



HIGHWAY SYSTEM MAINTENANCE AND PRESERVATION

PROGRAM DETAIL MANUAL

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Effective upon issuing a new edition of any program detail manual, all previous editions of that program detail manual become obsolete.

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IMPORTANT INFORMATION

The Institute occasionally makes changes in its certification programs that will significantly affect the currency of individual program detail manual. These changes could include any or all of the following:

- deletion, modification, or addition of work elements
- modification to the Examination Requirements Chart
- modification to crossover work element credit
- changes to the work experience requirement
- changes to the verification requirement

Such changes could affect the requirements for certification. Therefore, if this manual is more than a year old, NICET highly recommends that you check www.nicet.org (or, if you don't have access to the Internet, call NICET at 888-476-4238) to make sure that you have the current edition of the Program Detail Manual before applying for an examination. The date of publication of this manual is July 2008.

This July 2008 edition of the Highway System Maintenance and Preservation Program Detail Manual contains the following changes from the July 2007 edition:

- Revisions to the Crossover Tally Sheet
- Revisions to the Personal Tally Sheet

The July 2007 edition of the Highway System Maintenance and Preservation Program Detail Manual contained the following minor changes from the April 2007 edition:

- In the boxed-off notes lower down on this page, a statement was added (in bold) to explain that this program replaces the Highway Maintenance (subfield 09) program.
- On the Examination Requirements Chart, in the supplemental text that appears to the right of the Level I table, the note "Read note (A) below" has been added. (The actual Requirements table remains unchanged.)

IT IS THE APPLICANT'S RESPONSIBILITY TO MAKE SURE HE/SHE IS USING THE CURRENT EDITION OF THE MANUAL.

**KEEP YOUR
MANUALS
CURRENT**

Whenever an exam requirement changes, individuals who are already certified and do not intend to upgrade their level of certification do not need to comply with any changes for the level(s) of certification they have already been awarded.

Individuals who wish to upgrade must satisfy any "new" exam and/or certification requirements for the higher level once the posted deadline and grace period for satisfying the "old" exam and/or certification requirements has been passed.

On July 1, 2007, Highway System Maintenance and Preservation replaced Highway Maintenance (subfield 09). Candidates who previously tested in Highway Maintenance (subfield 09) were given a one-year grace period (through July 1 2008) to complete the exam requirements for the older program. If these candidates wish to upgrade their certification, they must now comply with the requirements in this manual.

Highway System Maintenance and Preservation

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General Information

This Program Detail Manual contains the certification criteria for Highway System Maintenance and Preservation Engineering Technology.

Policies, procedures, rules and forms referenced in this manual can be found on the NICET Website (www.nicet.org). If you cannot access the Website, please request the "Introduction to NICET" publication by calling or writing to the following address:

**National Institute for Certification
in Engineering Technologies (NICET)
1420 King Street, Alexandria, Virginia 22314-2794
1-888-476-4238 (staff response - 9am to 4pm Eastern Time)
(voice mail system at all other times)
1-703-548-1518 (local number)**

Program Description

This certification program is designed for engineering technicians who perform and inspect highway system maintenance and preservation work; the program is applicable to both private and public sector technicians. Technical areas covered are worksite safety and incident response; surveying, specifications, and plans; environmental protection; roadway, shoulder, roadside, and structure maintenance; materials testing; weather-related maintenance operations; construction and/or reconstruction inspection; verbal and written communication; recordkeeping and reporting; maintenance equipment, materials, and contract management; and maintenance and asset management duties.

This certification does not entitle the certificant to practice engineering. The practice of engineering is defined and regulated by state engineering licensing boards; unlawful practice of engineering is a violation of state laws. When not exempted by state law, the performance of work by the engineering technician or technologist which constitutes the practice of engineering must be under the direct supervision and control of a licensed professional engineer.

Development of the program was initiated in 2002, when a subcommittee of volunteers from the PENNDOT Maintenance Managers Training Committee (MMTC) identified job tasks that a Highway System Maintenance and Preservation Technician typically performs in the workplace. Certification competencies were next developed and reviewed by subject matter experts (SMEs) from the PENNDOT Bureau of Maintenance and Operations. After NICET and the MMTC modified the certification program in response to the SMEs' feedback, the revised program was reviewed by a MSDOT Professional Development Group and further modified. Later, the program was reviewed by the AASHTO Subcommittee on Maintenance (AASHTO SCOM), i.e. Workforce Development Focus Group and Bridge Maintenance Task Force. Their feedback was also incorporated into the final program. During the same four-year period, the Federal Highway Administration's (FHWA) Transportation Curricula Coordination Council (TCCC) developed core training curricula matrices in five program areas including Maintenance. The TCCC matrix of maintenance training competencies parallels the NICET Highway System Maintenance and Preservation certification competencies. (TCCC's Maintenance matrix can be viewed at <http://www.nhi.fhwa.dot.gov/tccc/matrix03.htm>.) The NICET certification program can help to verify that the maintenance technician is proficient in the TCCC training competencies.

Certification Requirements

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

- Completion of the written examination requirement
- Work element verification by the immediate supervisor
- Appropriate employment history (see the "Technician Profile" on page 7)
- Technician Personal Recommendation by an acceptable recommender (at Level III and IV)

All 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 on page 4 shows how many work elements must be passed to meet the exam requirement for Levels I, II, III and IV.

Work Element Examination

Highway System Maintenance and Preservation

The typical job duties and associated responsibilities of Highway System Maintenance and Preservation engineering technicians have been broken down into discrete work elements which form the basis for an evaluation of the candidate's knowledge. Each work element is written in sufficient detail to permit candidates to make reasonable assumptions about the types of questions likely to be asked.

In addition, the supervisor who is responsible for verifying the experience of the candidate should be able to interpret the scope of the activities associated with each work element.

Identification numbers

In order for NICET to prepare individualized examinations for each applicant, identification numbers have been assigned to each technical field and to each work element. Each technical field is represented by a 3-digit number. The technical field code number for Transportation Engineering Technology is 001.

The identification number assigned to Highway System Maintenance and Preservation work elements are 6 digits long. The first two digits identify the technical subfield within the field of Transportation Engineering Technology:

- (1) Highway Construction
- (2) Highway Design
- (4) Highway Traffic Operations
- (5) Highway Surveys
- (7) Bridge Safety Inspection
- (8) Highway Materials
- (14) Highway System Maintenance and Preservation

The third digit identifies the level (Levels I through IV) and the work element type (General or Special):

General Work Elements

- (1) Level I General
- (3) Level II General
- (5) Level III General
- (7) Level IV General

Special Work Elements

- (2) Level I Special
- (4) Level II Special
- (6) Level III Special
- (8) Level IV Special

The fourth, fifth, and sixth digits identify the individual work element within each category.

