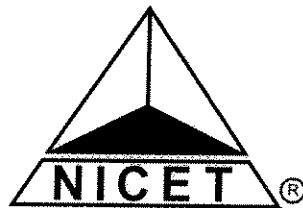


**NICET-NATIONWIDE TRANSPORTATION SYSTEM MAINTENANCE  
AND PRESERVATION CERTIFICATION PROGRAM MANUAL**

**FINAL MATRIX VERSION**

**July 12, 2006**



**National Institute for Certification in Engineering Technologies®**



## Introduction

This certification program was established to recognize the valuable contributions of engineering technicians to the Transportation System Maintenance and Preservation industry, to provide a standard scale of career achievement, and to provide employers and customers with a description of the individual competencies and competence levels possessed by certified technicians.

The 14 categories of work elements described herein were initially identified in 2002 by a subcommittee of volunteers from the PENNDOT Maintenance Managers Training Committee (MMTC). These volunteers identified the key job tasks that a Transportation System Preservation and Maintenance technician typically performs in the workplace. Parallel FHWA Transportation Coordination Curricula Council (TCCC) and NICET Certification Competencies were next developed and reviewed by subject matter experts (SME's) from the PENNDOT Bureau of Maintenance and Operations familiar with the specialty area. Twenty-seven (27) reviewers responded with excellent comments that were incorporated into an April 1, 2004 draft of the program by the MMTC Subcommittee. The April 2004 PENNDOT Draft was further reviewed and refined by a MSDOT Professional Development Group during the last week of September 2004 and further modified..

The AASHTO Subcommittee on Maintenance (AASHTO SCOM) Workforce Development Task Group and also reviewed an early 2002 program draft and closely followed the program's development. The AASHTO SCOM Workforce Development Focus Group and Bridge Task Force conducted a review of the final draft in early 2006 and their comments have been incorporated into this final program matrix version.

A crosswalk feature has been incorporated in to this program whereby a certified NICET Level III or IV in this Transportation System Maintenance and Preservation Certification Program who has passed the construction core elements (those with an asterisk after their title) has essentially completed the requirements to become certified as a NICET Level II in the NICET Highway Construction (Inspection) Program.

NICET gratefully acknowledges the assistance provided by the PENNDOT MMTC, the MSDOT Professional Development Group and the AASHTO SCOM Workforce Development Focus Group and Bridge Task Force for their invaluable work in the development of this program.

Questions or comments on this Final Matrix Version should be directed to Leonard "Bud" Darby, P.E. , NICET Civil Engineering Programs Administrator, tel: 888-476-4238 x120, or [bdarby@nicet.org](mailto:bdarby@nicet.org)



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## NICET Testing and Certification

NICET offers certification at each of four levels: Level I (Technician Trainee), Level II, Level III, and Level IV (Senior Engineering Technician). Applicants for certification select work elements in which they have work experience. Their test consists of a set of multiple-choice questions for each selected work element. They receive a separate score for each work element and may retest failed work elements. To be eligible for certification, a technician must pass sufficient work elements from various levels and Core/General/Special categories to meet established requirements (to be published in the Program Detail Manual for the subfield). To complete the certification process, the applicant submits a work history showing the required years of experience, verification of work experience by a supervisor, and a personal recommendation.

### Certification Requirements

There are four criteria that must be met to be certified at any level:

- complete the written examination requirement
- work element verification by the immediate supervisor
- appropriate employment history
- technician recommendation by an acceptable recommender (Levels III and IV)

The last three components **MUST** be accepted and approved in order to achieve certification. Simply passing the examination does not guarantee certification.

Level I is designed for entry-level technicians with very limited relevant work experience in the technical subfield. The Institute recommends that persons with eighteen or more months of relevant work experience set their initial certification goal at Level II. Certification at Levels II, III, and IV does not require prior certification at a lower level. The Examination Requirements Chart shows how many work elements must be passed to meet the exam requirement for Levels I, II, III, and IV.

### Exam Structure

Each work element in this listing is a description of a task, skill, and/or knowledge which might be performed by an engineering technician involved in highway maintenance. Note, however, that not every technician in every employment situation would be expected to master all work elements. These work elements are grouped into two "levels", each of which is intended to describe the work which might be accomplished by a technician at that level, but not by a technician at a lower level. The assigned level of each work element should reflect a technician's progression from very basic skills in some job areas to a high level of competence in most areas of his field or subfield, and an ability to deal with increasingly complex problems and situations. The levels are generally defined by the Technician Profile which is based upon the years of experience required to successfully perform specific work elements and hold specific degrees of responsibility. The work elements in this program have been tentatively assigned to levels by the Development Committee, but these may change as a result of this evaluation survey.

In order to establish requirements for certification which better reflect the fact that performance of some of the work elements at a particular level is more generally expected than is the case for others, each level will be further broken down into "General" and "Special" categories, with some Generals occasionally designated as "Core". This break down will be based on information from this evaluation and, so, is not shown in the work element listing in this booklet. When this program becomes operational, a certain number of work elements from each category will be required for certification at a given level:

General work elements are those which nearly all technicians would be expected to master.

Core work elements are General work elements which all technicians would be expected to master

Special work elements could be mastered by most technicians, but geographical and employer differences will create variations in the type and degree of individual experience acquired.

A lower percentage of the Special work elements is required for certification than of the Generals. Core work elements are mandatory for certification at a given level.

# Examination Requirements Chart 2006

## Subfield: NICET Transportation System Maintenance and Preservation

You must pass the number of work elements shown in each box to complete the exam requirement for certification at that level.

### Level I

Level I - General	- 8
Level I - Special	- <u>2</u>
<b>TOTAL</b>	<b>10</b>

You must pass this many work elements to complete the **Level I** requirement.

### Level II

Level I - General	-13 a
Level I - Special	- 3
Level II - General	-17
Level II - Special	- <u>4</u>
<b>TOTAL</b>	<b>37 d</b>

<b>Available</b>	
Level I - General	- 18
Level I - Special	- 4
Level II - General	- 21
Level II - Special	- <u>14</u>
<b>TOTAL</b>	<b>57</b>

### Level III

Level I - General	-13 a
Level I - Special	- 3
Level II - General	-17 b
Level II - Special	- 7
Level III - General	-21 c
Level III - Special	- <u>3</u>
<b>TOTAL</b>	<b>64 d</b>

<b>Available</b>	
Level I - General	- 18
Level I - Special	- 4
Level II - General	- 21
Level II - Special	- 14
Level III - General	- 23
Level III - Special	- <u>11</u>
<b>TOTAL</b>	<b>91</b>

### Level IV

Level I - General	-13 a
Level I - Special	- 3
Level II - General	-17 b
Level II - Special	- 7
Level III - General	-21 c
Level III - Special	- 6
Level IV - General	-10
<b>TOTAL</b>	<b>77 d</b>

<b>Available</b>	
Level I - General	- 18
Level I - Special	- 4
Level II - General	- 21
Level II - Special	- 14
Level III - General	- 23
Level III - Special	- 11
Level IV - General	- 12
<b>TOTAL</b>	<b>103</b>

#### NOTES:

- All Level I Maintenance Core elements (Bolded in the Matrix) must be passed for Level II, III and IV.
- All Level II Maintenance Core elements (Bolded in the Matrix) must be passed for Level III and IV.
- All Level III Maintenance Core elements (Bolded in the Matrix) must be passed for Level III and IV.
- Time restrictions dictate that no more than 34 work elements can be scheduled for any single examination sitting. Therefore, at least three examination sittings will be needed in order to complete this requirement.
- Read very carefully the two sections applicable to Level IV certification in this manual before seeking Level IV certification.

#### GENERAL NOTES:

- Work elements passed which are in excess of the requirement at a particular type and level, but which can be used to meet the requirement at the next higher level are automatically applied to that higher level requirement.
- Use the Personal Tally Worksheet on page 19 of this manual to keep track of the number of work elements you have successfully passed.

## Verification of Work Elements

Verification must be provided by the examinee's immediate supervisor as identified by the examinee in the employment history section of the NICET Test Application form. Verification of work elements is the acknowledgement that the verifier has personally observed the examinee repeatedly and correctly perform the task or utilize the knowledge required by the particular work element.

The verifier should read each work element description and then initial each work element. The verifier also completes and signs the statement of understanding that is part of the NICET Test Application form.

Lack of verification does not prevent testing a work element. However, work elements tested without verification are not counted for certification until acceptable verification is received and approved by the Institute.

If the examinee's immediate supervisor does NOT have technical expertise in the specialty area, or if the examinee has no supervisor, verification must be obtained from an individual who does have technical expertise in the specialty area AND has first-hand knowledge of the examinee's specific job skills. There is space on the application form (Section VII) for the verifier or examinee to explain how the verifier has been in a position to supervise, inspect and approve the work.

