NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES®

STORMWATER AND WASTEWATER SYSTEM INSPECTION

PROGRAM DETAIL MANUAL

Field Code: 021
Subfield Code: 3

Fourth Edition (National)
October 2006

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 October 2006.

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

KEEP YOUR MANUALS CURRENT

The Fourth Edition (National) of the Stormwater and Wastewater System Inspection Program Detail Manual contains the following substantive changes from the Second Edition (Regional) program:

- Renumbering under a different subfield code (3)
- Changes to the examination requirements for Levels I, II, and III
- Changes to some of the Level I, Level II, and Level III work element titles and/or descriptions
- Reassignment of some work elements to different Level or General/Special classification
- Addition of Level IV work elements

This October 2006 Fourth Edition (National) manual contains the following changes from the July 2006 Fourth Edition manual:

- Elimination of the "Conversion of Work Elements" Table. This document is available upon request. The table shows how credits from the 1st/2nd Edition (Regional) program transfer to the 4th Edition (National) program.
- Revision of 31007 Work Element description

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 or other certification requirements for the higher level once the deadline has been passed.

As of July 1, 2006, all applicants testing in Stormwater and Wastewater System Inspection for the first time must comply with the examination requirements found in this Fourth Edition (National) program detail manual.

Applicants who previously tested under the requirements of the 1st/2nd Editions (Regional) of the program may test under the requirements of the 1st/2nd Editions through December 31, 2006. After December 31, 2006, the 1st/2nd Edition (Regional) work elements (beginning with subfield code 2) will no longer be available for testing. Individuals who hold an Active-Status certication in the 1st/2nd Edition (Regional) program will be able to retain their certification by complying with NICET's Recertification Policy.

Once an individual tests a 4th Edition (National) work element (beginning with subfield code 3), then passed 1st/2nd Edition (Regional) work elements in the individual's test history will be converted to the 4th Edition (National) work element numbers.

Stormwater and Wastewater System Inspection

Table of Contents

General Information

This Program Detail Manual contains the certification criteria for Stormwater and Wastewater System Inspection Engineering Technology (National/4th Edition).

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 engaged in the inspection of stormwater and wastewater systems and is applicable to both private and public sector technicians. Technical areas covered are safety; specifications and contract plan interpretation; field installation and landscape restoration techniques; surveying; field inspection and testing procedures; verbal and written communication; recordkeeping and reporting; and project management duties.

Development of the program was initiated in 1999 at the request of the Five Cities Plus Group representing metropolitan, county, and city-wide sanitary and wastewater district owners and consultants from Northern Kentucky Sanitary Dist. No. 1, Lexington-Fayette County, Louisville, and Fort Wright, Kentucky; Fort Wayne, Evansville, Terre Haute, and Indianapolis, Indiana; Columbus, Cincinnati, Lima, ORSANCO, and Dayton, Ohio; ALCOSAN (Pittsburgh); Wheeling, West Virginia; and St. Louis and Jefferson City, Missouri.

The initial program development committee represented the major Five Cities Plus jurisdictions. It was expanded to include nationwide participation in 2004. In 2005, a panel of subject matter experts from across the country validated the program for national use.

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/technologist which constitutes the practice of engineering must be under the direct supervision and control of a licensed professional engineer.

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
- technician recommendation by an acceptable recommender
- appropriate employment history

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 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

Stormwater and Wastewater System Inspection

The typical job duties and associated responsibilities of Stormwater and Wastewater System Inspection engineering technicians have been broken down into discrete 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 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 Underground Utilities Construction is 021.

The identification number assigned to each work element is 5 or 6 digits long.
The first digit identifies the technical subfield within the field of Underground Utilities Construction:

(1) Water and Sewer Lines
(2) Stormwater and Wastewater System Inspection (1st and 2nd Editions - Regional)
(3) Stormwater and Wastewater System Inspection (4th Edition - National)

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

General Work Elements	**Special Work Elements**
(1) Level I General	(2) Level I Special
(3) Level II General	(4) Level II Special
(5) Level III General	(6) Level III Special
(7) Level IV General	(8) Level IV Special

The third, fourth and fifth digits identify the individual work element within each category.
A sample of this numbering system is illustrated below for work element number 003/55001:

Technical Field Code:	021	(Underground Utilities Construction)
Subfield:	3	(Stormwater and Wastewater System Inspection, 4th Edition - National)
Level/Type:	5	(Level III General)
Work Element Sequence:	001	Business Communications
Work Element Number:	021/35001	(Field Code Number/ 5-Digit Work Element ID Number)

This eight-digit identification number is needed when using the application form to request a work element on an exam or to provide work element verification.

