the construction project may have. This will allow them to realize what they must guard for during the course of the job, since these biases are a major impediment to the Partnering process.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify Partnering concepts.
2. Recognize the benefits of the Partnering process.
3. Plan and apply approaches for on-the-job application.

11. Recognize the elements of acceptance plans, including buyer and seller risks.
12. Recognize the elements of a quality assurance system.

TARGET AUDIENCE: Federal, State, and local highway agency materials, construction, research and other highway engineers and technicians involved in specification development, the laboratory, and field testing of highway materials.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov
TECHNICAL INFORMATION: Don Tuggle (202) 366-1553 e-mail: donald.tuggle@fhwa.dot.gov

COURSE NUMBER: 13442

COURSE TITLE: Materials Control and Acceptance - Quality Assurance

COURSE FEE: \$8,000/\$16,000 (See GENERAL INFORMATION section)

LENGTH: 4 1/2 Days (CEU: 2.7 Units)

CLASS SIZE: 40

DESCRIPTION: This 4 1/2-day quality course that uses statistics is presented over a 5-day period, normally starting at 8 a.m. on the first day and concluding at noon on the fifth day. A variety of instructional techniques are employed, including lectures, discussions, case studies and workshops, as well as the use of visual aids. Participants will receive a copy of the course notes, which should serve as a valuable future reference on the subject. The following sessions are included in the course:

- Introduction
- Sampling Theory
- Organization of Data
- Analysis of Data
- The Normal Distribution
- Sources of Variability
- Process Control
- Acceptance Plans and Risks
- Percent within Limits Acceptance Plans
- Implementation
- Summary

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the importance of organizing data, necessary forms of data organization and how to plot frequency histograms.
2. Recognize how a sample relates to the population, including the "myth of a single representative sample," establish and use random stratified random sampling plans.
3. Calculate population and sample means standard deviations and coefficient of variation.
4. Recognize the relationship between single and multiple samples.
5. Recognize basic probability concepts, illustrate the relationship of histograms to probability density functions and calculate areas under normal.
6. Explain the meaning of the terms precision, accuracy, and bias.
7. Identify sources of variability and how to use precision and bias statements.
8. Develop and apply process control plans, including how to calculate control chart limits and to plot and interpret statistical control charts.
9. Recognize the strengths and weaknesses of acceptance plans based on sample means and percent within limits (PWL).
10. Recognize the different types of specifications and how they work, including the inputs to specifications and requirements for the use of contractors.

COURSE NUMBER: 13440

COURSE TITLE: Slope Maintenance and Slide Restoration

COURSE FEE: \$2,500/\$5,000 (See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 40

DESCRIPTION: The course provides user-oriented training for first-level road maintenance supervisors and will assist supervisors in making quick technical decisions in their routine maintenance work and emergency situations.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the different types of highway slope movements.
2. Describe why slopes move in certain ways.
3. Identify the many features that may indicate slope problems and the need for preventive maintenance.
4. Identify those maintenance practices that should be performed and those that should be avoided.
5. Identify the various methods of repairing, protecting, and restoring, or reinstatement of highway slopes.
6. Recognize the safety measures and legal liabilities involved in slope maintenance and slide restoration.

TARGET AUDIENCE: Federal Highway Administration (FHWA), State and local agency engineers and technicians having duties and responsibilities in highway slope maintenance and slide restoration.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Bill Dowd (202) 366-1580 e-mail: william.dowd@fhwa.dot.gov

COURSE NUMBER: 13429

COURSE TITLE: Bridge Maintenance Training

COURSE FEE: \$8000/\$16,000 (See GENERAL INFORMATION section)

LENGTH: 4 ½ Days (CEU: 2.7 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides training to bridge maintenance personnel at various levels in planning, scheduling, and accomplishing routine maintenance for structures. Topics addressed, but are not limited, to the use of materials for bridge repairs, available equipment for maintenance of structures and work methods. Additional topics include: the effective management, evaluation of maintenance alternatives and prioritizing work, and mechanics of structures.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Justify, develop and implement a cost-effective preventive maintenance strategy for a specified number of bridges.
2. Detect problems related to deferred maintenance, which include the bridge condition worsening over time, expensive and reactionary maintenance activities, and unsatisfactory public relations.
3. Describe common bridge types and components, their function and operational requirements, and the impact of poor maintenance on each.
4. Evaluate existing bridge to identify maintenance or repair needs and select the best remedial strategy.
5. Execute repairs and treatments of common bridge materials such as concrete, metal and timber.
6. Perform the step-by-step tasks required to accomplish over 100 proven maintenance procedures on all the various parts of typical bridges to preserve, or upgrade, the current condition and, thereby, extend the service life.
7. Identify critical members and avoid procedures that might result in damage such as field welding repairs on fracture critical tension members.
8. Recognize problems that warrant specialized expertise.
9. Prioritize the safety of the public and agency employees during bridge maintenance operations.
10. Apply environmental protection requirements to planned bridge maintenance operations.
11. Collect bridge management system input data that will allow the system to produce meaningful management reports.
12. Exercise effective management techniques (such as planning, scheduling, monitoring and reporting) during daily bridge maintenance operations.

TARGET AUDIENCE: State and local bridge maintenance technicians and supervisors.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov
TECHNICAL INFORMATION: Bill Dowd (202) 366-1580 e-mail: william.dowd@fhwa.dot.gov

COURSE NUMBER: 13405

COURSE TITLE: Value Engineering Workshop

COURSE FEE: \$8,000/\$16,000 (See GENERAL INFORMATION section)

LENGTH: 5 Days (CEU: 3.0 Units)

CLASS SIZE: 40

DESCRIPTION: Value Engineering is the systematic process of review and analysis of a project during its design/development phase to provide suggestions for reducing its total cost while providing an equal or better quality project. A Value Engineering review is made by a multi-disciplined team who's objective is to: (1)investigate/analyze the design of an existing project; (2) analyze project functions and costs; (3) creatively speculate on alternative ways to perform the various functions; (4) evaluate the best and/or least life-cycle alternatives; (5) develop acceptable alternatives into fully supported recommendations; and (6) present the team's recommendations to management. This workshop provides the Value Engineering education necessary for the participants to successfully participate in future value studies. It also encourages formation of interactive Value Engineering teams at the State and division office level. The workshop incorporates value analysis of actual projects furnished by the host agency.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the difference between Value Engineering and other cost reduction or problem solving techniques.
2. Identify areas where the application of Value Engineering techniques have potential for savings in financial or material resources.
3. Participate in a Value Engineering team and provide guidance to team members who have less experience.
4. Support the use of Value Engineering, recognizing it as a management tool for product improvement and cost reduction.

TARGET AUDIENCE: Professional and technical staff of FHWA and State highway/transportation departments, including officials of local transportation agencies involved in recurrent Federal-aid work.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION:Keith Borkenhagen (202) 366-4630 e-mail: keith.borkenhagen@fhwa.dot.gov

COURSE NUMBER: 13401

COURSE TITLE: Principles of Writing Highway Construction Specifications

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 25

DESCRIPTION: This course addresses the engineering, legal aspects, and linguistics of writing specifications. **THIS IS NOT A COURSE IN TECHNICAL WRITING!** The course, however, addresses the issues of how to draft new specifications or rewrite existing ones into clear, readable, and definitive statements of contract requirements. Classroom activities include: lectures, case studies, workshops and writing assignments.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize and apply the principles to write clear, concise, complete, and technically correct specification.
2. Write specifications in the active voice imperative mood.
3. Write specifications without ambiguities and with measurable standards.
4. Describe the difference between traditional methods specifications and statistically-based quality assurance specifications.
5. Identify newer types of procurement and contracting methods.
6. Demonstrate appreciation for the importance of specifications for highway construction contracting.

TARGET AUDIENCE: Personnel working in contract administration, design, materials selection and quality control, and the management of highway construction, including contribution of information in contract provisions. This includes specification writers who use the information in writing the formal contract documents.

PREREQUISITES: This course is not for beginners! Participants must have experience (five years are recommended as a minimum) in at least one of the following disciplines:

- Contract Administration
- Materials
- Specification Writing
- Roadway or Bridge Design
- Roadway or Bridge Construction

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Mike Rafalowski (202) 366-1571 e-mail: michael.rafalowski@fhwa.dot.gov

COURSE NUMBER: 13375

COURSE TITLE: Freeway Traffic Operations

COURSE FEE: \$5,000/\$10,000 - 3 Days (See GENERAL INFORMATION section)
\$8,000/\$16,000 - 5 Days (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)
5 Days (CEU: 3.0 Units)

CLASS SIZE: 40

DESCRIPTION: This course addresses basic traffic flow theory for freeways; evaluating freeway operations during project development and design. In addition, this course provides information on the freeway traffic control systems; traffic management centers; and operations analysis procedures for freeways.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify the interrelationships between various elements that affect freeway operations.
2. Identify the operational concerns of greatest significance.
3. Describe the concept of system integration and the relationships between freeway planning, design, construction, operations, safety, and maintenance issues.
4. Describe theoretical models for traffic flow theory.
5. Explain how freeway geometric characteristics affect operational efficiency.
6. Recognize the role of data in managing a freeway system and determine the most appropriate data to use and how to collect it.
7. Analyze the operational quality of various freeway components using the procedures described in the course.
8. Describe alternatives for controlling freeway traffic and its impact on operations.
9. Assess the effectiveness of various procedures for managing incidents that affect freeway operations.
10. Develop plans and procedures for managing scheduled activities to minimize the impacts on freeway operations.

TARGET AUDIENCE: Federal, State, and local transportation professionals involved in planning, design, and implementation of freeway traffic operational improvements.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Morris Oliver (202) 366-2251 e-mail: morris.oliver@fhwa.dot.gov

COURSE NUMBER: 13372

COURSE TITLE: High Occupancy Vehicle (HOV) Facilities

LENGTH: 1 Day (CEU: 0.6 Units) - \$2,500/\$5,000
2 Days (CEU: 1.2 Units) - \$3,500/\$7,000
3 Days (CEU: 1.8 Units) with 2 instructors - \$5,000/\$10,000
3 Days (CEU: 1.8 Units) with 3 instructors - \$6,500/\$13,000

CLASS SIZE: 40

DESCRIPTION: One of the approaches for improving urban mobility is to provide special facilities for high occupancy vehicles (HOV). These facilities offer vehicles with 2 or more persons reserved lanes, which save time over mixed-flow lanes, during peak traffic periods. The course addresses the planning, designing, implementing, operating, and evaluating of HOV facilities. The 1, 2, and 3-day versions of the course can be tailored to the needs of the host agency. For example, the 3-day course with 3 instructors includes a marketing instructor to address specific marketing topics. Other specialty subject modules include air quality conformity, enforcement strategies, access treatments, and transit considerations.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the role the HOV facilities serve.
2. Conduct planning studies for region-wide and corridor applications.
3. Identify various demand estimation procedures.
4. Apply public involvement techniques and strategies in project development.
5. Implement a marketing plan for HOV project roll-out.
6. Design HOV lanes, access ramps and supporting facilities.
7. Operate HOV facilities on streets and freeways.
8. Address key issues influencing the success of HOV projects.
9. Perform monitoring and evaluation HOV projects.

TARGET AUDIENCE: Practitioners at Federal, State and local levels responsible for planning, designing, implementing, operating, and evaluating HOV facilities.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Jon Obenberger (202) 366-2221 e-mail: jon.obenberger@fhwa.dot.gov

COURSE NUMBER: 13371

COURSE TITLE: Design and Application of Telecommuting Projects

COURSE FEE: \$2,500/\$5,000 (See GENERAL INFORMATION section)

LENGTH: 1 Days (CEU: 0.6 Units)

CLASS SIZE: 35

DESCRIPTION: This course provides participants with knowledge and skills on how to plan, develop, design, operate, and evaluate telecommuting projects for the public and private sectors. Specific information will be presented on the effectiveness and experience with telecommuting, including guidance on developing and evaluating telecommuting programs at employment sites and satellite centers. A variety of instructional techniques are employed, including lecture and discussion with visual aids, and workshops.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Explain the various forms of telecommuting, common myths and rationale.
2. Apply process steps to plan, implement and evaluate telecommute prototypes.
3. Recognize and proactively respond to telecommute program barriers.
4. Instill a "design for success" philosophy in telecommuter programs.

TARGET AUDIENCE: Staff from public agencies or private companies who are responsible for establishing and/or managing programs in telecommuting projects. The course is recommended for employee transportation coordinators, including the staff from Federal, State, or local agencies who work with or help support telecommuting or travel demand management program areas. Participants should have employment in, or responsibility for telecommuting or travel demand management programs.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Barry Zimmer (202) 366-4082 e-mail: barry.zimmer@fhwa.dot.gov

COURSE NUMBER: 13370

COURSE TITLE: **Design and Application of Travel Demand Management (TDM) Techniques, Not Including Telecommuting**

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 35

DESCRIPTION: Both courses, 13369 and 13370, address the planning, developing, designing, operating, and evaluating of TDM programs for the public and private sectors. Specific information is presented on the effectiveness and experience with a broad range of TDM actions that cover improved alternatives, incentives and disincentives, and alternative work arrangements. Guidance is presented on developing and evaluating TDM programs at employment sites. A computer model to evaluate the impact of TDM programs is also demonstrated. The lecture/discussion/workshop format provides an opportunity to discuss current research and technical assistance tools developed jointly through the FHWA and the Federal Transit Administration (FTA).

This course does not include information on telecommuting, while course 13369 does.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the major elements of TDM and how they can be applied in the public and private sectors.
2. Describe the actions necessary to plan design, implement, operate, and evaluate effective TDM projects in the public and private sectors.
3. Identify and describe the guidance materials and technical tools developed by the FHWA and the FTA for implementing effective travel demand management projects.

TARGET AUDIENCE: Staff from public agencies or private companies responsible for establishing and/or managing TDM programs. The course is recommended for employee transportation coordinators, including the staff from Federal, State, or local agencies who work with or help support demand management program areas. Participants should be employed in, or responsible for TDM programs.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Barry Zimmer (202) 366-4082 e-mail: barry.zimmer@fhwa.dot.gov

COURSE NUMBER: 13369

COURSE TITLE: **Design and Application of Travel Demand Management (TDM) Techniques, Including Telecommuting**

COURSE FEE: \$6,500/\$13,000 (See GENERAL INFORMATION section)

LENGTH: 4 Days (CEU: 2.4 Units)

CLASS SIZE: 35

DESCRIPTION: Both courses, 13369 and 13370, address the planning, developing, designing, operating, and evaluating of TDM programs for the public and private sectors. Specific information will be presented on the effectiveness and experience with a broad range of TDM actions that cover improved alternatives, incentives and disincentives, and alternative work arrangements. Guidance is presented on developing and evaluating TDM programs at employment sites. A computer model to evaluate the impact of TDM programs is also demonstrated. The lecture/discussion/workshop format provides an opportunity to discuss current research and technical assistance tools developed jointly through the FHWA and the Federal Transit Administration (FTA).

This course includes information on telecommuting, while course 13370 does not.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the major elements of TDM and how they can be applied in the public and private sectors.
2. Describe the actions necessary to plan design, implement, operate, and evaluate effective TDM projects in the public and private sectors.
3. Identify and describe the guidance materials and technical tools developed by the FHWA and the FTA for implementing effective travel demand management projects. Explain the various forms of telecommuting, common myths and rationale.
4. Apply process steps to plan, implement and evaluate telecommute prototypes.
5. Recognize and proactively respond to telecommute program barriers.
6. Instill a "design for success" philosophy in telecommuter programs.

TARGET AUDIENCE: Staff from public agencies or private companies responsible for establishing and/or managing TDM programs. The course is recommended for employee transportation coordinators, including the staff from Federal, State, or local agencies who work with or help support demand management program areas. Participants should be employed in, or responsible for TDM programs.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Barry Zimmer (202) 366-4082 e-mail: barry.zimmer@fhwa.dot.gov

COURSE NUMBER: 13348

COURSE TITLE: Incident Management

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course addresses the concepts and techniques of incident management. The course focuses on the safety and operational efficiency of the responding agencies, and the institutional and administrative barriers that hinder interagency cooperation. Modules include the following topics:

- Module 1. Incident Management and ITS
- Module 2. Introduction to Incident Management
- Module 3. Barriers to Effective Incident Management
- Module 4. Detection and Verification
- Module 5. Motorist Information
- Module 6. Response
- Module 7. Site Management
- Module 8. Clearance
- Module 9. Traffic Operations Center
- Module 10. Putting it All Together

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the need for a formalized structure for inter-agency and inter-disciplinary coordination to manage incidents.
2. Identify the various institutional and technical aspects of incident management.
3. Create a task force to develop or improve a planned multi-agency response to major and minor incidents.

TARGET AUDIENCE: Individuals from different disciplines and agencies, such as: police, fire and rescue, towing, traffic reporting media, highway, and emergency responding to incidents on freeways and surface streets.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: David Helman (202) 366-8042 e-mail: david.helman@fhwa.dot.gov

COURSE NUMBER: 13345

COURSE TITLE: Traffic Management Strategies

COURSE FEE: \$4,500/\$9,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides participants with an overview of the urban and suburban congestion problem and the effective use of traffic management strategies for its relief by optimizing highway system operations and performance. The course focuses on the application of traffic management strategies for freeways and non freeways, their effectiveness in reducing congestion and optimizing operations, the role of interagency cooperation, traffic management for major reconstruction, and the commitment of resources for congestion relief. Among the strategies covered are freeway surveillance, freeway control, freeway widening and low-cost improvements, high occupancy vehicle facilities, freeway incident management, traffic signal control systems, traffic operation improvements, access and curb space management, integrated traffic control systems, traffic management teams, and demand management. Various instructional techniques are used, such as: lectures, discussions, case studies, workshops, as well as using slides, overheads, and videotapes. Each participant will receive a course book and a supplemental notebook, which includes current reports, studies, and papers on congestion and traffic management.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the nature of the urban and suburban congestion problem--its causes, its associated problems and consequences, and the obstacles for its relief.
2. Identify the concepts, applications, and benefits of key traffic management strategies for the relief of urban and suburban congestion.
3. Discuss the role of interagency coordination in applying the aggressive actions needed to effectively reduce congestion.

TARGET AUDIENCE: Federal, State, and local traffic engineers, State and local police officials, and other State and local agencies that are responsible for planning, designing, implementing, or operating traffic operations improvement programs.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Raj Ghaman (703) 285-2408 e-mail: raj.ghaman@fhwa.dot.gov

COURSE NUMBER: 13332

COURSE TITLE: Developing Traffic Control Strategies

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course addresses the development of traffic control plans for the five primary categories of temporary traffic control zones according to work duration, as defined in the proposed Part VI of the Manual on Uniform Traffic Control Devices (MUTCD). The curriculum will discuss state-of-the-art traffic control and management strategies, including advantages and disadvantages of each of them. Operational problems associated with specific strategies when applied to common activities (e.g., application of typical mobile operation on a multilane highway layout to a striping operation) will be identified along with suggested mitigation. Suggested specifications and/or special provisions to contracts for innovative strategies are also be included.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the current work zone traffic control standards and policies, and recognize the importance of providing a safe and efficient temporary traffic control zone.
2. Describe the logical, sequential process for developing traffic control plans which maximizes safety and minimizes traffic disruption, and recognize the degree of effort necessary for specific categories of work zones.
3. Demonstrate the state-of-the-art strategies for routing traffic through or around specific types of work zones, the advantages and disadvantages of each strategy, the effect each strategy has on safety and congestion, and the contracting requirements for innovative strategies.
4. Identify the problems to be encountered when typical traffic control schemes are applied, and recognize the possible solutions.
5. Develop effective traffic control plans and strategies for specific categories of work zones.

TARGET AUDIENCE: Federal, State and local government personnel involved in developing and implementing traffic control plans and strategies. Participants should have attended NHI Course 38003 - Design and Operation of Work Zone Traffic Control or equivalent.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Henry Sandhusen (202) 366-2218 e-mail: henry.sandhusen@fhwa.dot.gov

COURSE NUMBER: 13328

COURSE TITLE: Traffic Control Software and Signalization

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 1 ½ Days (CEU: 0.9 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides participants with skills to evaluate the process by which signal control projects are developed, designed, implemented, maintained, and operated. The course addresses the application of the Manual on Uniform Traffic Control Devices to intersection displays, as well as signal timing, computerized traffic signal systems, control strategies, integrated systems, traffic control simulation and optimization software. The course is divided into three parts: Traffic Signal Design, Traffic Signal Systems, and Traffic Software.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Determine the adequacy of plans, specifications, and estimates.
2. Review and make basic recommendations regarding traffic signal timing and progression and have a background/understanding of available computer software for optimizing signal timing and progression.
3. Design, manage and/or evaluate a traffic control signalization process.
4. Communicate with traffic control signalization specialists.
5. Promote signal timing optimization, traffic control signalization, efficient design, good construction management, and adequate maintenance.

TARGET AUDIENCE: Federal, State and local traffic engineers involved in the design, review and inspection of traffic control projects.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov
TECHNICAL INFORMATION: Raj Ghaman (703) 285-2408 e-mail: raj.ghaman@fhwa.dot.gov

COURSE NUMBER: 13310 (Under revision for Fall 1998)

COURSE TITLE: Computerized Traffic Signal Systems

COURSE FEE: \$6,500/\$13,000 (See GENERAL INFORMATION section)

LENGTH: 4 Days (CEU: 2.4 Units)

CLASS SIZE: 40

DESCRIPTION: This course presents current technology and control options available for computerized traffic control, including microcomputer applications. The course covers the technical issues of a computerized traffic control system and steps necessary to develop and manage a system. These steps begin with problem identification, followed by a feasibility study, control system design, installation, maintenance and, finally, operation and system evaluation.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the basic functions and utility of a computerized signal system.
2. Describe various optional functions along with cost and maintenance considerations.
3. Describe the functions and integration of hardware and software components of a system.
4. Identify various types of systems architecture.
5. Describe Timing Plan Development and Maintenance.
6. Describe Systems operation and maintenance.
7. Describe System procurement methods.

TARGET AUDIENCE: Traffic engineering personnel from State, Federal, and local agencies involved in the technical aspects of traffic engineering. The course will not assume any prior knowledge of computers and thus will describe the theory of operation and the manner in which it can be applied to traffic signal controls.

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COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Pamela Crenshaw (202) 366-1482 e-mail: pamela.crenshaw@fhwa.dot.gov

COURSE NUMBER: 13305

COURSE TITLE: Highway Capacity and Quality of Flow

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides basic instruction in the use of the 1994 Highway Capacity Manual (HCM) and the accompanying Highway Capacity Software (HCS). Chapters 1 through 11 of the HCM are presented. Approximately one-half of the course is dedicated to sessions on interrupted flow facilities (i.e. signalized intersections, unsignalized intersections and arterials). The remainder of the course covers freeways, weaving sections, ramps, multilane, and two-lane rural facilities. The course includes lectures, including demonstrations and hands-on application of the software.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Discuss the capacity analysis procedures for interrupted and uninterrupted flow facilities.
2. Perform capacity analyses both manually and with the HCS.
3. Interpret the results of capacity analyses.
4. Determine when and where capacity analysis is appropriate.