## Technician Recommendation Form (required at Levels III and IV)

This form is available on the Website. It must be completed by a person who is familiar with the examinee's technical capabilities and background.

A valid Technician Recommendation form **MUST** be on file to award certification at Level III or IV. It is valid for one year from the date shown next to the recommender's signature.

## Employment History

Your work experience will not be evaluated until a written exam requirement has been met. Carefully consider your actual experience before testing in a technical area where you have limited or no experience -- **meeting an exam requirement does not guarantee certification.**

- NICET certification is only awarded to persons performing engineering **technician** level work. This must be documented in the examinee's Employment History in the Test Application form.
- A preponderance of the work experience must be acquired while residing in the United States and its territories, employing U.S. standards and work practices.
- A significant proportion of the relevant work experience must be recent.
- See also the Technician Profile (on the next page).

## Level IV Major Program

Ten years or more of employment in the certification area, by itself, is **not** sufficient for the granting of Level IV certification. An absolute requirement for certification at Level IV is a write-up that documents senior-level involvement in a variety of significant highway maintenance activities which are field-based and area-wide.

### Level IV Major Program Write-Up Guidelines NICET- Highway Maintenance

- The program write-up is a separate document from the work history.
- It is a concise, detailed, two- to three-page written description of one or more major maintenance programs specific to the subfield of certification, i.e. a Highway Maintenance program.
- The write-up must be prepared by the candidate. Official job descriptions, testimonials from others, company reports, etc. are not acceptable.
- The maintenance program must have taken place well into your career in the certification area and must be recent (has taken place within the past 3 to 4 years).
- The write-up must demonstrate independent, senior-level engineering technician work, including supervisory capacity and delegated responsibilities and duties in the majority of the activities associated with the program area.

The write-up must describe in detail the following:

#### THE PROGRAM

- Type of maintenance program, i.e. roadway, bridge, interchange, viaduct, tunnel, causeway, etc.
- Interaction with outside State DOT agencies and organizations
- Program location, owner, contractor and consulting firm
- Type of maintenance program, i.e. Drainage Pipe Installation and Maintenance; Worksite and Public Safety; Highway Construction Inspection and Acceptance; Materials, Sampling, Testing, & Inspection; Environmental Protection; Roadway and Shoulder Maintenance; Structure Maintenance; Roadside Maintenance; Maintenance Equipment and Materials Management; Maintenance Operations Management; Winter Maintenance Operations
- Size and scope of program, i.e. county size, road miles, number of intersections/interchanges, number and type of highway assets managed, fleet size, property inventory, etc.
- Program cost, i.e. funding levels and budgeted amounts
- Time period of candidate's involvement
- Scope of maintenance activities, i.e. drainage pipe installation, roadside, roadway and shoulder, structural, winter, project inspection, materials sampling and testing, and erosion and sediment control.

#### THE CANDIDATE'S INVOLVEMENT

- Supervisory responsibilities, i.e. position and authority, daily duties and tasks, number and categories of people supervised and the various tasks they performed
- Type of service and range of experience as related to specific maintenance activities, including program management, documentation, reporting, project closeout, etc.

**NOTE:** If a wide range of highway maintenance activities cannot be documented for a single program, they may be accumulated via several more narrowly focused programs.

## Technician Profile –July 2006

### NICET- Transportation System Maintenance and Preservation Certification Program

The technician profile is a brief description career path of the Roadway Maintenance Technician to Roadway Program Manager

	Level I	Level II	Level III	Level IV
<b>Educa- tion</b>	No formal education requirement. Program content at Level II and above assumes knowledge and skills based on work and/or educational experiences (college, self-study, correspondence courses, workshops, or field assignments, etc.) that develop knowledge equivalent to courses in construction, maintenance or civil engineering technology or a closely related Associate Degree program coupled with internships.			
<b>Minimum Work Experi- ence</b>	Limited work experience in highway maintenance, highway construction or related activities	A minimum two years of highway maintenance and/or construction related work, one year of which shall be specifically involved with maintenance. The balance may be in related technical specialties within the normal scope of highway facility maintenance, equipment operations or maintenance, construction, site restoration and erosion control, or general construction	Level II certification experience plus a minimum of three years of highway facility maintenance or construction inspection, during which at least one year shall be supervising maintenance activities. One year of the work experience must have been acquired within the three-year period prior to the date this Level III certification is awarded.	Level III certification experience plus five years of full time supervision of highway facility maintenance or construction inspection, including at least one major facility involving substantial complexity. At least three years of this five-year period must be in connection with highway facility maintenance. One year of the three years must have been acquired within the three year period prior to the date this Level IV certification is awarded.
<b>Level of Respon- sibility</b>	Under direct supervision	Under general supervision	Minimal or no daily supervision. May supervise others	Independent performance of assigned or delegated responsibilities.
<b>Typical Activities</b>	Performs repetitive, specific highway maintenance tasks or related activities	Perform a wide range of various types of maintenance operations including fleet management. Supervises specific maintenance operations or crew assignments. Assists in maintaining complex highway facilities	Plan, schedule and implement specific maintenance work plans for a variety of standard and specialized maintenance operations. Participate in the construction inspection of highway facilities including project planning, contract compliance, documentation, and recommends acceptance.	Manage county level or above overall maintenance operations. Overall responsibility for allocating and scheduling resources to a wide variety of department force and contract maintenance activities. Supervises construction contract inspection including specification compliance, documentation and acceptance. Interacts positively with owners, architects, engineers, construction project managers, and other contractors to correct problems, resolve complaints and complete projects
<b>Typical Job Titles</b>	Maintenance Foreman I Roadway Program Tech I Temporary Maintenance Foreman Maintenance Repairman 2	Maintenance Foreman II Roadway Program Tech II Mechanic Supervisor Automotive Equipment Foreman Training Site Administrator Transportation Automotive Equipment Specialist	Maintenance Foreman III Roadway Program Tech III Roadway Program Specialist Highway Maintenance Manager Trainee, 1 Highway Equipment Manager 1	Highway Equipment Manager 2,3,4 Roadway Program Coordinator Roadway Program Manager Highway Maintenance Manager 2, 3 Senior Highway Maintenance Manager



## NICET Transportation System Maintenance and Preservation Program - Technician Profile Addendum

### Work Experience Requirements And Certification Levels

LEVEL II - 1 year maintenance plus 1 year maintenance or construction related

Minimum Work Experience Required for Level II Certification: Work experience must include 1 year working in 2 or more of the following maintenance work competencies: Worksite and Public Safety, Drainage Pipe Installation and Maintenance, Roadside Maintenance, Environmental Protection, Materials Sampling, Testing and Inspection, Highway Construction Inspection and Acceptance, Roadway and Shoulder maintenance, and Weather Related Maintenance Operations

LEVEL III- LEVEL II PLUS a minimum of 1 year maintenance supervision and 2 years maintenance or construction inspection

RESULT: Minimum 2 years maintenance (1 Supervisory) plus 2 years maintenance or construction inspection plus 1 year maintenance or construction related

EXAMPLE: 3 years maintenance (1 Supervisory) plus 1 year construction inspection and 1 year maintenance or construction related

Minimum Work Experience Required for Level III Certification: Work experience must include 2 years working in 4 or more of the following maintenance work competencies: Worksite and Public Safety, Drainage Pipe Installation and Maintenance, Roadside Maintenance, Environmental Protection, Materials Sampling, Testing and Inspection, Roadway and Shoulder Maintenance, Highway Construction Inspection and Acceptance, Bridge Maintenance, Maintenance Equipment and Materials Management, and Weather Related Maintenance Operations

LEVEL IV- LEVEL III PLUS a minimum of 3 years maintenance supervision and 2 years maintenance or construction inspection

RESULT: Minimum 5 years maintenance (4 Supervisory) plus 4 years maintenance or construction inspection plus one year maintenance or construction related

EXAMPLE: 6 years maintenance (5 Supervisory) plus 3 years construction inspection and 1 year maintenance or construction related

Minimum Work Experience Required for Level IV Certification: Work experience must include 5 years working in 6 or more of the following maintenance work competencies: Worksite and Public Safety, Drainage Pipe Installation and Maintenance, Roadside Maintenance, Environmental Protection, Materials Sampling Testing and Inspection, Surveying, Plans and Specifications, Roadway and Shoulder Maintenance, Maintenance Equipment and Materials Management, Maintenance Operations Management, and Weather Related Maintenance Operations

