Fire Protection Engineering Technology

Special Hazards Suppression Systems

PROGRAM DETAIL MANUAL

Please check NICET’s website (www.nicet.org) to make sure you have the most recent edition of this document.

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

This manual may be freely copied in its entirety.
Special Hazards Suppression Systems replaced Special Hazards Systems Layout in 1998. Testing for Systems Layout is no longer available. Anyone certified in Systems Layout will be able to retain the certification awarded as long as the requirements for recertification are met.

All applicants for certification in Suppression Systems must be aware that once any Suppression Systems work element is tested, all passed Systems Layout work elements will be converted to the newer Suppression Systems work element numbers.

Thus, if you hold a Level II in Systems Layout and pass the Level III exam requirements in this manual, your Level III will be in Special Hazards Suppression Systems.

The Institute occasionally makes changes in its certification programs that will significantly affect the currency of individual program detail manuals. 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 June 2010.

It is the responsibility of all applicants to make sure they are using a current manual.

This third edition of the Special Hazards Suppression Systems program detail manual contains the following substantive change from the second edition.

- Work element #51004, “Basic Metric Units and Conversions,” is no longer mandatory for certification at Levels II, III and IV.

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 passed.
FIELD OF FIRE PROTECTION ENGINEERING TECHNOLOGY
SUBFIELD OF SPECIAL HAZARDS SUPPRESSION SYSTEMS

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GENERAL INFORMATION

This Program Detail Manual contains the certification criteria for the Special Hazards Suppression Systems subfield of Fire Protection Engineering Technology.

National Institute for Certification in Engineering Technologies (NICET)
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(voice mail system at all other times)
1-703-548-1518 (local number)
www.nicet.org

PROGRAM DESCRIPTION

This certification program is designed for technicians engaged in the detailing and layout and/or field activities related to special hazards fire suppression systems.  Read the Technician Profile on page 7 for details.

Technical areas covered include knowledge of physical science and mathematics, elements of electricity and electronics, available fire suppression agents, available fire protection devices, hydraulics of the flow of various agents, systems installation, servicing and maintenance, applicable codes and insurance authority standards, and contract interpretation and preparation.

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.

This program became operational in August 1998 when it replaced the Special Hazards Systems Layout program that had existed since 1985. Development of the program was initiated in 1996 with technical guidance from the Fire Suppression Systems Association (FSSA).

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

Certification candidates must meet the following criteria:

- complete the written examination requirement
- work element verification by the immediate supervisor
- technician recommendation by an acceptable recommender
- appropriate employment history

Simply passing the examination does not guarantee certification.  All other components MUST be accepted and approved in order to achieve 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 5 shows how many elements must be passed to meet the exam requirement for Levels I, II, III, and IV.
WORK ELEMENT DESCRIPTION

The typical job duties and associated responsibilities of Special Hazards Suppression Systems 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.

FIELD CODE AND 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 Fire Protection Engineering Technology is 003.

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 Fire Protection Engineering Technology:

1. Automatic Sprinkler Systems Layout
2. Special Hazards Systems Layout (Program closed 1/01/00)
3. Fire Alarm Systems
4. Inspection and Testing of Water-Based Fire Protection Systems
5. Special Hazards Suppression Systems

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

<table>
<thead>
<tr>
<th>GENERAL WORK ELEMENTS</th>
<th>SPECIAL WORK ELEMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Level I General</td>
<td>(2) Level I Special</td>
</tr>
<tr>
<td>(3) Level II General</td>
<td>(4) Level II Special</td>
</tr>
<tr>
<td>(5) Level III General</td>
<td>(6) Level III Special</td>
</tr>
<tr>
<td>(7) Level IV General</td>
<td>(8) Level IV Special</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Technical Field Code:</th>
<th>003</th>
<th>(Fire Protection Engineering Technology)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subfield:</td>
<td>5</td>
<td>(Special Hazards Suppression Systems)</td>
</tr>
<tr>
<td>Level/Type:</td>
<td>5</td>
<td>(Level III General)</td>
</tr>
<tr>
<td>Work Element Sequence:</td>
<td>001</td>
<td>(Construction Plans)</td>
</tr>
<tr>
<td>Work Element Number:</td>
<td>003/55001</td>
<td>(Field Code Number/ 5-Digit Work Element ID Number)</td>
</tr>
</tbody>
</table>