TARGET AUDIENCE: Federal, State and local transportation planners and engineers who are involved in the analysis and/or design of highway facilities, including participants who are not familiar with capacity analysis procedures, but deal on a regular basis with capacity.

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COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Ron Giguere (202) 366-2203 e-mail: ron.giguere@fhwa.dot.gov

COURSE NUMBER: 13241

COURSE TITLE: Geotechnical and Foundation Engineering: Module 11 - Geotechnical Instrumentation

COURSE FEE: \$4,000/\$8,000 (See GENERAL INFORMATION section)

LENGTH: 2.0 Days (CEU: 1.2 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the last in a series of 11 modules for the four week advanced level NHI training course 13216 - Geotechnical and Foundation Engineering. Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The four week course will cover all aspects of Geotechnical and Foundation Engineering related to the design and construction monitoring of surface transportation facilities.

Module 11 is offered as a separate two day course covering geotechnical instrumentation. The course is designed to provide the student with a thorough understanding of the use of geotechnical instrumentation in highway construction. The course will discuss measurement tools, including recommendations for a systematic and complete approach to planning monitoring programs. Recommendations for the selection of proper instrumentation for various types of construction are presented. Field tasks covered include: calibration, maintenance and installation of instrumentation, collection of instrumentation data, processing and presentation of collected data, interpretation of processed data and reporting of results.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Demonstrate knowledge of available instrumentation through proper selection of monitoring equipment.
2. Plan and implement a systematic and complete monitoring program for a variety of highway facilities.
3. Explain the important details associated with the instrumentation installation.
4. Explain the limitations associated with the various monitoring devices.
5. Evaluate data received from the monitoring program, and prepare a complete and concise data report.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers/geologists who are or will be involved in the planning, evaluation and execution of geotechnical instrumentation programs. An undergraduate degree in engineering, geology or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13240 (Under development for Spring 1999)

COURSE TITLE: **Geotechnical and Foundation Engineering: Module 10 - Geotechnical Aspects of Pavements**

COURSE FEE: \$3,000/\$6,000 (See GENERAL INFORMATION section)

LENGTH: 1.0 Day (CEU: 0.6 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the tenth in a series of 11 modules for the four week advanced level NHI training course 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The four week course will cover all aspects of Geotechnical and Foundation Engineering related to the design and construction monitoring of surface transportation facilities.

Module 10 is offered as a separate one half day course covering the geotechnical issues associated with pavement design.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Explain the geotechnical parameters affecting the performance of different types of pavements.
2. Provide proper geotechnical recommendations associated with the design of pavements.
3. Evaluate and explain the impact of unsuitable subgrades on pavement performance and design of appropriate stabilization measures for pavement subgrades.
4. Explain the geotechnical aspects of construction including selection and proper use of compaction equipment.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers/geologists who are or will be involved in the design, evaluation and construction of pavements. An undergraduate degree in engineering, geology or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13239 (Under development for Summer 1998)

COURSE TITLE: Geotechnical and Foundation Engineering: Module 9 - Geotechnical Earthquake Engineering

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 2.5 Day (CEU: 1.5 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the ninth in a series of 11 modules for the four week advanced level NHI training course 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The complete four week course will cover all aspects of Geotechnical and Foundation Engineering related to the design and construction monitoring of surface transportation facilities.

Module 9 is offered as a separate two day course covering the seismic design issues associated with geotechnical engineering.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Assess and select appropriate design ground motion parameters using code-specified or regional hazard maps.
2. Demonstrate the principles of hazard analysis methodology.
3. Determine appropriate dynamic soil properties through field and laboratory testing as well as empirical correlations.
4. Explain how site response analysis can be used to understand local soil effects.
5. Apply procedures and methodologies used in practice for analyzing seismic slope stability and predicting seismic ground deformations.
6. Conduct liquefaction potential evaluation.
7. Define the critical issues for the seismic design and analysis of various types of foundations including footings, piles, caissons and retaining walls.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers/geologists who are or will be involved in the design, evaluation and construction of geotechnical features in seismic areas. An undergraduate degree in engineering, geology or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13238 (Under development for Spring 1999)

COURSE TITLE: Geotechnical and Foundation Engineering: Module 8 - Deep Foundations

COURSE FEE: \$5,500/\$11,000 (See GENERAL INFORMATION section)

LENGTH: 3.0 Day (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the eighth in a series of 11 modules for the four week advanced level NHI training course 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The four week course will cover all aspects of Geotechnical and Foundation Engineering related to the design and construction monitoring of surface transportation facilities.

Module 8 is offered as a separate three day course covering the design and construction of deep foundations.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Assess the suitability of various deep foundation alternatives for particular soil and rock conditions.
2. Select a deep foundation system.
3. Analyze and design the selected deep foundation system considering different loading conditions.
4. Explain the important aspects of various static and dynamic testing methods.
5. Explain the important aspects of various construction considerations.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers/geologists who are or will be involved in the design, evaluation and construction of foundations. An undergraduate degree in engineering, geology or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13237 (Under development for late 1998)

COURSE TITLE: Geotechnical and Foundation Engineering: Module 7 - Shallow Foundations

COURSE FEE: \$4,000/\$8,000 (See GENERAL INFORMATION section)

LENGTH: 2.0 Days (CEU: 1.2 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the seventh in a series of 11 modules for the four week advanced level NHI training course 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The four week course will cover all aspects of Geotechnical and Foundation Engineering related to the design and construction monitoring of surface transportation facilities.

Module 7 is offered as a separate one day course covering the design and construction of shallow foundations.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Evaluate appropriate sites for use of shallow foundations.
2. Explain the basic theories for analyzing bearing capacity and settlement of shallow foundations.
3. Design shallow foundations.
4. Explain the impact of problem soils and design appropriate remedial measures to mitigate their impact.
5. Describe important construction considerations including excavation, dewatering and impact on adjacent facilities.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers/geologists who are or will be involved in the design and construction of foundations. An undergraduate degree in engineering, geology, engineering geology or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13236

COURSE TITLE: **Geotechnical and Foundation Engineering: Module 6 - Earth Retaining Structures**

COURSE FEE: \$5,500/\$11,000 (See GENERAL INFORMATION section)

LENGTH: 3.0 Days (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the sixth in a series of 11 modules for the four week advanced level NHI training course 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The complete four week course covers all aspects of Geotechnical and Foundation Engineering related to the design and construction of surface transportation facilities.

Module 6 is offered as a separate two and one half day course covering the selection, design, construction and performance of earth retaining structures used for support of fills or excavations. Factors that affect wall selection are discussed, including contracting approaches with an emphasis on required bidding documents for each approach. Class discussions will include: design procedures and case histories, demonstrating the selection, design and performance of various earth retaining structures.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify the various earth retaining systems available for highway applications.
2. Provide recommendations for earth retaining systems to be considered in specific applications.
3. Select soil parameters needed for design.
4. Explain the earth pressure theory and demonstrate understanding by application of appropriate design earth pressures to be used for alternative wall systems.
5. Select and design earth retaining systems for a given application.
6. Prepare contract documents using alternative contracting procedures.
7. State the important issues associated with the construction and maintenance of the various systems discussed.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty. Consultant engineers and geologists who are or will be involved in the selection, contracting, design, construction and performance of earth retaining structures, can also attend. An undergraduate degree in engineering, geology, engineering geology or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13235 (Under development for early 1999)

COURSE TITLE: Geotechnical and Foundation Engineering: Module 5 - Rock Slopes: Design, Excavation, Stabilization

COURSE FEE: \$4,000/\$8,000 (See GENERAL INFORMATION section)

LENGTH: 2.0 Days (CEU: 1.2 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the fifth in a series of 11 modules for the four week advanced level NHI training course 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The four week course will cover all aspects of Geotechnical and Foundation Engineering related to the design and construction monitoring of surface transportation features..

Module 5 is offered as a separate two day course covering design and construction aspects associated with rock slopes. The course presents appropriate geological investigation techniques, shear strength theories and determination of rock strength, and various design methods for rock slopes with different failure mechanisms. Other topics include: rock blasting, rock slope stabilization methods and contracting issues. Classroom instructions include the discussion of sample problems and case histories involving rock slope analyses and design.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the basic principles of rock slope design.
2. Plan and execute a geological investigation including geologic mapping.
3. Perform appropriate in-situ and laboratory strength tests.
4. Determine rational design rock strength parameters by proper evaluation of in-situ and laboratory test data along with appropriate rock strength correlations.
5. Identify the failure mechanisms associated with rock slopes and apply appropriate design methodologies.
6. Design effective rock-fall protection and slope stabilization measures.
7. Design a monitoring program for cut slopes.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers/geologists who are or will be involved in the design, excavation and stabilization of rock slopes. An undergraduate degree in geology, engineering geology, civil engineering, or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13234 (Under development for late 1998)

COURSE TITLE: Geotechnical and Foundation Engineering: Module 4 - Ground Improvement Techniques

COURSE FEE: \$5,500/\$11,000 (See GENERAL INFORMATION section)

LENGTH: 3.0 Days (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the fourth in a series of 11 modules for the four week advanced level NHI training course 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The four week course will cover all aspects of Geotechnical and Foundation Engineering for the design and construction monitoring of surface transportation facilities.

Module 4 is offered as a separate three day course covering important design and construction aspects associated with ground improvement techniques. Topics on ground improvement techniques include: grouting, vertical drains, stone columns, lightweight fill, vibro compaction, dynamic compaction, deep soil mixing and other new and innovative concepts.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Assess the suitability of various improvement techniques for particular ground conditions.
2. Describe aspects to consider in the selection, design and implementation of ground improvement techniques.
3. Implement the techniques to improve problem soil conditions.
4. Design and implement construction monitoring programs for Ground Improvement projects.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers who are or will be involved in the geotechnical aspects of the design and construction of transportation facilities through problem soils. An undergraduate degree in geology, engineering geology, civil engineering or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13233 (Under development for late 1998)

COURSE TITLE: **Geotechnical and Foundation Engineering: Module 3 - Soil Slopes and Embankments**

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 2.5 Days (CEU: 1.5 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the third in a series of 11 modules for the four week advanced level NHI trainingcourse 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The four week course will cover all aspects of Geotechnical and Foundation Engineering as related to the design and construction monitoring of Surface Transportation Facilities.

Module 3 is offered as a separate two and one-half day course covering important aspects associated with the design and construction of soil slopes and embankments.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify important aspects to consider in the design and construction of soil slopes and embankments for a surface transportation project.
2. Develop appropriate soil design parameters necessary for design.
3. Interpret and apply slope stability and settlement analyses.
4. Design soil slopes and embankments for new and remedial projects.
5. Select and design remedial measures for slope stability problems.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers who are involved in the design and construction of soil slopes and embankments. An undergraduate degree in engineering or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13232 (Under development for 1999)

COURSE TITLE: **Geotechnical and Foundation Engineering: Module 2 - Geotechnical Contracting and Quality Assurance/Quality Control**

COURSE FEE: To be determined

LENGTH: 0.5 Day (CEU: 0.3 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the second in a series of 11 modules for the four week advanced level NHI trainingcourse 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The complete four week course will cover all aspects of Geotechnical and Foundation Engineering.

Module 2 is offered as a separate half-day course covering technical and administrative aspects associated with the contracting and quality assurance/quality control of geotechnical design and construction monitoring.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Develop proper contract specifications for geotechnical work required for a surface transportation project.
2. Provide meaningful input when participating in contractual related activities such as value engineering, partnering, etc.
3. Plan and implement appropriate quality assurance/quality control procedures for both in-house and contracted work.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers who are or will be involved in the contracting and construction of geotechnical work. An undergraduate degree in geology, engineering geology, civil engineering or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13231

COURSE TITLE: Geotechnical and Foundation Engineering: Module 1 - Subsurface Investigations

COURSE FEE: \$5,500/\$11,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course is the first in a series of 11 modules for the four week advanced level NHI training course 13216 - Geotechnical and Foundation Engineering. This course is offered as either: individual stand alone short course, in conjunction with other separate modules within NHI course 13216, or as part of the overall four week NHI course 13216. The four week course will cover all aspects of Geotechnical and Foundation Engineering as related to the design and construction of surface transportation facilities.

Module 1 is offered as a separate 3-day course covering the latest methods and procedures in the planning, execution and interpretation of the various subsurface investigation methods and the development of appropriate soil and rock design parameters for engineering applications. Topics include: the geotechnical specialist's role in subsurface investigations; exploration methodologies; exploratory equipment types and their suitability for various subsurface conditions; the use of in-situ testing and geophysical surveys for subsurface characterization; the handling, transportation and storage of soil and rock samples; and laboratory testing techniques and interpretation of data. Contracting for soil and rock investigations, correlation of soil and rock properties, and the preparation of a clear and concise geotechnical reports are also covered. Classroom instructions includes student exercises and sample problems to reinforce the course objective.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Plan and execute a subsurface exploration program for a typical surface transportation project.
2. Use existing information in the planning of the investigation program.
3. Apply appropriate in-situ testing procedures based upon the expected subsurface conditions and obtain high quality soil and rock samples for laboratory testing.
4. Assign appropriate laboratory testing procedures for determining soil and rock design parameters.
5. Interpret the results of laboratory tests and determine soil and rock parameters to be used in design.
6. Summarize results of subsurface investigation in a concise geotechnical investigation report

TARGET AUDIENCE: FHWA, State, and local transportation agency employees, college and university faculty, and consultant engineers who are or will be involved in the planning, execution, review and interpretation of subsurface investigations. An undergraduate degree in geology, engineering geology, civil engineering or equivalent engineering experience in the highway/transportation field is desirable.

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COURSE NUMBER: 13222

COURSE TITLE: Driven Pile Foundations - Construction Monitoring

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course, including NHI course 13221 and 13223, provide information on current methods of driven pile technology with emphasis on data interpretation and decision making issues common to driven pile installation and monitoring. The course covers the following areas: (1) specifications, (2) contracting issues, (3) pile installation, (4) monitoring and (5) inspection. Topics are similar to those covered in the description of course 13221, however, design issues are not included. Application and interpretation of the wave equation, and dynamic and static pile load testing methods are highlighted, with an emphasis on the practical issues related pile monitoring and acceptance on typical construction projects. (Refer to course *13221 - Driven Pile Foundations - Design and Construction* for additional background information.)

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Demonstrate methods of driven pile construction monitoring and inspection practices and procedures.
2. Demonstrate methods of pertinent driven pile specification and contracting document issues.
3. Describe wave equation, dynamic testing and static testing results in terms of their application and interpretation on construction projects.
4. Discuss the basis components and differences between various types pile driving systems, associated installation equipment, pile splices, and pile tip attachments.
5. Interpret a set of driven pile plan details and specifications.
6. Inspect a driven pile project with knowledge and confidence.

TARGET AUDIENCE: Public and private sector engineers and advanced level technicians involved and responsible for the, specification and construction monitoring of driven pile foundations. The course material has been developed for attendance by geotechnical specialists, bridge engineers, construction engineers, consultant review specialists and advanced level technicians. This course is suitable for attendance by entry level and experienced engineers and higher level technicians. Basic knowledge of subsurface investigation methods is desirable.

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TECHNICAL INFORMATION: Jerry DiMaggio (202) 366-1569 e-mail: jerry.dimaggio@fhwa.dot.gov

TARGET AUDIENCE: Public and private sector engineers and advanced level technicians involved and responsible for the design, specification and construction monitoring of driven pile foundations. The course material has been developed for attendance by geotechnical specialists, bridge engineers, construction engineers, consultant review specialists and advanced level technicians. This course is suitable for attendance by entry level and experienced engineers and advanced level technicians. Attendees should have a basic knowledge of subsurface investigation methods and the general aspects of foundation design and construction.

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COURSE NUMBER: 13221

COURSE TITLE: Driven Pile Foundations - Design and Construction

COURSE FEE: \$6,000/\$12,000 (See GENERAL INFORMATION section)

LENGTH: 4 Days (CEU: 2.4 Units)

CLASS SIZE: 40

DESCRIPTION: This course covers the practical application of pile technology, as previously outlined in the Demonstration Project No. 66, *Design and Construction of Driven Pile Foundations*. The original 32 hour basic design and construction monitoring course has been complemented by two related courses. A new 16 hour course 13222, *Driven Pile Foundations - Construction Monitoring*, focuses on the construction aspects of driven pile installation, monitoring, and inspection. Methods of computer aided, driven pile design are addressed within the new specialty 20 hour course 13223, *Driven Pile Foundations - Computer Aided-Design*, which includes training on the use, interpretation and integration of the micro computer programs SPILE, EMBANK, COM624P Version 2.0 and GRL WEAP into the project development process (See Specific Course Descriptions for Additional Information).

All three courses address current methods of driven pile technology, with the emphasis on data interpretation and decision making issues common to real life construction projects. The course on basic design and construction covers all aspects of driven pile technology, including such topics as: subsurface investigation, pile selection, economic analysis, static design analysis (single pile and pile group behavior under compression, tension and lateral loading, pile settlement, negative skin friction) specifications and contracting documents, as well as construction monitoring (pile inspection, dynamic driving formulas, wave equation analysis, dynamic testing), static methods of pile load testing, driven pile installation equipment and accessories. Classroom presentations include workshops, student exercises and sample problems.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Demonstrate methods of driven pile foundation design.
2. Demonstrate methods of driven pile construction materials and installation equipment.
3. Describe the timing and scope of the involvement of foundation specialists as a project evolves from concept through completion.
4. Perform a foundation economic analysis and determine the need for a driven pile foundation.
5. Recognize the pile type selection process and the advantages and disadvantages of common driven pile types.
6. Compute driven single and pile group capacity to resist compression, tensile and lateral loads.
7. Demonstrate knowledge of dynamic pile formulas, wave equation, dynamic testing, and static load testing.
8. Discuss the components of structural foundation reports and controlling issues of specifications and contracting documents as related to a successful construction project.
9. Describe the concept and project influence of drive ability, pile refusal, minimum and estimated pile tip elevations, soil setup and relaxation.

4. Demonstrate the timing, scope and details of geotechnical and foundation engineering as they relate to the development of transportation related projects from the planning and scoping phase through post construction evaluations.

TARGET AUDIENCE: FHWA, State, and local highway agency employees, college and university faculty, and consultant engineers/geologists who are or will be involved in the research, design, construction and maintenance of geotechnical features on surface transportation facilities. An undergraduate degree in engineering, geology or equivalent engineering experience in the highway/transportation field, including a good academic background in mathematics and science is desirable.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: Andy Muñoz (817) 978-4382 e-mail: andy.munoz@fhwa.dot.gov
Jerry DiMaggio (202) 366-1569 e-mail: jerry.dimaggio@fhwa.dot.gov
Pete Osborn (617) 494-2515 e-mail: peter.osborn@fhwa.dot.gov

COURSE NUMBER: 13216 (Under development for late 1999)

COURSE TITLE: Geotechnical and Foundation Engineering

COURSE ANNOUNCEMENT: A new announcement will be issued to provide course dates, locations, and application information

COURSE FEE: To be determined. Each participant, or their sponsor, will also be responsible for their own travel and per diem. (See also GENERAL INFORMATION section).

LENGTH: 4 Weeks (CEU: 12.0 Units)

CLASS SIZE: 30

DESCRIPTION: This advanced course addresses all aspects of Geotechnical and Foundation Engineering currently under development. The course is divided into eleven stand alone modules. As each module is developed it will be offered as a stand alone course (see NHI course listings 13231-13241). A state-of-the-art manual for each module will be a practical reference for later use. The following topics are covered:

Module 1 - Subsurface Investigations	3.0 days
Module 2 - Geotechnical Contracting and Quality Assurance/Quality Control	0.5 day
Module 3 - Soil Slopes and Embankments	2.5 days
Module 4 - Ground Improvement Techniques	3.0 days
Module 5 - Rock Slopes	2.0 days
Module 6 - Earth Retaining Structures	2.5 days
Module 7 - Shallow Foundations	1.0 day
Module 8 - Deep Foundations	3.0 days
Module 9 - Geotechnical Earthquake Engineering	1.0 day
Module 10 - Geotechnical Aspects of Pavements	0.5 day
Module 11 - Geotechnical Instrumentation	1.0 day

Instructors for the course are nationally and internationally recognized experts in each topic area. The course includes class lectures, field subsurface investigation and testing demonstrations, laboratory demonstrations, practical student design problems, discussions of case histories, and extensive use of microcomputers. A university campus is the proposed training facility for the full four-week course.

OBJECTIVES: Learning objectives are included in the descriptions of each course module. The overall training objective of this course are to:

1. Update the knowledge of experienced geotechnical and foundation specialists.
2. Provide new practicing geotechnical and foundation specialists with a practical and comprehensive understanding of all geotechnical engineering involved in the development of a surface transportation project.
3. Provide a quick learning experience in the diverse technical topic areas which are required of the transportation specialist who is responsible for the selection, design and construction of geotechnical transportation features.

COURSE NUMBER: 13214

COURSE TITLE: Drilled Shafts

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: A drilled shaft is an alternate type of deep foundation that may be more cost-effective than driven piles in bridge piers at river crossings, retrofit operations, high-mast lighting, earth retaining structures, single column piers and similar applications. This course provides participants with all aspects of designing, installing and monitoring of drilled shafts. The first day covers uses, advantages and disadvantages of drilled shafts for transportation structure foundations, general requirements for subsurface investigations for drilled shafts, and construction methods for drilled shafts. During the second day, construction case histories are presented, and construction specifications are suggested. The remainder of the second day is dedicated to describing principles of design of drilled shafts for axial loading, in which the participants have an opportunity to work simple design problems. The third and final day of the course summarizes the design of drilled shafts for lateral loading, expansive soils, downdrag and similar effects; load testing; inspection; integrity testing; repair and retrofit of defective shafts; and cost estimation.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe examples of good and poor construction practices.
2. Prepare draft construction specifications for drilled shafts.
3. Characterize soil and rock for making drilled shaft designs.
4. Design drilled shafts for axial loading.
5. Evaluate non-destructive alternatives for evaluating the integrity of drilled shafts.
6. Evaluate repair alternatives.
7. Make elementary cost estimates.

TARGET AUDIENCE: FHWA and State highway agency geotechnical engineers, foundation designers, bridge engineers, and project engineers.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: Jerry DiMaggio (202) 366-1568 e-mail: jerry.dimaggio@fhwa.dot.gov

8. Determine the need for site specific monitoring or special inspection schemes to ensure compliance with design. [3-day]
9. Locate references on geosynthetic materials and geosynthetic applications. [1-day and 3-day]

TARGET AUDIENCE:

1-DAY SUMMARY COURSE - Federal, State and local transportation personnel (bridge, hydraulic, pavement, geotechnical, construction, and maintenance engineers, and construction inspectors and technicians) involved with construction and maintenance of transportation facilities that include earthwork construction.

3-DAY DESIGN & CONSTRUCTION COURSE - Federal, State and local transportation personnel (bridge, hydraulic, pavement, geotechnical, construction, and maintenance engineers, and construction inspectors and technicians) involved with design and/or construction of transportation facilities that incorporate earthwork.