# NICET- Transportation System Maintenance and Preservation Certification Program Core Competencies Matrix

DOMAIN	Level I	Level II	Level III	Level IV
Written & Verbal Communications	Basic Communications Skills* Basic Record Keeping	Intermediate Communications Skills* Reference Materials	Daily Observations, Reports and Presentations*	Technical Presentations and Reports
Mathematics and Data Entry	Basic Mathematics*	Computer Uses in Highway Maintenance and Construction	Computer Applications in Highway Maintenance & Construction*	Intermediate Mathematics
Surveying, Plans and Specifications	Simple Plans & Specifications* Drainage Installation Layout, Line and Grade Control	Structure Location and Elevation Checks*	Basic Surveying* Intermediate Plans, As-Built Plans and Specifications	
Drainage Pipe Installation and Maintenance	Drainage Pipe Characteristics Inspection of Prefabricated Drainage Components	Pipe Bedding & Trench Backfill Inspection*	Pipe Handling & Installation*	
Worksite and Public Safety	Basic Individual Safety Practices and First Aid Procedures* Maintenance Worksite Protection and Traffic Regulation	Recognize & Report Unsafe Worksite Conditions* Hazardous Materials and Probable Consequences ReflectORIZED Signs and Markings Reconstruction Zone Traffic Control	Traffic Control Devices Hazardous Spills & Other Highway Emergency Situations <b>Construction Traffic Control Plans*</b> Emergency Medical Preparedness	Safety Assurance Program
Highway Construction Inspection & Acceptance	Aggregate Surfacing Inspection	Embankment Placement Inspection* Median Barrier and Guidrail Placement Inspection Rigid Pavements* Flexible Pavements*	<b>Major Paving Project*</b> Concrete and Steel Structure Construction*	External Working Relations
Materials, Sampling, Testing & Inspection	Basic Materials Sampling*	<b>Basic Compaction Testing*</b> Basic Soils and Aggregates Testing Basic Hot Mix Asphalt Materials Testing Basic PCC Materials Testing	Compaction of HMA Mixtures* Placement and Curing of Concrete* Pavement Smoothness*	Materials Testing in the Field

Maintenance and Preservation Program Core Elements are **BOLDED**  
Construction Inspection Program Core Elements are followed by an ASTERISK (\*) (continued)

# NICET- Transportation System Maintenance and Preservation Certification Program

## Core Competencies Matrix

DOMAIN	Level I	Level II	Level III	Level IV
Environmental Protection	Basic Erosion Processes & Controls*	Construction Erosion Control Best Management Practices* Wetlands Recognition	Slope Erosion And Repair Stormwater Management Post-Construction Best Management Practices	
Roadway and Shoulder Maintenance	Asphalt Pavements & Surface Treatments <b>Roadway Surface Distress Inspection and Emergency Repair</b>	Crack Sealing and Joint Repair Rigid Pavement Blowups and Jacking HMA Milling, Recycling & Overlays*	Seal Treatments (Chip and Fog Seals) * Surface Treatments (Slurry & Microsurface)* Roadway and Shoulder Widening* Bituminous Mixing Plant Inspection Pavement Patching	Strategic Pavement Maintenance Program Roadway Condition Inventory and Rehabilitation Techniques
Structure Maintenance	Welding Basics	<b>Bridge Structure Maintenance Inspection</b> Minor Structure Maintenance and Repair Weld Inspection	Protective Coatings Expansion and Contraction Devices Timber Structure Maintenance	
Roadside Maintenance	Guardrail, Barrier and Fencing Installation and Repair Vegetation Control Surveys	<b>Landscaping and Slope Protection*</b> Chemical Spraying	Chemical Herbicides	Roadside Maintenance Management
Maintenance Equipment and Materials Management	Maintenance Equipment Basic Maintenance Materials	<b>Quantity Estimating/ Measurement/ Verification*</b> Equipment Repair Inspection	<b>Equipment Selection, Assignment &amp; Maintenance</b> Materials and Supplies Management	Property Management Systems Fleet Management Systems
Maintenance Operations Management	<b>Public Image/Customer Service/Liability*</b>	<b>Basic Supervision*</b> On - The-Job Training Tort Investigation	Labor Relations and Grievance Procedures Maintenance Responsibilities Management Techniques Work Crew Scheduling	Cost and Performance Management Strategic Maintenance Management
Weather Related Maintenance Operations	Fundamentals of Materials and Chemicals Applications Fundamentals of Snow Plowing and Ice Control	Storm/Event Operations Anti-icing, Prewetting and Deicing Procedures using Materials & Chemicals Relationship between Weather Forecasts and Maintenance Operations	Pre-storm/Event Preparation and Review Anti-icing and De-icing Materials Management Weather Forecast Based Maintenance Operation Decisions	

**Maintenance and Preservation Program Core Competency Elements are BOLDED**  
**Construction Inspection Program Core Competency Elements are followed by an ASTERISK (\*)**

# NICET-Nationwide Transportation System Maintenance and Preservation

## Competency Categories (Domains)

1. Written and Verbal Communications
2. Mathematics and Data Entry
3. Surveying, Plans, and Specifications
4. Drainage Pipe Installation and Maintenance
5. Worksite and Public Safety
6. Highway Construction Inspection and Acceptance
7. Materials, Sampling, Testing, & Inspection
8. Environmental Protection
9. Roadway and Shoulder Maintenance
10. Structure Maintenance
11. Roadside Maintenance
12. Maintenance Equipment and Materials Management
13. Maintenance Operations Management
14. Weather Related Maintenance Operations

*Work Elements are formatted as follows:*

123\* WORK ELEMENT TITLE

Work Element Description: This wording will describe the tasks and knowledge which are included in this work element. (ABCD-1234\*\*)

\* Work Element Number: This number uniquely identifies each work element.

\*\* Some work elements include, in parentheses, reference to a published technical standard which is considered important to the competent performance of the work element.

## WRITTEN AND VERBAL COMMUNICATIONS

### Level I General

- 91002 **BASIC COMMUNICATIONS SKILLS\*** (Highway Maintenance)  
Communicate effectively using basic punctuation, vocabulary, spelling, and sentence structure. Follow written instructions. (See basic grammar references.)
- 91011 **BASIC RECORDKEEPING** (Highway Maintenance)  
Ability to keep accurate records and daily work reports such as payrolls and equipment logs pertaining to equipment materials and personnel.

### Level II General

- 23001 **INTERMEDIATE COMMUNICATIONS SKILLS\*** (Stormwater)  
Communicate effectively when explaining project to customers and media representatives using intermediate verbal communication skills. . Prepare internal and external draft written correspondence. Keep essential discussion and meeting records, including highlighting issues needing follow-up.

### Level II Special

- NEW **REFERENCE MATERIALS** (National & State Specific)  
Recognize basic maintenance reference materials including maintenance operation manuals, pertinent publications and standard operation procedures.

### Level III General

- 25002 **DAILY OBSERVATIONS, REPORTS, AND PRESENTATIONS\*** (Stormwater)  
Ability to effectively review daily reports of observations/inspections/quantities and prepare summary reports for submittal to the supervisor or manager. Develop and give short internal project reports and summary presentations.

### Level IV General

- 95014 **TECHNICAL PRESENTATIONS AND REPORTS** (Highway Maintenance)  
Organize and effectively deliver oral presentations and prepare technical reports and correspondence. Proficient in giving media interviews, reports and public presentations.

Maintenance and Preservation Program Core Elements are **BOLDED**  
Construction Inspection Program Core Elements are followed by an ASTERISK (\*)

## MATHEMATICS AND DATA ENTRY

### Level I General

- 91001 BASIC MATHEMATICS\*** (Highway Maintenance)  
Solve mathematical problems requiring simple addition, subtraction, multiplication, and division. Round to the correct number of significant figures, calculate percentages, read graphs, and use simple geometric definitions and formulas. (See general math textbooks.)

### Level II General

- 25003 COMPUTER USES IN HIGHWAY MAINTENANCE AND CONSTRUCTION** (Stormwater)  
Describes the function and use (actual and potential) of computers and electronic networks in the field of highway maintenance operations documentation, data entry, data transfer and reporting as would be normally taught in an Introduction to Computers class.

### Level III General

- NEW COMPUTER APPLICATIONS IN HIGHWAY MAINTENANCE AND CONSTRUCTION\*** (PENNDOT)  
Demonstrates the use of computers for routine maintenance and construction operations including data entry, computations and analyses, materials test data entry and analysis, and data transfer

### Level IV General

- 95018 INTERMEDIATE MATHEMATICS** (Highway Maintenance)  
Perform mathematical calculations utilizing basic algebra (fundamental laws, algebraic expressions), geometry, and trigonometric functions of right triangles. (See basic textbooks on algebra and trigonometry.)

Maintenance and Preservation Program Core Elements are **BOLDED**  
Construction Inspection Program Core Elements are followed by an ASTERISK (\*)

## SURVEYING, PLANS, AND SPECIFICATIONS

### Level I General

- 23007 STANDARD PLANS AND SPECIFICATIONS\* (Stormwater)  
Reads and interprets, under supervision, standard plans and specifications such as location, grading, erosion control, traffic control, and utility plans.