Selection

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. 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 120 days from the last time you failed it before you will be permitted to test that element again. Retesting a failed work element or Part A/B exam will be limited to three attempts in a two-year span to achieve a passing score.

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.

Examination Requirements Chart - April 2006

Stormwater and Wastewater System Construction Inspection (4th Edition - National)

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 -  8a
Level I –  Special -  1

           TOTAL      9
```

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

Level II

```
Level  I - General - 11a
Level  I – Special -  2
Level II - General - 12a
Level II - Special -  5

           TOTAL     30
```

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

Level III

```
Level   I - General - 11a
Level   I – Special -  2
Level  II - General - 12a
Level  II - Special – 11
Level III – General – 12
Level III – Special –  7

            TOTAL     55
```

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

Level IV

```
Level   I - General - 11a
Level   I – Special -  2
Level  II - General - 12a
Level  II - Special – 11
Level III – General – 12
Level III – Special – 14
Level  IV - General -  6
Level  IV - Special -  4

            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 <u>in excess</u> 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. 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

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 project which is **directly related to the subfield in which Level IV certification is sought.** The major project selected must be completed, must be recent (within the past 3-4 years), and must have taken place well into your career in the certification area. A write-up submitted too early (for example, after only 5 or 6 years in the certification area) will not be reviewed.

The write-up on each of the projects should include such information as:

1. **type of project (stormwater or wastewater, system capacity);**
2. **scope of the project (project time period, time spent on the job);**
3. **your supervisory responsibilities and/or on-site authority on each project; and**
4. **the range of your experiences on each project as related to recordkeeping, testing, inspection, observation, quality control, etc. If all of these components cannot be documented for a single project, they may be accumulated via several narrowly-focused projects.**

Your write-up must address the Level IV requirement that your level of responsibility demonstrates independent senior engineering technician work, including delegated responsibilities and duties for which engineering precedent exists. The pertinent work experience must be described in depth by you personally -- official job descriptions or testimonials from others will not be evaluated.

In order to avoid lengthy delays in processing your Level IV certification, this documentation should be sent with the Level IV examination application.

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

Stormwater and Wastewater System Inspection Engineering Technology

The technician profile is a brief description of the work and career path of the stormwater and wastewater system inspection 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 or civil engineering technology or a closely related Associate Degree program coupled with internships.			
Minimum Work Experience	None to very limited work experience in stormwater and wastewater system inspection or related activities	A minimum two years of installation and/or design-related work, one year of which shall be specifically involved with stormwater and wastewater system inspection. The balance may be employment in technical specialties within the normal scope of underground utilities construction, land management and erosion control, or building construction.	Level II certification experience plus a minimum of three years of underground utilities construction, land management and erosion control, or building construction, during which at least two of the years shall be stormwater and wastewater system inspection. One year of the work experience in this subfield must have been acquired within the three-year period prior to the date the certification at this level is awarded. Experience in a variety of standard designs and design modifications on major systems. Working knowledge of soils, hydraulics, and surveys.	Level III certification experience plus five years of full-time underground utilities construction, land management and erosion control, or building construction inspection, including at least one major stormwater and wastewater system inspection project of substantial complexity. At least three years of this five-year period must be in connection with stormwater and wastewater system inspection. One year of the work experience in this subfield must have been acquired within the three-year period prior to the date the certification at this level is awarded.
Level of Responsibility	Under direct supervision	Under general supervision	Under little or no daily supervision. May supervise others	Independent performance, including delegated responsibilities
Typical Activities	Performs simple, repetitive, specific installation tasks, measurements, and assigned duties.	Perform a wide range of various segments of standard system installation; participate in job planning; conduct supervised maintenance or service projects; assist in maintaining as-built drawings; lay out simple systems.	Participate in the inspection of complete and operating stormwater and wastewater systems including job planning, contract compliance documentation, change order preparation, final testing, and commissioning. Develop specific layouts for a variety of standard systems and design modifications on major systems.	Provide technical advice, complete system layout and contract compliance documentation, and oversee specialized completion or acceptance testing. Interact with owners, architects, engineers, construction project managers, and other contractors to correct problems and complete projects.
Typical Job Titles	Inspector I Technician I	Inspector II Technician II	Inspector III Technician III Senior Technician Senior Inspector	Inspector IV Senior Technician Project Supervisor / Manager Resident Inspector

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 contains information relevant to this program.