EXAMPLE

An example of this numbering system is illustrated below for work element number 001/145004:

Technical Field Code:	001	(Transportation Engineering Technology)
Subfield:	14	(Highway System Maintenance and Preservation)
Level/Type:	5	(Level III General)
Work Element Sequence:	004	Daily Observations, Reports, and Presentations
Work Element Number:	001/145004	(Field Code Number/ 6-Digit Work Element ID Number)

This nine-digit identification number is needed when completing Part IV, Section 2, of the application to request a work element on an exam or to provide work element verification.

Work Element Selection for Testing

1. Refer to Examination Requirements Chart on the following page
2. Select the appropriate box for the level of certification desired.
3. Note the number/type of work elements required for certification, by category, as shown in the selected box.
4. Turn to the Work Element Listing section and carefully select work elements from the required categories, paying attention at each level to whether they are classified as **General** or **Special** work elements. It is also very important that you read and understand the subject work element descriptions. When possible, select a few extra in each category so that failing one or more work elements leaves enough passed work elements to satisfy the examination requirements.
5. The maximum number of work elements for any single examination sitting is 34, due to time restrictions.
6. The Institute recommends that the maximum number of work elements (34) be selected for each examination. This provides the greatest opportunity for successful completion of the examination requirements with the least number of subsequent examinations. Recognize, however, that all elements selected on an exam application **will be scored**, even if no attempt is made to answer the questions. That is, a score of "0" will be assigned to the work element even if the questions are not answered and the work element will have one failure marked against it.
7. If the requirement for the desired level is more than 34, it is advisable to test first all lower-level work elements needed to achieve certification. Save the upper-level work elements for a subsequent examination.
8. Examination candidates should keep copies of their applications for their records.
9. It is not necessary to retest failed work elements if there are other work elements, in the appropriate categories, which can be selected. If you need to retest a failed work element, you must wait four months from the last time you failed it before you will be permitted to test that element again. NICET Policy #20 (available on NICET's website) governs the frequency at which failed work elements can be retested.
10. If an adequate number of work elements has been selected to meet the desired certification requirement (with a few extra selected to provide a cushion), and there is room on the exam application to add more elements, it is appropriate to include work elements that will satisfy the examination requirement of the next level of certification or to include work elements from another field/subfield that also match the candidate's work history activities, duties, and responsibilities. **NOTE:** NICET reserves the right to question and/or exclude listed work element(s) either partially or totally and disallow testing or cancel test results if it is determined that any of the subject work elements do not relate in any way to the candidate's documented work experience and have been requested for the sole purpose of gaining additional examination time.

Examination Requirements Chart

Highway 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 a
Level I - Special - <u>2</u>
TOTAL 10

You must pass this many work elements to complete the **Level I** exam requirement. Read note (a) below.

Level II

Level I - General - 12 a
Level I - Special - 3
Level II - General - 15 a
Level II - Special - <u>5</u>
TOTAL 35

You must pass this many work elements to complete the **Level II** exam requirement. Read note (a) below.

Level III

Level I - General - 12 a
Level I - Special - 3
Level II - General - 15 a
Level II - Special - 11
Level III - General - 12 a
Level III - Special - <u>5</u>
TOTAL 58

You must pass this many work elements to complete the **Level III** exam requirement. Read note (a) below.

Level IV

Level I - General - 12 a
Level I - Special - 3
Level II - General - 15 a
Level II - Special - 11
Level III - General - 12 a
Level III - Special - 10
Level IV - General - <u>9</u>
TOTAL 72

You must pass this many work elements to complete the **Level IV** exam requirement. Read note (a) below.

Note:

(a) All core work elements in this category must be passed to complete the exam requirement at this level.

General Notes:

- (1) No more than 34 work elements can be scheduled for any single examination sitting.
- (2) 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.

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 as required. The verifier must also complete and sign 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 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

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 Levels III and 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 page 7).

Level IV Work Experience Requirement

Ten years or more of employment in the certification area, by itself, is **not** sufficient for the granting of Level IV. An absolute requirement for certification at Level IV is senior-level involvement in a major program which is **directly related to the subfield in which Level IV certification is sought**. In order to avoid lengthy delays in processing your Level IV certification, this documentation should be sent with the Level IV examination application.

Level IV Major Program Write-Up Guidelines Highway System Maintenance and Preservation

- 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 and Preservation program.
- The write-up must be prepared by the candidate. Official job descriptions, testimonials from others, company reports, etc. are not acceptable.
- The maintenance and preservation 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 and preservation 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 highway maintenance and preservation program, i.e. Drainage Pipe Installation and Maintenance; Worksite Safety and Incident Response; Highway (Roadway and/or Bridge) Construction and/or Reconstruction Inspection and Acceptance; Materials, Sampling, Testing, & Inspection; Environmental Protection; Roadway and Shoulder Maintenance; Structure Maintenance; Roadside Maintenance; Maintenance Equipment, Materials, and Contract Management; Maintenance Operations and Asset Management; Weather-Related 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 and preservation activities, i.e. drainage pipe installation, roadside, roadway and shoulder, structural, weather-related, 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 and preservation activities, including program management, documentation, reporting, project closeout, etc.

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

Early Testing and Verification Of Level IV Work Elements

Although we permit testing of Level IV work elements prior to satisfying the work experience requirement, we reserve the right to question the validity of Level IV work elements passed by, and verified for, persons with little work experience. If, for example, a technician with a total of 3 years of experience passes Level IV work elements, we may require documentation of how this higher level knowledge was obtained without accumulating the requisite work experience. NICET may require specific work elements to be tested and passed again, at the candidate's expense, at the time of the Level IV certification decision.

In addition, we reserve the right to require reverification of work elements designated for meeting the Level IV examination requirement if the verifications were signed more than three years prior to the time of the Level IV certification decision.

Technician Profile

Highway System Maintenance and Preservation

The technician profile is a brief description of the work and career path of the highway system maintenance and preservation technician.