### Level I Special

- 24016 DRAINAGE INSTALLATION LAYOUT, LINE AND GRADE CONTROL (Stormwater)  
Uses plans, specifications, and local jurisdiction information to locate and stake drainage culverts, pipelines and collection facilities. Indicate appropriate excavation information on stakes and provide reference stakes for checking depth, gradient, alignment, and location.

### Level II Special

- 23008 STRUCTURE LOCATION AND ELEVATION CHECKS (Stormwater)  
Locates and stakes structures using accepted surveying practices. Performs structure location and elevation checks during construction

### Level III General

- 93012 BASIC SURVEYING\* (Maintenance/Stormwater)  
25010 Perform basic surveying, including rodman and chainman duties to required precision. Make corrections for temperatures, tension, etc. Reduce and check field book notes of simple survey to detect possible errors. Use approved procedures to correct and compute needed information. Determine, plot and check basic cross sections from field book notes. Assure that the project is laid out and staked in accordance with plans and specifications, including drainage, grade, line, earthwork, curbs and gutters. Properly use and maintain survey instruments; read angles and distances to designated precision; assure completeness and accuracy of notes. Verify dimensions and volumes by trigonometric and quantity survey methods. (Example: determine quantities removed from borrow pits.)
- 23001/ INTERMEDIATE PLANS, AS-BUILT PLANS AND SPECIFICATIONS (Highway Design/Stormwater)  
25006 Uses intermediate plans and specifications to determine dimensions, types of materials, grades, slopes, cut and fill, surfaces, densities, and quantities. Verifies completion and adequacy of as-built inspection and posting. Describes as-built ties and their conformance to standards or to original plans.

Maintenance and Preservation Program Core Elements are **BOLDED**

Construction Inspection Program Core Elements are followed by an ASTERISK (\*)

## DRAINAGE PIPE INSTALLATION AND MAINTENANCE

### Level I General

- 24008/ DRAINAGE PIPE CHARACTERISTICS (Stormwater/Highway Maintenance)  
92008 Defines the engineering characteristics of commonly used pipes and other drainage system components including RCP, PVC, DI, and CMP and typical handling, bedding, jointing, and backfill of system components. Recognizes the types of highway drainage devices/designs and knows their functions, such as the difference between subsurface and surface systems and their components (pipes, culverts, ditches, etc.)

### Level I Special

- 21014 INSPECTION OF PREFABRICATED DRAINAGE COMPONENTS (Stormwater)  
Performs basic inspections of pipe, inlets and precast concrete drainage system components, including all manhole elements, fittings, and connections. Records findings.

### Level II General

- 24015/ PIPE BEDDING AND TRENCH BACKFILL INSPECTION\* (Stormwater)  
21013 Uses the proper techniques and materials to provide proper pipe trench backfill under a variety of field conditions. Observes backfilling to assure use of proper materials, moisture content, lift depths, and compaction methods. Assures compliance with final grade requirements. Reports quantities of materials and equipment used.

### Level III General

- 21015/ PIPE HANDLING & INSTALLATION\* (Stormwater)  
21016 Performs basic inspection to assure compliance with contract requirements on sizes and materials used for unloading culverts, job storage culverts, bedding, cover, approach and outfall slopes, headwalls and wingwalls, finishing and cleanup. Checks and reports on final work.

Maintenance and Preservation Program Core Elements are **BOLDED**

Construction Inspection Program Core Elements are followed by an ASTERISK (\*)



## WORKSITE AND PUBLIC SAFETY

### Level I General

- 13004 BASIC INDIVIDUAL SAFETY PRACTICES AND FIRST AID PROCEDURES\*** (H. Con./H. Maint.)  
91003 Applies standard safety practices in performing job tasks. Practices the basic rules and procedures of first aid. (See general handbooks on first aid.)
- 91004 MAINTENANCE WORKSITE PROTECTION AND TRAFFIC REGULATION** (Highway Maintenance)  
91005 Performs traffic control setup and flagging duties. Moves traffic through or around the work zone in a manner that is conducive to the safety of motorists and workers. Able to use a two-way radio. Informs supervisors of road conditions and provide for reassignment of units, when necessary. Arranges aid for disabled vehicles and maintenance units. Recognizes potential unsafe conditions at worksite and reports suspected violations to project supervisor or manager. (OSHA)

### Level II General

- 23006/ RECOGNIZE AND REPORT UNSAFE WORKSITE CONDITIONS\*** (Stormwater/Highway Maintenance)  
45018 Recognizes and reports possible violations of federal, state and governing safety regulations.  
Recognizes hazards associated with working in confined space and applies governing safety regulations.
- 92009 **HAZARDOUS MATERIALS AND PROBABLE CONSEQUENCES** (Highway Maintenance)  
Recognizes the types and probable consequences of hazardous materials likely to be encountered during maintenance operations. Describes responsibilities in regard to handling or not handling the materials and reporting their presence to your supervisor or similar person.
- 93002 **RECONSTRUCTION ZONE TRAFFIC CONTROL \*** (Highway Maintenance)  
Implements and maintains traffic control plans around repair and construction sites. Recognizes hazards on special jobs and uses signalmen, signals, signs and other controls to maintain safe movement of traffic. Describes the advantages and disadvantages of using detours or by-pass routes.

### Level II Special

- 91006/ **RETROREFLECTORIZED SIGNS AND MARKINGS** (Highway Traffic Operations/Highway Maintenance)  
44002/ Describes the retroreflectivity requirements of installed warning, guide, and regulatory signs and pavement markings.  
44005 Determines from plans and/or from on-site inspections the manner in which vehicle lights will strike reflectorized devices. Using this information and the retroreflectivity requirements furnishes recommendations as to the suitability of the devices in their present or proposed locations. Recommends changes in location or orientation as necessary.

Maintenance and Preservation Program Core Elements are **BOLDED**

Construction Inspection Program Core Elements are followed by an **ASTERISK (\*)**

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## WORKSITE AND PUBLIC SAFETY, continued

### Level III General

- 15006/ **CONSTRUCTION TRAFFIC CONTROL PLANS\*** (Highway Construction)  
13005 Establishes Traffic Control Plans with adequate signs, signals, markings, and protective barriers, to protect workers and the public during all phases of a construction project. Coordinates activities with other offices and agencies as required. Arranges in advance for detours and traffic maintenance procedures. Enforces rigid traffic controls during use of explosives
- 95006/ **EMERGENCY MEDICAL PREPAREDNESS** (Highway Maintenance)  
95008 Provides for the jobsite safety of maintenance personnel, public traffic and pedestrians during emergency maintenance operations including emergency first aid materials suited to the type of project and number of persons involved. Set up cyclic review of material to assure continuing availability. Provides means to transport injured persons safely to ambulance pick-up point and arranges for availability of emergency ambulance and hospital service. OSHA, EPA, MSHA)
- 96016 **TRAFFIC CONTROL DEVICES** (Highway Maintenance)  
Establishes temporary or permanent traffic control signs and devices in accordance with plans and specifications, assuring locations are in conformance with requirements for safety and visibility. Observes safety requirements during installation. Records installations and perform inspections to see if installed devices are functioning properly. Reports malfunctions and/or make minor adjustments as authorized. Selects proper device for specific requirement on basis of MUTCD or State equivalent standard.

### Level III Special

- 98005/ **HAZARDOUS SPILLS & OTHER HIGHWAY EMERGENCY SITUATIONS** (Highway Maintenance)  
98006 Uses the most expedient response to the hazard to insure the safety of the public and the highway workers, and to protect any property involved. Defines the rules and procedures pertaining to different types of emergency situations on the highway. Verifies that all required maintenance tools and devices available for emergency situations.

### Level IV General

- NEW **SAFETY ASSURANCE PROGRAM** (PENNDOT)  
Establishes and implements a safety assurance program that assures the safety of the traveling public, maintenance operations, and safe adjacent property use through a system of safety reviews and inspection.

Maintenance and Preservation Program Core Elements are **BOLDED**  
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## HIGHWAY CONSTRUCTION INSPECTION AND ACCEPTANCE

### Level I Special

- 12001/ AGGREGATE SURFACING INSPECTION (Highway Construction)  
12010 Computes base and subbase materials quantities delivered to site. Insures the materials are placed in the lifts required by the specifications and compacted in the manner specified... Checks surface smoothness using eye or straight-edge

### Level II General

- 14007 EMBANKMENT PLACEMENT INSPECTION\* (Erosion)  
Insures the proper inspection and testing of embankments including foundation preparation, embankment placement, finishing and acceptance of earthwork construction.