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

Since this Stormwater and Wastewater System Inspection certification program is administered by NICET, individuals who have tested in other NICET subfields may be eligible to receive crossover credit towards the examination requirement. NICET's Personal Records 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 Website.

    - **Personal Crossover Evaluation** lists your "potential" crossover credit to a designated **untested s**ubfield.

    - **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.

Stormwater and Wastewater System Inspection

Level I - General Work Elements

Core Work Elements (See Note 1)

ID# Work Element Title and Description

31001 BASIC COMMUNICATIONS SKILLS
Use proper punctuation, vocabulary, spelling, and sentence structure in keeping basic field notes and records. Follow basic written instructions. (See dictionaries and basic grammar references.)

31002 BASIC MATHEMATICS
Solve mathematical problems requiring simple addition, subtraction, multiplication, division, and raising numbers to exponential powers. Round to the correct number of significant figures, calculate percentages, read graphs, and use simple geometric definitions and formulas. (See general mathematics textbooks.)

31003 ENTRANT PERSONAL SAFETY PROCEDURES
Apply basic entrant safety procedures as they apply to the tasks being performed, particularly in deep and/or unstable excavations, confined spaces, and when explosive gas mixtures or oxygen-deficient conditions exist.

31004 BASIC PLANS, SPECIFICATIONS, AND RELATED CONTRACT DOCUMENTS
Read basic plans, specifications, and related contract documents to determine site conditions, construction requirements, types of materials, dimensions, elevations, and slopes.

Non-core Work Elements

31005 TERMS AND DEFINITIONS
Know the standard definitions of soil and rock terms as defined by ASTM. (ASTM D-653)

31006 TOPOGRAPHIC MAPS
Determine ground distances and areas. Determine elevations and differences of elevations and slopes. Determine direction of drainage.

31007 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 basic practices and procedures used to control erosion.

31008 STANDARD CONSTRUCTION EQUIPMENT
Describe the primary use of construction equipment such as bulldozers, backhoes, cranes, scrapers, vibrators, rollers, draglines, pile drivers and drills.

31009 FIRST AID PROCEDURES
Demonstrate the basic rules and procedures of first aid. (See general handbooks on first aid.)

(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.

(Level I - General Work Elements, continued)

31010 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.

31011 BACKFILLING
Monitor backfilling to confirm proper materials usage, moisture content, lift depths, and compaction methods. Assure compliance with final grade requirements. Ensure compliance with final grade requirements. Report on quantities of materials and equipment used; assure protection of buried pipes, tanks, etc.

31012 MANUFACTURED COMPONENTS
Perform basic inspection of pipe, conduit, fittings and precast concrete structures, including all manhole elements, fittings, and connections. Record findings.

31013 STORM SEWER PIPE HANDLING AND 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.

31014 SANITARY SEWER PIPE HANDLING AND INSTALLATION
Apply basic principles associated with the handling of sanitary sewer pipe and pipe materials, including unloading and storage on the job site.

Level I – Special Work Elements

32001 WETLANDS RECOGNITION
Recognize the basic attributes and in-situ conditions associated with wetlands.

32002 HANDLING AND STORING SOIL SAMPLES
Apply the proper methods of handling, labeling and storing bulk soil samples. (ASTM D420)

32003 BASIC SOIL CLASSIFICATION AND SOIL PROFILES
Perform visual/manual classification of soils in the field and laboratory, and assist in the preparation of generalized soil profiles. (ASTM D2488)

Level II - General Work Elements

Core Work Elements (See Note 1)

33001 INTERMEDIATE COMMUNICATION SKILLS
Explain project to customers, record appropriate communications accurately and completely. Draft correspondence to contractors and customers. Record contractor/engineer discussions and meetings, including highlighting issues needing follow-up.

33002 AREAS, VOLUMES, AND COST ESTIMATES
Calculate areas and volumes of work items, including truckload. Record results. Compute loose, compacted, and in-place volumes, weights, and densities. Compute costs from unit prices.

33003 INSPECTION AND TESTING OF CONSTRUCTION MATERIALS
Inspect pipe, soil, concrete, crushed stone, and sand, leading to recommendations to approve, reject, or repair such material. Record findings.