In addition, public agency and private sector construction engineers and project inspectors responsible for installation, construction monitoring and inspection of geosynthetics installations can attend either course. There are no prerequisites, although prior attendance of NHI course 13212 - Soils and Foundations Workshop is recommended.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: Jerry DiMaggio (202) 366-1569 e-mail: jerry.dimaggio@fhwa.dot.gov

COURSE NUMBER: 13213 (Course material updated 1998)

COURSE TITLE: Geosynthetics Engineering Workshop

COURSE FEE: \$2,500/\$5,000 - 1 Day Summary Course
\$5,000/\$10,000 -3 Day Design and Construction Course
(See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)
3 Days (CEU: 1.8 Units)

CLASS SIZE: 50

DESCRIPTION: A separate 1-day Summary course and a 3-day Design and Construction course are available. These courses provide training on the correct, and cost-effective utilization of geosynthetics in transportation applications. State-of-practice utilization of geosynthetics in highway works and developments are reviewed. The use of geotextiles, geogrids, pavement edge drains, drainage composites, erosion control materials, sediment control materials, and geomembranes are examined. Applications of filtration, drainage, temporary and permanent erosion control, sediment control, roadway separation, roadway reinforcement, roadway subgrade improvement, pavement overlays, embankments over soft foundations, mechanically stabilized earth walls, mechanically stabilized earth slopes, geomembrane containment ponds, and geomembrane pavement encapsulation are covered.

The 1-day Summary course provides an introduction to geosynthetics, focusing on identifying, specifying, testing, installing, and inspecting geosynthetic installations.

The 3-day Design and Construction course provides a review of design procedures, expands on the material of the 1-day Summary course and includes workshop problems, student exercises, and addresses all aspects of geosynthetics use.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize potential geosynthetic applications for use in transportation facilities construction and maintenance. [1-day and 3-day]
2. Differentiate between types of geosynthetics and the primary and secondary functions they perform in respective applications. [1-day and 3-day]
3. Prepare conceptual and basic designs for filtration, drainage, temporary and permanent erosion control, sediment control, roadways, pavement overlays, embankments over soft foundations, mechanically stabilized earth walls, mechanically stabilized earth slopes, and geomembrane transportation applications. [3-day]
4. Determine if geosynthetics are a feasible, cost-effective option for construction or maintenance of transportation earthworks. [1-day and 3-day]
5. Select appropriate material property and design parameter test methods for specific geosynthetic projects, and differentiate between index and performance tests/properties. [3-day]
6. Specify procedures for and oversee geosynthetic installations. [1-day and 3-day]
7. Develop appropriate materials and construction specifications for geosynthetic projects. [3-day]

COURSE NUMBER: 13212

COURSE TITLE: Soils and Foundations Workshop

COURSE FEE: \$6,000/\$12,000 The sponsoring agency is responsible for providing access to a materials laboratory for demonstration purposes. (See GENERAL INFORMATION section)

LENGTH: 4 Days (CEU: 2.4 Units)

CLASS SIZE: 50

DESCRIPTION: This course is geared toward the practicing engineer in the foundation field, routinely dealing with soil and foundation problems, but has little theoretical background in the soil mechanics or foundation engineering. The course takes a project oriented approach whereby the soils input to a fictitious bridge project is followed from conception to completion. A visit to a laboratory is used to illustrate basic soil concepts in typical major project phases. In each phase of the fictitious project, the soils concepts will be developed into specific foundation designs and recommendations. Classroom presentation includes a variety of exercises to verify achievement of learning objectives. At the conclusion of the course, the participant will take away a notebook containing a complete foundation design, completed participant exercises, and enough reference data to independently do others related activities.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify where foundation input is required in major project phases.
2. Identify soil and/or foundation problems.
3. Evaluate solutions to the problems.
4. Evaluate the content and quality of geotechnical reports.

TARGET AUDIENCE: Bridge and foundation engineers involved in the preliminary layout, design, and/or construction aspects of a project.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: Richard Cheney (202) 366-1568 e-mail: richard.cheney@fhwa.dot.gov

COURSE NUMBER: 13153

COURSE TITLE: Superpave for Local Governments

COURSE FEE: \$2,000/\$4,000 (One day course) (See GENERAL INFORMATION section)
\$3,500/\$7,000 (Two day course) (See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)
2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides participants with the fundamental concepts of Superpave technology and addresses the requirements, benefits and impacts of the Superpave system. The content focuses on implementation strategies for local governments and describes how to incorporate this evolving technology into local paving programs. The course describes various testing methods used in Superpave research, summarizes the data generated from these tests, and relates this information to mix design, quality and performance. This course is taught by subject-matter experts from one of the Superpave Regional Center.

In order to be responsive to the needs of local governments, both one-day and two-day course lengths are available. For the one-day course, the sponsoring agency selects modules based upon the needs of the agency. Please contact the Course Coordinator below for guidance in selecting modules.

OBJECTIVES: Upon completion of the two-day course, participants will be able to:

1. Recognize the advantages and benefits of Superpave technology.
2. Explain the principles of Superpave technology.
3. Differentiate between Superpave and current asphalt technology.
4. Discuss the basic functions of testing procedures and equipment operation.
5. Interpret the data obtained from testing procedures.
6. Apply test results to select materials for high quality mix design and performance.
7. Identify the impacts of Superpave implementation on government, industry and academia.
8. Recognize the roles and responsibilities of partnerships in Superpave implementation.

TARGET AUDIENCE: This course is intended for local government officials, including managers, engineers, and technicians who are responsible for road repair and maintenance.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov

TECHNICAL INFORMATION: John Bukowski (202) 366-1287 e-mail: john.bukowski@fhwa.dot.gov

COURSE NUMBER: 13152

COURSE TITLE: Superpave for the Generalist Engineer and Project Staff

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Day (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides participants with the fundamental concepts of Superpave technology and addresses the requirements, benefits and impacts of the Superpave system. The content includes not only theory based upon the latest technology but also focuses on implementation strategies. The course describes various testing methods used in Superpave research, summarizes the data generated from these tests, and relates this information to mix design, quality and performance. This course is taught by subject-matter experts from one of the Superpave Regional Centers.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the advantages and benefits of Superpave technology.
2. Explain the principles of Superpave technology.
3. Differentiate between Superpave and current asphalt technology.
4. Discuss the basic functions of testing procedures and equipment operation.
5. Interpret the data obtained from testing procedures.
6. Apply test results to select materials for high quality mix design and performance.
7. Identify the impacts of Superpave implementation on government, industry and academia.
8. Recognize the roles and responsibilities of partnerships in Superpave implementation.

TARGET AUDIENCE: This course is intended for Federal and State highway and materials engineers; industry pavement professionals and contractors who have a basic understanding of hot-mix asphalt pavements.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov

TECHNICAL INFORMATION: John Bukowski (202) 366-1287 e-mail: john.bukowski@fhwa.dot.gov

COURSE NUMBER: 13151

COURSE TITLE: Superpave for Senior Managers

COURSE FEE: \$1,000*/\$2,000* (See GENERAL INFORMATION Section)
*Fee is waived if scheduled concurrently with Course No. 13152 or 13153

LENGTH: ½ Day (CEU: NA)

CLASS SIZE: Unlimited

DESCRIPTION: This course provides highway agency senior managers with an overview of the Superpave system, the current status of its implementation, and its impacts on the transportation industry. The content includes a summary of the results of the Strategic Highway Research Program (SHRP), the current challenges of the asphalt paving industry, and the evolution of the Superpave system. An overview of Superpave mix design and testing is also included. This course is taught by subject-matter experts from one of the Superpave Regional Centers.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the advantages and benefits of Superpave technology.
2. Differentiate between Superpave and current asphalt technology.
3. Identify the impacts of Superpave implementation on government, industry and academia.
4. Recognize the roles and responsibilities of partnerships in Superpave implementation.

TARGET AUDIENCE: This course is intended for FHWA and State highway agency senior managers or their designees; industry pavement professionals and contractors who have a basic understanding of hot-mix asphalt pavements.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov

TECHNICAL INFORMATION: John Bukowski (202) 366-1287 e-mail: john.bukowski@fhwa.dot.gov

COURSE NUMBER: 13150 (Under development for Spring 1999)

COURSE TITLE: Asphalt Pavement Recycling for State and Local Governments

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: Recycling of existing asphalt pavements for pavement rehabilitation has the following advantages: (a) reduced costs of construction, (b) conservation of asphalt and aggregate, (c) preservation of the environment, and (d) conservation of energy. This course covers the major aspects of recycling materials and mix design, construction methods and equipment, case histories and quality control/quality assurance (QC/QA) of the four major categories of recycling: Hot Plant, Hot In-place, Cold In-place and full depth reclamation. The training also includes the following topics: performance data of recycled mixes, specification limits, selection of pavements for recycling, and economics of recycling.

OBJECTIVES: Upon completion of this course, participants will be able to:

1. Describe the various methods (hot and cold) of recycling pavements.
2. Determine when asphalt recycling is a viable pavement rehabilitation alternative.
3. Select the most appropriate asphalt recycling method or technique.
4. Identify materials and mix design for recycled pavements.
5. Specify equipment, construction methods, and QC/QA involved in recycling.
6. Demonstrate design methods for hot and cold recycled pavements.

TARGET AUDIENCE: This course is intended for State and local agency highway officials, administrators, pavements design engineers and technicians, and construction engineers and inspectors.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov

TECHNICAL INFORMATION: Jason Harrington (202) 366-1576
e-mail: jason.harrington@fhwa.dot.gov

COURSE NUMBER: 13145 (Under development for Spring 1999)

COURSE TITLE: Hot-Mix Asphalt Materials, Characteristics and Control

COURSE FEE: \$8,000 (See GENERAL INFORMATION Section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: This training course is the result of a partnership between AASHTO, FHWA, and the Hot-Mix Asphalt (HMA) Industry. It was developed through the cooperative efforts of the Joint AASHTO/FHWA Industry Committee on Asphalt. It combines lectures and problem solving workshop sessions to provide participants with a working knowledge of hot-mix asphalt (HMA) materials, their characteristics and controls. The course focuses on two areas. The first provides technical information on the material properties of HMA, the processes used to measure these properties, and the effect that these properties have on the final, compacted pavement. The second involves achieving these properties in the field, with discussions on quality management, and analyzing the impact of segregation and density on HMA pavement performance. The course concludes with an examination which reviews the key elements of HMA materials, characteristics and control.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify the various and desirable properties of asphalt, aggregates, and mixtures.
2. Describe the proper procedures for handling, storing, sampling and testing the materials.
3. Distinguish between desirable and undesirable results of tests used for controlling and analyzing the quality of HMA.
4. Select the processes and procedures that assure the quality of HMA pavements.

TARGET AUDIENCE: The course is designed for an audience directly involved in the production and construction of hot-mix asphalt pavements. This includes contractor personnel at both the production facility and on the pavement lay down site, and owner/agency personnel involved with the inspection of HMA pavement construction.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov
TECHNICAL INFORMATION: Michael Rafalowski (202) 366-1571
e-mail: michael.rafalowski@fhwa.dot.gov

COURSE NUMBER: 13144 (Under development for Fall 1998)

COURSE TITLE: Hot-Mix Asphalt Production Facilities

COURSE FEE: \$8,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 UNITS)

CLASS SIZE: 40

DESCRIPTION: This training course combines lectures and workshop sessions to provide participants with a working knowledge of Hot-Mix Asphalt (HMA) Production Facilities. The training program is the result of a partnership among the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA), and the HMA Industry. This course covers the entire HMA Production Facilities process and addresses the following topics: types of plants, drying and heating systems, emission control systems, feeders and conveyor systems, storage systems, plant operation and maintenance, quality control and quality assurance. It concludes with an examination which emphasizes the key elements of HMA Production Facilities.

OBJECTIVES: Upon completion of this course, participants will be able to:

1. Define the roles and responsibilities of each person at the HMA Production Facility.
2. Identify the different types of plants, the main components of each, and how these components interact.
3. Describe the materials control process and its effect on the quality of the final product.
4. Differentiate between acceptable and non-acceptable methods of plant operation and maintenance.
5. Explain the operation of the exhaust fan and emission control systems and discuss their importance.
6. Identify potential problems that may occur during production and develop specific solutions to those problems.

TARGET AUDIENCE: This course is designed for project engineers, lead inspectors, plant supervisors, and all others involved with the HMA plant production. Industry professionals and contractors are welcome. Participants are required to bring a hand held calculator.

CURRICULUM MATERIAL: Copies of the curriculum materials will be available upon completion of the development phase for this course. Costs of these materials will be determined at that time.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov
TECHNICAL INFORMATION: Michael Rafalowski (202) 366-1571
e-mail: michael.rafalowski@fhwa.dot.gov

COURSE NUMBER: 13135

COURSE TITLE: Pavement Management Systems (PMS)

COURSE FEE: \$7,000/\$14,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides participants with an overview of PMS and describes the basic components of a PMS, from the most basic to the most complex systems. It outlines the step-by-step methodology for developing, implementing and maintaining a PMS. The course identifies key elements such as relational databases, automated data collection equipment, and multi-year prioritization. The course is divided into twelve modules as follows:

- Module 1: Fundamental Principles of Asset Management
- Module 2: Overview of Pavement Management Systems
- Module 3: Relational Database Systems
- Module 4: Inventory, History and Location Referencing Systems
- Module 5: Pavement Condition Surveys
- Module 6: Pavement Distress Indices
- Module 7: ESAL Flow Maps in PMS
- Module 8: Measuring, Monitoring and Predicting Pavement Performance
- Module 9: Remaining Service Life
- Module 10: Multi-year Prioritization.
- Module 11: PMS Feedback Process
- Module 12: Implementation and Institutional Issues

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the basic concepts of Pavement Management.
2. Assist their agency's top management in establishing agency PMS goals.
3. Determine their agency's needs and identify the products that will best serve those needs.
4. Develop, implement and operate a PMS.
5. Coordinate all PMS activities within the agency.
6. Address institutional issues concerning PMS.

TARGET AUDIENCE: This course is designed for PMS practitioners at the engineering and management levels.

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COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov

TECHNICAL INFORMATION: Frank Botelho (202) 366-1336 e-mail: frank.botelho@fhwa.dot.gov

COURSE NUMBER: 13134

COURSE TITLE: Pavement Distress Identification

COURSE FEE: \$3,000 /\$6,000 - 1 ½ Days (See GENERAL INFORMATION section)
\$6,500 /\$13,000 - 3 ½ Days (See GENERAL INFORMATION section)
\$ 7,500 / NA - 4 ½ Days (See GENERAL INFORMATION section)

LENGTH: 1 ½ Days (CEU: 0.9 Units)
3 ½ Days (CEU: 2.1 Units)
4 ½ Days (CEU: 2.7 Units)

CLASS SIZE: 12

DESCRIPTION: A 1 ½ day "Train-the-Trainer" course, a 3 ½ day course and a 4 ½ day course are available. The 3 ½ day and 4 ½ day versions provide training in the application of the procedures used to identify pavement distress as outlined in the Strategic Highway Research Program's (SHRP) "Distress Identification Manual for the Long-Term Pavement Performance Project." The 4 ½ day version has 2 more field exercises than the 3 ½ day course (6 total) and is suitable for calibration of raters. The 1 ½ day course is intended to prepare State highway agency trainers who are interested in conducting this training on their own. It includes one field exercise. An instructor's guide and one set of slides will be provided to each requesting State highway agency.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the pavement distress types outlined in the SHRP "Distress Identification Manual for the Long-Term Pavement Performance Project."
2. Recognize and measure different pavement distress severity levels.
3. Map pavement distress on the SHRP/Long Term Pavement Performance pavement distress map sheets.
4. Summarize all data from the map sheets accurately.
5. Measure Portland Cement Concrete pavement faulting with the Georgia fault meter.
6. Measure asphalt pavement rutting with the dipstick.

TARGET AUDIENCE: Federal Highway Administration (FHWA), State and local agency engineers and technicians and highway contractor and consulting engineer personnel having duties and responsibilities in pavement distress identification. These individuals should be involved in day-to-day monitoring of pavement distress or research studies on highway pavement performance.

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COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov

TECHNICAL INFORMATION: Bill Bellinger (703) 285-2530 e-mail: william.bellinger@fhwa.dot.gov

COURSE NUMBER: 13133

COURSE TITLE: Construction of Portland Cement Concrete Pavements

COURSE FEE: \$6,000 For All Course Sponsors

LENGTH: 2 ½ Days (CEU: 1.5 Units)

CLASS SIZE: 40

DESCRIPTION: The course provides participants with an overview of the entire Portland Cement Concrete (PCC) paving process: preparing plans and specifications, establishing grades, setting forms, hauling, curing and grinding concrete, and joint sealing. This course is presented in 4 modules: 1) Plant Operations: Truck Mixed Concrete and Central Mixed Concrete; 2) Paving Operations: Slipform Paving and Fixed-form Paving; 3) Saw and Seal Operations; and 4) Concrete Pavement Restoration (CPR) Operations. The course is designed to allow presentation of all or part of the modules at the discretion of the host agency. The course focuses on the proper methods for construction of concrete paving with an emphasis on cause and effect.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the differences between truck-mixed and ready-mixed concrete.
2. Identify factors in production and paving operations that contribute to achieving a smooth ride.
3. Describe the differences between slip-form and fixed-form paving.
4. Identify the factors that impact saw timing and crack control.
5. Recognize the key factors in placing joint sealant materials.
6. Identify the components of concrete pavement restoration application and construction techniques.

TARGET AUDIENCE: This course is intended for contractors, technicians and inspectors who are involved in daily pavement operations for the placement of PCC pavements. Participants should have some working knowledge of concrete pavement construction.

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COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov
TECHNICAL INFORMATION: John Bukowski (202) 366-1287 e-mail: john.bukowski@fhwa.dot.gov

COURSE NUMBER: 13132

COURSE TITLE: Hot-Mix Asphalt Construction

COURSE FEE: \$7,500 For All Course Sponsors

LENGTH: 2 ½ Days (CEU: 1.5 Units)

CLASS SIZE: 40

DESCRIPTION: This training course is the result of a partnership between AASHTO, FHWA, and the Hot-Mix Asphalt (HMA) Industry. It was developed through the cooperative efforts of the Joint AASHTO/FHWA/Industry Training Committee on Asphalt. It combines lectures and problem solving workshop sessions to provide participants with a working knowledge of the Hot-Mix Asphalt (HMA) construction process and equipment. The course is designed to help participants understand the effect of construction actions on the final product. This program reviews the entire HMA construction process beginning with the delivery of the HMA to the job site, through lay down and compaction, and concluding with quality control/quality assurance (QC/QA) of the completed pavement. A variety of exercises are used, including trouble shooting typical field problems, to emphasize recommended good practice in HMA construction. The course concludes with an examination which reviews the key elements of HMA construction.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the roles and responsibilities of each person on the HMA construction job.
2. Describe the purpose of project documents, pre-construction and pre-paving conferences, and cooperative communications on the job.
3. List the steps involved in preparing bases and existing pavements for overlays.
4. Select correct patching materials and placement techniques for pavement repair.
5. Define a proper HMA delivery process to the job site.
6. Explain the effect of the various components of a HMA paving machine on the finished mat.
7. Describe how to make a good longitudinal or transverse joint.
8. Describe what effect the compaction process has on the finished pavement.
9. Identify QC/QA techniques that apply to the HMA construction.

TARGET AUDIENCE: This course is designed for an audience that contains 50 percent contractor supervisory personnel, and 50 percent Federal, State, and local highway agency construction engineers and field inspectors involved in the planning, construction, and review of HMA placement projects. Participants are required to bring a hand held calculator.

CURRICULUM MATERIAL: Copies of the curriculum material are available for anyone wanting to present this course with their own instructors. A set of instructors' material includes the Instructor Manual, the Participant Manual, the Hot-Mix Asphalt Paving Handbook, a set of 598 35 mm slides, course handouts, and one VHS video cassette. The cost per set is \$300. Additional copies of the copyrighted Participant Manual and the Hot-Mix Asphalt Paving Handbook are available for \$35 per set.

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TECHNICAL INFORMATION: José Garcia (202) 366-2226 e-mail: jose.garcia@fhwa.dot.gov

COURSE NUMBER: 13129

COURSE TITLE: AASHTO Pavement Overlay Design

COURSE FEE: \$6,000/\$12,000 (See GENERAL INFORMATION section). The sponsoring agency must provide 15 computers with the following minimum requirements: 486DX Processor, 8 MB RAM, 100 MB Hard Disk, 3.5" Floppy Disk Drive, Windows 95, VGA Graphics Card, Excel 5.0, and AASHTOWare DARWin 3.0. One or more printers are also required. "AASHTOWare" and "DARWin" are trademarks of the American Association of State Highway and Transportation Officials (AASHTO)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 30 absolute maximum.

DESCRIPTION: This 3-day training course is presented over a 4-day period, normally starting at 1 p.m. on the first day and concluding at noon on the fourth day. A variety of instructional techniques are employed, including lecture and discussion with visual aids, case studies, and workshops facilitated by hands on usage of appropriate computer software packages. Participants will receive a copy of the course notes which should serve as a valuable future reference on this subject. The course focuses on Part III, Chapter 1, 2, 3, and 5 (as revised) of the "AASHTO Guide for Design of Pavement Structures." **Participants will need to furnish their own 1993 "AASHTO Guide for Design of Pavement Structures."**

OBJECTIVES: Upon completion of the course the participants will be able to:

1. Describe the significance of various items for consideration in the development of various overlay strategies, including overlay materials, preoverlay repair, subdrainage, milling and recycling, causes of existing pavement deterioration, and others.
2. List the procedures and considerations for determining overlay design input parameters, including design serviceability loss, overlay design reliability, effective design subgrade resilient modulus, pavement condition adjustment factors, and others.
3. Design any of the following type of overlays, given a set of design conditions, using the condition survey method (and the remaining life method for applicable overlay types):

- Asphalt overlay of an asphalt concrete (AC) pavement
- Asphalt overlay of fractured Portland Cement Concrete (PCC) pavement
- Asphalt overlay of PCC pavement
- Asphalt overlay of an AC/PCC pavement
- Bonded concrete overlay of a PCC pavement
- Unbonded concrete overlay of a PCC or AC/PCC pavement
- Concrete overlay of an AC pavement

TARGET AUDIENCE: Highway engineers who have pavement design and analysis responsibilities. A working knowledge of pavement design and associated engineering principles is desirable.

COURSE NUMBER: 13126 (Under development for Fall 1998)

COURSE TITLE: **Pavement Subsurface Drainage Design**

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: This 3-day course is presented over a 4-day period, normally starting at 1 p.m. on the first day and concluding at noon on the fourth day. The course provides detailed information concerning pavement subsurface drainage design for new or reconstructed Portland Cement Concrete (PCC) or Asphalt Concrete (AC) pavements and retrofit edge drains. This course teaches cost-effective design methods, including permeable bases and edge drains where appropriate, to prevent or minimize moisture related distress to pavements.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Evaluate the need for subsurface drainage systems for existing pavements or new pavement designs.
2. Design subsurface drainage systems for Portland Cement Concrete and Asphalt Concrete pavements.
3. Explain the guidelines for developing plans and specifications for subsurface drainage systems.
4. Develop monitoring and maintenance programs for pavements with subsurface drainage systems.