	Level I	Level II	Level III	Level IV
Education	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.			
Minimum Work Experience	Limited work experience in highway maintenance, highway construction or related activities	A minimum of two years of highway maintenance and/or construction related work, one year of which shall be specifically involved with highway maintenance and preservation. 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.	A minimum of five years of highway facility maintenance or construction inspection work. Three years shall be specifically involved with highway maintenance and preservation work; at least one year shall be in 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.	A minimum of 10 years of highway facility maintenance, preservation, or construction inspection. Eight years shall be specifically involved with highway maintenance and preservation work; at least three years shall be in supervising maintenance activities. One year of supervision experience must have been acquired within the three year period prior to the date this Level IV certification is awarded.
Level of Responsibility	Under direct supervision	Under general supervision	Minimal or no daily supervision. May supervise others	Independent performance of assigned or delegated responsibilities.
Typical Activities	Perform repetitive, specific highway maintenance tasks or related activities	Perform a wide range of various types of maintenance operations including fleet management. Supervise specific maintenance operations or crew assignments. Assist 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 inspection of highway facilities including project planning, contract compliance, and recommends acceptance.	Manage overall maintenance operations at county level or above. Responsible for allocating and scheduling resources to a wide variety of department force and contract maintenance activities. Supervise contract compliance including specification compliance, documentation and acceptance. Interact positively with owners, engineers, project managers, and other contractors to correct problems, resolve complaints, and complete projects.
Typical Job Titles	Maintenance Foreman I Roadway Program Tech I Temporary Maintenance Foreman Trades Specialist Maintenance Repairman 2	Maintenance Foreman II Roadway Program Tech II Mechanic Supervisor/ Equipment Foreman Trades Specialist	Maintenance Foreman III Roadway Program Tech III Roadway Program Supervisor Area Maintenance Supervisor Highway Equipment Supervisor	District Maintenance Manager Highway Equipment Manager Senior Highway Maintenance Manager Roadway Program Manager Highway Maintenance Manager

Testing

The NICET written examinations are designed by the individual who has performed the work elements associated with the program. Preparation for this examination should be minimal.

The exam is open-book; therefore, standards, references, and/or textbooks are permitted (and encouraged) at the test site. When appropriate, the work element description specifies the applicable standards or procedures.

When work elements are keyed directly to specific industry-wide standards, the standard will be identified by a normally used notation at the end of the work element description.

When a specific publication is used as an authoritative source, the title will be listed at the end of the work element. Refer to the "Selected General References" in this manual.

Training

NICET does not endorse, certify, or accredit training programs. The Institute does, however, provide information on the certification procedures and objectives so that training courses can be developed specifically to help persons planning to take a NICET certification exam.

In the back of this manual is a list of "Selected General References" that contain information relevant to this program.

The Federal Highway Administration's (FHWA) Transportation Curricula Coordination Council (TCCC) has developed core training competencies in Maintenance and four other program areas. TCCC's matrix of maintenance training competencies parallels the certification competencies of NICET's Highway System Maintenance and Preservation program. The TCCC webpage at www.nhi.fhwa.dot.gov/tccc/matrix.htm includes a link to the Maintenance matrix and an explanation on how to read it.

Expiration of Certificate

The first certificate(s) awarded to all new NICET certificants will have an expiration date of three years from the date of award. The certificate(s) will expire at the end of that three-year period unless renewed through recertification. A consequence of the certificate going into Expired Status will be deletion of all records for that certification, including test history.

Upgrading the certificate or adding a certificate in a different technical area does not change your 3-year expiration date.

Recertification Policy

All certificants should read Policy #30, "Continuing Professional Development." At the end of each 3-year period, all certificants must demonstrate that they have accumulated sufficient Continuing Professional Development (CPD) points within the certification area(s) held to renew the certificate(s) for another 3 years. Once renewed, the certificate is valid for an additional three-year period. The recertification fee must be paid when submitting the recertification application form.

Crossover Work Elements

Individuals who have tested in other NICET subfields may be eligible to receive crossover credit towards the examination requirement. NICET's Crossover Listing order form, available on the NICET website (www.nicet.org) may be used to order a crossover listing free of charge.

NICET "Crossover" work elements are identified as identical or nearly identical in topic coverage and test questions to work elements in other selected fields/subfields. Almost all NICET certification programs have "generic" crossover work elements covering communication skills, mathematics, physical science and other basic areas of knowledge. Once a crossover work element is passed on an examination, it does not normally have to be taken again on any other examinations. Crossover credit for the passed elements will be assigned to an examinee's record as follows:

- **First Time Testing in New Subfield:** When you test work elements in a new subfield (at least one element), any crossover credit from previously tested subfields will automatically be assigned to the new subfield. At the same time, any crossover credit from the new subfield will automatically be assigned to previously tested subfields. This assignment of crossover credit will occur every time a new subfield is tested.
- **Additional Testing in Previously Tested Subfield:** When you test new work elements or retest failed work elements from a previously-tested subfield, any crossover credit from the newly-passed work elements will automatically be assigned to all previously-tested subfields.
- No crossover credit will be assigned to a subfield until you **test at least one work element** from that subfield.
- Crossover credit will not be assigned to or from work elements if the certification is in Delinquent or Expired Status.
- The 120-day waiting period policy, which applies to, failed work elements also applies to all work elements that have crossover credit to that work element (see Policy #20).
- The following documents are available. Use the Decal and Personal Records Order Form on the NICET website.
 - **Personal Crossover Evaluation** lists your "potential" crossover credit to a designated **untested** subfield.
 - **Crossover Listing** lists all current crossovers between three specified subfields.
 - **Official Personal Transcript** lists all work elements presently credited to the examinee's testing record (including those passed on an exam and those achieved through crossover) for a designated subfield.

WARNING

Revisions to certification programs can occasionally eliminate previous crossovers relationships or create new ones. Thus, crossover credit shown on the "Personal Crossover Evaluation" and on any "Crossover Listing" cannot be assumed to be permanent.

The Personal Crossover Evaluation is a "potential" list. Only when a new subfield is tested and the crossover credit is posted to the test record does it become permanent. The Official Personal Transcript shows the crossover credit actually awarded.

Crossover Work Element Listing: from Highway System Maintenance & Preservation to Highway Construction Inspection

This program includes several work elements that crossover to the Highway Construction Inspection certification program. These work elements are identified with an asterisk in the "Work Element Listing" section of this manual. For a listing of these work elements, please see the Crossover Tally Sheet in this manual.

Note: any crossover work elements will be posted to the Highway Construction Inspection test history only after the applicant has tested a Highway Construction Inspection work element. Also, to achieve the Highway Construction Inspection certification, applicants must meet all of the Highway Construction Inspection program's work history experience and other certification criteria.

Highway System Maintenance and Preservation

Level I - General Work Elements

Core Work Elements (See Note 1)

ID# Work Element Title and Description

141001 BASIC COMMUNICATIONS SKILLS * (See note 2)

Communication effectively using basic punctuation, vocabulary, spelling, and sentence structure. Follow written instructions. (See basic grammar references.)

141002 BASIC MATHEMATICS *

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.)