33004 CONSTRUCTION EROSION CONTROL BEST MANAGEMENT PRACTICES
Assure that the accepted best management practices and procedures (BMPs) are implemented to control erosion and sedimentation during construction. Demonstrate knowledge of BMP principles, determine areas needing attention, recognize potential problems, and develop strategies to solve problems that have arisen or will arise.

Non-core Work Elements

33005 LANDSCAPING AND CLEANUP
Inspect construction operations to assure proper preparation of soils for seeding, sodding, or planting, proper slopes and drainage provisions, use of specified fertilizer, seeds or plants, and the installation of required supports and protection. Measure and record areas covered, plants placed, etc. Ensure cleanup and provisions for watering to establish growth is completed as specified. Ensure that final appearance of job complies with plans and specifications.

33006 RECOGNIZE UNSAFE CONDITIONS ON WORKSITE
Recognize possible violations of OSHA, organizational, state and local safety requirements. Recognize potential unsafe conditions at worksite and report suspected violations to project engineer or supervisor. (OSHA)

33007 STANDARD PLANS AND SPECIFICATIONS
Examine, interpret under supervision, and validate standard plans and specifications (such as location, grading, erosion control, traffic control), utility plans, HPDES construction activity permits, and construction and post-construction stormwater management plans.

33008 LINE AND GRADE INSPECTIONS
Using accepted surveying practices including the use of laser line, perform quality control inspection of utility lines to ensure proper alignment and grade. Apply the accepted procedures for checking lines and grades from stakes and reference hubs.

33009 PRECONSTRUCTION INSPECTION
Inspect job-site for variances against plans and specifications, including location of existing utilities, borings and sampling sites, and other features and site conditions. Report findings.

33010 INSTALLATION PRACTICES FOR LARGE DRAINAGE AND SEWAGE PIPES
Apply various standard and unique requirements in the handling and installation of large pipes (greater than 24 inches in diameter) and their valves, fittings, gaskets, and seals.

(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)

33011 MOISTURE-DENSITY RELATIONS/SOILS
Determine the relation between moisture content and density of soils by use of the Standard Proctor and Modified Proctor tests. (AASHTO T99, T180, T224, ASTM D698, D1557)

33012 CONFINED SPACE AND TRENCH SAFETY
Demonstrate and apply the OSHA confined space and trench safety regulations.

33013 WORKSITE TRAFFIC CONTROL PROCEDURES
Demonstrate the implementation of basic traffic safety controls at construction work sites.

33014 SEWER REHABILITATION METHODS
Describe the common methods of sewer line assessment and rehabilitation (sealing joints, slip lining, and cured-in-place pipe).

33015 BASIC SUPERVISION
Practice the fundamentals of good supervision. Know supervisor's authority and responsibility, and assure uniform, consistent interpretation and implementation of policies, plans, and programs.

Level II - Special Work Elements

34001 INTERMEDIATE MATHEMATICS
Perform mathematical calculations utilizing basic algebra (fundamental laws, algebraic expressions), geometry, and the trigonometric functions of right triangles. (See basic algebra and trigonometry texts.)

34002 CONSTRUCTION COMPUTATIONS AND QUANTITY VERIFICATIONS
Perform sewage and drainage system construction computations and quantity verifications using basic formulas. Determine reservoir full and drawdown rates, trench excavation volumes, and pipe backfill volumes, etc. Compare constructed quantities with estimated quantities and document reasons for variances.

34003 STORMWATER MANAGEMENT POST-CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPs)
Demonstrate the design and proper usage of permanent practices to control erosion and sedimentation during and after construction.

34004 CONTRACTOR CLAIMS AND DISPUTES
Identify and document potential disputes. Define alternate dispute resolution methods such as Dispute Review Boards.

34005 NUCLEAR METHODS
Determine the density and moisture content of soil and soil-aggregate in-place using nuclear equipment. Be familiar with safety precautions and all applicable government regulations. (ASTM D-2922 and D-3017)

34006 HORIZONTAL EARTH BORING
Inspect horizontal earth boring operations and record the activities associated with these operations, including the field checking of line and grade. Be familiar with types of equipment used.

34007 TRENCH BACKFILL COMPACTION
Know the techniques and materials that should be employed to provide proper trench backfill under a variety of field conditions.

34008 LOCATING UTILITIES AND FACILITIES
Read plans, specifications, and local jurisdiction information to locate and stake collection/distribution lines, laterals, and pumping/treatment facilities. Indicate appropriate excavation information on stakes and provide reference stakes for checking depth, gradient, alignment, and location.