### Level II Special

- 12005 MEDIAN BARRIER AND GUIDERAIL PLACEMENT INSPECTION (Highway Construction)  
Inspects the installation of median barriers and guiderails to assure compliance with specifications, plans and staking. Verifies materials used, workmanship, curing (if necessary), and cleanup. Checks barrier and rail alignment and grade for compliance with specifications requirements. Documents and submits findings.
- 94005/ RIGID PAVEMENTS\* (Highway Maintenance/ Highway Construction)  
14001 Inspect to assure that the base upon which pavement is placed complies with plans and specifications. Evaluate portland cement concrete trial mix and adjust for moisture in aggregate stockpile. Assure proper mixer rotation rate and mixing time. Assure adequacy of forms or slip forming methods, and verify alignment, grade and cross section. Check placement of reinforcing, dowels and joint materials. Assure proper surface finishing, curing, surface treatment and cleanup. Check and report on final appearance and compliance with plans and specifications. Provide accurate quantity records.
- 94004/ FLEXIBLE PAVEMENTS\* (Highway Maintenance/ Highway Construction)  
14002 Inspect to assure that the base upon which pavement is placed complies with plans and specifications. Adjust prime and track coat application to provide optimum cover. Adjust application of asphalt and aggregate in chip seals. Assure proper texture, surface, tolerance, thickness and density of asphalt and aggregate in chipped seals. Assure proper texture, surface, tolerance, thickness and density of ACHM base and surface courses. Check design and control of asphalt mix to assure compliance with specifications. Run extraction and gradation tests; verify temperature at time of placement; verify lift thickness, grade cross section, rolling methods, finishing and cleanup. Provide accurate records of quantities placed.

Maintenance and Preservation Program Core Elements are **BOLDED**  
Construction Inspection Program Core Elements are followed by an ASTERISK (\*)

## HIGHWAY CONSTRUCTION INSPECTION AND ACCEPTANCE, continued

### Level III General

#### 16004 MAJOR PAVING PROJECT\*

(Highway Construction)

Compile all reports; verify necessary certificates, shop inspection reports, progress payments and payrolls; and consolidate claims and decisions and furnish all background information concerning possible future claims. Prepare final project report in conformance with required forms; submit to proper authority for review, approval and filing, as necessary.

### Level III Special

#### 16001/ CONCRETE AND STEEL STRUCTURE CONSTRUCTION\*

(Highway Construction)

15011 Insures compliance with plans, specifications and safety requirements by supervision, inspection, and recording of the following activities: staking and layout; erection and removal of temporary supports or bracing (verify compliance with standard requirements before permitting forms or braces to be stripped and assure placement of concrete under safe conditions and in temperatures permitted within specifications); forming, curing, stripping, finishing and treating concrete; placing, fastening and covering of reinforcing steel, dowels and joint materials; and conformance to final line, grade, and dimensions. Determines correct courses of action to bring errors or inaccuracies to attention of appropriate persons. Prepares complete and accurate reports on proper forms to reflect work accomplished.

### Level IV General

#### 17005 EXTERNAL WORKING RELATIONS

(Erosion 17005 / Highway Construction 17002)

Establishes effective working relations with contractors, subcontractors, suppliers, consultants, utility companies, government agencies, municipalities, property owners, employees and the public. Arranges work schedules to permit effective accomplishment of work by all involved.

Maintenance and Preservation Program Core Elements are **BOLDED**

Construction Inspection Program Core Elements are followed by an ASTERISK (\*)



## MATERIALS, SAMPLING, TESTING, & INSPECTION

### Level I Special

- 11001/ BASIC PCC MATERIALS SAMPLING\* (Highway Construction/CMT/Erosion)  
72001/ Collects and identifies samples in field as directed or per standard practices. Places samples in containers or protects them  
14022 for laboratory analyses. Preserves "in situ" conditions as required by specifications or by ASTM or AASHTO. Samples liquid, semisolid, or solid bituminous materials at the point of manufacture, supply terminal, or at the point of shipment delivery. (T40, T168, D140, D979). Defines procedures for representative sampling of fresh concrete as delivered to project site. Describes slump and air content tests, and how to cast and store concrete specimens for subsequent testing.

### Level II General

- 94006/ BASIC COMPACTION TESTING\* (Construction Materials Testing)  
94007/ Performs, computes and reports soils and aggregates proctor and compaction tests  
94010

### Level II Special

- 82015/ BASIC SOILS AND AGGREGATES TESTING (Highway Materials)  
82008 Performs, computes and reports basic soils and aggregates tests including sample preparation and sieve analysis.
- 74015/ BASIC HOT MIX ASPHALT MATERIALS TESTING (CMT/Highway Materials)  
74019/ Performs, computes and reports basic HMA tests including extraction of bitumen, degree of compaction of  
82011 bituminous – aggregate mixtures and sieve analysis of extracted aggregates.
- 84002/ BASIC PCC MATERIAL TESTING (Highway Materials)  
84008/ Performs, computes and reports basic PCC tests including slump, air content, unit weight, molding cylinders and determining  
84018 compressive strength

Maintenance and Preservation Program Core Elements are **BOLDED**  
Construction Inspection Program Core Elements are followed by an ASTERISK (\*).

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## MATERIALS, SAMPLING, TESTING, & INSPECTION, continued

### Level III General

- 84108 COMPACTION OF HMA MIXTURES\* (Highway Materials)  
Calculate the degree of pavement compaction of a bituminous-aggregate mixture as related to standard specimens composed of the same materials and with the tolerances of the job mix formula. (T230)

### Level III Special

- 84031 PLACEMENT AND CURING OF CONCRETE\* (CMT)  
Describe the requirements for placement, consolidation, and curing of concrete. (ACI 301 and 318)
- 86006 PAVEMENT SMOOTHNESS\* (Highway Materials)  
Describes the proper operation of an Inertial Profiler in accordance with manufacturer's instructions to determine a pavement profile. Operates a profile measuring equipment over a specified section of roadway to determine International Roughness Index (IRI) measurements of surface smoothness. Prepares necessary reports and recommend percent compliance with established standards.

### Level IV General

- 15001 MATERIALS TESTING IN THE FIELD (Highway Construction)  
Performs, supervises, and coordinates material testing in the field to assure compliance with plans and specifications pertaining to soils, aggregates, portland cement concrete mixes, bituminous mixes, subgrades, bases, structural members, etc. by application of required field tests or by collection, preparation and transmittal of samples to designated laboratories. Verifies adequacy of number of samples and locations at which samples are collected to assure representative coverage of sites. Verifies use of appropriate, properly calibrated testing equipment. Records the determinations and certificates properly and see that they get to the designated persons.

Maintenance and Preservation Program Core Elements are **BOLDED**  
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## ENVIRONMENTAL PROTECTION

### Level I General

- 31007 BASIC EROSION PROCESSES AND CONTROLS\*** (Stormwater and Wastewater System Inspection)  
Recognize the types of erosion, the principle causes of various types of erosion, the factors that influence the amount of erosion, and the indicators of the active erosion process.

### Level II General

- 24004 CONSTRUCTION EROSION CONTROL BMP'S\***  
Describe the basics of accepted practices and procedures for controlling erosion and sedimentation during construction. Demonstrate knowledge of control principles, determine areas needing attention, recognize potential problems, and develop strategies to solve problems that have arisen or will arise.
- 22001 WETLANDS RECOGNITION**  
Recognize the basic attributes and in-situ conditions associated with wetlands.

### Level III General

- 94010/ SLOPE EROSION AND REPAIR** (H. Maint./H. Mat/Erosion/Stormwater)  
**84005/** Uses the proper procedures for collecting and preserving water samples. Describes the basic requirements for slope surface  
**16001/** subsurface drainage systems, surface preparation, and planting for natural and compacted earth fill slopes. Defines the  
**16006/** procedures and techniques used in restoring shallow, non-complex slumped or failed earthen slopes back to a condition  
**23005** similar to that existing prior to the failure. Performs inspection to assure proper preparation of soils for seeding, sodding or planting, proper slopes and drainage provisions, use of specified fertilizer, seeds or plants, and installation of required supports or protection. Records areas covered, plants placed, etc. Enforces cleanup and provisions for watering to establish growth as specified. Insures that the final appearance of job complies with plans and specifications.
- 24005 STORMWATER MANAGEMENT POST-CONSTRUCTION BMP'S**  
Demonstrate the design and proper usage of permanent practices to control erosion and sedimentation during and after construction. *II-S*

Maintenance and Preservation Program Core Elements are **BOLDED**  
Construction Inspection Program Core Elements are followed by an **ASTERISK (\*)**



## ROADWAY AND SHOULDER MAINTENANCE

### Level I General

- 92007 **ROADWAY SURFACE DISTRESS INSPECTION AND EMERGENCY REPAIR** (Highway Maintenance)  
Visually survey existing pavement conditions, recognizing the type, severity, and amount of distress. Patch potholes, depressions, or sharp breaks in a pavement surface.
- 14009 **ASPHALT PAVEMENTS AND SURFACE TREATMENTS** (Water and Sewer Lines)  
Lists the basic types of asphaltic pavements and surface treatments, including the basic purposes of prime and tack coats, Checks the compaction (rolling) of asphalt paving mixtures and surface treatments. Describes the requirements for acceptance during maintenance and rehabilitation operations. Records and reports findings.