141003 FIRST AID PROCEDURES *

Practice the basic rules and procedures of first aid. (See general handbooks on first aid.)

141004 BASIC INDIVIDUAL SAFETY PRACTICES *

Follow standard safety practices in performing job tasks. Recognize and call the attention of the project supervisor to improper safety practices at the work site.

141005 WORKSITE PROTECTION AND TRAFFIC REGULATION *

Perform traffic control setup and flagging duties. Move traffic through or around the work zone in a manner that is conducive to the safety of motorists and workers. Use a two-way radio. Inform supervisors of road conditions and provide for reassignment of units when necessary. Arrange aid for disabled vehicles and maintenance units. Recognize potential unsafe conditions at worksite and reports suspected violations to project supervisor or manager. (OSHA)

141006 PUBLIC IMAGE/CUSTOMER SERVICE/LIABILITY

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 worksite free of trash, and obey all traffic laws at the worksite and enroute to and from the worksite. Use interpersonal skills to consider and respond tactfully to the feelings and needs of different people with different complaints and concerns.

(Level I - General Work Elements continued on the next page)

Note 1: All General work elements are categorized as either Core or Non-Core Work Elements. Read the Examination Requirements Chart on page 4 and the Personal Tally Worksheet at the back of this manual carefully to see when the Core elements are mandatory for certification.

Note 2: An asterisk (*) follows the title of work elements that are crossovers to the Highway Construction Inspection program. For more information about crossovers to the Highway Construction Inspection program, please see pages 9 and 24.

(Level I - General Work Elements, continued)

Non-core Work Elements

- 141007 BASIC SURVEYING *
Describe the various types of survey benchmarks and temporary survey aids set up during a construction project. Utilize cut sheets. Confirm field notes of simple surveys to detect possible errors. Perform pipe alignment checks and grade checks from and between offset hub layouts.
- 141008 BASIC EROSION PROCESSES AND CONTROLS
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.
- 141009 ROADWAY SURFACE DISTRESS INSPECTION AND EMERGENCY REPAIR
Visually survey existing pavement conditions, recognizing the type, severity, and amount of distress. Repair potholes and basic failures, depressions, or sharp breaks in a pavement surface using hand tools to compact and level asphalt as needed.
- 141010 BASIC RECORDKEEPING
Keep accurate records and daily work reports such as payrolls and equipment logs pertaining to equipment materials and personnel. Assist in maintaining various maintenance reports detailing labor, material and equipment cost of repairs.
- 141011 DRAINAGE PIPE CHARACTERISTICS
Define 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. Recognize the types of highway drainage devices/designs and know their functions, such as the difference between subsurface and surface systems and their components (pipes, culverts, ditches, etc.)
- 141012 ASPHALT PAVEMENTS AND SURFACE TREATMENTS
List the basic types of asphaltic pavements and surface treatments, including the basic purposes of prime and tack coats, Check the compaction (rolling) of asphalt paving mixtures and surface treatments. Describe the requirements for acceptance during maintenance and rehabilitation operations. Record and report findings.
- 141013 GUIDERAIL AND MEDIAN BARRIER INSTALLATION AND REPAIR
Repair guardrails, barriers, and fences, assuring necessary safety and traffic control on job. Provide proper personnel, tools, equipment and materials. Check workmanship, ensure proper alignment of guardrails and barriers, and adhere to standard practices and cleanup procedures. Maintain proper records to enable determination of job man hours, materials, and equipment hours.
- 141014 MAINTENANCE EQUIPMENT
Define the basic types of hand tools and mechanized equipment used in maintenance and repair work. Define what factors to consider in selecting the proper type and size of equipment for efficient job completion. Apply the safety rules for special large equipment and vehicles such as cranes, hydraulic shovels and grabs, large dump trucks and spreaders on public roads. Select proper equipment type and size for efficient job completion. Monitor production rates and equipment operating costs.
- 141015 BASIC MAINTENANCE MATERIALS
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).
- 141016 FUNDAMENTALS OF SNOW PLOWING AND ICE CONTROL
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.

Level I – Special Work Elements

- 142001 INSPECTION OF PREFABRICATED DRAINAGE COMPONENTS *
Perform basic inspections of pipe, inlets and precast concrete drainage system components, including all manhole elements, fittings, and connections. Record findings.
- 142002 AGGREGATE SURFACING INSPECTION *
Compute base and subbase materials quantities delivered to site. Ensure the materials are placed in the lifts required by the specifications and compacted in the manner specified. Check surface smoothness using eye or straight-edge.
- 142003 BASIC MATERIALS SAMPLING *
Collect and identify samples in field as directed or per standard practices. Place samples in containers or protect them for laboratory analyses. Preserve "in situ" conditions as required by specifications or by ASTM or AASHTO. Sample liquid, semisolid, or solid bituminous materials at the point of manufacture, supply terminal, or at the point of shipment delivery. (T40, T168, D140, D979). Define procedures for representative sampling of fresh concrete as delivered to project site. Describe slump and air content tests, and how to cast and store concrete specimens for subsequent testing.
- 142004 WETLANDS RECOGNITION
Recognize the basic attributes and in-situ conditions associated with wetlands.
- 142005 FUNDAMENTALS OF MATERIALS AND CHEMICALS APPLICATIONS
Defines the types of materials, chemicals, spreaders, application and equipment calibration procedures. Selects the proper materials for specific snow/ice conditions.

Level II - General Work Elements

Core Work Elements (See Note 1)

- 143001 QUANTITY ESTIMATING, MEASUREMENT AND VERIFICATION *
Compute volumetric and weight (tonnage) quantities of materials delivered to site or ordered for delivery to the site. Verify quantities required by the specifications and properly incorporated into the work are accurately measured. Perform sewage and drainage system construction computations and quantity verifications. Compute reservoir full and draw-down rates, trench excavation, and pipe backfill volumes, etc. Compare constructed with estimated quantities and document reasons for variances.
- 143002 CONSTRUCTION/MAINTENANCE ZONE TRAFFIC CONTROL *
Implement and maintain traffic control plans around repair and construction sites. Recognize hazards on special jobs and use signalmen, signals, signs and other controls to maintain safe movement of traffic. Describe the advantages and disadvantages of using detours or by-pass routes.
- 143003 BASIC SUPERVISION
Define the fundamentals of authority and supervision. Define the supervisor's authority and responsibility. Consistently perform assigned tasks in accordance with established policies and procedures. Communicate explicit expectations and standards of performance to employees.
- 143004 INTERMEDIATE COMMUNICATIONS SKILLS *
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.