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

(Level II - Special Work Elements, continued)

34009 EVALUATE SYSTEMS FOR TRENCHLESS TECHNOLOGY RECONSTRUCTION
Apply the various techniques for investigating and evaluating existing underground utility systems.

34010 TRENCHLESS TECHNOLOGY METHODS AND SOIL CONDITIONS
Define the relationships between different soil types, host pipe conditions and trenchless technology methods.

34011 FIELD DENSITY BY SAND CONE METHOD
Determine the in-place dry density, moisture content, and percent compaction of soil and granular backfill materials. (AASHTO T191, ASTM D1556)

34012 PIPELINE PRESSURE TESTS
Perform two-hour high-pressure and 24-hour hydrostatic water pressure tests. Report and interpret results.

34013 TESTING OF SANITARY SEWER SYSTEMS
Perform negative air pressure (vacuum) and low-pressure air tests. Report and interpret results. (ASTM C924 and 1214)

34014 REINFORCING STEEL
Apply the requirements for handling and placement of reinforcing steel for reinforced concrete. (ACI-301 and 318)

34015 READY MIX CONCRETE
Apply the requirements for placement, delivery, consolidation and curing of ready mix concrete. Read and interpret specifications for manufacture and delivery of ready mixed concrete (ACI-301 and 318, ASTM C-94)

Level III – General Work Elements

35001 BUSINESS COMMUNICATIONS
Use the rules of syntax and style to write clear sentences and paragraphs in preparing routine correspondence and reports. Follow standard business communications procedures. (See basic grammar and writing handbooks)

35002 DAILY OBSERVATIONS, REPORTS, AND PRESENTATIONS
Summarize daily reports of observations/inspections/quantities for submittal to the supervisory engineer. Prepare and deliver short, internal verbal presentations regarding projects.

35003 COMPUTERS
Define the functions and applications (actual and potential) of computers and electronic networks in stormwater and wastewater system inspection documentation, data entry, data transfer, and reporting.

35004 OSHA AND OTHER SAFETY REQUIREMENTS
Determine which OSHA, local, state, or other governing body requirements pertain to jobs being performed. Demonstrate safety practices set by OSHA, MNSHA, and NUCA, including locating and marking underground utilities before excavating. Recognize and report observed improper safety practices on the job. Recognize the authority of OSHA inspectors. (relevant OSHA, MNSHA, and NUCA standards)

35005 CONTRACT DOCUMENTS
Describe the purposes and requirements of contract documents, including performance, maintenance, payment, retainage, labor and material bonds; contractor insurance; information for bidders; awards; contract forms; and shop and working drawings. Identify whether the documents are in proper form, display full coverage and protections, are properly executed and filed, and are otherwise in conformance with expected practices and requirements.

35006 AS-BUILT PLANS
Verify completion and adequacy of as-built inspection and posting. Confirm certification by authorized inspector or engineer of dimensions, workmanship, and materials. Understand as-built ties and their conformance to standards or to original plans.

35007 DISPUTE AND CONFLICT MANAGEMENT
Collect and review information, and assist in the analysis of documents related to claims, arbitrations, litigation and mediations.

35008 ON-THE-JOB TRAINING AND SPECIAL TRAINING NEEDS
Implement on-the-job training programs to increase the skills of workers performing routine and special duties. Evaluate the progress and capabilities of trainees and others in on-the-job training situations.

35009 CONSTRUCTION SURVEYS
Ensure that the project is laid out and staked in accordance with plans and specifications, including drainage, grade, line, earthwork, curbs and gutters. Place sufficient stakes to permit accurate work in locations that will not be knocked down. Maintain survey instruments and data collection devices; utilize crew effectively; read angles and distances to designated precision. Ensure completeness and accuracy of notes. Review as-built reports, GPS surveys, and quantity surveys. Verify dimensions and volumes by trigonometric and quantity survey methods. (Example: determine quantities removed from borrow pits.)

35010 UTILITIES RELOCATION
Read plans and specifications and perform necessary survey to permit staking of utilities relocation. Provide necessary reference stakes for determining depth, gradients (if necessary), and alignment. Indicate excavation depths on stakes if required.

35011 STORMWATER AND WASTEWATER SYSTEMS
Understand the basic operation of water/wastewater systems.

35012 TRENCHLESS TECHNOLOGY METHODS
Describe the various types of trenchless technologies, their benefits, limitations, and applicabilities.