TARGET AUDIENCE: The course is directed to Federal, State and local highway engineers, designers, and personnel involved in hydraulic design, materials control, pavements design, research, construction and maintenance of pavement subsurface drainage systems.

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COURSE COORDINATOR: Patricia Lees (703) 235-0524 e-mail: pat.lees@fhwa.dot.gov
TECHNICAL INFORMATION: Robert Baumgardner (202) 366-4612
e-mail: robert.baumgardner@fhwa.dot.gov

COURSE NUMBER: 13108 (Revised 1998)

COURSE TITLE: Techniques for Pavement Rehabilitation

COURSE FEE: \$8,000/\$16,000 (See GENERAL INFORMATION section)

LENGTH: 3 ½ Days (CEU: 2.1 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides detailed information concerning the quality standards for pavement rehabilitation. It includes the concepts that assist pavement engineers in developing the most reliable and cost effective rehabilitation alternatives for existing flexible and rigid pavements. It addresses the problem of rehabilitation for both pavement types in a logical sequence: existing pavement structural evaluation and condition assessment, distress mechanisms, needs assessment, assignment of feasible alternatives from four categories of reconstruction, restoration, recycling and resurfacing (4R), selection of preferred alternatives, overall design and construction. The reference material contains information useful in identifying potential problems and providing specific solutions, while understanding the effects on the final rehabilitated pavement. The course combines lectures and workshop sessions to provide participants with hands-on experience with the techniques for pavement rehabilitation. The course is taught in five separate blocks as follows:

Block 1 - Introduction

Block 2 - Project Level Survey and Evaluation

Laboratory Materials Characterization
Condition Data Collection and Processing
Drainage Survey and Evaluation
Nondestructive Data Collection and Interpretation

Traffic Loading Evaluation
Overall Project Evaluation
Pavement Types

Block 3 - Flexible Pavement Rehabilitation Techniques

Flexible Pavement Overview
Hot Mix Asphalt (HMA) Overlays
Patching with Bituminous Mixtures
Identification of Feasible Alternatives
Surface Rehabilitation Techniques

Hot In-Place Recycling
Cold In-Place Recycling
Hot Central Plant Recycling
Cold Milling
Crack Sealing

Block 4 - Rigid Pavement Rehabilitation Techniques

Rigid Pavement Overview
Joint Sealing
Pressure Relief Joints
Partial Depth Repairs
Full Depth Repairs
Accelerated Rigid Paving Techniques

Load Transfer Restoration
Shoulder Rehabilitation Considerations
Retrofitted Edge Drains
Recycling
Portland Cement Concrete Overlays
HMA Overlays

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COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: Larry Arneson (303) 969-5772 x-349 e-mail: larry.arneson@fhwa.dot.gov

COURSE NUMBER: 13071 (Under development for late 1998)

COURSE TITLE: Finite Element Surface Water Modeling System (FESWMS-2DH)/Surface Modeling System (SMS)

COURSE FEE: \$8,000/\$16,000 (See GENERAL INFORMATION section)

LENGTH: 5 Days (CEU: 3.0 Units)

CLASS SIZE: 25

DESCRIPTION: The course presentation provides a balance of hydraulic theory, background of the finite element method, data requirements necessary to operate the FESWMS-2DH computer program, and the use of SMS in the development of input data files and the analysis of the data output.

The Finite Element Surface Water Modeling System (FESWMS-2DH) is a depth averaged two-dimensional surface water model for analyzing complex flow patterns in river or tidal situations. The program has been designed for modeling bridges and hydraulic structures commonly found in highway hydraulic applications. The program is capable of modeling bridges, bridges in pressure flow, culverts, weir flow over the roadway, and general and local scour through the reach being analyzed. The model is capable of handling steady and unsteady flow through hydraulic systems. Because of the intensive input data requirements and large amounts of output generated by the FESWMS-2DH computer program, a pre- and post-processing program named Surface-Water Modeling System (SMS) is used in the course. SMS is capable of interactively building finite element networks, including the input data files necessary to use the FESWMS-2DH computer program. The program is also capable of graphically presenting the output from FESWMS-2DH, using a variety of formats.

Participants will receive a notebook that includes: course materials, a FESWMS-2DH User's Manual and SMS User's Manual, including copies of the software used in the course. Non-State highway agency course participants will receive a demonstration version of the proprietary SMS computer program.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Apply the fundamentals and use the capabilities of the FESWMS-2DH computer program to develop two-dimensional water surface elevations and velocity fields.
2. Develop input data necessary for use in the FESWMS-2DH computer program.
3. Use SMS as a pre- and post-processing program for the FESWMS-2DH computer program.
4. Use SMS to build finite element networks and input data files for use with the FESWMS-2DH computer program, including to graphically view and manipulate the output.

TARGET AUDIENCE: Federal, State, and local hydraulic engineers who have responsibility for the design and analysis of highway stream crossings. In order to derive the most benefit from this training, course participants should have knowledge of the fundamentals of open channel flow and should be familiar with the general concepts associated with two-dimensional surface water flow modeling. Experience with the operation of Windows based computers programs is helpful.

and/or maintenance of bridge paint systems. Training applicable to managers who are responsible for procurement approval and for other personnel involved in such operations.

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TECHNICAL INFORMATION: Robert Kogler (703) 285-2018 e-mail: robert.kogler@fhwa.dot.gov

COURSE NUMBER: 13069 (Under development for Summer 1998)

COURSE TITLE: Hazardous Bridge Coatings: Design and Management of Maintenance and Removal Operations

COURSE FEE: \$6,500/\$13,000 Estimated (See GENERAL INFORMATION section)

LENGTH: 4 Days (CEU: 2.4 Units)

CLASS SIZE: 28

DESCRIPTION: The focus of this training course is on the maintenance and/or removal of bridge paint systems that contain lead or other potentially toxic materials. In an effort to ensure that these operations are cost effective and performed in compliance with applicable regulations, the course offers a step-by-step method to the design, specification, and management of bridge painting projects.

OBJECTIVES: Upon completion of this course, participants will be able to:

1. Recognize the health hazards and legal risks associated with lead-containing paint, and the impacts on bridge painting programs,
2. Use coating assessment surveys to maximize the service life of individual coating systems and improve the cost-effectiveness of an overall bridge painting program,
3. Select appropriate combinations of removal methods and containment systems, based upon the chosen painting strategy and the relative risks of the paint disturbance operation to workers, the public and the environment,
4. Implement a monitoring program that adequately demonstrates that associated risks have been controlled,
5. Establish performance standards to protect workers, reduce long-term liabilities associated with hazardous wastes, and document successful clearance of project sites,
6. Discuss the process undertaken to develop construction cost estimates of installed and life-cycle costs in order to evaluate alternative maintenance painting strategies,
7. Prepare clear, well organized, performance-based, project-specific specifications which establish objective goals for all areas of contract performance but leave the means and methods of construction to the contractor, and
8. Use available tools to help pre-qualify contractors, conduct effective pre-bid meetings, review contractor submittals, and enforce project specifications.

The classroom presentation includes a combination of lectures and discussions, demonstrations of key methods and procedures, and extensive workshops comprising nearly half of the class time. In addition, each participant receives a user-friendly field guide containing a detailed project design checklist, a model/template specification, suggested contractor pre-qualification package and pre-bid meeting agenda, submittal review checklist, as well as an environmental, health, and safety checklist to assess project specific performance.

TARGET AUDIENCE: Highway and transportation agency employees and private industry personnel who are responsible for development of contract specifications and procurement requirements for both the removal

- estimation of geotechnical resistance.
7. Explain the need for and activities associated with continued development/improvement of the AASHTO LRFD Specifications.

TARGET AUDIENCE: The course is intended for structural design engineers, geotechnical engineers and engineering geologists who are responsible for the implementation of LRFD methods. Attendees should have basic knowledge and/or experience in the design of structural foundations, earth retaining structures and buried structures, including an understanding of soil mechanics principles and terminology. The course is not intended to be a comprehensive geotechnical design course for these highway features.

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TECHNICAL INFORMATION: Jerry DiMaggio (202) 366-1569 e-mail: jerry.dimaggio@fhwa.dot.gov

COURSE NUMBER: 13068 (Under development for Fall 1998)

COURSE TITLE: Load and Resistance Factor Design (LRFD) for Highway Bridge Substructures

COURSE FEE: \$4,000/\$8,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 30

DESCRIPTION: This course is an advanced curriculum which emphasizes practical LRFD application for the design of structural foundations, retaining walls and abutments, and flexible- and rigid-wall culverts. The course illustrates the principles of limit state design as embodied in the development and application of LRFD by reference to the current American Association of State Highway and Transportation Officials (AASHTO) LRFD Specifications. The presentation addresses the necessary interaction between the structural and geotechnical specialists to successfully accomplish a design, and highlights the primary differences between Allowable Stress Design (ASD) and LRFD. Training materials include a comprehensive Reference Manual and a Participant's Workbook for use in noting important issues raised during instructor presentations. Important LRFD concepts are discussed in lectures and illustrated via numerous student problem solving exercises developed to show typical design situations which could be encountered by the participants. The course agenda is structured to encourage significant interaction between the students and instructors, and includes time for presentation by host agency representatives on local LRFD implementation activities. The training course will cover the following:

- Introduction and Transition to LRFD
- Principles of Limit State Design
- Loads, Load Factors and Combinations
- Comparison of LRFD and ASD
- Spread Footing Design
- Driven Pile Design
- Anchored Wall Design
- Mechanically Stabilized Earth Wall Design
- Process for Resistance Factor Calibration

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the benefits of and differences between LRFD and ASD.
2. Explain the benefit of reliability-based design specifications in attempting to achieve uniform safety levels in the design of structure components.
3. Select limit states, load factors and load combinations for substructure design as embodied in the AASHTO LRFD Specifications.
4. Apply LRFD concepts as embodied in the AASHTO LRFD Specifications for the design of spread footing and driven pile foundations.
5. Apply LRFD concepts as embodied in the AASHTO LRFD Specifications for the design of reinforced concrete cantilever and anchored walls.
6. Discuss the advantages of LRFD in considering the uncertainty inherent in site characterization and

TARGET AUDIENCE: Federal, State, and local hydrologic design engineers and technicians who are responsible for the design of highway bridges.

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COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: Arlo Waddoups (415) 744-2618 e-mail: arlo.waddoups@fhwa.dot.gov

COURSE NUMBER: 13067

COURSE TITLE: Practical Highway Hydrology

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course is designed around the updated Hydraulic Design Series (HDS) No. 2, "Hydrologic Design of Highways." The course provides engineers and technicians with the knowledge and practical application of hydrologic principles to highway design. Participants will be required to work example problems that stress actual design situations. The course addresses the following major topics:

- Review of fundamentals
- Runoff process
- Hydrologic data
- Frequency analysis and peak flow determination
- Peak flow determination for ungaged sites
- Determination of flood hydrographs
- Hydrograph routing
- Urbanization and other factors affecting discharge and hydrographs
- Reliability and risk analysis
- Stormwater management
- Arid lands hydrology
- Role of GIS in the design and analysis of highway drainage structures
- Computer models applicable to practical highway hydrology

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Distinguish between deterministic and statistical methods for analyzing the hydrologic behavior of a watershed.
2. Describe the factors affecting the shape of runoff hydrographs, and the relationship between storm duration and frequency.
3. Outline a reasonable strategy for obtaining and evaluating hydrologic data.
4. Generate peak flow estimates for any return period using a given record of annual peak flows.
5. Calculate peak flow estimates using available regression equations and the rational formula.
6. Develop a direct runoff hydrograph, given a unit hydrograph and an excess rainfall hyetograph, and separate the baseflow component.
7. Solve storage routing and channel routing problems by prescribed methods.
8. Adjust peak flow estimates to different levels of urbanization.
9. Characterize hydrologic models and outline the basic steps of hydrologic model development.
10. Describe the special issues associated with analyzing the hydrology of arid areas.

COURSE NUMBER: 13065

COURSE TITLE: Introduction to Highway Hydraulics

COURSE FEE: \$6,500/\$13,000 (See GENERAL INFORMATION section)

LENGTH: 4 Days (CEU: 2.4 Units)

CLASS SIZE: 30

DESCRIPTION: This course is based on the revised and renamed Hydraulic Design Series No. 4 (HDS-4), "Introduction to Highway Hydraulics," providing participants with information on current hydraulic techniques. The emphasis is placed on methods suitable to small drainage areas, such as storm drains, roadside ditches, etc., servicing primarily small drainage areas. In addition, fundamental hydraulic concepts are discussed, followed by open-channel flow principles and design applications of open-channel flow in highway drainage, including open-channel applications and the design of stable channels, pavement and drainage. Closed-conduit concepts and applications in highway drainage will be presented, as well as the application of culvert and storm drainage design. The presentation concludes with an introduction to concepts and design of energy dissipaters and a comprehensive design workshop. Detailed design criteria are drawn from other Hydraulic Design Series manuals and Hydraulic Engineering Circulars, providing a broad overview of all components of highway drainage design with an emphasis on practical applications. A portable hydraulic flume is set up in the classroom for the participants to observe numerous hydraulic principles and see the effects of weir shapes improved inlets for culverts, pipe slope, corrugated versus smooth pipe and hydraulic jump. The participants take velocity and discharge measurements from the flume while in various setups and use the information to make actual design calculations.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Calculate design discharge using the Rational Method or Regression Equation procedures.
2. Apply the continuity and energy equation to solve practical design problems.
3. Use the Weir equation to calculate the flow overtopping a roadway embankment.
4. Use Manning's equation to calculate velocity or flow depth in simple or compound channels, and recognize when this equation cannot be appropriately applied.
5. Evaluate channel flow conditions (subcritical, critical or supercritical) using the Froude number.
6. Design a stable channel using basic hydraulic concepts and HEC-15.
7. Apply basic pavement drainage concepts in calculation procedures described in HEC-22.
8. Design a simple culvert crossing using the procedures in HDS-5.
9. Design a simple storm drain and calculate the HGL using the energy equation and HEC-22.
10. Describe which energy dissipaters are useful for culvert or storm drain applications based on HEC-14.

TARGET AUDIENCE: Entry-level engineers or engineering technicians who are doing highway drainage calculations on transportation facilities. It will also be useful as a refresher course on hydraulic fundamentals for experienced personnel.

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TECHNICAL INFORMATION: Jorge Pagan (202) 366-4606 e-mail: jorge.pagan@fhwa.dot.gov

CURRICULUM MATERIAL SALES COORDINATOR: Lynn Cadarr, (703) 235-0528 Phone
(703) 235-0593 Fax

Orders may be placed by mail or fax. Mail orders should be addressed to:

Ms. Lynn Cadarr
National Highway Institute (HHI-10)
901 North Stuart St., Suite 300
Arlington, VA 22203

All checks should be made payable to the Federal Highway Administration.

Faxed orders, or mail orders that do not include payment, must include a billing address to which NHI should send an invoice.

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: James Keeley (303) 969-5949 e-mail: james.keeley@fhwa.dot.gov

1300-foot radius curve (Unit 2). The superstructure is composed of four steel plate girders with a composite cast-in-place concrete deck. The substructure elements, seat-type abutments, and single-column intermediate piers, are all cast-in-place concrete supported on steel H-piles. All substructure elements are oriented normal to the centerline of the bridge. This example illustrates preliminary seismic design, multiple unit behavior, deck force transfer through steel cross frames, seismic performance category B effects on single column piers, and steel pile design.

The sixth example is a 290' sharply curved (104 degrees) 3-span concrete box girder bridge in the Northwestern United States with a design acceleration of 0.20g. The substructure is composed of steel pipe piles in monolithic end wall type abutments and single column flared piers founded on drilled shafts. This example illustrates the effect of large curvature, drilled shafts, integral abutments with piles, and rectangular flared column to circular drilled shaft detailing.

The seventh example is a 717' 10-span prestressed girder bridge with open pile bents and a design acceleration of 0.10g. The superstructure consists of three continuous span bridges arranged in a 3-4-3 span series. This example illustrates preliminary seismic design for six different options for the pile piers; plumb piles, batter piles, concrete piles, and steel piles. For each option, the seismic analysis is done using hand calculations in order to illustrate how various pile options can be quickly evaluated without using a computer.

The Seismic Help Desk service provides three levels of customer support. Level I provides follow-through training to answer questions arising from the design examples or the seminars. Level II service provides seismic design assistance on actual design projects. Level III offers the development and presentation of seismic training at the requestor's office to meet the specific needs of the requestor. Contact James Keeley at (303) 969-5949 for more information about the Seismic Help Desk service and the costs for receiving this service.

OBJECTIVES: Participants that attended the seismic seminars or that study the curriculum material from the course will be able to:

1. Select appropriate seismic design criteria.
2. Model common bridges for either a hand single-mode or a computer multi-mode analysis.
3. Interpret and gain confidence with the analysis results.
4. Accomplish the AASHTO required design tasks.
5. Develop the AASHTO required details.

TARGET AUDIENCE: Federal, State, and local transportation agency structural design engineers, including private sectors engineers, who are responsible for the design of highway bridges. The course material is designed for graduate engineers who have been trained in basic structural engineering.

CURRICULUM MATERIAL:

\$100 Per Set = Set of Seven Seismic Design Examples and Two Participant Workbooks

\$ 15 Each = Additional Copies of Individual Seismic Design Examples

\$ 15 Each = Additional Copies of Individual Participant Workbooks

No Charge = Video Tapes of the two 1-day training courses are available on loan for viewing or copying

COURSE NUMBER: 13063

COURSE TITLE: Seismic Bridge Design Applications

COURSE FEE: See Below

LENGTH: NA

CLASS SIZE: NA

DESCRIPTION: Two 1-day seismic seminars were presented by satellite in 1996 to over 20 downlink sites across the United States. They provided a brief review of seismic design fundamentals and had many sessions on actual seismic design application. No additional satellite presentations of these seminars are planned, but training can be arranged through the Seismic Help Desk discussed on the next page. The participant's workbooks used during the satellite broadcasts, seven seismic design examples, video tapes of the entire broadcast, and a Seismic Help Desk service are still available. Each seminar had a participant's workbook that included copies of approximately 300 visual aids used in the seminars. The seismic design examples are comprehensive and serve to illustrate how to apply AASHTO's seismic specification to seven common bridges selected from around the United States. These are from actual bridges submitted by State highway departments.

The first example is a 242' reinforced concrete box girder two span overdressing with spread footing foundations. The bridge is located in the northern Rocky Mountain region. It is designed for an acceleration of 0.28g and falls into AASHTO Seismic Performance Category C. The example begins with a full analysis and design using the single-mode spectral method with basic (fixed) foundation supports. The next section illustrates analysis and design using the single-mode spectral method with foundation spring supports and abutment springs. Other sections illustrate load method and the multimode spectral methods for both basic and spring supports.

The second example is a 400' 3-span skewed steel plate girder bridge over a river in New England in an AASHTO Seismic Performance Category B with a design acceleration of 0.15g. The superstructure rests on steel reinforced elastomeric bearings and wall piers with spread footings on rock. This example highlights the modeling of elastomeric bearings, skew effects on girder systems, varying cross sections, and wall pier design.

The third example is a skewed 70' single span prestressed concrete girder bridge with tall-closed seat-type abutments on spread footings. This bridge is in the Mississippi Valley with a design acceleration of 0.36g. It illustrates AASHTO's requirements for tall abutments and the Mononobe-Okabe seismic earth pressure forces.

The fourth example is a 320' reinforced concrete box girder 3-span skewed bridge in the western United States with a design acceleration of 0.30g. It has two column bents with pinned connections between the columns and spread footing foundations. It illustrates skew effects, foundation springs for spread footings, two-column behavior, and pinned base column design.

The fifth example is a 1488' steel plate girder bridge in the inland Pacific Northwest with a design acceleration of 0.15g. It has nine spans and consists of two units: a four-span tangent (Unit 1) and a five-span with a

COURSE NUMBER: 13061

COURSE TITLE: Load and Resistance Factor Design for Highway Bridges

COURSE FEE: \$8,000/\$16,000 (See GENERAL INFORMATION section)

LENGTH: 4 Days (CEU: 2.4 Units)

CLASS SIZE: 40

DESCRIPTION: This course addresses AASHTO's adoption of the specification for Load and Resistance Factor Design (LRFD) for highway bridges. Major topics include:

- Introduction and background of the new LRFD Bridge Design Code
- Loads, load factors, load combinations, and methods of structural analysis
- Concrete structures
- Steel structures
- Abutments, piers, and walls

The course discusses the primary differences in Auto Stress Design, Load Factor Design and LRFD, including the process of establishing live-load models, load and resistance factors, and other major departures from the Standard Specifications. With the use of examples, the application of LRFD to steel girders, concrete girders, concrete decks, timber decks, P/C culverts, and retaining wall designs will be addressed.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Discuss the benefits of changing to the LRFD specifications for bridge design.
2. Apply limit states to design reasoning.
3. Recognize qualitatively the reliability theory basis of establishing safety, but not necessarily to be able to apply it qualitatively.
4. Apply new load models and load distribution calculation procedures to bridge design.
5. Design routine structures involving steel or concrete girders, concrete decks, timber bridges, walls and culverts using the new LRFD specifications.

TARGET AUDIENCE: Federal, State, and local structural design engineers who are responsible for the design of highway bridges. The course is designed for graduate engineers who have been trained in basic structural engineering.

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TECHNICAL INFORMATION: John Hooks (202) 366-6712 e-mail: john.hooks@fhwa.dot.gov

Physical Protection (Fixed and Moveable Bridges)
Motorist Warning Systems / Aids-to-Navigation

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Apply the AASHTO vessel collision specification to design bridge structures.
2. Determine ship and barge characteristics for vessels transiting a waterway.
3. Compute vessel impact forces and collision energies.
4. Determine the location of impact forces on bridge members.
5. Determine design impact loads using Method I (semi-deterministic) criteria.
6. Determine design impact loads using Method II (risk analysis) criteria.
7. Determine design impact loads using Method III (benefit/cost) criteria.
8. Describe alternative pier protection systems for bridge structures.
9. Apply vessel collision planning guidelines for the development of new bridges.

TARGET AUDIENCE: Federal, State, and local highway bridge design engineers and bridge managers who are responsible for the construction of bridges over marine or inland waterways navigable by large commercial vessels. It will also be of interest to other parties who are responsible for the management of inland waterway, port, and navigation facilities or for the operation of merchant vessels.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

COURSE NUMBER: 13060

COURSE TITLE: Vessel Collision Design of Highway Bridges

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 35

DESCRIPTION: The *AASHTO Guide Specification and Commentary for Vessel Collision Design of Highway Bridges* was developed to enable bridge engineers to assess the risk of vessel collision with a bridge, calculate the costs of probable collisions with the bridge, develop plans to minimize the risk of collision, and develop designs to protect the bridge and its motorists in the event of a collision.