Non-core Work Elements

- 143005 RECOGNIZE UNSAFE CONDITIONS ON THE WORKSITE
Recognize and report possible violations of federal, state and governing safety regulations. Recognize hazards associated with working in confined space and apply governing safety regulations.
- 143006 CONSTRUCTION EROSION CONTROL BMPs
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.
- 143007 BASIC COMPACTION TESTING
Perform, compute and report soils and aggregates proctor and compaction tests.
- 143008 STRUCTURE INSPECTION BASICS
Recognize the basic bridge types, components and structural members including arch, beam, cantilever, girder, suspension, truss, and decks, parapets, wingwalls, abutments, stringers, girders, diaphragms, bearings, etc. Describe the definitions, explanations, and procedures in the current AASHTO "Manual for Maintenance Inspection of Bridges" and the National Bridge Inspection Standards (NBIS).
- 143009 LANDSCAPING AND CLEAN-UP *
Inspect 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. Inspect cleanup and watering to establish growth as specified. Ensure that final appearance of job complies with plans and specifications.
- 143010 COMPUTER USES IN HIGHWAY MAINTENANCE AND CONSTRUCTION
Describe the function and use (actual and potential) of computers and electronic networks in the field of highway maintenance operations documentation, data collection, data entry, data transfer and reporting as would be normally taught in an Introduction to Computers class.

(Level II - General Work Elements continued on the next page)

Note 1: All General work elements are categorized as either Core or Non-Core Work Elements. Read the Examination Requirements Chart on page 4 and the Personal Tally Worksheet at the back of this manual carefully to see when the Core elements are mandatory for certification.

(Level II - General Work Elements, continued)

- 143011 STANDARD PLANS AND SPECIFICATIONS *
Read and interpret, under supervision, standard plans and specifications such as location, grading, erosion control, traffic control, utility plans, NPDES construction activity permits and post construction stormwater management plans.
- 143012 PIPE BEDDING AND TRENCH BACKFILL INSPECTION *
Use the proper techniques and materials to provide proper pipe trench backfill under a variety of field conditions. Observe backfilling to assure use of proper materials, moisture content, lift depths, and compaction methods. Assure compliance with final grade requirements. Report quantities of materials and equipment used.
- 143013 EMERGENCY MEDICAL PREPAREDNESS AND FIRST RESPONSE *
Provide 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. Provide means to transport injured persons safely to ambulance pick-up point and arrange for availability of emergency ambulance and hospital service. (OSHA, EPA, MSHA).
- 143014 EMBANKMENT PLACEMENT PREPARATION AND INSPECTION
Ensure the proper inspection and testing of embankments including foundation preparation, embankment placement, finishing and acceptance of earthwork construction. Ensure that special preparations required prior to and during embankment placement, including subdrains, grubbing, culverts, organic material removal, benches and keys, are properly installed.
- 143015 CRACK SEALING AND JOINT REPAIR
Recognize the pavement distress that requires this maintenance repair. Describe the basic types of sealant materials and the appropriate techniques to properly repair cracking in bituminous and concrete pavements and concrete joint re-sealing. Operate an asphalt distributor (backend) to seal cracked surfaces.
- 143016 HMA MILLING, RECYCLING, AND OVERLAYS
Explain both cold and hot recycling methods. Inspect milling operations, and the reuse of millings including acceptance of recycled mixes. Inspect overlay operations and apply quality principles based on experience and knowledge of the specifications and good practices.
- 143017 EQUIPMENT INSPECTION AND ACCEPTANCE
Check work order to determine what work was done after major equipment repairs or overhaul of vehicles and mechanical equipment. Perform road or job test and physical inspection to determine performance and quality of repair work. Inform shop superintendent if corrections are needed.
- 143018 ON-THE-JOB TRAINING AND SPECIAL TRAINING NEEDS *
Implement on-the-job training programs using experience and knowledge of performance factors to increase the skills of workers. Evaluate progress and capabilities of trainees and others in on-the-job training situations.
- 143019 ANTI-ICING, PREWETTING AND DE-ICING PROCEDURES USING MATERIALS AND CHEMICALS
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.
- 143020 STORM/EVENT OPERATIONS
Demonstrates knowledge of pre-storm/event preparations, storm/event operations, and post-storm/event operations.

Level II - Special Work Elements

- 144001 REFERENCE MATERIALS
Recognize basic maintenance reference materials including maintenance operation manuals, pertinent publications and standard operation procedures.
- 144002 DRAINAGE INSTALLATION LAYOUT, LINE AND GRADE CONTROL
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.
- 144003 LINE AND GRADE INSPECTIONS
Demonstrate accepted surveying practices including the use of laser line; perform quality control inspection of earthwork and structures to ensure proper alignment and grade. Apply the accepted procedures for checking lines and grades from stakes and references hubs.
- 144004 HAZARDOUS MATERIALS AND PROBABLE CONSEQUENCES
Recognize the types and probable consequences of hazardous materials likely to be encountered during maintenance operations.
- 144005 MEDIAN BARRIER AND GUIDERAIL PLACEMENT INSPECTION *
Inspect the installation of median barriers and guiderails to assure compliance with specifications, plans and staking. Verify materials used, workmanship, curing (if necessary), and cleanup. Check barrier and rail alignment and grade for compliance with specifications requirements. Document and submit findings.
- 144006 RIGID PAVEMENT CONSTRUCTION INSPECTION *
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.
- 144007 FLEXIBLE PAVEMENT CONSTRUCTION INSPECTION *
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.
- 144008 BASIC SOILS AND AGGREGATES TESTING
Perform, compute and report basic soils and aggregates tests including sample preparation and sieve analysis.
- 144009 BASIC HOT MIX ASPHALT MATERIALS TESTING
Perform, compute and report basic HMA tests including extraction of bitumen, degree of compaction of bituminous – aggregate mixtures and sieve analysis of extracted aggregates.
- 144010 BASIC PCC MATERIALS TESTING
Perform, compute and report basic PCC tests including slump, air content, unit weight, molding cylinders and determining compressive strength.

(Level II - Special Work Elements continued on the next page)

(Level II - Special Work Elements, continued)

144011 RIGID PAVEMENT BLOWUPS AND JACKING

Supervise the repair of concrete pavement blowups. Provide for traffic bypass as soon as blowup is discovered and provide signs, signals, or flaggers to protect vehicles, drivers, and crews. Ensures proper trimming of blowup area. Maintain availability and supply of replacement materials. Provide necessary traffic-free period to permit set up and clean up of repair area. Assign properly trained and experienced personnel to pavement jacking and leveling jobs. Assure proper final grade of slab (use proper instruments to verify). Provide adequate traffic or load-free period to permit set-up according to specifications for materials used and provide adequate cleanup and reporting.