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

(Level III -General Work Elements, continued)

35013 SOILS CLASSIFICATION
Classify soils in accordance with the Unified Soil Classification System and the AASHTO Soil Classification System. (AASHTO M145, ASTM D2487, ASTM D3282)

35014 STORMWATER POLLUTION PREVENTION PLAN (SWPPP) INSPECTION
Inspect the materials, installation, maintenance, and repair of project site Stormwater best management practices (BMPs) and determine compliance with the approved SWPPP. Document findings. Establish a post-construction Stormwater management plan, including standard inspection procedures and reporting systems.

Level III - Special Work Elements

36001 ENGINEERING OFFICE WORKS
Perform all duties associated with Construction Coordinator / Project Office Person / Clerk-of-the-Work positions including initial progress schedule and schedule update reviews.

36002 TRAFFIC CONTROLS AND DETOURS
Ensure adequate measures to protect workers and the public during all phases of a project. Coordinate activities with other offices and agencies as required. Arrange in advance for detours and traffic maintenance procedures. (MUTCD – Part VI)

36003 EARTHWORK PREPARATIONS AND OPERATIONS
Apply the special preparations required prior to embankment operations related to subdrains, culverts, organic materials and keys in soil or rock, and techniques to correct typical problems during construction.

36004 WATERWAY AND STREAMBANK PROTECTION
Recognize the basic causes of waterway and streambank erosion, and apply standard methods used to stabilize waterways and streambanks.

36005 PUMPS AND VALVES
Apply the installation and performance requirements for various types of pumps and valves used in water/wastewater systems.

36006 COMPLEX VALVE SYSTEMS
Perform and document inspections of complex installations of large valves commonly associated with complex pipe systems and ensure compliance with the specifications and manufacturers' recommendations.

36007 TRENCHLESS TECHNOLOGY CONTRACT OPTIONS AND PROJECT MANAGEMENT
Evaluate the unique aspects, risks, and contingencies associated with the various types of trenchless technology contracts including specifications, site conditions, inspection requirements, measurements, and payment options.

36008 LOCATE UNDERGROUND UTILITIES FOR TRENCHLESS TECHNOLOGY OPERATIONS
Contact utility companies, municipalities or central records agency to elicit information on all utilities in area of project. Determine locations of all underground or concealed utilities. Stake utilities locations in such a manner as to prevent inadvertent destruction of lines or to permit safe removal or movement of lines. Be aware of special precautions necessary when dangerous conditions exist.

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

(Level III - Special Work Elements, continued)

36009 MANNING'S EQUATION
Use Manning's Equation in standard and derivative forms to determine flow velocities, flow volumes and channel areas.

36010 MONITOR GROUNDWATER LEVELS AND CONDITIONS
Recognize changed groundwater conditions in the field and monitor groundwater levels in boreholes and observation wells.

36011 SLOPE EROSION AND REPAIR
Define the basic requirements for slope surface drainage systems, including surface preparation and planting to prevent erosion, and the procedures for restoring shallow, non-complex, slumped or failed earthen slopes back to a stable and restored condition.

36012 CULVERT DESIGN BASICS
Demonstrate the fundamental hydraulic design concepts and analytical procedures used in culvert design.

36013 WASTEWATER PUMPING STATIONS
Know the major components of wastewater pumping stations including generators, pumps, motors, shafts, flushing water systems, etc. Be familiar with the installation and operation of equipment.

36014 BIO-SOLIDS MANAGEMENT SYSTEMS
Describe the basic sludge management system components and processes, including conveyor systems, shakers and screens, bottom hoppers, settlement ponds, weigh scales and blower systems. Inspect for contract compliance.

36015 LINE INSPECTION BY TV
Be familiar with the equipment and procedures used for television inspection of water/wastewater lines.

36016 HORIZONTAL DIRECTIONAL DRILLING PROCEDURES
Verify and document acceptable horizontal direction drilling pipe characteristics including safe loads and allowable bend radius.

36017 INFILTRATION AND INFLOW
Describe the principles behind and the practices involved in reducing or eliminating infiltration and inflow on the operation of sanitary sewer systems, including pipelining, remote grouting practices and other reduction methods.

36018 CONCRETE PAVEMENT REPLACEMENT
Inspect the reinforcement, placement, finishing and curing of concrete pavement. Ensure proper preparation prior to replacement. Ensure conformance to concrete replacement details on the plans.