This 2-day training course provides bridge engineers with the background and overall approach of the design specification. Bridge engineers will be trained on the detailed application of those specifications through the use of a typical design situation. The course covers the following subjects:

Background and Historical Collisions

General Provisions

- Applicability of the Specification
- Data Collection
- Bridge Importance Classification
- Vessel Types and Characteristics
- Design Vessel
- Design Impact Speed/Vessel Collision Energy
- Collision Force on Piers and Superstructures
- Ship and Barge Bow Damage Depth
- Impact Load Combination and Location of Forces

Design Vessel Selection

- Waterway/Bridge/Vessel Characteristics
- Impact Distribution
- Design Loads
- Selection Methods:
 - Semi-Deterministic
 - Risk Analysis
 - Cost-Effectiveness

Substructure Provisions

Concrete and Steel Design

Bridge Protection Design Provisions and Planning Guidelines

COURSE NUMBER: 13057

COURSE TITLE: HYDRAIN - Integrated Drainage Design Computer System

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section) The sponsoring agency is responsible for providing microcomputers with MS-DOS version 3.0 or better, 640K (560K or more free), color graphics, VGA color monitors, and hard disk.

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 30 or no more than 3 participants per computer

DESCRIPTION: The HYDRAIN system is a set of hydraulic and hydrologic microcomputer programs for the design and analysis of drainage components such as storm drains and inlets, culverts, bridges, and roadside channels. Included in the HYDRAIN shell is an editor program that provides full screen text editing to the command line engineering programs. The editor program supplies intermediate to high level support. The course provides hands-on computer training using the HYDRAIN shell and editor. While sample problems for each engineering program will be solved, comprehensive training in each of the programs is not provided.

The HYDRAIN programs covered in the training course are:

- HYDRO - Hydrologic analysis
- HYDRA - Design and analysis of storm drains and sanitary sewers
- WSPRO - Analysis of backwater effects resulting from a bridge
- HYCLV/HY 8 - Design and analysis of culvert systems
- HYCHL - Design and analysis of roadside channel linings

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify the computer programs that make up the HYDRAIN system.
2. Describe what input parameters are required to use HYDRAIN and how to interpret the output.
3. Use HYDRAIN effectively for the design of drainage components.

TARGET AUDIENCE: Experienced hydraulic engineers in Federal, State and local highway agencies. Participants would get maximum benefit from the course if they have some experience with HYDRAIN or the engineering programs that make up HYDRAIN.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: Abbi Ginsberg (202) 366-8080 e-mail: abbi.ginsberg@fhwa.dot.gov

COURSE NUMBER: 13056

COURSE TITLE: Culvert Design

COURSE FEE: \$5,500/\$11,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course provides participants with the recommended design procedures for the hydraulic design of culverts. Computer programs will be distributed, discussed and demonstrated. (However, this is not a "hands-on" computer course). A portable hydraulic flume is set up in the classroom for the participants to observe numerous hydraulic principles and the hydraulic effects of improved inlets, pipe slope, material roughness and various end treatments. The participants take velocity and discharge measurements from the flume while in various setups and use the information to make actual design calculations. The training course covers the following topics:

- "Hydraulic Design of Highway Culverts" (FHWA publication HDS-5)
- Culvert Hydraulic Design/Analysis Computer Program (HY-8)
- "Hydraulic Design of Energy Dissipators for Culverts and Channels" (FHWA pub. HEC-14)

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify design alternatives based on culvert type, material, shape and service life considerations.
2. Describe the factors that govern inlet and outlet control and predict how each factor influences culvert performance.
3. Calculate tailwater depth and velocity and describe how tailwater effects culvert performance.
4. Design conventional culverts using HDS-5.
5. Improve culvert performance for inlet control culverts by designing and improved inlet using HES-5.
6. Evaluate culvert outlet velocity and the need for energy dissipators, and select alternative energy dissipators using HEC-14.
7. Identify appropriate computer programs for culvert and energy dissipator design.

TARGET AUDIENCE: Engineers and technicians responsible for culvert design on transportation facilities. The course is suitable for entry level personnel and is valuable as a refresher course for those with previous culvert design training or experience.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: Philip L. Thompson (202) 366-4611 e-mail: philip.thompson@fhwa.dot.gov

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Evaluate a variety of bridges and determine the critical areas for inspection including fracture-prone details, common points of deterioration and/or distress and fracture critical members.
2. Review as-built plans and previous inspection reports and, based on this review, plan and conduct an effective safety inspection for all common bridge types including bridges with fracture critical members and for bridge-length culverts.
3. Recognize the various deficiencies that can exist on a bridge and discuss the cause of the deficiencies.
4. Recognize the need to inspect the underwater portions of bridge structures; describe the types of deficiencies to look for (e.g., scour); determine when an inspection is necessary; and identify the procedures and types of equipment available and the advantages and limitations of each.
5. Recognize the consequences of improper inspection or inadequate inspection frequency.
6. Evaluate the general and specific condition of a bridge and its components by using a variety of inspection procedures and equipment.
7. Evaluate the severity of material deterioration and member distress and assign ratings according to coding guidance as developed by FHWA and/or the highway agency. Determine when it is necessary to close the bridge (or recommend closure to appropriate authority) because of imminent danger.
8. Discuss the equipment requirements for a complete inspection and demonstrate proficiency in the use of same.
9. Recognize when further inspection, such as Nondestructive Testing (NDT), is required beyond the usual visual and hand tool inspection and decide what type of further inspection should be conducted.
10. Satisfy the requirements for training described in the NBIS for individuals in charge of the organizational unit that has been delegated bridge inspection responsibilities and for individuals in charge of a bridge inspection team.
11. Successfully complete a written examination on the material presented.

TARGET AUDIENCE: Federal, State, and local highway agency employees involved in inspecting bridges or in charge of a bridge inspection unit. A background in bridge engineering or completion of NHI course 13054 - Engineering Concepts for Bridge Inspectors is strongly recommended.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: John Hooks (202) 366-6712 e-mail: john.hooks@fhwa.dot.gov

COURSE NUMBER: 13055

COURSE TITLE: Safety Inspection of In-Service Bridges

COURSE FEE: \$20,000/\$40,000 which includes a \$2,000 cost for 40 copies of the "Bridge Inspector's Training Manual 90." (See GENERAL INFORMATION section)

LENGTH: 2 Weeks (CEU: 6.0 Units)

CLASS SIZE: 40

DESCRIPTION: This course is based on the updated "Bridge Inspector's Training Manual 90," providing training on the safety inspection of a variety of in-service highway bridges. Satisfactory completion of this course will fulfill the training requirements of the National Bridge Inspection Standards (NBIS) for a comprehensive training course, based on the manual.

A comprehensive examination based on the content of the course has been developed and will be administered to the participants on the last day of the course. The host State may monitor the examination and retain the scores for purposes of qualifying or certifying bridge inspectors under the State's procedures.

The training course will cover the following topics:

- Bridge Inspection Programs.
- Review of Basic Concepts.
- Safety.
- Inspection Documentation.
- Inspection and Evaluation of:
 - Bridge Decks
 - Common Timber, Steel and Concrete Superstructures
 - Fracture Critical Bridge Members
 - Bridge Bearings
 - Substructures
 - Waterways
 - Underwater Inspections
 - Culverts

In addition, the host agency may tailor the course to their specific needs by selecting a combination of topics from the following list: pins and hangars, eyebars, cable supported bridges, prestressed segmental bridges, and moveable bridges. Sufficient topics will be selected to provide 2-week training sessions. One or two field trips to inspect, evaluate and rate bridges are included in the schedule. The host agency's inspection forms will be used in these exercises.

COURSE NUMBER: 13054

COURSE TITLE: Engineering Concepts for Bridge Inspectors

COURSE FEE: \$10,000/\$20,000 which includes a \$2,000 cost for 40 copies of the "Bridge Inspector's Training Manual 90." (See GENERAL INFORMATION section)

LENGTH: 5 Days (CCU: 3.0 Units)

CLASS SIZE: 40

DESCRIPTION: This course prepares technicians and other personnel who have a limited knowledge of bridge engineering for a more intensive course in bridge inspection, such as the NHI 2-week course no. 13055 on Safety Inspection of In-Service Bridges. This course provide knowledge of the elementary concepts in bridge engineering that are needed by bridge inspectors. Materials, material properties, bridge components and details, loadings, stresses and strains, and deterioration of bridge materials and members are covered. The course concludes with an examination reviewing key elements of bridge engineering.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify common bridge types and recognize and name the typical major components and members of a highway bridge and also the members and features unique to bridges such as trusses, arches, cable-stayed and suspension spans.
2. Name the common materials used in bridges and describe the basic properties, strengths and weaknesses of each.
3. Discuss the basic concepts of elasticity of materials, response of materials and structural members to a variety of loadings, and the relationship between stresses and strains.
4. Describe the various types of deterioration of the common structural materials that result from weathering, loading, etc.
5. Recognize the more common signs of material distress such as steel corrosion and cracking and concrete cracking, spalling and scaling.
6. Name the secondary elements and features of bridges such as joints, railings, scuppers, etc., and describe the proper role of each in the performance of a bridge.
7. Demonstrate knowledge of bridges, bridge components, material properties and mechanics of materials so as to be prepared to take a comprehensive course on bridge inspection.
8. Successfully complete a written examination on the material presented.

TARGET AUDIENCE: Federal, State, and local technicians, inspectors and engineers with basic experience relating to highway bridges. Individuals completing this course could serve on a bridge inspection team, but would require additional experience and training to qualify as team leaders.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: John Hooks (202) 366-6712 e-mail: john.hooks@fhwa.dot.gov

CASE STUDY BRIDGE TYPES:

Case Study R1	Steel Truss
Case Study R2	Metal plate Pipe Arch Culvert
Case Study R3	CIP Concrete T-Beam
Case Study R4	Steel Multi-Beam
Case Study R5	4 Span Prestressed I-Beam
Case Study R6	Concrete Culvert
Case Study R7	Prestressed Adjacent Box Beam
Case Study R8	Timber Multi-Beam

Host agencies interested in using element level data collection procedures for the case studies or additional information on topic options should call Mr. Ray Hartle of Michael Baker Corporation at (412) 269-7905.

OBJECTIVE: Upon completion of the course, participants will be able to:

1. Approach bridge safety inspection, condition rating, appraisal, and data collection in a uniform manner consistent with standard NBI practice and agency requirements.
2. Apply current inspection techniques to fatigue-prone members.
3. Evaluate channel scour as applied to waterway ratings.
4. Apply load rating concepts to collect field data more effectively.

TARGET AUDIENCE: Federal, State, and local highway agency employees and private sector employees involved in inspecting bridges or in charge of bridge inspection units. Participants must have (1) completed NHI Course No. 13055 - Safety Inspection of In-Service Bridges, or (2) meet the criteria for a bridge inspector under the State's procedures or requirements.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: John Hooks (202) 366-6712 e-mail: john.hooks@fhwa.dot.gov

COURSE NUMBER: 13053

COURSE TITLE: Bridge Inspection Refresher Course

COURSE FEE: \$5,000/\$10,000 Estimated (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: This course is based on the updated "Bridge Inspector's Training Manual 90." The training provides a review of the National Bridge Inventory (NBI) inspection method and includes discussions on structure inventory items, structure types, and the appropriate codes for Federal Structure, Inventory and Appraisal reporting. The case study-oriented program will employ the host agency's inspection forms to emphasize proper condition and appraisal ratings, and includes discussions on fatigue and fracture critical member inspections, and scour and waterway inspection procedures.

CORE COURSE TOPICS:

- Session 1: Introduction
- Review of Structure Inventory Items (SI&A Sheet)
- Review NBI Coding Rating Guidelines (Article 14.2, Manual 90)
- Condition Coding Exercise
- Bridge Load Rating and Analysis (Article 3.6, Manual 90)
- Fatigue and FCM Inspections (Chapter 18, Manual 90; video)
- Structure Type Identification
- Scour & Waterway Inspection (Chapter 13, Manual 90; handout)
- Review Inspector's Responsibilities and Duties
- Closing Remarks

SUGGESTED OPTIONAL TOPICS: (555 minutes total required)

- Agency Presentation (60 minutes)
- Pins and Hangers (45 minutes)
- Eyebars (45 minutes)
- Team Case Study Number 1 (90 minutes)
- Culvert Inspection Overview (60 minutes)
- Team Case Study Number 2 (60 minutes)
- Coatings (75 minutes)
- Team Case Study Number 3 (60 minutes)
- Team Case Study Number 4 (60 minutes)

OTHER OPTIONAL TOPICS:

- Additional Team Case Studies (60 minutes each)
- Basic Metrication (30 minutes)
- Segmental Concrete Box Girder Inspection (30 minutes)

COURSE NUMBER: 13051

COURSE TITLE: Bridge Management: Inspection Session

COURSE FEE: \$2,500/\$5,000 (See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 40

DESCRIPTION: The intent of this course is to provide highway agency inspection personnel with the essential bridge inspection data requirements for a Bridge Management System (BMS). This 1-day BMS: Inspection Session trains bridge inspectors how to perform element level data collection which is a method and format different than that typically used for National Bridge Inventory inspections. The course provides the fundamental principles of a BMS and emphasizes the data collection process through case studies. Host agencies can choose up to three case studies from the following list of ten available structure types:

Case Study 3-2	Rolled Steel Multi-Beam
Case Study 3-3	Prestressed I-Beam
Case Study 3-4	Steel Truss
Case Study 3-5	Concrete Closed-Spandrel Deck Arch
Case Study 3-6	Prestressed Adjacent Box Beam
Case Study 3-7	Glulam Timber Multi-Beam
Case Study 3-8	Concrete T-Beam
Case Study 3-9	Metal Plate Arch Culvert
Case Study 3-10	Concrete Slab

OBJECTIVES: Upon completion of this course, inspectors will be able to:

1. Analyze a set of bridge plans to identify the BMS elements which define the bridge, and estimate quantities (e.g. linear feet or linear meters).
2. Inspect a bridge and determine the condition-state of each element.
3. Record the condition of each element according to the established condition-state language.

TARGET AUDIENCE: Bridge inspection staff responsible for field evaluation and condition documentation of highway bridges.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: George Romack (202) 366-4606 e-mail: george.romack@fhwa.dot.gov

Executive Briefing Session

This session will only be presented concurrently with the 3-day Course No. 13050 - BMS: Management Session or concurrently with the 1-day Course No. 13051 - BMS: Inspection Session.

OBJECTIVES: Upon completion of the 2-hour Executive Briefing session, participants will be able to:

1. Recognize the purpose of a BMS.
2. Grasp the fundamental concepts and principles of Bridge Management.
3. Recognize advantages and disadvantages of various BMS approaches.
4. Evaluate the resources needed to implement and operate a formal BMS.

TARGET AUDIENCE: The Executive Briefing Session is directed toward the upper management level of State highway agencies, such as the Chief Executive Officer and/or Secretary of Transportation, heads of major agency divisions and their immediate staffs. The Bridge Management session, which includes training on software applications, is directed toward the middle management level of State highway agencies and bridge program personnel responsible for bridge design, planning, programming, inspection, maintenance, and management systems.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: George Romack (202) 366-4606 e-mail: george.romack@fhwa.dot.gov

COURSE NUMBER: 13050

COURSE TITLE: **Bridge Management: Management Session (3 Days)
-Optional Executive Briefing Session (2 Hours)**

COURSE FEE: \$6,000/\$12,000 = Management Session (See GENERAL INFORMATION)
\$ -0- = Executive Briefing

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 20 (Class size is limited for the Management Session to give participants ample opportunity to use the five computers that will be provided for use during this training course.)

DESCRIPTION: Some States are well along in developing and implementing a Bridge Management System (BMS) and are committed to using the system to assist them in maintenance, repair and replacement decisions. Accomplishing the development and implementation of a formal, comprehensive BMS will be a major undertaking in some of the other States - requiring the collection of additional data, reorganization, and formal training of personnel. To assist States in the area of training, the FHWA is offering a BMS training package for program managers (i.e., those directly responsible for bridge design, programming, inspection, and maintenance functions).

OVERALL COURSE OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify BMS principles, concepts, and objectives.
2. Provide guidance to middle management, including information on the development, establishment, and implementation of an effective Bridge Management System.

Bridge Management Session

Upon completion of the 3-day Management Session, participants will be able to:

1. Recognize the purpose of a BMS.
2. Grasp the fundamental concepts and principles of Bridge Management.
3. Evaluate BMS features.
4. Supervise development and establishment of a BMS.
5. Recognize the basic analytical approaches to computer modeling of deterioration, user costs, life cycle costs, and optimization.
6. Establish monitoring and tracking systems.
7. Apply the outputs of a BMS in the planning, programming, and budgeting processes.
8. Identify organizational issues and requirements.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: James Cooper (703) 285-2060 e-mail: james.cooper@fhwa.dot.gov

COURSE NUMBER: 13048

COURSE TITLE: Seismic Design and Retrofit of Highway Bridges

COURSE FEE: 3 Days = \$6,000/\$12,000 (See GENERAL INFORMATION section)
 4 Days = \$8,000/\$16,000 (See GENERAL INFORMATION section)
 4 ½ Days = \$9,000/\$18,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)
 4 Days (CEU: 2.4 Units)
 4 ½ Days (CEU: 2.7 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides material on seismology, structural dynamics, and limited computer applications, and familiarizes designers with the 1996 AASHTO code, including recent developments in seismic design and retrofit of bridges. In addition, the technique of using push-over analysis to evaluate various limit state conditions in the bridge will be presented. Other topics include: seismic loading, seismic response analysis, design concepts, and retrofitting. The course can be tailored to the needs of the participants in that more advanced material can be added for classes located in more seismically active regions of the country. To determine the course content and length of presentation before submitting a course request to NHI, contact the course instructor, Roy Imbsen, at (916) 366-0632.

In 1995 the FHWA published the updated "Seismic Retrofit Manual for Bridges" which incorporated recent research and introduced the use of displacement analysis techniques in the retrofit of bridges. In addition, FHWA presented course 13063 - Seismic Bridge Design Applications by satellite broadcast. That course presented several design examples illustrating the application of the current AASHTO code to new seismic designs. This updated version of course 13048 uses and builds upon examples from that material.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize how the current AASHTO seismic specifications apply to their region.
2. Design a highway bridge using AASHTO specifications.
3. Identify basic seismology, soil-structure interaction, and structural dynamics and how they affect bridge design.
4. Identify capacity limit states and modes of failure.
5. Identify practical retrofitting concepts.
6. Identify seismic isolation for bridges.

TARGET AUDIENCE: Federal, State, and local highway agencies and private sector structural design engineers who have responsibility for designing highway bridges. While the course should be of interest to bridge engineers at all levels, the course is designed for experienced designers who need to have knowledge of the current AASHTO specifications on seismic design. Bridge design experience using the current AASHTO specifications, and a basic understanding of structural dynamics, while not required, will also be helpful.

COURSE NUMBER: 13047

COURSE TITLE: Stream Stability and Scour at Highway Bridges for Bridge Inspectors
(See course 13046 for a description of the 3 Day course)

COURSE FEE: \$2,500/\$5,000 - 1 Day Course (See GENERAL INFORMATION)

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 30

DESCRIPTION: This course is an abbreviated presentation of NHI Course No. 13046. The course provides an understanding of and assistance in detecting hydraulic-related problems at highway bridges. The effects of steam instability, scour, erosion, and stream aggradation and degradation are covered. Countermeasures to these problems are discussed. As with course number 13046, material for this course will come from two Hydraulic Engineering Circulars (HEC), "Evaluating Scour at Bridges" (HEC-18), and "Stream Stability at Highway Structures" (HEC-20). This course concentrates on visual keys to detecting scour and stream instability problems. The course emphasizes inspection guidelines to complete the hydraulic and scour-related coding requirements of the National Bridge Inspection Standards (NBIS). This course can be offered as a 1-day module in conjunction with the 3-day course 13046 or as a stand-alone presentation.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify stream instability and scour problems at bridges.
2. Define problems caused by stream instability and scour.
3. Conduct field evaluations for scour and steam instability problems and properly code the results in the NBIS.

TARGET AUDIENCE: Federal, State and local highway bridge inspectors responsible for detecting possible hydraulic-related problems that may threaten the integrity of highway bridges. Consultants who do bridge inspection work for the States may attend if space is available.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: Jorge Pagan (202) 366-4604 e-mail: jorge.pagan@fhwa.dot.gov

TARGET AUDIENCE: Federal, State and local highway hydraulic, structural, and geotechnical engineers and bridge inspectors responsible for maintaining the integrity of highway bridges against possible hydraulic related problems. Consultants, who do bridge engineering work, are encouraged to attend.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: Jorge Pagan (202) 366-4604 e-mail: jorge.pagan@fhwa.dot.gov

COURSE NUMBER: 13046

COURSE TITLE: **Stream Stability and Scour at Highway Bridges**
(See course 13047 for a description of the 1 Day course for Bridge Inspectors)

COURSE FEE: \$5,000/\$10,000 - 3 Day Standard Course (See GENERAL INFORMATION)
\$6,000/\$12,000 - 3 Day Standard Course plus ½ Day on Tidal Scour
\$6,000/\$12,000 - 3 Day Standard Course plus ½ Day on Countermeasures

LENGTH: 3 Days (CEU: 1.8 Units)
3 ½ Days (CEU: 2.1 Units)

CLASS SIZE: 30

DESCRIPTION: This course provides comprehensive training in the prevention of hydraulic related failures of highway bridges. The effects of stream instability, scour, erosion and stream aggradation and degradation are covered. An overview of countermeasures to these problems is provided. Course material, based on HEC-18, includes revisions made to the contraction scour procedure, modification of the pier scour equation to account for the armoring effect of larger particle sizes in the bed material, and the design of riprap for protecting abutments. The course emphasizes the use of FHWA's WSPRO computer model as a basis for scour computation. Material for the 3-day course comes primarily from two Hydraulic Engineering Circulars (HEC), "Evaluating Scour at Bridges" (HEC-18), and "Stream Stability at Highway Structures" (HEC-20).

In addition to the 3-day course, two optional half-day modules are available. Coverage of the tidal scour problem, including tidal concepts and a workshop, is available for coastal states. A half-day workshop on countermeasures design based on the recently published HEC-23, "Bridge Scour and Stream Instability Countermeasures - Experience, Selection, and Design Guidance," is also available.

OBJECTIVES: Upon completion of the 3-day course, participants will be able to:

1. Identify stream stability and scour problems at bridges.
2. Define problems caused by stream instability and scour.
3. Estimate the magnitude of scour at bridge piers and abutments and in the bridge reach.
4. Propose countermeasures for stream instability and scour problems.

Tidal Scour Module

5. Compute scour components under tidal hydraulics and storm surge conditions.

Countermeasures Module

6. Identify countermeasures for bridge scour and stream instability using the HEC-23 countermeasures matrix.
7. Design selected countermeasures with HEC-23 design guidelines.

COURSE NUMBER: 13041

COURSE TITLE: HEC-RAS, River Analysis System

COURSE FEE: \$8,000/\$16,000 (See GENERAL INFORMATION section). The sponsor must provide MS-DOS 486 or better microcomputer with 8 MB of free extended memory, math coprocessor chip, and Windows 3.1 or later.