144012 CONCRETE STRUCTURE INSPECTION AND MAINTENANCE

Describe the behavior of plain, reinforced and prestressed concrete bridges relating to sound and deteriorated concrete, rebars and prestressed tendons. Define the methods and devices that accommodate expansion and contraction of entire concrete bridges and bridge components such as rollers and rockers, elastomeric pads, sliding plates, roadway joints and joint fillers. Establish maintenance schedules using preventive maintenance concepts.

144013 STEEL STRUCTURE INSPECTION AND MAINTENANCE

Define the behavior of steel, especially in relation to sound and unsound steel, steel wire and cable. Inspect and document the extent and severity of damage or deterioration in the overall structure, including load repetitions (fatigue), fire, and heat that accommodate expansion and contraction of entire bridges and bridge components. Establish maintenance schedules using preventive maintenance concepts.

144014 TIMBER STRUCTURE INSPECTION AND 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.

144015 CHEMICAL SPRAYING

Calibrate chemical spray equipment in accordance with manufacturers' directions to assure delivery of proper concentrations on targeted areas. Make minor adjustments as required or returns faulty equipment for repair. Supervise spraying operations to assure safety to crew and public in accordance with licensing requirements.

144016 VEGETATION CONTROL SURVEYS

Conduct 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. Determine if obstruction growth is within ROW and note hazards beyond ROW for action by designated office. Perform removal of hazardous shrubs, trees, and roots. Identify noxious weeds and perform specified removal.

144017 ACCIDENT PRONE LOCATIONS AND CORRECTIVE MEASURES

Investigate and collect perishable accident/incident data. Record and report findings. Recommend corrective measures.

144018 RELATIONSHIP BETWEEN WEATHER FORECASTS & WINTER MAINTENANCE OPERATIONS

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 Work Elements

Core Work Elements (See Note 1)

- 145001 **COMPUTER APPLICATIONS IN HIGHWAY MAINTENANCE AND CONSTRUCTION**
Demonstrate the use of computers for routine maintenance and construction operations including data collection, data entry, computations and analyses, materials test data entry and analysis, and data transfer.
- 145002 **CONSTRUCTION TRAFFIC CONTROL PLANS ***
Establish Traffic Control Plans with adequate signs, signals, markings, and protective barriers, to protect workers and the public during all phases of a construction project. Coordinate activities with other offices and agencies as required. Arrange in advance for detours and traffic maintenance procedures. Enforce rigid traffic controls during use of explosives.
- 145003 **DAILY OBSERVATIONS, REPORTS, AND PRESENTATIONS**
Effectively review or maintain daily, weekly and monthly reports of observations/inspections/quantities and prepare summary reports for submittal to the supervisor. Develop and give short internal project reports and summary presentations.
- 145004 **MAINTENANCE RESPONSIBILITIES AND LIABILITIES**
Describe 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.

Non-core Work Elements

- 145005 **PIPE HANDLING & INSTALLATION ***
Perform 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. Check and report on final work.
- 145006 **MAJOR PAVING PROJECT ***
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.
- 145007 **EQUIPMENT SELECTION, ASSIGNMENT AND MAINTENANCE**
Assign appropriate heavy equipment, trucks and hand tools to facilitate prompt, safe, and economical job performance. Analyze the associated costs and be able to select an economical combination of materials, equipment and tools for each job. Schedule periodic maintenance of equipment to minimize downtime, maximize equipment utilization and minimize operating costs.
- 145008 **COMPACTION TESTING OF HMA MIXTURES**
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)
- 145009 **SLOPE EROSION AND REPAIR**
Use the proper procedures for collecting and preserving water samples. Describe the basic requirements for slope surface subsurface drainage systems, surface preparation, and planting for natural and compacted earth fill slopes. Define the procedures and techniques used in restoring shallow, non-complex slumped or failed earthen slopes back to a condition similar to that existing prior to the failure. Perform 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. Record areas covered, plants placed, etc. Enforce cleanup and provisions for watering to establish growth as specified. Ensure that the final appearance of job complies with plans and specifications.

(Level III - General Work Elements continued on the next page)

Note 1: All General work elements are categorized as either Core or Non-Core Work Elements. Read the Examination Requirements Chart on page 4 and the Personal Tally Worksheet at the back of this manual carefully to see when the Core elements are mandatory for certification.

(Level III -General Work Elements, continued)

- 145010 SEAL TREATMENTS (CHIP AND FOG SEALS)
Explain the various sealing operations and equipment requirements. Ensure the use of proper procedures to efficiently perform these operations including calibration of the equipment.
- 145011 PAVEMENT PATCHING
Describe bituminous and portland cement concrete patching materials and the appropriate conditions for their use. Trim distressed area and apply patch materials in the prescribed manner under acceptable conditions. Provide for the necessary traffic-free period to permit curing or set-up. Ensure safety of maintenance crews , public traffic and property. Keep proper records to summarize costs, man hours equipment hours and materials used.
- 145012 MATERIALS AND SUPPLIES MANAGEMENT *
Use project plans, specifications and periodic work programs to determine the quantity, quality and specifications of materials and supplies, allowing for timely and efficient requisition. Schedule delivery times and locations to minimize additional material handling and stockpiling. Inspect delivered materials and supplies for compliance with the order specifications and purchasing requirements. Check delivered quantities and dimensions of metal sign stock for compliance with specifications. Measure thickness (gauge) and check finish. Check shop inspection certificates, if available. Record and report deficiencies.
- 145013 MANAGEMENT TECHNIQUES
Define the role of the supervisor as the link between employees and upper management. Establish and implement performance standards. Apply sound management techniques to manage and improve work efficiency and crew productivity. Demonstrate how to build consensus and cooperation.
- 145014 WORK CREW SCHEDULING
Analyze recurring and specialized maintenance and repair work needs. Prepare schedules for accomplishment of work by recurring and specialized crews to assure effective use of personnel, equipment and materials. Monitor work performance rates and modify schedules if appropriate. Maintain record of milestones achieved in accordance with the schedule.
- 145015 PRE-STORM/EVENT PREPARATION AND REVIEW
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.
- 145016 ANTI-ICING AND DE-ICING MATERIALS MANAGEMENT
Establishes and maintains an inventory and location information system on the various anti-icing, prewetting and de'icing 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.
- 145017 PLACEMENT AND CURING OF CONCRETE
Demonstrate the inspection requirements for placement, consolidation, and curing of concrete. (ACI 301 and 318)