36019 ASPHALT PAVEMENT REPLACEMENT
Describe the basic types of asphaltic pavements, prime and tack coats, and the compaction (rolling) of asphalt paving mixtures. Apply the requirements for acceptance during construction. Record findings.

Level IV – General Work Elements

37001 PUBLIC IMAGE/ PUBLIC RELATIONS
Provide an image to public of a stormwater wastewater system inspector 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, and obey all traffic laws at worksite and enroute to and from worksite. Use interpersonal skills to consider and respond tactfully to the feelings and needs of people who have complaints and concerns.

37002 COMPUTER APPLICATIONS
Operate computer and electronic networks to enter, summarize, analyze, and report stormwater and wastewater system construction inspection, operation, and maintenance information and data (derived from basic formulas and as-built calculations). Use spreadsheets.

37003 CMOM COMPONENTS/REQUIREMENTS
Describe the six major components of a Capacity, Maintenance, Operation, and Management (CMOM) program, including the performance standards and documentation requirements.

37004 QUALITY ASSURANCE REVIEWS
Conduct quality assurance reviews of all work. Recognize construction quality deficiencies, safety hazards, structural defects and unacceptable workmanship. Select appropriate corrective measures to eliminate deficiencies. Document and report results to the proper authorities.

37005 SCHEDULING AND COORDINATION
Interpret Critical Path Method (CPM) diagram submissions for construction project scheduling. Verify the establishment of clear communication channels between the contractor's scheduling and execution operations.

37006 PERFORMANCE EVALUATION AND MANAGEMENT
Evaluate the performance of subordinates. Prepare accurate and detailed performance appraisals. Recognize the need for on-the-job training or other training programs to increase the skills of workers. Develop and implement education programs. Maintain personnel records to establish standards for quality operating procedures, which can be used to assess the need for future training.

37007 INSPECTION OF A MAJOR PROJECT
Organize and conduct inspection efforts as chief inspector or as assistant to the project engineer on one or more projects encompassing all aspects of a comprehensive project. Account for equipment selection, personnel assignments, report reviewing, and permit transfers. Supervise inspectors and survey parties, soils and materials samplers and testers, and other technicians and workers on job; coordinate safety and traffic movement. Maintain current records of work to facilitate project closeout, permit termination, and preparation of as-built plans. Supervise submittal of required reports, certificates, payroll documents, etc.

37008 CHANGE ORDERS/CONSTRUCTABILITY REVIEWS
Review plans, specifications and site conditions. Recognize plan and specification inconsistencies, conflicts and deficiencies and/or differing site conditions. Analyze job requirements and develop recommended alternative and corrective actions. Prepare, in final format, complete contract change orders with clear justifications and cost estimates for approval of a contracting officer.

Level IV – Special Work Elements

38001 DEWATERING PROCEDURES
Describe common dewatering methods, monitoring procedures, and evaluation procedures.

38002 TRENCHLESS TECHNOLOGY GEOTECHNICAL INVESTIGATIONS
Correlate soil borings and available geotechnical information to the geophysical properties of the subsurface conditions.

38003 REPAIR OF REINFORCED CONCRETE STRUCTURES
Apply the basics of reinforced concrete structural systems repair and related erection and installation inspection and documentation procedures. Describe approved repair and reconstruction practices for precast and cast-in-place concrete structures including crack filling, substructure protection and protective coatings.

38004 TUNNELING PRACTICES
Describe the routine tunneling procedures for boring and jacking pipe in soft and hard rock materials.

38005 VIBRATION MONITORING AND BLASTING
Describe the applications of vibration monitoring relative to blasting in trenching excavation and tunneling operations. Define the practices and principles of blasting operations as they apply to trenching and underground structures.

38006 STORMWATER/WASTEWATER TREATMENT CONTROL SYSTEMS
Explain the electromechanical control systems for stormwater and wastewater treatment plants. Inspect construction, operation and maintenance thereof.

Personal Tally Worksheet

Stormwater and Wastewater System Inspection 4th Edition (National)

- 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
___31001 Core
___31002 Core
___31003 Core
___31004 Core
___31005
___31006
___31007
___31008
___31009
___31010
___31011
___31012
___31013
___31014

Level I
Special
___32001
___32002
___32003

Level II
General
___33001 Core
___33002 Core
___33003 Core
___33004 Core
___33005
___33006
___33007
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Level II
Special
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Level III
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Level III
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Level IV
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Level IV
Special
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___38006

NOTE:
If you previously tested in the 1st/2nd Edition (Regional) Stormwater program, contact NICET to find out how 1st/2nd Edition work element credits can be transferred over to the 4th Edition (National) program.