### Level II General

- New **CRACK SEALING AND JOINT REPAIR** (PENNDOT)  
Recognizes the pavement distress that requires this maintenance repair. Describes the basic types of sealant materials and the appropriate techniques to properly repair cracking in bituminous and concrete pavements and concrete joint re-sealing.

### Level II Special

- 96008/ **RIGID PAVEMENT BLOWUPS AND JACKING** (Highway Maintenance)
- 96010 Supervises the repair of concrete pavement blowups. Provides for traffic bypass as soon as blowup is discovered and provide signs, signals or flaggers to protect vehicles, drivers and crews. Insures proper trimming of blowup area. Maintains availability and supply of replacement materials. Provides necessary traffic-free period to permit set up and clean up of repair area. Assigns properly trained and experienced personnel to pavement jacking and leveling jobs. Assures proper final grade of slab (uses proper instruments to verify). Provides adequate traffic or load-free period to permit set-up according to specifications for materials used and provides adequate cleanup and reporting.
- New **HMA MILLING, RECYCLING, AND OVERLAYS\*** (NHI 131050 A)  
Explains both cold and hot recycling methods. Inspects milling operations, and the reuse of millings including acceptance of recycled mixes. Inspects overlay operations and applies quality principles based on knowledge and experience.

Maintenance and Preservation Program Core Elements are **BOLDED**  
Construction Inspection Program Core Elements are followed by an **ASTERISK (\*)**

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## ROADWAY AND SHOULDER MAINTENANCE, continued

### Level III General

- New SEAL TREATMENTS (CHIP AND FOG SEALS)\* (PENNDOT)  
Explains the various sealing operations and equipment requirements. Insures the use of proper procedures to efficiently perform these operations including calibration of the equipment.
- New SURFACE TREATMENTS (SLURRY AND MICROSURFACE)\* (PENNDOT)  
Describes the basic types of surface treatments and equipment requirements. Uses the proper procedures to efficiently perform these operations including calibration of the equipment.
- New ROADWAY AND SHOULDER WIDENING\* (PENNDOT)  
Establishes inspection and acceptance procedures based on knowledge of and experience with the unique aspects involved with widening existing roadways and shoulders apply it to produce a quality product.

### Level III Special

- 76001 BITUMINOUS MIXING PLANT INSPECTIONS (Construction Materials Testing)  
Insures compliance with specifications covering materials produced by a plant by verifying accuracy of automatic controls on quantities, weights, or other characteristics of final products. Defines applicable specs or published standards as necessary. Tests samples on random basis to assure quality control. (T172, D290)
- 95005 PAVEMENT PATCHING (Highway Maintenance)  
Describes bituminous and portland cement concrete patching materials and the appropriate conditions for their use. Trims distressed area and applies patch materials in the prescribed manner under acceptable conditions. Provides for the necessary traffic-free period to permit curing or set-up. Insures safety of maintenance crews, public traffic and property. Keeps proper records to summarize costs, man hours equipment hours and materials used.

### Level IV General

- New STRATEGIC PAVEMENT MAINTENANCE PROGRAM (PENNDOT)  
Develops and implements strategic pavement maintenance program using currently available preventive maintenance techniques and accommodating different pavement types, treatment frequencies and adjustments for extreme weather events resulting in budget constraints.
- 94003 ROADWAY DISTRESS AND REHABILITATION TECHNIQUES (Highway Maintenance/ ASCE/NHI 03)  
Investigate reliable and cost-effective rehabilitation alternatives for existing flexible and rigid pavements including existing pavement structural evaluation and condition assessment, needs assessment, and assignment of feasibilities to reconstruction, recycling, restoration and resurfacing.

Maintenance and Preservation Program Core Elements are **BOLDED**

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## STRUCTURE MAINTENANCE

### Level I Special

#### LTAP WELDING BASICS

Defines the principles, materials and procedures for the proper creation and inspection of the various types of welds

### Level II General

- 96022/ **BRIDGE STRUCTURE MAINTENANCE INSPECTION** (Highway Maintenance/Bridge Safety)  
75006 Describe the definitions, explanations, and procedures in the current AASHTO "Manual for Maintenance Inspection of Bridges" and the National Bridge Inspection Standards (NBIS).
- 96002 **MINOR STRUCTURE MAINTENANCE AND REPAIR** (Highway Maintenance)  
Performs maintenance and repair on minor concrete structures including headwalls, parapets and railroad crossings. Insures compliance with structural, functional and aesthetic requirements of the facility.

### Level II Special

- 86028 **WELD INSPECTION** (Highway Materials)  
Performs weld inspection with full responsibility for qualifying welders and welding procedures, checking weld preparation, welding equipment, welding electrodes, and compliance with welding procedures, visual inspection, and determining and witnessing appropriate non-destructive testing. (AASHTO or AWS) Standard Specifications for Welding.

### Level III Special

- 96014/ **PROTECTIVE COATINGS** (Highway Maintenance/Bridge Safety)  
76009 Inspect or perform structural painting; assign personnel and equipment in accordance with predetermined schedules (or prepare adequate schedule). Insures specification compliance of materials used; condition of surfaces painted; temperature when surfaces are primed and painted; adequacy of drying time; and adequacy of paint coverage.
- 96021/ **EXPANSION AND CONTRACTION DEVICES** (Highway Maintenance/Bridge Safety)  
74008 Defines the methods and devices that accommodate expansion and contraction of entire bridges and bridge components such as rollers and rockers, elastomeric pads, sliding plates, roadway joints and joint fillers. Establishes maintenance schedules using preventive maintenance concepts.
- New **TIMBER STRUCTURE MAINTENANCE**  
Demonstrate the methods used to inspect, detect, maintain and repair decayed and damaged timber structure members including sounding, core sampling and field preservative treatments.

Maintenance and Preservation Program Core Elements are **BOLDED**

Construction Inspection Program Core Elements are followed by an ASTERISK (\*)

## ROADSIDE MAINTENANCE

### Level I General

- 92001 GUIDERAIL, BARRIER AND FENCING INSTALLATION AND REPAIR (Highway Maintenance)  
Repairs guardrails, barriers, and fences, assuring necessary safety and traffic control on job. Provide proper personnel, tools, equipment and materials. Checks workmanship, ensure proper alignment of guardrails and barriers, and adhere to standard practices and cleanup procedures. Maintains proper records to enable determination of job manhours, materials, and equipment hours.
- 94016/ VEGETATION CONTROL SURVEYS (Highway Maintenance)
- 96013 Conducts vegetation control surveys to observe and note growth of weeds, shrubbery, trees, and roots that might constitute a safety hazard by obstructing vision or by being too close to the road. Determines if obstruction growth is within ROW and note hazards beyond ROW for action by designated office. Performs removal of hazardous shrubs, trees, and roots. Identify noxious weeds and perform specified removal.

### Level II General

- 94006/ LANDSCAPING AND SLOPE PROTECTION\* (Highway Maintenance/Stormwater)
- 23005 Inspects the proper preparation of soils for seeding, sodding or planting; proper slopes, irrigation, and drainage provisions; use of specified fertilizer, seeds or plants; installation of required supports or protection. Record areas covered, plants placed, etc. Inspects cleanup and watering to establish growth as specified. Insures that final appearance of job complies with plans and specifications.

### Level II Special

- 94009 CHEMICAL SPRAYING (Highway Maintenance)  
Calibrates chemical spray equipment in accordance with manufacturers' directions to assure delivery of proper concentrations on targeted areas. Makes minor adjustments as required or return faulty equipment for repair. Supervises and checks spraying operations to assure safety to crew and public in accordance with licensing requirements.

### Level III Special

- 96007 CHEMICAL HERBICIDES (Highway Maintenance)  
Selects a proper chemical herbicide for the specific jobs to be accomplished, complying with environmental regulations and licensing requirements issued by local, state and federal agencies, following directions of your designated supervisor, and referring to appropriate published guidelines. Prepares the proper dilution and select the distribution devices best suited to the work. Investigates the types of weeds to be controlled and consider whether spraying will fall on any open water and whether humans or animals will come in contact with sprayed areas. Completes the work in a safe manner.