Level III - Special Work Elements

- 146001 APPLIED MATHEMATICS *
Perform mathematical calculations utilizing fundamental distance measurements, and geometric and trigonometric functions involving lengths, angles, triangles and other geometric shapes.
- 146002 INTERMEDIATE PLANS, AS-BUILT PLANS AND SPECIFICATIONS *
Use intermediate plans and specifications to determine dimensions, types of materials, grades, slopes, cut and fill, surfaces, densities, and quantities. Verify completion and adequacy of as-built inspection and posting. Describe as-built ties and their conformance to standards or to original plans.
- 146003 HAZARDOUS SPILLS & OTHER HIGHWAY INCIDENTS
Use the most expedient response to the hazard to ensure the safety of the public and the highway workers and to protect any property involved. Define the rules and procedures pertaining to different types of emergency situations on the highway. Verify that all required maintenance tools and devices are available for emergency situations.
- 146004 CONCRETE AND STEEL STRUCTURE CONSTRUCTION INSPECTION *
Ensure 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. Determine correct courses of action to bring errors or inaccuracies to attention of appropriate persons. Prepare complete and accurate reports on proper forms to reflect work accomplished.
- 146005 SURFACE TOLERANCES AND PAVEMENT SMOOTHNESS *
Describe the proper operation of an Inertial Profiler in accordance with manufacturer's instructions to determine a pavement profile. Operate a profile measuring equipment over a specified section of roadway to determine International Roughness Index (IRI) measurements of surface smoothness. Prepare necessary reports and recommend percent compliance with established standards.
- 146006 STORMWATER MANAGEMENT POST-CONSTRUCTION BMPs
Demonstrate the design and proper usage of permanent practices to control erosion and sedimentation during and after construction.
- 146007 BITUMINOUS MIXING PLANT INSPECTIONS
Ensure compliance with specifications covering materials produced by a plant by verifying accuracy of automatic controls on quantities, weights, or other characteristics of final products. Define applicable specs or published standards as necessary. Test samples on random basis to assure quality control. (T172, D290)
- 146008 SURFACE TREATMENTS (SLURRY AND MICROSURFACE)
Describe the basic types of surface treatments and equipment requirements. Use the proper procedures to efficiently perform these operations.
- 146009 STRUCTURAL PAINTING
Inspect existing structural painted surfaces and inspect or perform structural painting; assign personnel and equipment in accordance with predetermined schedules (or prepare adequate schedule). Ensure specification compliance of materials used, condition of surfaces painted, temperature when surfaces are primed and painted, and adequacy of drying time and paint coverage.
- 146010 WELD INSPECTION
Perform weld inspection with full responsibility for qualifying welders and welding procedures. Check weld preparation, welding equipment, and welding electrodes. Ensure compliance with welding procedures. Perform visual inspection. Determine and witness appropriate non-destructive testing. (AASHTO or AWS standard specifications for welding)

(Level III - Special Work Elements continued on the next page)

(Level III - Special Work Elements, continued)

146011 WATERWAY PROTECTION AND COASTAL BRIDGES

Recognize and explain the significance of waterway conditions such as channel stability, (pools, shoals, siltation, erosion and scour) current velocity, discharge rate, ice dam, floods, and protective measures such as embankment protection (dikes, revetments) and substructure protection (fenders, dolphins). Observe and report waterway influences such as scour and debris build-up. Describe the special environment problems associated with bridges located in sea water areas. Detect and assess superstructure and substructure deterioration and damage.

146012 CHEMICAL HERBICIDES

Select a proper chemical herbicide for the specific jobs to be accomplished. Comply with environmental regulations and licensing requirements issued by local, state and federal agencies. Following directions of your designated supervisor. Refer to appropriate published guidelines. Prepare the proper dilution and select the distribution devices best suited to the work. Investigate 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. Complete the work in a safe manner.

146013 TRAFFIC CONTROL DEVICES *

Establish 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. Observe safety requirements during installation. Record installations and perform inspections to see if installed devices are functioning properly. Report malfunctions and/or make minor adjustments as authorized. Select proper device for specific requirement on basis of MUTCD or State equivalent standard. Describe the retroreflectivity requirements of installed warning, guide, and regulatory signs and pavement markings. Determine from plans and/or from on-site inspections the manner in which vehicle lights will strike reflectorized devices. Make recommendations about the suitability of the reflectorized devices in their present or proposed locations; recommend changes in location or orientation as necessary.

146014 LABOR RELATIONS AND GRIEVANCE PROCEDURES

Uniformly apply policies and regulations to local and statewide labor relations contracts and issues. Soundly hear, investigate, and resolve grievances.

146015 WEATHER FORECAST-BASED WINTER MAINTENANCE OPERATION DECISIONS

Demonstrates the use of RWIS and other system information relating to weather forecasting of critical humidity and temperature parameters. Selects and uses the appropriate individual or combination of anti-icing, prewetting and deicing materials and chemicals during the various stages of the storm/event for maximum removal at minimum cost.

Level IV – General Work Elements

- 147001 TECHNICAL PRESENTATIONS AND REPORTS *
Organize and effectively deliver oral presentations, and prepare technical reports and correspondence. Proficiently deliver media interviews, reports, and public presentations.
- 147002 SAFETY ASSURANCE PROGRAM
Establish and implement a program that uses safety reviews and inspection to assure the safety of the traveling public, maintenance operations, and safe adjacent property use. Conduct routine and special safety meetings.
- 147003 NATIONAL INCIDENT MANAGEMENT SYSTEM (NIMS)
Describe and implement the concepts and principles of the National Incident Management System (NIMS).
- 147004 QUALITY ASSURANCE REVIEWS
Conduct quality assurance reviews of all work. Recognize construction quality deficiencies, safety hazards, structural defects, and unacceptable workmanship. Select and implement corrective measures; document and report results.
- 147005 MATERIALS TESTING IN THE FIELD *
Perform, supervise, and coordinate 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. Verify adequacy of number of samples and locations at which samples are collected to assure representative coverage of sites. Verify use of appropriate, properly calibrated testing equipment. Record the determinations and certificates properly, and confirm delivery to the designated persons.
- 147006 PAVEMENT MAINTENANCE AND PRESERVATION SYSTEMS
Develop and implement a strategic pavement maintenance and preservation program. Use currently available preventive maintenance and preservation techniques; accommodate different pavement types, treatment frequencies and adjustments for extreme weather events that result in budget constraints.
- 147007 ROADWAY DISTRESS AND REHABILITATION TECHNIQUES
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.
- 147008 ROADSIDE MAINTENANCE MANAGEMENT
Coordinate and supervise 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. Assign crews, equipment and materials; observe work during and after jobs; assure required safety measures. Maintain proper records of work performed. Assign personnel and equipment for ditch clearing and drainage maintenance in accordance with predetermined schedules. Supervise and inspect work performed to ensure that undesirable ponding is avoided (use survey instruments if required). Ensure compliance with all environmental requirements.
- 147009 PROPERTY MANAGEMENT SYSTEMS *
Establish and monitor systems to ensure compliance with requirements for current, complete and accurate property records which reflect location, condition and use of equipment and materials. Complete necessary forms and reports to establish responsibility. Take corrective action as necessary.
- 147010 COST AND PERFORMANCE MANAGEMENT
Maintain 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. Manage personnel, equipment, and materials effectively; assure compliance with EEO, OJT, OSHA and other agencies, utilities, and the public. Handle grievances and employee morale matters effectively and keep supervisors up-to-date.