Selected General References

ACI Manual of Concrete Inspection (SP2). 9th Ed. American Concrete Institute. Detroit, Michigan.

Annual Book of ASTM Standards. American Society of Testing and Materials. Philadelphia, PA.

ASCE Standard Construction Guidelines for Micro Tunneling. CI/ASCE 36-01. American Society of Civil Engineers. Reston, VA. 2001.

Concrete Pipe Handbook. American Concrete Pipe Association. Vienna, VA

Concrete Pipe Installation Manual. American Concrete Pipe Association. Vienna, VA.

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Design and Control of Concrete Mixtures. Portland Cement Association. Skokie, IL.

Forms of Corrosion - Recognition and Prevention. (NSACE Handbook 1). The National Association of Corrosion Engineers. Houston, TX.

Fundamentals of Quality Precast. National Precast Concrete Association. Indianapolis, IN.

A Guide for the Installation of Ductile Iron Pipe. Ductile Iron Pipe Research Association. Birmingham, AL.

Guide to Pipe Jacking and Micro Tunneling Design. National Utility Contractors Association. Arlington, VA.

Handbook: Ductile Iron Pipe, Cast Iron Pipe. Cast Iron Pipe Research Association. Oak Brook, IL.

Handbook of Steel Drainage and Highway Construction Products. American Iron and Steel Institute. New York, NY.

Horizontal Directional Drilling Good Practices Guidelines. North American Society for Trenchless Technology. Arlington, VA.

Horizontal Directional Drilling Installation Guidelines. National Utility Contractors Association Foundation for Education and Research. Arlington, VA.

International Society for Trenchless Technology Guidelines. North American Society for Trenchless Technology. Arlington, VA.

Iseley, D. T. and M. Najafi (Editors) Trenchless Pipeline Rehabilitation Manual. National Utility Contractors Association. Arlington, VA. 1999.

Iseley, D. T., M. Najafi, and R. Tanwani (Editors). Trenchless Construction Methods and Soil Compatibility Manual. 3rd ed. National Utility Contractors Association. Arlington, VA. 1999.

Iseley, D. T. and S. B. Gokhale. Synthesis of Highway Practice 242: Trenchless Installations of Conduits Beneath Roadways. Transportation Research Board, National Research Council. Washington, DC. 1997.

Manual on Uniform Traffic Control Devices for Streets and Highways. Federal Highway Administration. U.S. Department of Transportation. Washington, D.C.

Najafi, M. Trenchless Pipeline Rehabilitation: State-of-the-Art Review. Trenchless Technology Center. Ruston, LA. 1994.

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

(continued)

Selected General References, continued

O'Brien, James J. Construction Inspection Handbook. 2nd ed. Van Nostrand Rheinhold Company, Inc. New York, NY.

OSHA Construction Regulations (29 CFR 1926). National Utility Contractors Association. Arlington, VA.

Safety and Health Standards for the Construction Industry. (OSHA 3149) U. S. Department of Labor. 1996.

Public Works Inspectors' Manual. 5th ed. BNI Publications. 1996.

Standard First Aid and Personal Safety. American Red Cross. Washington, D.C.

Standard Specifications for Transportation Materials and Methods of Sampling and Testing. American Association of State Highway and Transportation Officials. Washington, D.C.

Stormwater Wastewater Construction Inspection Field Guide. National Society Of professional Engineers, Alexandria, VA, 2006

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.

Water and Wastewater Calculations Manual. McGraw Hill, New York, NY. 2001.

Work Area Traffic Control Handbook (WATCH). BHI Building News. Anaheim, CA

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

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EXAMINATION SCORE REPORT

SAMPLE

Exam No. 99999 Test Date: 06/11/96
Examinee: JOHN EXAMINE Report Date: 06/28/96

Work Element Number and Title	Score (%)	Pass/Fail

STORMWATER AND WASTEWATER SYSTEM INSPECTION

21031001 Basic Communications Skills	80.00	P
21031002 Basic Mathematics	80.00	P
21031006 Topographic Maps	35.00	F*
21032001 Wetlands Recognition	65.00	P
21032003 Basic Soil Classification and Soil Samples	80.00	P
21033001 Intermediate Communication Skills	100.0	P
21033011 Moisture-Density Relationships	20.00	F**
21034001 Intermediate Mathematics	90.00	P
21034005 Nuclear Methods	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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