### Level IV General

- 96009 ROADSIDE MAINTENANCE MANAGEMENT (Highway Maintenance)
- 96012 Coordinates and supervises maintenance programs for rest areas, medians and roadsides by use of a predetermined schedule, or by actually preparing a schedule on the basis of policies set by proper authorities. Assigns crews, equipment and materials; observe work during and after jobs; assure required safety measures. Maintains proper records of work performed. Assigns personnel and equipment for ditch clearing and drainage maintenance in accordance with predetermined schedules. Supervises and inspects work performed to be sure that undesirable ponding is avoided (use survey instruments if required). Insures compliance with environmental requirements for erosion control.

Maintenance and Preservation Program Core Elements are **BOLDED**

Construction Inspection Program Core Elements are followed by an ASTERISK (\*)

## MAINTENANCE EQUIPMENT AND MATERIALS MANAGEMENT

### Level I General

- 91007 MAINTENANCE EQUIPMENT (Highway Maintenance)  
95015 Defines the basic types of hand tools and mechanized equipment used in maintenance and repair work. Defines what  
91008 factors to consider in selecting the proper type and size of equipment for efficient job completion. Applies the safety rules  
for special large equipment and vehicles such as cranes, hydraulic shovels and grabs, large dump trucks and spreaders on  
public roads. Selects proper equipment type and size for efficient job completion. Monitors production rates and equipment  
operating costs.
- 91010 BASIC MAINTENANCE MATERIALS (Highway Maintenance)  
Define the basic materials used in maintenance activities and know how they are classified (aggregates, asphalt, portland  
cement, paints, chemicals, metals, lumber, fuels, lubricants, grass, seeds and reflectorized sheeting for signs).

### Level II General

- 93008 QUANTITY ESTIMATING, MEASUREMENT AND VERIFICATION\* (Highway Maintenance/Stormwater)  
24002 Computes volumetric and weight (tonnage) quantities of materials delivered to site or ordered for delivery to the site.  
Verifies quantities required by the specifications and properly incorporated into the work are accurately measured.  
Performs sewage and drainage system construction computations and quantity verifications. Computes reservoir full and  
draw-down rates, trench excavation, and pipe backfill volumes, etc. Compares constructed with estimated quantities and  
document reasons for variances.
- 92006 EQUIPMENT REPAIR INSPECTION (Highway Maintenance)  
Checks work order to determine what work was done after major equipment repairs or overhaul of vehicles and mechanical  
equipment. Performs road or job test and physical inspection to determine performance and quality of repair work. Inform  
shop superintendent if corrections are needed.

Maintenance and Preservation Program Core Elements are **BOLDED**

Construction Inspection Program Core Elements are followed by an ASTERISK (\*)

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## MAINTENANCE EQUIPMENT AND MATERIALS MANAGEMENT, continued

### Level III General

- 95004/ EQUIPMENT SELECTION, ASSIGNMENT AND MAINTENANCE** (Highway Maintenance)  
**93009** Assigns appropriate heavy equipment, trucks and hand tools to facilitate prompt, safe, and economical job performance. Analyzes the associated costs and be able to select an economical combination of materials, equipment and tools for each job. Schedules periodic maintenance of equipment to minimize downtime, maximize equipment utilization and minimize operating costs.
- 95012/ MATERIALS AND SUPPLIES MANAGEMENT** (Highway Maintenance)  
**96004** Uses project plans, specifications and periodic work programs to determine the quantity, quality and specifications of materials and supplies allowing for timely and efficient requisition. Schedules delivery times and locations to minimize additional material handling and stockpiling. Inspects delivered materials and supplies for compliance with the order specifications and purchasing requirements. Checks delivered quantities and dimensions of metal sign stock for compliance with specifications. Measures thickness (gauge) and checks finish. Checks shop inspection certificates, if available. Records and reports deficiencies.

### Level IV General

- 95009 PROPERTY MANAGEMENT SYSTEMS** (Highway Maintenance)  
Establishes and monitors systems to insure compliance with requirements for current, complete and accurate property records which reflect location, condition and use of equipment and materials. Completes necessary forms and reports to establish responsibility. Takes corrective action as necessary.
- New **FLEET MANAGEMENT SYSTEMS** (PENNDOT)  
Establishes and implements strategic equipment selection criteria based on replacement cycles and budget restraints that meet current and projected equipment needs. Establishes and monitors fleet inventory and locating systems along with total cost and depreciation records.

Maintenance and Preservation Program Core Elements are **BOLDED**  
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## MAINTENANCE OPERATIONS MANAGEMENT

### Level I General

- 91009 PUBLIC IMAGE/CUSTOMER SERVICE/LIABILITY\*** (Highway Maintenance)  
Understand the importance of providing an image to the public of a maintenance worker who obeys the same laws as the public and respects the rights of others. Be courteous to all people and avoid arguments, respect the environment by keeping work site free of trash, obey all traffic laws enroute to worksite, while there, and when returning. Use interpersonal skills to consider and respond tactfully to the feelings and needs of different people with different complaints and concerns.

### Level II General

- 95019 BASIC SUPERVISION\***  
Defines the fundamentals of authority and supervision. Defines the supervisor's authority and responsibility. Consistently performs assigned tasks in accordance with established policies and procedures.
- 25009 ON-THE-JOB TRAINING** (Highway Maintenance/SW/HC)  
Implements on-the-job training programs using experience and knowledge of performance factors to increase the skills of workers. Evaluates progress and capabilities of trainees and others in on-the-job training situations.
- NEW TORT INVESTIGATIONS** (PENNDOT)  
Investigates and collects perishable accident/incident data. Records and reports findings.

### Level III General

- NEW LABOR RELATIONS AND GRIEVANCE PROCEDURES** (PENNDOT& W/WP IV-G)  
Uniformly applies policies and regulations to local and statewide labor relations contracts and issues. Demonstrates sound investigation, hearing, and resolving grievances skills.
- 95011 MAINTENANCE RESPONSIBILITIES** (Highway Maintenance)  
Describes how maintenance work is authorized and accomplished within maintenance unit. Define correct channels for authorizing changes and know who to contact to perform work and gain access to sites. Describe procedures for authorizing traffic controls; locations of required records; and limits of geographic and technical responsibilities. List all pertinent governmental organizations and divisions of maintenance responsibilities.
- 97006 MANAGEMENT TECHNIQUES** (Highway Maintenance)  
Define the role of the supervisor as the link between employees and upper management. Establishes and implements performance standards. Applies sound management techniques to manage and improve work efficiency and crew productivity. Demonstrates how to build consensus and cooperation.
- 95002 WORK CREW SCHEDULING** (Highway Maintenance)  
Analyzes recurring and specialized maintenance and repair work needs. Prepares schedules for accomplishment of work by recurring and specialized crews to assure effective use of personnel, equipment and materials. Monitors work performance rates and modify schedules, if appropriate. Maintains record of milestones achieved in accordance with the schedule. Maintains record of milestones achieved in accordance with the schedule.

Maintenance and Preservation Program Core Elements are **BOLDED**  
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## MAINTENANCE OPERATIONS MANAGEMENT, continued

### Level IV General

- 97008 COST AND PERFORMANCE MANAGEMENT (Highway Maintenance)  
Maintains full and complete compliance with budgetary and operational policies during an entire season and support all actions with records that will substantiate expenditures, provide details on work accomplished, and permit cost analysis for future reference. Manages personnel, equipment and materials effectively; assure compliance with EEO, OJT, OSHA and other agencies, utilities, and the public. Handles grievances and employee morale matters effectively and keep supervisors up-to-date.
- 97004/ STRATEGIC MAINTENANCE MANAGEMENT (Highway Maintenance)  
97001/ Establishes asset management systems, including the review of recurring maintenance requirements and their  
97007/ priorities for area of responsibility, the development of inventories, condition levels, minimum standards, and establishment of prioritized scheduling. Applies strategic maintenance management techniques to improve the efficiency of work programs and overall productivity of crews. Analyzes and determines the need for and effective use of maintenance contracting for overall asset management efficiency. Applies the principles of risk management to operate an effective highway maintenance program which will reduce liability risks during all phases of maintenance operations. Applies maintenance standards for various installations and repairs to such items as guardrails, highway signs, slopes, and pavements.

Maintenance and Preservation Program Core Elements are **BOLDED**

Construction Inspection Program Core Elements are followed by an ASTERISK (\*)



## **WEATHER RELATED MAINTENANCE OPERATIONS**

### **Level I General**

- NEW/ 92002 FUNDAMENTALS OF SNOW PLOWING AND ICE CONTROL (PENNDOT/Highway Maintenance)  
Performs the basic fundamentals of snow plowing procedures, including direction, timing, frequency, and route considerations. Recognizes that conditions will be different from one locality to another because of latitude, prevailing temperature, and precipitation. Selects the proper equipment for specific snow/ice conditions.
- NEW FUNDAMENTALS OF MATERIALS AND CHEMICALS APPLICATIONS (PENNDOT)  
Defines the types of materials, chemicals, spreaders, application and equipment calibration procedures. Selects the proper materials for specific snow/ice conditions.