(Level IV - General Work Elements continued on the next page)

(Level IV -General Work Elements, continued)

147011 RISK AND ASSET MANAGEMENT SYSTEMS

Establish asset management systems, including the review of recurring maintenance requirements and their priorities for area of responsibility; the development of inventories, condition levels, minimum standards; and establishment of prioritized scheduling. Apply strategic maintenance management techniques to improve the efficiency of work programs and overall productivity of crews. Analyze and determine the need for and effective use of maintenance contracting for overall asset management efficiency. Apply the principles of risk management to operate an effective highway maintenance program which will reduce liability risks during all phases of maintenance operations. Apply maintenance standards for various installations and repairs to such items as guardrails, highway signs, slopes, and pavements.

147012 STRUCTURE MAINTENANCE AND PRESERVATION SYSTEMS

Develop and implement a strategic structure maintenance and preservation program using currently available preventive maintenance techniques and accommodating different structures, treatment frequencies and adjustments for extreme weather events resulting in budget constraints.

Personal Tally Worksheet

Highway System Maintenance and Preservation

- Put a check mark next to the appropriate work element number when you receive a passing score on your Examination Score Report.
- Put a "C" next to the appropriate work element number if you have crossover credit from another field. Read page 9 in this manual concerning crossover credit.
- Refer to the chart on page 4 to determine whether you have passed an exam requirement.

Level I General

141001 Core *
 141002 Core *
 141003 Core *
 141004 Core *
 141005 Core *
 141006 Core
 141007 *
 141008
 141009
 141010
 141011
 141012
 141013
 141014
 141015
 141016

Level II General

143001 Core *
 143002 Core *
 143003 Core
 143004 Core *
 143005
 143006
 143007
 143008
 143009 *
 143010
 143011 *
 143012 *
 143013 *
 143014
 143015
 143016
 143017
 143018 *
 143019
 143020

Level III General

145001 Core
 145002 Core *
 145003 Core
 145004 Core
 145005 *
 145006 *
 145007
 145008
 145009
 145010
 145011
 145012 *
 145013
 145014
 145015
 145016
 145017

Level IV General

147001 *
 147002
 147003
 147004
 147005 *
 147006
 147007
 147008
 147009 *
 147010
 147011
 147012

Level I Special

142001 *
 142002 *
 142003 *
 142004
 142005

Level II Special

144001
 144002
 144003
 144004
 144005 *
 144006 *
 144007 *
 144008
 144009
 144010
 144011
 144012
 144013
 144014
 144015
 144016
 144017
 144018

Level III Special

146001 *
 146002 *
 146003
 146004 *
 146005 *
 146006
 146007
 146008
 146009
 146010
 146011
 146012
 146013 *
 146014
 146015

* An asterisk (*) follows work elements that are crossovers to NICET's Highway Construction Inspection program.

Crossover Tally Worksheet

From: Highway System Maintenance and Preservation
To: Highway Construction Inspection

Listed below are the Highway System Maintenance and Preservation work elements that crossover to NICET's Highway Construction Inspection program.

Note: any crossover work elements will be posted to the Highway Construction Inspection test history only after the applicant has tested a Highway Construction Inspection work element.

In addition to meeting the written exam requirement, applicants must satisfy all of the Highway Construction Inspection program's work history, work element verification, and other required criteria for certification. (Please see the Highway Construction Inspection Program Detail Manual.)

Level I General

___141001 (11007)
___141002 (11005)
___141003 (13006)
___141004 (13004)
___141005 (13005)
___141007 (11002)

Level II General

___143001 (13007)
___143002 (14003)
___143004 (15012)
___143009 (14004)
___143011 (13003)
___143012 (12003)
___143013 (15005)
___143018 (16010)

Level III General

___145002 (15006)
___145005 (14012)
___145006 (16004)
___145012 (15013)

Level IV General

___147001 (17010)
___147005 (15001)
___147009 (17004)

Level I Special

___142001 (12009)
___142002 (12010)
___142003 (11001)

Level II Special

___144005 (14010)
___144006 (14001)
___144007 (14002)

Level III Special

___146001 (13008)
___146002 (15003)
___146004 (15011)
___146005 (14007)
___146013 (14013)

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

TCCC Matrix of Maintenance Competencies and List of Training Courses

During the four-year development period of the NICET Highway System Maintenance and Preservation certification program, the Federal Highway Administration's (FHWA) Transportation Curricula Coordination Council (TCCC) developed core training competencies in five program areas including Maintenance. TCCC's matrix of maintenance training competencies (available at www.nhi.fhwa.dot.gov/tccc/matrix03.htm) parallels the NICET Highway System Maintenance and Preservation certification competencies. TCCC's matrices are supported by a comprehensive listing of training courses, which can be found at www.fhwa.dot.gov/infrastructure/tccc/train.cfm.

The NICET certification program can help to verify that the highway system maintenance technician is proficient in the TCCC training competencies.



EXAMINATION SCORE REPORT

SAMPLE

Exam No. 99999

Examinee: JOHN EXAMINE

Test Date: 06/11/96

Report Date: 06/28/96

Work Element Number and Title

Score (%) Pass/Fail

Highway System Maintenance and Preservation

1141001	Basic Communications Skills	80.00	P
1141002	Basic Mathematics	80.00	P
1142001	Inspection of Prefabricated Drainage Components	65.00	P
1142003	Basic Materials Sampling	80.00	P
1143001	Quantity Estimating, Measurement, and Verification	100.0	P
1143011	Standard Plans and Specifications	20.00	F**
1144001	Reference Materials	90.00	P
1144005	Median Barrier and Guiderail Placement Inspection	50.00	F***

* This failed work element cannot be retested prior to 120 days after the test date shown on this score report.

** This is your second failure for this work element. It cannot be retested prior to 120 days after the test date shown on this score report.

*** This is your third failure for this work element. A request to retest it will not be considered until you have complied with NICET Policy #20.

JOHN DOE

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Alexandria, Virginia 22314-2115