LENGTH: 4 ½ Days (CEU: 2.7 Units)

CLASS SIZE: 30 or no more than 2 participants per computer

DESCRIPTION: HEC-RAS is a computer program designed as the successor to the U.S. Army Corps of Engineer's HEC-2, Water Surface Profiles program. The program incorporates the Standard Step Method for Water Surface Profile Computations, Bridge Hydraulics, Hydraulics including the contracted opening method presented in WSPRO, Culvert Hydraulics, Flood Encroachments, Design of open channel flow, Analyzing split flow options and Sub - and Supercritical flow computations. The program can be used to compute bridge pier and abutment scour following the HEC-18 guidelines. The program is Windows based and uses a Graphical User Interface for file management, data entry and editing, program execution and output display. It provides easy conversion from English to metric units and vice-versa.

The course provides an overview and hands-on experience with the computer program. Each course participant will receive a notebook containing the course notes, a User's Manual, a Hydraulic Reference Manual, HEC-RAS software and disks of example computer workshops.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Apply the conservation of mass, energy and momentum to computations of water surface profiles, hydraulics of bridges and the hydraulics of culverts.
2. Create cross section, bridge and culvert data files.
3. Create flow files.
4. Run the HEC-RAS computer program.
5. Import HEC-2 data files.
6. Trouble shoot the output data to determine the validity of the run.

TARGET AUDIENCE: Federal, State and local hydraulic engineers who have responsibility for the design and analysis of river systems and stream crossings. Participants should have experience in using the Windows environment and knowledge of the fundamentals of open channel flow, including basic understanding of HEC-2 or WSPRO.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: Larry Arneson (303) 969-5772 x-349 e-mail: larry.arneson@fhwa.dot.gov

COURSE NUMBER: 13038

COURSE TITLE: Bridge Painting Inspection

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course covers metallic corrosion and how coating systems inhibit corrosion. Inspectors will learn how to inspect for proper paint storage and handling, surface preparation, and application of coatings, including compliance with applicable specifications and how to document findings. Hands-on training with common paint inspection tools is included. Course topics are: Corrosion and its Control; Bridge Coatings, Pertinent Documents; Responsibility of Inspectors; Inspection of Existing Coatings; Pre-Surface Preparation Inspection; Inspection of Surface Preparation; Inspection of Coating Application; Hazardous Waste Regulations; Safety Hazards; and Planning and Documentation.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Define the process of steel corrosion and how coating systems work.
2. Inspect surface preparation and coating application operations and recognize deficiencies and problems.
3. Perform a complete inspection on all phases of a bridge painting project including determining atmospheric conditions and using inspection instruments.
4. Recognize, interpret, and determine compliance with the painting and surface preparation specifications.
5. Record relevant data and field observations and prepare formal or informal reports to document the inspection.

TARGET AUDIENCE: State and local personnel responsible for on-site inspection of bridge painting projects, including supervisors or inspectors such as bridge maintenance engineers. Previous hands-on inspection experience on bridge painting projects is desirable.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: Robert Kogler (703) 285-2018 e-mail: robert.kogler@fhwa.dot.gov

COURSE NUMBER: 13035

COURSE TITLE: Bridge Backwater Computer Program

COURSE FEE: \$8,000/\$16,000. The sponsor is responsible for providing MS-DOS 286 or better microcomputer with 640K, color graphics, VGA color monitors, math coprocessors and hard disk. (See GENERAL INFORMATION section)

LENGTH: 5 Days (CEU: 3.0 Units)

CLASS SIZE: 24 or no more than 3 participants per computer.

DESCRIPTION: The Bridge Backwater Program (WSPRO) is a computer program for water-surface profile computation with special consideration given to design of bridge waterway openings. The program provides a powerful, yet flexible, computational tool for the analysis of one-dimensional, gradually varied flow profiles through natural rivers and bridge openings. Special capabilities of the program include the ability to analyze multiple openings (including culverts), road overflow, orifice and submerged orifice flow, and a design mode that easily alters the size and configuration of the bridge being analyzed. Many desirable features from existing step-backwater programs have been incorporated into this model. The WSPRO computer program runs on IBM compatible micro-computers. It is also available for use on mainframe computers.

The course presentation combines a balance of bridge hydraulic theory and hands-on familiarity with the program and its capabilities. Each course participant is provided a notebook containing copies of the course notes, a WSPRO Users Manual, a Bridge Waterways Analysis Model: Research Report, and other material to complement the course presentation and to serve as reference documents. The participants will receive a copy of the computer program and workshop examples.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Use the Bridge Backwater Computer Program (WSPRO) functions and capabilities to develop water-surface profiles.
2. Use the Bridge Backwater Computer Program (WSPRO) functions and capabilities to delineate flood plains.
3. Compute and compare water-surface profiles for various bridge openings.
4. Compute and compare local scour for fixed bed conditions for various bridge openings.

TARGET AUDIENCE: Federal, State, and local hydraulic engineers who have responsibility for the design and analysis of highway stream crossings. In order to derive the most benefit from this course, participants should have knowledge of the fundamentals of open channel flow and should be familiar with the general concepts associated with bridge backwater analysis.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov

TECHNICAL INFORMATION: Larry Arneson (303) 969-5772 x-349 e-mail: larry.arneson@fhwa.dot.gov

COURSE NUMBER: 13027

COURSE TITLE: Urban Drainage Design

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)
 \$6,500/\$13,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)
 3 ½ Days (CEU: 2.1 Units) w/Pumping Station Design

CLASS SIZE: 30

DESCRIPTION: This course provides a detailed introduction to roadway drainage design. Design guidance for solving basic problems encountered in roadway drainage design is provided. Topics to be discussed:

HYDROLOGY

- Rational Equation
- Soil Conservation Method
- Regression Equations
- Synthetic Hydrographs

HIGHWAY DRAINAGE

- Gutter Flow
- Inlet Interception
- Storm Drains
- Storm Water Management

Since the needs of individual State highway agencies vary, the course curriculum can be adjusted as necessary. In addition to the basic 3-day course, a ½ day presentation on **STORM WATER PUMPING STATION DESIGN** will be conducted upon request.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Determine runoff (peak flows and volumes) from urban watersheds.
2. Apply basic hydraulic principles to urban drainage design.
3. Perform roadway drainage designs using various roadway inlets.
4. Size and/or analyze storm drain piping systems.
5. Establish the energy and hydraulic grade lines for storm drain systems.
6. Design and/or analyze detention basins.
7. Perform the hydraulic design of pumping stations.

TARGET AUDIENCE: FHWA and State highway agencies engineers who are responsible for designing and reviewing highway drainage systems.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: Chris Dunn (503) 326-3886 e-mail: chris.dunn@fhwa.dot.gov

COURSE NUMBER: 13010

COURSE TITLE: Highways in the River Environment

COURSE FEE: \$10,000/\$15,000 (See GENERAL INFORMATION section)

LENGTH: 4 ½ Days (CEU: 2.7 Units)

CLASS SIZE: 30

DESCRIPTION: The course provides training in the application of open-channel flow, fluvial geomorphology, and river mechanics to the planning, location, design, construction, maintenance and operation of highways. Additional topics include: sediment transport, bank protection, river training work, and design examples.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Apply open channel flow equations and concepts in the design and evaluation of highway hydraulic structures.
2. Determine resistance to flow and sediment transport at highway structures.
3. Evaluate the interrelationships between fluvial (river) geomorphology and hydraulic design.
4. Determine the stability or potential instability of rivers at highway encroachments and crossings.
5. Determine and design countermeasures for scour and river channel instability.
6. Integrate river mechanics equations, concepts and principles into the design, maintenance, evaluation and inspection of highways in the river environment.

TARGET AUDIENCE: Federal, State, and local engineers who are responsible for the design of highway hydraulic structures. Applications from university faculty members will be considered on a space available basis. The course is designed for graduate engineers who have been trained in basic hydraulics.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Larry Jones (703) 235-0523 e-mail: larry.jones@fhwa.dot.gov
TECHNICAL INFORMATION: Jorge Pagan (202) 366-4604 e-mail: jorge.pagan@fhwa.dot.gov

COURSE NUMBER: 12301

COURSE TITLE: Metric (SI) Training for Highway Agencies

COURSE FEE: \$3,000/\$6,000 (See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides training in the correct use of the metric system with emphasis on those units which are used in highway planning, design, construction, and material sampling/testing. The course material consists of a series of independent modules that are designed to stand alone so each presentation can be tailored to the specific needs and resources of a particular course sponsor.

OBJECTIVES: Upon completion of the course, participants will be able to:

- 1 Apply metric (SI) units for highway program development, design, and construction work.
2. Apply English/metric conversion factors for highway program development, design, and construction work.

TARGET AUDIENCE: Federal, State and local highway engineers and technicians. Consultants working in the highway industry may also purchase the course.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov
TECHNICAL INFORMATION: Al Benet (202) 366-0355 e-mail: alfonso.benet@fhwa.dot.gov

COURSE DESCRIPTIONS

Calculations of contact hours involved in a continuing education experience may include the following elements:

1. Classroom or meeting session time with direct participation between the learner and instructor or discussion leader is converted directly to contact hours.
2. Activities that use methods of instruction such as supervised independent study, directed reading, or project-based assignments may be awarded CEU. In such cases, the contact hours to be awarded may be determined after field-testing has shown the average amount of time (in hours) required to complete the learning activity.
3. Field trips (minus travel and other administrative time) and other experiential course activities may be awarded CEU, but usually on a basis of at least two experiential hours being required for each contact hour of instruction.

The following and similar activities are *not* included when calculating the number of instructional contact hours for any continuing education experience:

1. Time for study, assigned reading, and other related activities outside the classroom or meeting schedule;
2. Meeting time devoted to business or committee activities;
3. Meeting time devoted to announcements, welcoming speeches, or organizational reports;
4. Time allocated to social activities, refreshment breaks, luncheons, reception, dinners, and so forth. NOTE: Time devoted to a luncheon or dinner presentation integral to the continuing education experience may be included in calculating instructional contact hours.

The following is quoted from IACET's publication *Criteria and Guidelines*:

International Association for Continuing Education and Training
1101 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 857-1122

DETERMINING THE NUMBER OF CEU TO BE AWARDED

One Continuing Education Unit (CEU) is awarded for each 10 contact hours of instruction included in a specified continuing education program or activity. The number of contact hours of instruction and appropriate CEU to be awarded are determined *prior* to conducting a learning experience and only after the purpose and intended learning outcomes, requirements for satisfactory completion, content and content level, format, instructional methodology, instructional staff, and time schedule have been established. A decision to award CEU is not made after the program or activity has been offered.

The 60-minute clock hour is used as the contact hour in all continuing education experiences. Only the number of complete instructional hours is considered in assigning CEU. For example, 1.7 CEU are assigned for learning experience with a total of 17, 17.50, or 17.75 contact hours. Any fractional portion of an instructional hour calculated for the total program or activity is disregarded. When unforeseen circumstances require a significant alteration in the instructional schedule, an appropriate adjustment in the number of CEU to be awarded should be recommended by those planning and approving the program.

To determine the number of contact hours, count the hours in the program, and subtract refreshment breaks, lunches, and other activities not directly part of the instructional experience. Continuing education activities that involve less than 10 contact hours of instruction (less than 1.0 CEU) should be evaluated carefully in terms of the CEU program criteria before deciding to award fractional (e.g., 0.3 or 0.4) CEU. Often, learning experiences scheduled for relatively short periods of

time are not adequately planned, sequentially designed, or extensive enough to build a measurable competency that can be considered a significant continuing education experience.

Although the number of CEU to be awarded for each program or activity is recommended during the planning process, responsibility for final determination of the number of CEU awarded for a particular continuing education experience rests with a designated individual who is responsible for administering the CEU system. The accuracy and consistency with which CEU are assigned depends upon the understanding and professional competence of that designated individual.

United States Code, paragraph (b) to redefine the eligibility of NHI course costs for reimbursement from the Federal-aid apportionment to the States. This paragraph now reads:

(b) Set-Aside; Federal Share.--Not to exceed 1/16 of 1 percent of all funds apportioned to a State under section 104(b) for the surface transportation program shall be available for expenditures by the State highway department for payment of not to exceed 80 percent of the cost of tuition and direct educational expenses (but not travel, subsistence, or salaries) in connection with the education and training of State and local highway department employees as provided in this section.

Application procedures for these funds are contained in the Federal-Aid Policy Guide, Title 23, Chapter I, Subchapter D, Part 260, Subpart D.

In addition, the Surface Transportation and Uniform Relocation Assistance Act of 1987 modified Section 151 of Title 23, United States Code, to establish a National Bridge Inspection Program. Funds made available under this section of Title 23 may also be used for payment of training costs for bridge inspectors.

7. Continuing Education Unit

The course descriptions include Continuing Education Units (CEU) that may be awarded to course participants who have successfully completed these NHI courses. According to the International Association for Continuing Education and Training (IACET):

One Continuing Education Unit (CEU) is TEN CONTACT HOURS OF PARTICIPATION IN AN ORGANIZED CONTINUING EDUCATION EXPERIENCE UNDER RESPONSIBLE SPONSORSHIP, CAPABLE DIRECTION, AND QUALIFIED INSTRUCTION.

Beyond this general statement, the IACET's 24 page publication on *Criteria and Guidelines* acquaints providers of continuing education and training with the appropriate use and application of the CEU. The portion of IACET's publication that provides guidance for precisely establishing the number of CEU to be awarded is included in its entirety at the end of this section. The IACET's address is also included for those who would like to request copies of their publication.

The CEU shown for the courses in our catalog have been established based on a typical course presentation with 6 hours of actual instruction time or 0.6 CEU, per day. Adjustments to the course length to match local work hours or to accommodate increased/decreased emphasis on certain topics or for travel on field trips etc. may affect the actual number of CEU that should be awarded. The local coordinator for the sponsoring agency of an NHI course, and the course instructors, should determine the actual contact hours of instruction and CEU to be awarded. Each agency is encouraged to maintain their own records for CEU awarded to their course participants. CEU records maintained by NHI verify the course location, date, participants' name, and CEUs that are awarded for a typical course.

3. Local Coordinators Checklist

Appendix A of this catalog includes a Local Coordinators Checklist that should be useful for those people who may have attended dozens of training sessions, but never personally shouldered the responsibility for making all of the arrangements. This appendix offers suggestions that will stimulate thinking about the physical facilities and what is needed to create an effective learning situation. The person assigned Local Coordinator responsibilities should review this checklist, and add to it as additional requirements arise.

4. Course Fees

The fees shown for each course are effective through July 1 of the year following the issue date of this catalog. The first fee shown for each course has been subsidized by the Federal government and is applicable only to public highway and transportation agencies located within the United States. All other course sponsors located within the United States will be charged the second fee shown for each course, which is subsidized at a lower rate, unless more than half of the course participants are from public highway and transportation agencies. Fees for international courses will be negotiated on an individual basis.

5. Payment

a. Domestic Customers

The NHI will send an invoice to the sponsoring organization upon successful completion of the course. Checks, money orders, **credit cards**, or other generally accepted forms of payment from individual course participants will be accepted as part of the course fee. Checks and money orders should be made payable to the Federal Highway Administration.

b. International Customers

The NHI will fax or e-mail an invoice to the individual or organization upon successful completion of the course. Cashier's checks, international money orders, and **credit cards** are accepted forms of payments. Special arrangements will have to be made for wire transfers, and customers must ensure that they pay all related bank fees. All cashier's checks and international money orders should be payable in U.S. dollars to the Federal Highway Administration.

For additional information, please contact Lynn Cadarr by telephone at (703) 235-0528, by fax at (703) 235-0593, or by e-mail at lynn.cadarr@fhwa.dot.gov.

6. Reimbursement

a. Domestic Customers Only

The Intermodal Surface Transportation Efficiency Act of 1991 amended Section 321 of Title 23,

employees to attend without charge. There are a few exceptions where NHI does charge FHWA employees to attend unique courses such as long-term courses, courses offered by satellite, etc. In those instances, the fees are specified in the NHI Course Catalog or on the NHI web site. The procedure FHWA employees should follow to attend NHI courses is as follows:

- I. Registration of FHWA employees to attend NHI courses is controlled by the FHWA Course Coordinator in the State in which the training is being presented. The names of these coordinators are listed in the Training Management System (TMS) and they are *usually* the FHWA Division Office training coordinator. Registration in TMS alone is not enough to reserve a slot in NHI courses.
- ii. At least two weeks prior to the course starting date, any FHWA employee interested in attending an NHI course may check TMS to see if vacant slots still exist, and if so, should request a slot by contacting the FHWA Course Coordinator in the State in which the training is being presented.
- iii. Once confirmation of the slot is received, the FHWA employee's *local* FHWA Training Coordinator (not the FHWA Course Coordinator in the State in which the training is being presented) should promptly register the employee's enrollment in TMS. This keeps the vacant slot information in TMS current so that when the next person checks to see if any openings are available, they are not misled by false numbers.
- iv. Not later than two weeks prior to the course starting date, the FHWA Course Coordinator in the State in which the training is being presented should inform the sponsoring organization of the number of FHWA employees that will be attending. If the FHWA spaces are not filled within two weeks of the course starting date, the sponsoring organization may fill these spaces with other participants.

b. Domestic Customers

Individuals located within the United States that wish to attend an NHI training course should contact the Local Coordinator of that course as listed in the Course Schedule section of the NHI web page. The Local Coordinator determines whether the course is open to outside participants and can provide specific information such space available, course location and cost.

c. International Customers

The NHI will arrange the participation of international customers in training courses in the United States. In addition, the NHI provides assistance to international organizations wishing to purchase standard NHI training courses on a variety of technical subjects. These courses can be tailored to the specific needs of the organization at an additional cost.

For more information about training courses for international participants, please contact Bill Williams by telephone at (703) 235-0539 or by e-mail at bill.williams@fhwa.dot.gov.

Registration & Coordination

In this section, you will find everything you need to know about course registration and fees, the award of Continuing Education Units (CEUs), and the different sources available for obtaining more information about NHI training courses.

1. Course Requests

Requests to sponsor NHI courses should be submitted on the "Course Request and Confirmation" form (Form FHWA 1530) through the local FHWA division office. A few copies of this form are included in the back of the catalog (photo copies are acceptable) or on the NHI web site. The addresses for the FHWA division offices are shown in Appendix B. The FHWA division office is responsible for forwarding the form to the FHWA regional office and then to NHI. **Requested dates may be shown on the form, but no course is officially confirmed until the sponsoring organization receives a copy of the Form FHWA 1530 back from NHI approved in Section B by the authorizing official.**

2. Participation

Potential sponsors of NHI courses are encouraged to survey the training needs of other entities outside their own organization at the same time they determine their internal training needs. In some cases the combined needs may be sufficient to warrant sponsoring a course for which there otherwise would not be enough interest to justify the expense. In other cases where there is more than enough interest to fill one class, two classes could be justified and all of the staff would not be away from the office at the same time. Or, classes could be held at different locations and thereby save on travel expenses. In many cases where contractors are working for State agencies, unless the State includes the contractors in their training activities, they do not have access to the unique, state-of-the-practice, training that is offered by NHI. By attending training together, both sides receive the same training, they benefit from the added breadth of classroom discussions, and the participants establish a closer relationship by working together on class projects.

Course sponsors may charge participants from outside their organization a fee in order to recover all or part of the NHI course fee, plus other costs associated with hosting the course. However, it is requested that the sponsor not charge substantially more than enough to assure coverage of these costs. In order to avoid the transfer of monies, outside participants could be asked to provide classroom facilities or cover the expense of coffee and pastries. Otherwise, checks, money orders, or other generally accepted forms of payment from individual course participants will be accepted as part of the course fee so long as they are made payable to the Federal Highway Administration. Such payments may be forwarded to NHI as soon as they are received and the amount the invoice will be reduced accordingly, or they can be held and submitted as part of the total payment when an invoice is received by the sponsoring organization upon successful completion of the course.

a. FHWA Employees

NHI training is provided to sponsoring agencies at a subsidized rate. Therefore, space for up to 15 percent of the maximum number of participants specified for a given course is reserved for FHWA

GENERAL INFORMATION

What is NHI?

The National Highway Institute (NHI) is the technical training organization of the Federal Highway Administration. Created in 1970 by federal legislation, the NHI develops and administers transportation-related training and education programs that assist in applying new technologies to the planning, design, construction, maintenance, and rehabilitation of our Nation's transportation infrastructure.

By congressional mandate, the NHI is also very active in providing training and education programs to the international community. The NHI is one of 81 Technology Transfer Centers of the Pan American Institute of Highways. In this role it conducts and promotes training courses, seminars, and conferences, as well as professional exchanges, to transportation organizations around the world.

The NHI has opened a home page on the World Wide Web to enable our customers to obtain reliable, up-to-date information on all our courses and other activities. Our web site at <http://www.nhi.fhwa.dot.gov> provides course descriptions, dates, locations and local coordinators for all currently scheduled courses, as well as registration forms, training tips, and other newsworthy information. Visitors to our web site can also meet the entire NHI staff.

Whom do we serve?

With the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, the customer base of the NHI was expanded to include private sector transportation providers, firms, and universities in the United States, as well as transportation agencies and organizations around the world.

Our customers can be grouped as follows:

- **Federal, State, and Local Surface Transportation Agencies** - This group represents most of our customer base and reaches over 12,000 people per year.
- **Private Transportation Providers, Firms, and Associations** - The NHI is expanding its efforts to provide private sector organizations, especially those that work with public agencies, with instruction and training materials.
- **Universities and Other Academic Institutions** - The NHI provides technical course materials for inclusion in undergraduate and graduate curricula, and collaborates with community colleges, technical schools, and secondary and grade schools to identify the transportation professionals of tomorrow.
- **International Transportation Community** - The NHI develops and coordinates highway training in the U.S. and other countries for international agencies, organizations, groups, and individuals. Courses are primarily conducted in English, although special arrangements can be made to present the training in other languages.