### **Level II General**

- NEW ANTI-ICING, PREWETTING and DEICING PROCEDURES USING MATERIALS AND CHEMICALS (PENNDOT)  
Describes the differences between anti-icing and deicing materials and chemicals. Describes the procedures for prewetting chemicals. Demonstrates the proper spreading of these materials including calibration of the spreader.
- NEW STORM/EVENT OPERATIONS (PENNDOT)  
Demonstrates knowledge of pre-storm/event preparations, storm/event operations, and post-storm/event operations.

### **Level II Special**

- NEW RELATIONSHIP BETWEEN WEATHER FORECASTS & WINTER MAINTENANCE OPERATIONS (PENNDOT)  
Defines the relationship between weather forecast parameters and the choice between the use of anti-icing or deicing materials or chemicals and the effectiveness of prewetting agents and its effect on pre-storm/event preparations and storm/event operations.

### **Level III General**

- 96015 PRE-STORM/EVENT PREPARATION AND REVIEW (Highway Maintenance)  
Analyzes existing snow removal and ice control records to plan and organize for future storm/events. Calculates future manpower, equipment and materials projections to maximize use of resources. Develops and provides specialized crews and new contractor personnel with training in the proper use of equipment and materials and instruction in their duties and responsibilities. Supervises storm/event operations elements including crew scheduling and monitoring, communications, radio procedures, dispatcher priorities, snow plowing routes, material applications procedures, snow disposal, storage, and post-storm clean-up. Supervises post-storm cleanup operations including when to switch from plowing to cleaning, intersection/ramp cleanup priorities, and push back procedures.
- NEW ANTI-ICING AND DE-ICING MATERIALS MANAGEMENT (PENNDOT)  
Establishes and maintains an inventory and location information system on the various anti-icing, prewetting and deicing materials and chemicals. Analyzes records of past storm/event materials and chemicals use records to develop a future quantity order and inventory level system. Maintains stockpiles of materials and chemicals at optimum levels while complying with environmental and safety regulations.

### **Level III Special**

- NEW WEATHER FORECAST BASED WINTER MAINTENANCE OPERATION DECISIONS (PENNDOT)  
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**TRAINING PROVIDERS**  
**NICET HIGHWAY MAINTENANCE PROGRAMS**

The following organizations offer professional and credible training in Highway Maintenance. Specific information on their training courses must be obtained directly from the training organization.

Publications/Workshops/Seminars/Symposiums

American Concrete Institute (ACI)  
PO Box 9094  
Farmington Hills, MI 48333-9094  
[www.aci-int.org](http://www.aci-int.org)  
Registration Information for ACI Education Seminars:  
248-848-3815 or [www.concreteseminars.com](http://www.concreteseminars.com)  
Current Publication orders: 248-848-3800 (TEL)  
248-848-3801 (FAX)

International Erosion Control Association  
PO BOX 774904  
Steamboat Springs, CO 80477-4904  
[www.ieca.org](http://www.ieca.org)  
800-455-4322 or 970-879-3010 (TEL)  
970-879-8563 (fax)  
e-mail: [ecinfor@ieca.org](mailto:ecinfor@ieca.org)

Publications/Training Courses/Seminars/Workshops

American Society of Civil Engineers  
1801 Alexander Bell Drive  
Reston, VA 20191-9400  
1-800-548-2723  
1-703-295-6222 (FAX)  
[www.asce.org](http://www.asce.org)  
e-mail: [conted@asce.org](mailto:conted@asce.org)

University of Wisconsin College of Engineering  
Engineering Registration, The Pyle Center  
702 Langdon Street, Dept 107  
Madison Wisconsin 53706  
1-800-462-0876  
1-800-442-4214 (FAX)  
[epdweb.engr.wisc.edu](http://epdweb.engr.wisc.edu)

US DOT-Federal Highway Administration (FHWA)      OR  
National Highway Institute  
4600 North Fairfax Drive Suite 800  
Arlington, VA 22203  
[www.nhi.fhwa.dot.gov](http://www.nhi.fhwa.dot.gov)  
703-235-0500  
Training programs administered through  
FHWA Division Offices in each state and the  
Local Transportation Assistance Program (LTAP).  
Find your nearest local LTAP center at [www.ltapt2.org](http://www.ltapt2.org)

Pennsylvania Local Roads Program  
Penn State Eastgate Center  
1010 N. 7<sup>th</sup> Street, Ste. 304  
Harrisburg, PA 17102-1410  
1-800-FOR-LTAP (TEL)  
717-772-1998 (FAX)  
e-mail: [Ltap@psu.edu](mailto:Ltap@psu.edu)

Engineering, Utilities and Public Works Training Institute  
Texas Engineering Extension Service (TEEX)  
The Texas A&M University System  
301 Tarrow, Suite 119  
College Station, Texas 77840-7896  
800-824-7303 or 979-458-6775  
979-458-6771 (FAX)  
[transportation@teexmail.tamu.edu](mailto:transportation@teexmail.tamu.edu)  
[www.teex.com/ett](http://www.teex.com/ett)

American Public Works Association  
Staff Contact: Patricia Kutt  
2345 Grand Boulevard, Suite 500  
Kansas City, Missouri 64108-2641  
816-472-6100  
816-472-1610 (FAX)  
[www.apwa.net/Education/CEP/](http://www.apwa.net/Education/CEP/)

### Selected General References

- ACI Manual of Concrete Inspection (SP2). 9<sup>th</sup> Ed. American Concrete Institute. Detroit, Michigan.
- ADA and Accessibility: Let's Get Practical. 2<sup>nd</sup> Ed. American Public Works Association, Kansas City, Missouri.
- Annual Book of ASTM Standards. American Society of Testing and Materials. Philadelphia, PA.
- AASHTO Maintenance Manual: The Maintenance and Management of Roadways and Bridges. American Association of State Highway and Transportation Officials. Washington, D.C. 1999.
- AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing. American Association of State Highway and Transportation Officials. Washington, D.C.
- Concrete Pipe Handbook and Installation Manual American Concrete Pipe Association. Vienna, VA
- Construction Inspection Manual. 7<sup>th</sup> Ed. ENR/BNI Books. New York, New York.
- Design and Control of Concrete Mixtures. Portland Cement Association. Skokie, IL.
- Lewis, Bernard and Richard Payant. Facility Inspection Field Manual: A Complete Condition Assessment Guide. McGraw-Hill. 2000.
- Forms of Corrosion - Recognition and Prevention. (NSACE Handbook 1). National Association of Corrosion Engineers. Houston, TX.
- Fundamentals of Quality Precast. National Precast Concrete Association. Indianapolis, IN.
- Hot Mix Asphalt Paving Handbook. National Asphalt Pavement Association. Lanham, MD.
- Iseley, D. T. and M. Najafi (Editors) Trenchless Pipeline Rehabilitation Manual. National Utility Contractors Association. Arlington, VA. 1999.
- Manual on Uniform Traffic Control Devices for Streets and Highways. 2003 Edition. Federal Highway Administration. U.S. Department of Transportation. Washington, D.C. (can be downloaded off FHWA's web site.)
- O'Brien, James J. Construction Inspection Handbook. 2<sup>nd</sup> ed. Van Nostrand Reinhold Company, Inc. New York, NY.
- OSHA Part 1910, Occupational Safety and Health Standards. U. S. Department of Labor
- OSHA Part 1926, Safety and Health Regulations for Construction. U. S. Department of Labor.
- Pavement Maintenance Effectiveness / Innovative Materials Workbook. Federal Highway Administration (#FHWA-SA-96-002).
- Pavement Maintenance Effectiveness / Preventive Maintenance Treatments Handbook. Federal Highway Administration (#FHWA-SA-96-027). 1996
- Roberts, F L., P. S. Kandhal, E. R. Brown, D. Y. Lee, and T. W. Kennedy. Hot Mix Asphalt Materials, Mixture Design and Construction. 2<sup>nd</sup> ed. National Asphalt Pavement Association. Lanham, MD.
- Standard First Aid and Personal Safety. American Red Cross. Washington, D.C.
- Traffic Control Devices Handbook. ISBN No: 0-935403-66-3. ITE 2001.
- Urban Hydrology for Small Watersheds. (Technical Release 55). USDA Soil Conservation Service. Washington, D.C. June 1986.
- Utility Structures. National Precast Concrete Association. Indianapolis, IN.

\*This listing is not intended to be complete or representative.