Urban Planning (Continued)

15257 - Estimation of the Impacts of Urban Transportation Alternatives 130
15259 - Congestion Management for Technical Staff 132
15260 - Advanced Urban Travel Demand Forecasting for Large Urban Areas 133
15264 - Landside Access for Intermodal Facilities 134
15265 - Workshop on Transportation/Air Quality Analysis 135

Financial Management

35005 - Highway Program Financing 136

Civil Rights

36114 - Conducting EEO Contract Compliance Reviews 137
36119 - On the Road to Equality: Women in Highway Construction 138
36120 - Partnering for Indian Employment in Highway Construction 139

Highway Safety

38003 - Design and Operation of Work Zone Traffic Control 140
38005 - Railroad-Highway Grade Crossing Improvement Program 141
38032 - AASHTO Roadside Design Guide 142
38034 - Design, Construction, and Maintenance of Highway Safety
 Appurtenances and Features 143
38060 - Work Zone Traffic Control for Maintenance and Utility Operations 144
38061 - Pedestrian and Bicyclist Safety and Accommodation 145
38063 - Construction Zone Safety Inspection 147
38064 - Highway Routing of Hazardous Materials NLA
38065 - Advanced Safety Management System NLA

= New or Substantially Revised Course Listing
@ = Future Course Now Under Development or Revision
NLA = No Longer Available

Civil Engineering - Intelligent Transportation Systems (ITS)

@ 13601 - Intelligent Transportation Systems (ITS) Awareness Seminar 97
@ 13602 - Deploying Integrated Intelligent Transportation Systems (ITS) 98
@ 13603 - Intelligent Transportation Systems (ITS) Public/Private Partnerships 99
@ 13604 - Intelligent Transportation Systems (ITS) and the Transportation Planning Process 100
@ 13605 - Intelligent Transportation Systems (ITS) Telecommunications Overview 101

Right-of-Way

14126 - Appraisal and Appraisal Review for Federal-Aid Highway Programs 102
14128 - Highway/Utility Coordination Issues 103
14129 - Basic Relocation 104
14130 - Advanced Relocation Workshop 105
14131 - Business Relocation 106
14132 - Appraisal Principles 107
14133 - Appraisal Procedures 109
14134 - Standards of Professional Practice, Part A (USPAP) 111
14135 - Fundamentals of Rural Appraisal 112
14136 - Eminent Domain Training for Attorneys and Appraisers 113

Environment

14205 - Documenting NEPA and Transportation Decision Making 115
14207 - Fundamentals and Abatement of Highway Traffic Noise 116
14211 - Historic and Archeological Preservation 117
@ 14213 - Public Involvement During the Transportation Decision Making Process 118
@ 14217 - Fundamentals of Air Quality for Highway Planning and Project Development 119
14218 - Functional Assessment of Wetlands (WET II) 120
14228 - Environmental Training Center (Managing the Environmental Process) 122

Planning

15118 - Application of the FHWA Traffic Monitoring Guide 123
15121 - Administration of FHWA Planning Grants 124
15129 - Applications of Geographic Information Systems for Transportation 125
15130 - Corridor Preservation for Technical Staff 126
15134 - Development and Implementation of Travel Surveys 127

Urban Planning

15250 - Capacity and Planning Applications for Arterial Analysis NLA
15254 - Introduction to Urban Travel Demand Forecasting 128
15255 - Access Management, Location and Design 129

- # = New or Substantially Revised Course Listing
- @ = Future Course Now Under Development or Revision
- NLA = No Longer Available

Civil Engineering - Geotechnical (Continued)

#	13231 - Geo./Found. Engr.: Mod. 1 - Subsurface Investigation	65
@	13232 - Geo./Found. Engr.: Mod. 2 - Geotechnical Contracting and QA/QC	66
@	13233 - Geo./Found. Engr.: Mod. 3 - Soil Slopes and Embankments	67
@	13234 - Geo./Found. Engr.: Mod. 4 - Ground Improvement Techniques	68
@	13235 - Geo./Found. Engr.: Mod. 5 - Rock Slopes: Design, Excavation, Stabilization	69
#	13236 - Geo./Found. Engr.: Mod. 6 - Earth Retaining Structures	70
@	13237 - Geo./Found. Engr.: Mod. 7 - Shallow Foundations	71
@	13238 - Geo./Found. Engr.: Mod. 8 - Deep Foundations	72
#	13239 - Geo./Found. Engr.: Mod. 9 - Geotechnical Earthquake Engineering	73
@	13240 - Geo./Found. Engr.: Mod. 10 - Geotechnical Aspects of Pavements	74
#	13241 - Geo./Found. Engr.: Mod. 11 - Geotechnical Instrumentation	75

Civil Engineering - Design and Traffic Operations

	13305 - Highway Capacity and Quality of Flow	76
@	13310 - Computerized Traffic Signal Systems	77
	13328 - Traffic Control Software and Signalization	78
	13332 - Developing Traffic Control Strategies	79
	13342 - Human Factors: Principles for Highway, Traffic and Design Engineers	NLA
	13345 - Traffic Management Strategies	80
#	13348 - Incident Management	81
	13353 - Improved Highway Travel Considerations for an Aging Population	NLA
	13369 - Design and Application of Travel Demand Management (TDM) Techniques, Including Telecommuting	82
	13370 - Design and Application of Travel Demand Management (TDM) Techniques, Not Including Telecommuting	83
	13371 - Design and Application of Telecommuting Projects	84
	13372 - High Occupancy Vehicle (HOV) Facilities	85
	13374 - Advanced Traffic Signal Controller	NLA
	13375 - Freeway Traffic Operations	86

Civil Engineering - Construction and Maintenance

	13401 - Principles of Writing Highway Construction Specifications	87
	13405 - Value Engineering Workshop	88
	13429 - Bridge Maintenance Training	89
	13440 - Slope Maintenance and Slide Restoration	90
	13442 - Materials Control and Acceptance - Quality Assurance	91
	13444 - Partnering Concepts	93
@	13445 - Identifying and Controlling Runoff Pollution from Roads, Highways and Bridges	95
@	13446 - Identifying and Controlling Erosion and Sedimentation	96

- # = New or Substantially Revised Course Listing
- @ = Future Course Now Under Development or Revision
- NLA = No Longer Available

Civil Engineering - Structures and Hydraulics (Continued)

13064 - Bridge Engineering NLA
13065 - Introduction to Highway Hydraulics 30
13067 - Practical Highway Hydrology 31
@ 13068 - Load and Resistance Factor Design (LRFD) for Highway Bridge Substructures 33
13069 - Hazardous Bridge Coatings: Design and Management of Maintenance and Removal Operations . . 35
@ 13071 - Finite Element Surface Water Modeling System (FESWMS) Surface Water Modeling . . . 37

Civil Engineering - Materials, Pavements, and Base Design

13108 - Techniques for Pavement Rehabilitation 39
13119 - Portland Cement Concrete Materials 41
13123 - Highway Materials Engineering NLA
@ 13126 - Pavement Subsurface Drainage Design 42
13127 - Pavement Deflection Analysis NLA
13128 - AASHTO Design Procedures for New Pavement NLA
13129 - AASHTO Pavement Overlay Design 43
13130 - Pavement Analysis and Design Checks NLA
13132 - Hot-Mix Asphalt Construction 45
13133 - Construction of Portland Cement Concrete Pavements 47
13134 - Pavement Distress Identification 48
13135 - Pavement Management Systems (PMS) 49
@ 13144 - Hot-Mix Asphalt Production Facilities 50
@ 13145 - Hot-Mix Asphalt Materials, Characteristics and Control 51
@ 13150 - Asphalt Pavement Recycling for State and Local Governments 52
13151 - Superpave for Senior Managers 53
13152 - Superpave for the Generalist Engineer and Project Staff 54
13153 - Superpave for Local Governments 55

Civil Engineering - Geotechnical

13211 - Rock Blasting and Overbreak Control NLA
13212 - Soils and Foundations Workshop 56
13213 - Geosynthetics Engineering Workshop 57
13214 - Drilled Shafts 59
@ 13216 - Geotechnical and Foundation Engineering 60
13219 - Rockfall Hazard Mitigation NLA
13220 - Rockfall Hazard Rating System NLA
13221 - Driven Pile Foundations - Design and Construction 62
13222 - Driven Pile Foundations - Construction Monitoring 64

= New or Substantially Revised Course Listing
@ = Future Course Now Under Development or Revision
NLA = No Longer Available

Table of Contents

General Information	vi-xii
Course Descriptions	1-147
Local Coordinators Checklist	Appendix A
NHI Contact List	Appendix B
Course Request and Confirmation Form (Form FHWA 1530)	Appendix C

Course Descriptions

Mathematical Sciences

12301 - Metric (SI) Training for Highway Agencies	3
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Civil Engineering - Structures and Hydraulics

13010 - Highways in the River Environment	4
13023 - Nondestructive Testing Methods for Steel Bridges	NLA
13027 - Urban Drainage Design	5
13035 - Bridge Backwater Computer Program	6
13036 - Inspection of Fracture Critical Bridge Members	NLA
13038 - Bridge Painting Inspection	7
13039 - Culvert Inspection and Operation	NLA
13041 - HEC-RAS, River Analysis System	8
13046 - Stream Stability and Scour at Highway Bridges	9
13047 - Stream Stability and Scour at Highway Bridges for Bridge Inspectors	11
13048 - Seismic Design and Retrofit of Highway Bridges	12
13050 - Bridge Management: Management Session	14
13051 - Bridge Management: Inspection Session	16
# 13053 - Bridge Inspection Refresher Training	17
13054 - Engineering Concepts for Bridge Inspectors	19
13055 - Safety Inspection of In-Service Bridges	20
# 13056 - Culvert Design	22
13057 - HYDRAIN - Integrated Drainage Design Computer System	23
13060 - Vessel Collision Design of Highway Bridges	24
13061 - Load and Resistance Factor Design for Highway Bridges	26
13062 - High-Strength Bolts for Bridges	NLA
13063 - Seismic Bridge Design Applications	27

- # = New or Substantially Revised Course Listing
- @ = Future Course Now Under Development or Revision
- NLA = No Longer Available

COURSE NUMBER: 15255

COURSE TITLE: Access Management, Location and Design

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course covers access management along streets and highways and includes information from the 1996 National Conference on Access Management. General benefits, as well as the social, economic, political and legal implications of access control are examined. Existing access management practices and policies from sample States and jurisdictions are used as examples of what types of programs have been initiated and how effective they have been. Through in-depth discussion, access management techniques and the warrants for their use are reviewed. Geometric standards and guidelines for design and application of these access management techniques are described in detail. Strategies for developing and implementing retrofit programs to improve existing access control are presented. Several "before" and "after" case studies show the impacts of retrofit programs on local businesses. Techniques and procedures for evaluating the impacts of access control on the safety and operations of the highway system are also covered.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the various elements involved in planning, developing, implementing, and administering an effective access management program.
2. Assess the safety and operational impacts of alternative access management techniques.
3. Demonstrate convincingly the merits of obtaining and maintaining good access management along streets and highways.

TARGET AUDIENCE: This course is designed for Federal, State, and local planners and engineers who are currently involved or expect to be involved in decisions on and/or design of access to existing or new sites.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Ron Giguere (202) 366-2203 e-mail: ronald.giguere@fhwa.dot.gov

COURSE NUMBER: 15257

COURSE TITLE: Estimating the Impacts of Urban Transportation Alternatives

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

The sponsoring agency is responsible for providing MS-DOS microcomputers capable of loading Lotus 123 or Excel if computers are to be used on the third day of the course.

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40 or (for the computer sessions) no more than three students per computer

DESCRIPTION: This course provides an analysis of costs, benefits, and economic, social and environmental impacts of multi-modal investment and demand management alternatives. The innovative and timely analysis techniques presented in the course are applicable for evaluation of cross-modal alternatives for Long Range Planning (LRP), screening of alternatives for Major Investment Studies (MIS), Congestion Management Systems (CMS), Transportation Control Measure (TCM) and Travel Demand Management (TDM) analysis, and estimation of emissions impacts of projects proposed for funding through Congestion Mitigation and Air Quality (CMAQ) funds. Students apply the techniques in manual workshops (using hand calculators) to perform a sketch planning analysis of a real-world corridor study problem involving a variety of transportation alternatives, including general purpose highway lanes, HOV lanes, light rail transit, bus transit, bicycle lanes, pricing and demand management.

On the third day, at the option of the course sponsor, the course can be done either manually or on microcomputers by using the Sketch Planning Analysis Spreadsheet Model (SPASM). This software package was developed by FHWA for the purpose of assisting cross-modal comparisons based on economic efficiency (i.e., benefit-cost analysis). The course does not discuss methodologies for estimating travel demand impacts. Other NHI courses focus on demand estimation; course No. 13369 and 13370 on TDM impact estimation, No. 15254 on the basic four-step process, and course No. 15260 on advanced application of the four-step process.

COURSE OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the factors that must be considered to effectively evaluate proposed transportation investments.
2. Identify references, data sources, and travel model results that can be used to quantify and monetize impacts.
3. Conduct analyses to estimate public costs, user benefits, emissions, energy consumption, and overall economic worth of transportation alternatives for sketch planning purposes.
4. Recognize approaches to cost-benefit analyses and common inappropriate applications.
5. Use FHWA's software package Sketch Planning Analysis Spreadsheet Model (SPASM) and explain FHWA's more sophisticated Surface Transportation Efficiency Analysis Model (STEAM).

TARGET AUDIENCE: FHWA, States, Metropolitan Planning Organization, and local government planning staffs involved in urban transportation planning.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov
TECHNICAL INFORMATION: Jim Hunt (202) 366-4056 e-mail: james.hunt@fhwa.dot.gov

COURSE NUMBER: 15259

COURSE TITLE: Congestion Management for Technical Staff

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 30

DESCRIPTION: This course covers the development and implementation of congestion management systems (CMS). The essential elements of a CMS are discussed, including methods for defining congestion and identifying existing and future areas of congestion. Descriptions of the existing measures and methodologies are provided for monitoring recurring and nonrecurring congestion, as well as discussions on the data requirements for the methodologies and guidance on the possible sources of that data. A detailed listing of congestion reduction and mobility enhancement strategies are provided along with recommended processes for selecting the best strategies. The models and methodologies for evaluating alternatives are also covered. Workshops focus on developing prototype CMS's.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the principles of congestion and mobility and the concept of congestion management.
2. Identify the specific elements of a CMS and understand the importance of monitoring congestion.
3. Use performance measures and their data requirements, including sources of requisite data.
4. Apply congestion reduction and mobility enhancement strategies, and evaluate the operation of those strategies.
5. Explain the process for developing and implementing a CMS.

TARGET AUDIENCE: Planners and engineers at State and local levels, including representatives from MPO's, transit agencies and other organizations who will be participating in the development and implementation of CMS.

COURSE SCHEDULING: Lynn Cadarr (703)235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Douglas Laird (202) 366-5972 e-mail: douglas.laird@fhwa.dot.gov

COURSE NUMBER: 15260

COURSE TITLE: Advanced Urban Travel Demand Forecasting for Large Urban Areas

COURSE FEE: \$6,000/\$12,000 (See GENERAL INFORMATION section)

LENGTH: 3 ½ Days (CEU: 2.1 Units)

CLASS SIZE: 40

DESCRIPTION: An introductory level NHI training course on urban travel demand forecasting (NHI Course No. 15254) is currently offered by FHWA. The purpose of NHI Course No. 15260 is to build upon the introductory travel demand forecasting course, emphasizing advanced practices for travel demand modeling at the system level in large urban areas. The course consolidates the best procedures and methodologies to estimate demand impacts of a broad range of multimodal infrastructure investment and transportation/land use policy options for system planning. Topics covered include advanced practices for modeling of trip generation inputs, trip generation, trip distribution, mode choice, time-of-day analysis, traffic and transit trip assignment, and feedback loops, and overall model validation and reasonableness checks. Special issues relating to estimating travel impacts of Intelligent Transportation System (ITS) strategies are also discussed. Applications in each topic area are demonstrated through workshops exercises.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Select appropriate procedures and model structures to improve the capability of their four-step models.
2. Assess the contribution of various potential model input variables toward accuracy of their model forecasts, and the sensitivity of their models to policy input variables.
3. Evaluate the level of accuracy and reasonableness of model outputs.

FOR WHOM DESIGNED: This course is designed for FHWA, FTA, State DOT, Metropolitan Planning Organization, transit agency and local government modeling practitioners with modeling responsibilities in large urban areas. A thorough understanding of the four-step travel demand forecasting process and a minimum of 2 years of hands-on experience with this process is essential.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Patrick DeCorla-Souza (202) 366-4076
e-mail: patrick.decorla-souza@fhwa.dot.gov

COURSE NUMBER: 15264

COURSE TITLE: Landside Access for Intermodal Facilities

COURSE FEE: \$6,000/\$12,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40 (May be increased to 60)

DESCRIPTION: This course will cover in detail the design elements for intermodal facilities and the issues to be resolved regarding access to intermodal facilities.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the planning concepts and methodology for providing access to intermodal facilities.
2. Identify the data and analysis procedures needed to design access to an intermodal facility, and comprehend how the Clean Air Act amendments affect the process.
3. Identify the tools and techniques necessary to perform assessments of intermodal access strategies and actions.
4. Identify, apply and evaluate strategies for improving the efficiency of moving people and goods.
5. Recognize the problems and needs of shippers and facilities operators.
6. Illustrate the State and local planning and project development process, including constraints, for access improvements.

TARGET AUDIENCE: Technical staff responsible for the planning and design of access for intermodal facilities. Individuals involved in any aspect of transportation system planning will also benefit from attending this course. Because the targeted audience represents a broad range of individuals actively involved in landside access issues, it is recommended that the initial presentations of courses be sponsored by Port Authorities either individually or in cooperation with State DOTs and/or MPOs. In this particular situation, it is permissible to increase the class size to 60 participants.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Lee Chimini (202) 366-4068 e-mail: leroy.chimini@fhwa.dot.gov

COURSE NUMBER: 15265

COURSE TITLE: Workshop on Transportation/Air Quality Analysis

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section) It is desirable but not essential for the sponsoring agency to provide one 386 MS-DOS microcomputer and a VGA projection panel.

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course covers the availability of current analytical techniques for developing travel estimates for Regional emissions analysis. The course is separated into modules, with each module consisting of a discussion of definitions, technical issues, and state-of-the practice analyses procedures. Several manual workshops are included which provide opportunities for in-class application of the analysis techniques presented during the course. The modules incorporated into the course include: (a) travel demand forecasting models and land use/accessibility; (b) emission factor models and travel related data requirements; (c) travel model and emission factor model interactions; (d) assessing TCM effectiveness and impact on emissions; and (e) vehicle miles of travel (VMT) estimation and forecasting.

For a discussion of regulatory requirements, project level analysis and dispersion models, NHI course no. 14217 on the "Fundamental of Air Quality for Transportation Planning and Project Development" is recommended. NHI course no. 15260, Advance Transportation Systems Analysis, addresses advanced modelling issues. For discussion and an in-depth instruction on travel demand management (TDM) analysis and quantification procedures, NHI course no. 13369 or 13370 are recommended.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify the technical issues regarding transportation-air quality analyses.
2. Recognize both the capabilities and limitations of available analysis tools.
3. Select appropriate technical procedures for developing travel related data for mobile source emissions inventories, analyzing transportation plans for conformity to SIPs, forecasting and tracking VMT, and evaluating TCMs.

TARGET AUDIENCE: FHWA, State DOT, Metropolitan Planning Organization, and local government planning staff and other practitioners interested in the transportation/air quality linkage.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Jerry Everett (202) 366-4079 e-mail: everett.jerry@fhwa.dot.gov

COURSE NUMBER: 35005

COURSE TITLE: Highway Program Financing

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 50

DESCRIPTION: This course covers the various aspects of Federal-aid highway financing unique to the FHWA program. Topics include, but are not limited to:

- The content and policy implication of authorizing and appropriating legislation.
- The way Federal-aid highway funds are distributed to the States including discussion of contract authority, apportionment and allocation, deductions, earmarking, transferability, and obligation.
- The effect of policy and budget considerations on the use of Federal-aid funds, especially as manifested through obligation limitations.
- The operation of the Highway Trust Fund and its significance to the funding level for the Federal-Aid Highway Program.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the flow of Federal financing from authorization to reimbursement, including the apportionment and allocation processes, deductions, earmarkings, and obligations.
2. Use correct terminology to describe the financing process.
3. Discuss the impact contract authority and the obligation limitation have on the use of Federal funds.
4. Interpret how the Federal budgetary process applies to the Federal-Aid Highway Program.
5. Describe the significance of the Highway Trust Fund to the funding levels for the Federal-Aid Highway Program.

TARGET AUDIENCE: State and local government employees and private sector participants interested in the process by which Federal-Aid Highway Program receives and distributes funding. Course sponsoring organizations are encouraged to invite attendees from a variety of sources.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov

TECHNICAL INFORMATION: Dick Osborne (202) 366-4062 e-mail: richard.osborne@fhwa.dot.gov

COURSE NUMBER: 36114

COURSE TITLE: Conducting EEO Contract Compliance Reviews

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: The course covers such topics as (1) improving the implementation of the contract compliance program, (2) misunderstanding of requirements, and (3) elimination of waste caused by duplication. In addition, the course textbook is used as a new contract compliance review manual for FHWA and State personnel.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. List the legal authorities relating to the EEO Contract Compliance Review Program and the responsibilities assigned to agencies under these authorities.
2. Conduct a contract compliance review and determine the compliance of a contractor with the EEO provisions in the contract.
3. Communicate with contractor associations, labor unions, and community organizations, and apply methods for obtaining assistance from these organizations in the elimination of barriers to the employment of minorities and females.
4. Monitor the On-the-Job Training (OJT) program during the conduct of a contract compliance review.
5. Monitor and assess effectiveness of activity relating to the DBE program during the conduct of a contact compliance review.

TARGET AUDIENCE: State personnel responsible for on-site contract compliance reviews, including FHWA regional and division personnel who participate with, and monitor State activity. Prior understanding of FHWA Civil Rights program requirements would be beneficial.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov
TECHNICAL INFORMATION: Aretha Carr (202) 366-1585 e-mail: aretha.carr@fhwa.dot.gov

COURSE NUMBER: 36119

COURSE TITLE: On the Road to Equality: Women in Highway Construction

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides State Highway Agencies (SHAs) and construction contractors with information and materials which will enable them to increase the employment and retention of women in the skilled trades in the highway construction workforce. A variety of instructional techniques are employed, including lectures, group discussions, case studies, team consensus, and visual aids. Each participant receives a copy of the manual, "On the Road to Equality: Women in Highway Construction," which serves as a valuable reference.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe the past and current status of women in highway construction.
2. Describe the benefits of women in highway construction.
3. Identify and interpret the current and specific laws and regulations that impact women in highway construction.
4. Identify ways to increase employment opportunities and the strategies necessary to retain women in highway construction.
5. Identify methods and techniques to prevent sexual harassment in highway construction.
6. Identify skills training and understand the need for training women in highway construction.
7. Recognize the importance of contractor equal opportunity compliance reviews and provide strategies to correct identified deficiencies relative to women in construction.
8. Identify national and local agencies and groups that can assist contractors and women to increase women's involvement in highway construction work.

TARGET AUDIENCE: State personnel and highway construction contractors. The State personnel should have direct or indirect responsibility for assuring equal employment opportunity in highway construction. Representatives from community based organizations that provide training or orientation for women in non-traditional occupations are encouraged to attend.

PREREQUISITES: Course sponsor agrees to provide 20 to 40 participants, with a minimum of one-third construction contractors. For the purpose of a short panel presentation on the second day, sponsor agrees to provide 3 to 4 women currently working in the skilled crafts of construction.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov
TECHNICAL INFORMATION: Aretha Carr (202) 366-1585 e-mail: aretha.carr@fhwa.dot.gov

COURSE NUMBER: 36120

COURSE TITLE: Partnering for Indian Employment in Highway Construction

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides State Transportation Agencies (STAs), highway construction contractors, and Tribal representatives with information and materials which will prepare them to work together to increase the employment and retention of American Indians in the highway construction workforce. A variety of instructional techniques are employed, including lectures, group discussion, team consensus, and visual aids. Emphasis will be placed on the creation of an "Action Plan" for the host State to increase the employment of American Indians in highway construction. Participants receive a copy of the manual, "Partnering for Indian Employment in Highway Construction," which serves as a valuable reference.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Outline the benefits associated with the increased employment of American Indians in Federal-aid highway construction.
2. Recognize the need for partnering among Tribal, State and Federal governments, and highway construction contractors.
3. Identify Federal and State laws, regulations, and directives related to Indian employment preference for Federal-aid highway construction on and near Reservations.
4. Explain the purpose and nature of Tribal employment laws and requirements.
5. Recognize the cultural differences among the stakeholders--Tribes, Federal/State governments, and highway construction contractors.
6. Identify potential employment barriers caused by cultural differences among the stakeholders.
7. Create practical and innovative strategies to increase the employment of American Indians in highway construction.

TARGET AUDIENCE: Representing of the following three groups within each State: State Transportation Agencies, Tribal employment representatives, and highway construction contractors. The State personnel should have direct or indirect responsibility for assuring equal employment opportunity in highway construction.

PREREQUISITES: Course sponsors must agree to provide 20 to 40 participants, with a balanced mix of participants from the 3 groups: State, Tribal, and contractors.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Al Miller (703) 235-0521 e-mail: al.miller@fhwa.dot.gov
TECHNICAL INFORMATION: Teresa Banks (303) 969-6707 e-mail: teresa.banks@fhwa.dot.gov

COURSE NUMBER: 38003

COURSE TITLE: Design and Operation of Work Zone Traffic Control

COURSE FEE: \$2,500/\$5,000 - 1 Day (See GENERAL INFORMATION section)
\$5,000/\$10,000 - 3 Days (See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)
3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides participants with information on the safest and most efficient work zone traffic controls. This includes the application of effective design and installation concepts, using signs and markings for detours, construction zones, and maintenance sites. The legal, administrative, and operational aspects will also be discussed. Classroom presentations include lectures, case histories and workshops.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Describe each step involved in providing work zone traffic controls.
2. Identify and apply workable concepts and techniques for designing, installing, and maintaining controls in construction, maintenance, and utility operations.
3. Identify appropriate principles in the design of traffic control plans.
4. Apply traffic control plans to site conditions, monitor traffic controls, and make changes indicated by traffic accidents and incidents.
5. Discuss techniques and procedures used by different agencies.
6. Assess the legal consequences of action and inaction relative to work zone traffic control and identify risk management procedures.

TARGET AUDIENCE: Design, construction, and maintenance personnel responsible for designing, installing, and monitoring work zone traffic control.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov
TECHNICAL INFORMATION: Brian Gilleran (202) 366-0915 e-mail: brian.gilleran@fhwa.dot.gov

COURSE NUMBER: 38005

COURSE TITLE: Railroad-Highway Grade Crossing Improvement Program

COURSE FEE: \$3,500/\$7,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: FHWA's publication, "Railroad-Highway Grade Crossing Handbook," is the principal source document for this course. The handbook provides information on rail-highway crossings, grade crossing components, including program/project development and administration. Workshops will provide the participants a chance to make "hands-on" applications of the training material, which include such topics as:

- Introduction to the Handbook
- Historical background
- Railroad-highway intersection definition and components
- Collection and maintenance of data
- Assessment of crossing safety and operations
- Identification and selection of alternate improvements
- Program and project development and implementation
- Maintenance
- Other topics (i.e., private crossings, operation lifesaver)

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Develop and implement improvements to railroad-highway grade crossings.
2. Identify and evaluate techniques and engineering principles used for all crossing.
3. Use the Railroad-Highway Grade Crossing Handbook - Second Edition as a resource.

TARGET AUDIENCE: Federal, State, and local transportation agencies responsible for the design, construction, and/or maintenance of railroad-highway crossings.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov
TECHNICAL INFORMATION: Robert Winans (202) 366-4656 e-mail: robert.winans@fhwa.dot.gov

COURSE NUMBER: 38032

COURSE TITLE: AASHTO Roadside Design Guide

COURSE FEE: \$4,500/\$9,000 (See GENERAL INFORMATION section)

LENGTH: 2 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides an overview of the 1996 AASHTO, "Roadside Design Guide." Emphasis is on the relationship to current highway agency policies and practices. Each participant will receive a copy of the 1996 AASHTO "Roadside Design Guide" as the course text.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Apply the clear zone concept to all classes of roadways.
2. Recognize unsafe roadside design features and elements and make appropriate changes.
3. Identify the need for a traffic barrier.
4. Select, design and install a traffic barrier.
5. Apply safety concepts to roadside features and appurtenance selection/use in work zones.
6. Compare alternate safety treatments and select a cost-effective design.
7. Identify policies and practices that are inconsistent with current state-of-the-art.

TARGET AUDIENCE: Federal, State and local highway engineers involved in the formulation and/or application of policies and standards relating to the design of safer roadsides.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov

COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov

TECHNICAL INFORMATION: Richard Powers (202) 366-1320 e-mail: richard.powers@fhwa.dot.gov

COURSE NUMBER: 38034

COURSE TITLE: Design, Construction, and Maintenance of Highway Safety Appurtenances and Features

COURSE FEE: \$2,500/\$5,000 - 1 Day (See GENERAL INFORMATION section)
\$3,500/\$7,000 - 2 Days (See GENERAL INFORMATION section)
\$5,000/\$10,000 - 3 Days (See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)
2 Days (CEU: 1.2 Units)
3 Days (CEU: 1.8 Units)

CLASS SIZE: 40

DESCRIPTION: The course has been developed for a 3-day course presentation. The course can also be structured into a 1- or 2-day training course. The sponsoring agency will be able to choose the modules for presentation that will best meet their needs. The course covers the design, construction, or maintenance of highways. It covers the purpose and performance requirements of state-of-the-art highway safety features, such as breakaway sign supports, breakaway utility poles, traffic barriers, impact attenuators, traversable terrain and hardware features such as drainage inlets. The course describes how features function, what can go wrong, and how to recognize and correct improper installations.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Identify advantages and disadvantages of different types of longitudinal barriers and crash cushions.
2. Identify NCHRP 350 tested safety appurtenances.
3. Identify application of highway safety appurtenances, why they are used, when and where they should be used, and what is necessary to ensure their function.
4. Design the placement of, and determine the need for, longitudinal barriers.
5. Use required installation, construction, and maintenance procedures for proprietary longitudinal barriers, terminals, transitions, crash cushions, bridge railings, and sign supports.
6. Recognize substandard or potentially hazardous highway appurtenances and features.
3. Develop alternatives to eliminate, correct, or mitigate unsatisfactory operational characteristics of existing safety devices.

TARGET AUDIENCE: FHWA safety engineers and highway engineers, including State and local personnel involved in the design, construction, or maintenance of highway safety appurtenances and features. Available for other State and Federal employees, as space will permit.

COURSE SCHEDULING: Lynn Cadarr (703) 235-0528 e-mail: lynn.cadarr@fhwa.dot.gov
COURSE COORDINATOR: Harry Hersey (703) 235-0525 e-mail: harry.hersey@fhwa.dot.gov
TECHNICAL INFORMATION: Paul Harker (202) 366-2195 e-mail: paul.harker@fhwa.dot.gov

COURSE NUMBER: 38060

COURSE TITLE: Work Zone Traffic Control for Maintenance and Utility Operations

COURSE FEE: \$2,500/\$5,000 (See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides guidance and training for field personnel, such as maintenance crews, survey crews, and utility crews working in the planning, selection, application, and operation of short-term work zones. The course addresses typical short-term maintenance activities occurring on two-lane rural highways and multilane urban streets and highways. The course covers the applicable standards for work zone protection as contained in the Manual on Uniform Traffic Control Devices (MUTCD), discussing the need for proper application of devices, while addressing liability issues of highway agencies and individuals. Classroom presentation includes practical exercises to plan, set up, operate, and remove work zones safety devices, including appropriate flagging procedures for these operations.

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Apply traffic control through short term and mobile work areas.
2. Use national work zone standards and requirements as contained in Part VI of the MUTCD.
3. Use standard traffic control devices in work zones.
4. Design and install traffic control schemes for short term and mobile operations on rural two- and multilane streets and highways.
5. Apply proper flagging procedures.
6. Minimize liability exposure for agencies performing utility and maintenance operations.

TARGET AUDIENCE: State, county, and utility personnel who are responsible for establishing traffic controls through short-term, utility and maintenance work areas.

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TECHNICAL INFORMATION: Charles Sears (202) 366-1555 e-mail: charles.sears@fhwa.dot.gov

COURSE NUMBER: 38061

COURSE TITLE: Pedestrian and Bicyclist Safety and Accommodation

COURSE FEE: \$5,000/\$10,000 (See GENERAL INFORMATION section)

LENGTH: 3 Days (CEU: 1.2 Units)

CLASS SIZE: 40

DESCRIPTION: This course covers the safe integration of pedestrian and bicyclist into normal highway planning, design, operations, enforcement and education programs. Topics include:

- Needs Identification
- Program Development and Funding Opportunities
- Engineering Pedestrian and Bicyclist Accommodations
- Education Programs
- Law Enforcement Programs
- Marketing a Pedestrian and Bicyclist Program to the Community
- Resource Assessment
- Evaluating Pedestrian and Bicyclist Accommodations
- Post Course Action Plan

OBJECTIVES: Upon completion of the course, participants will be able to:

1. Recognize the value and benefit of adding walking and bicycling to the transportation menu.
2. Identify current practices that overlook or restrict people who choose to (or must) walk or bicycle.
3. Apply technical improvements, develop effective policy, and work effectively with the public on these issues.
4. Describe how to save lives and prevent injury. Recognize work that has a direct impact on public safety.
5. Recognize why and how all professionals involved in bicycling and walking need to work closely with one another to develop and implement successful programs.
6. Describe the concept of "institutionalizing" consideration of bicycle and pedestrian transportation; i.e. integrating non-motorized considerations into all aspects of land use, transportation, education, enforcement and safety programs.
7. Locate research resources, practical experience and professional contacts active in this field and available to share information.
8. Identify available funding sources.

TARGET AUDIENCE: FHWA and NHTSA field office personnel, State and local government representatives, traffic engineers, educators, and law enforcement personnel who are responsible for safely accommodating pedestrians and bicyclists within the highway system. Also for other State and Federal employees as space will permit.

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COURSE NUMBER: 38063

COURSE TITLE: Construction Zone Safety Inspection

COURSE FEE: \$2,500/\$5,000 (See GENERAL INFORMATION section)

LENGTH: 1 Day (CEU: 0.6 Units)

CLASS SIZE: 40

DESCRIPTION: This course provides training in the management of traffic control plans and the inspection of construction zone safety devices. Participants receive instruction in traffic control plan review, inspection of traffic control procedures and safety devices, and the resolution of discrepancies from the traffic control plan, as well as on deficiencies in safety hardware maintenance. The following major topics are covered:

- Inspection of traffic control plan operation
- Maintenance of work zone signs and markings
- Inspection of construction safety hardware
- Resolution of discrepancies from contract requirements

OBJECTIVES: Upon completion of this course, participants will be able to:

1. Recognize the importance of construction zone safety devices.
2. Identify the contract requirements for selected devices.
3. Inspect the installation and operation of safety devices, including discrepancies and deficiencies in safety devices.
4. Resolve discrepancies from the contract requirements and ensure corrections in the deficient safety devices.

TARGET AUDIENCE: FHWA safety engineers, FHWA highway engineers, and State and local personnel involved in the management of traffic control plans and the inspection of construction zone safety devices. Also for other State and Federal employees as space will permit.

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APPENDICES

LOCAL COORDINATORS CHECKLIST for NHI Training Courses

TO: Local Coordinators

Training is an essential ingredient to the long-term success of just about every program. The training may be on-the-job, correspondence study, night school, etc. Regardless of what form the training may take there are certain expenses involved. There is usually a fee charged for presenting the course, plus the course sponsor has the additional expense of furnishing training facilities, projection equipment and some incidental items. Probably the greatest expense of all is the time course participants must take away from their regular jobs.

We have all attended training sessions where the instructor could not find the chalk, or the eraser, or the light switch when it came time to show the slides, or the room was too hot, or ..., or ..., or.... Since there are so many details to remember when preparing for and presenting a successful training course, we have compiled a few simple suggestions and reminders that will hopefully prevent some last minute scurrying around before the training starts, and may mean the difference between a good course and a great course.

We in the National Highway Institute (NHI) appreciate the behind-the-scenes effort Local Coordinators must provide to assure the requested training matches their agencies' needs and that course participants maximize their learning experience. We realize that many times the responsibility for coordinating a course is taken on in addition to a regular full-time job. Our suggestions are offered in hopes of making the job of coordinating NHI courses easier and that the sponsors of NHI courses will get the maximum benefit from their training dollars.

Best of luck with your training programs.

SUGGESTED CHECKLIST

REQUEST FOR TRAINING

Has the **COURSE REQUEST AND CONFIRMATION** form (Form FHWA 1530) been completed and sent to the local FHWA division office? The FHWA division office is responsible for forwarding the form to the FHWA regional office and then to NHI.

Has NHI provided at least verbal approval of the requested dates?

TRAINING SITE

Selection of a training room is critical to the success of any course. Great care should be taken to select a room that will not be overcrowded, hot/cold, or subject to outside distractions.

Has the instructor contacted you to provide specific requirements for the training facilities?

Has a training room been reserved?

Is the training room reserved for the duration of the course?

Will anyone else be using the room for nighttime functions?

Can all books and equipment be left in the room? Training courses requiring special equipment or computers must have after-hours security.

Have you personally visited the classroom to make certain it meets all requirements?

Other considerations for a training room:

Heat or air conditioning - are controls accessible?

Adequate size and shape. No poles or obstructions.

Special arrangements for demonstrations, labs, and experiments.

Seating arrangements.

Away from kitchen, construction area or other noise distractions.

Electrical outlets.

Lighting controls - Almost every training course uses visual aids that require a projection screen. It is very important to have a room where lighting can be controlled to prevent glare on the screen while not placing the room in total darkness.

Will shades completely darken all windows?

Can the lights be selectively dimmed when showing slides or viewgraphs?

Will overhead lights shine directly on the screen?

Could a bulb be removed above the screen or will the blackboard be too dark?

PARTICIPANTS AND INSTRUCTORS

Has a block of hotel/motel rooms been reserved for the course participants and instructors? Some hotels will provide a free meeting room if a minimum number of participants stay at the hotel.

Have the participants and instructors been:

Informed of course starting and ending times?

Advised on hotel accommodations and room rates?

Furnished with maps?

Advised on parking arrangements?

EQUIPMENT NEEDS

Nothing is more frustrating to the instructor and annoying to the participants than a slide projector that will not advance, a VCR that will not play, a computer that is not connected properly, a movie projector that starts spilling film all over the floor, and many other such disasters. All equipment needs should be determined well in advance and everything should be checked out thoroughly to make certain it functions properly.

The instructor should contact you to provide guidance on which of the following items of equipment will be needed:

- Slide projector with spare bulb and remote control extension
- Overhead projector with spare bulb
 - Blank transparencies
 - Marking pens in various colors
- Computers
- LCD projection equipment with cables
- Screen - 6' x 6' or larger
- Videotape player - VHS or Beta cassette
- Blackboard with chalk and eraser
- Whiteboard with dri-mark pens and eraser
- Easel with flip chart paper and various colored markers
- Pointer
- Lectern
- Public address system
- Extension cords
- Masking tape

Does all equipment work satisfactorily?

FINAL ARRANGEMENTS

2 Weeks Before The Course

- Has an approved copy of COURSE REQUEST AND CONFIRMATION (Form FHWA 1530) been received from NHI?
- Have training materials arrived?
- Have the boxes been opened and all items inventoried?
 - Participant notebooks
 - Tent Cards (Large felt tip markers will be needed.)
 - Evaluation forms
 - Class roster form
 - Certificates

Other Checks:

- Reconfirm the training facilities.
- Discuss the seating arrangements and who will set up the room.
- Discuss what time the room is unlocked/locked.
- Will a technician be available in case of problems setting up the room or if something goes wrong during the course?

1 Week Before The Course

Direction signs to classroom

Smoking policy.

Experience has shown that the best policy is no smoking in the classroom.

Signs should be posted or written on the blackboard.

Water and glasses

Refreshments

Morning and Afternoon

Donuts, fresh fruit, regular and decaffeinated coffee, tea, etc.

Who will pay?

Telephones

For outgoing calls

For telephone messages

Eating places for lunch

Should a list of eating places and addresses be passed out? Map?

Will someone welcome the participants and introduce the instructors?

Check out time from the hotel.

Can special check out arrangements be made to coincide with the course completion time?

Who will sign the certificates of training?

Who will pass out the certificates at the end of the course?

1 Day Before The Course

Set up classroom

Organize the participant material

Post direction signs

Test all equipment

During The Course

Let the instructor know where you will be or how you can be reached at all times during the course in case he/she needs assistance.

Provide a copy of the Class Roster to all course participants.

Prepare Certificates of Training. The time needed to prepare the Certificates of Training may be reduced and the appearance improved by using a computer with a graphics program and a laser printer.

After The Course

Make certain the instructor has the Class Roster, Course Evaluation forms, and Application for CEU's forms. The instructor is responsible for sending these items to NHI.

**FEDERAL HIGHWAY ADMINISTRATION
NATIONAL HIGHWAY INSTITUTE**

NHI CONTACTS LIST

March 24, 1998

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REGION 7
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NATIONAL HIGHWAY INSTITUTE CONTACTS
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FHWA REGIONAL AND DIVISION CONTACTS

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REGION 8
STATE CONTACTS

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REGION 8
STATE CONTACTS

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NATIONAL HIGHWAY INSTITUTE CONTACTS
REGION 9
FHWA REGIONAL AND DIVISION CONTACTS

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REGION 9
STATE CONTACTS

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NATIONAL HIGHWAY INSTITUTE CONTACTS
REGION 10
FHWA REGIONAL AND DIVISION CONTACTS

FHWA REGION 10 OFFICE

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NATIONAL HIGHWAY INSTITUTE CONTACTS
REGION 10
STATE CONTACTS

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**NATIONAL HIGHWAY INSTITUTE CONTACTS
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Federal Lands Highway Division
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HFL-23, Room 4136
Washington, DC 20590
202-366-9481

FHWA, EFLHD

Mr. Glenn Walters
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FHWA, CFLHD

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Central Federal Lands Highway Division (HMP-16)
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Western Federal Lands Highway Division (HTQ-17.62)
Federal Highway Administration
610 East 5th Street
Vancouver, WA 98661-3893
206-696-7723



NATIONAL HIGHWAY INSTITUTE COURSE REQUEST AND CONFIRMATION

SECTION A--COURSE REQUEST

1. NHI Course Number _____
2. NHI Course Title _____
3. Requested Location _____
4. Requested Date _____ Alternate Date _____
5. Sponsoring Agency _____
6. Local Coordinator Name _____ Tele _____
 U.S. Postal Address _____ Private Carrier _____
 P.O. Box _____ Street _____
 City, St., Zip _____ City, St., Zip _____
 (For Shipping Course Material - No P.O. Box)
7. Course Fee \$ _____
8. Billing Address Name _____ Tele _____
 Address _____

 City, State, Zip _____
9. Requesting Official Name _____ Tele _____
 Title _____
 Signature _____ Date _____
10. FHWA Div. Endorsement Name _____
 Signature _____ Date _____
11. FHWA Reg. Endorsement Name _____
 Signature _____ Date _____

SECTION B--CONFIRMATION

1. Confirmed Course Date _____
2. Contractor _____
3. Instructor _____ Tele _____
4. NHI Training Officer _____ Tele _____
5. Authorizing Official Name _____
 Signature _____ Date _____

SECTION C--REMARKS

SPECIAL NOTE: The course material will be mailed directly to the local coordinator unless we are requested to do otherwise. The local coordinator should use the packing list enclosed with each shipment to inventory the material immediately upon receipt. If the course material has not arrived 2 weeks prior to the scheduled presentation or if there are any questions on the arrangements, the local coordinator should contact the NHI Training Officer listed in Section B.
 Form FHWA-1530 (2-97)

SECTION D--DISTRIBUTION

Distribution:

Original--Submit to FHWA HHI-10
Returned to Requesting Official after approval

Hot Copies--after approval

NHI Official File
NHI State Training Officer
NHI Fee Folder
FHWA HPT-30
FHWA Program Office
Contractor
NHI Region Contact
NHI Division Contact
NHI State Contact
Local Coordinator

Instructions:

Section A, items 1-9 are to be completed by the sponsoring agency. Section A, items 10 & 11 are to be completed by the appropriate field offices of the Federal Highway Administration (FHWA). Section B is to be completed by the National Highway Institute (HHI-10), and the completed form returned to the FHWA field offices. Section C may be used by the sponsoring agency or the FHWA with additional sheets as necessary. Section D, the "Hot Copies-after approval" are to be made by the National Highway Institute.



NATIONAL HIGHWAY INSTITUTE COURSE REQUEST AND CONFIRMATION

SECTION A--COURSE REQUEST

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 U.S. Postal Address _____ Private Carrier _____
 P.O. Box _____ Street _____
 City, St., Zip _____ City, St., Zip _____
 (For Shipping Course Material - No P.O. Box)
7. Course Fee \$ _____
8. Billing Address Name _____ Tele _____
 Address _____

 City, State, Zip _____
9. Requesting Official Name _____ Tele _____
 Title _____
 Signature _____ Date _____
10. FHWA Div. Endorsement Name _____
 Signature _____ Date _____
11. FHWA Reg. Endorsement Name _____
 Signature _____ Date _____

SECTION B--CONFIRMATION

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2. Contractor _____
3. Instructor _____ Tele _____
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 Address _____

 City, State, Zip _____
9. Requesting Official Name _____ Tele _____
 Title _____
 Signature _____ Date _____
10. FHWA Div. Endorsement Name _____
 Signature _____ Date _____
11. FHWA Reg. Endorsement Name _____
 Signature _____ Date _____

SECTION B--CONFIRMATION

1. Confirmed Course Date _____
2. Contractor _____
3. Instructor _____ Tele _____
4. NHI Training Officer _____ Tele _____
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Contractor
NHI Region Contact
NHI Division Contact
NHI State Contact
Local Coordinator

Instructions:

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NATIONAL HIGHWAY INSTITUTE COURSE REQUEST AND CONFIRMATION

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 Title _____
 Signature _____ Date _____
10. FHWA Div. Endorsement Name _____
 Signature _____ Date _____
11. FHWA Reg. Endorsement Name _____
 Signature _____ Date _____

SECTION B--CONFIRMATION

1. Confirmed Course Date _____
2. Contractor _____
3. Instructor _____ Tele _____
4. NHI Training Officer _____ Tele _____
5. Authorizing Official Name _____
 Signature _____ Date _____

SECTION C--REMARKS

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SECTION D--DISTRIBUTION

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FHWA HPT-30
FHWA Program Office
Contractor
NHI Region Contact
NHI Division Contact
NHI State Contact
Local Coordinator

Instructions:

Section A, items 1-9 are to be completed by the sponsoring agency. Section A, items 10 & 11 are to be completed by the appropriate field offices of the Federal Highway Administration (FHWA). Section B is to be completed by the National Highway Institute (HHI-10), and the completed form returned to the FHWA field offices. Section C may be used by the sponsoring agency or the FHWA with additional sheets as necessary. Section D, the "Hot Copies-after approval" are to be made by the National Highway Institute.

HHI-10/4-98(5.5M)