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.
WORK ELEMENT SELECTION

1. Refer to Examination Requirements Chart on page 5.

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 three months from the last time you failed it before you will be permitted to test that element again. In addition, you will be blocked from signing up for a work element a fourth time if it has been previously failed four times within a two-year span. For further information, read Policy #20, “Retesting of Failed Work Elements,” available on our website (www.nicet.org).

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.
CROSSOVER WORK ELEMENTS

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 three-month 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 can be ordered from NICET’s 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.
**EXAMINATION REQUIREMENTS CHART**

Subfield: Special Hazards Suppression Systems

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

<table>
<thead>
<tr>
<th>Subfield (Core)</th>
<th>Level I - General</th>
<th>Level I - Special</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I</td>
<td>6</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Subfield (Core)</th>
<th>Level II - General</th>
<th>Level II - Special</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level II</td>
<td>8</td>
<td>2</td>
<td>29</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Subfield (Core)</th>
<th>Level III - General</th>
<th>Level III - Special</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level III</td>
<td>8a</td>
<td>2</td>
<td>51</td>
</tr>
</tbody>
</table>

You must pass this many work elements to complete the Level III exam requirement. Read Notes (a), (c), (d) and (e) below.

<table>
<thead>
<tr>
<th>Subfield (Core)</th>
<th>Level IV - General</th>
<th>Level IV - Special</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level IV</td>
<td>8a</td>
<td>2</td>
<td>73</td>
</tr>
</tbody>
</table>

You must pass this many work elements to complete the Level IV exam requirement. Read Notes (a), (c), (d), (e) and (f) below.

**NOTES:**
(a) All Level I Core elements must be passed for Level II, III and IV.
(b) 53001, 53003, 53004, 53005, 53006, and 53007 must be passed for Level II.
(c) All Level II Core elements must be passed for Level III and IV.
(d) All Level III Core elements must be passed for Level III and IV.
(e) Time restrictions dictate that no more than 34 work elements can be scheduled for any single examination sitting. Therefore, at least two examination sittings will be needed in order to complete this requirement.
(f) Read very carefully the two sections applicable to Level IV certification in this manual before seeking Level IV certification.

**GENERAL NOTES:**
(1) 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.
(2) Use the Personal Tally Worksheet on page 17 of this manual to keep track of the number of work elements you have successfully passed.
VERIFICATION OF WORK ELEMENTS

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

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

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

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

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 Work History in the application.

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.

The work history write-up must be complete, detailed, and specific. It must describe your specific job duties, responsibilities, work tasks, specific tests you perform, materials tested, assignments over the years, job title/position changes, and any other pertinent information. Lack of detail will delay certification.

Minimum Work Experience Required for Level II Certification: Work experience must include 1 year working exclusively with 3 or more of the following types of systems: pre-engineered dry chemical, pre-engineered wet chemical, automatic detection systems, Halon, CO₂, foam, water mist, CEA-410™ Perfluorobutane, FM-200™ (HFC-227ea), FE-13™ (HFC-23), Inergen™ (IG-541), and any other clean agent recognized by the Environmental Protection Agency and the National Fire Protection Association. The 1 year must have been acquired within the 3-year period just prior to the Level II certification award date. This information supplements the Technician Profile on page 7.

Minimum Work Experience Required for Level III Certification: Work experience must include 3½ years working exclusively with 4 or more of the following types of systems: engineered dry chemical systems, automatic detection systems, Halon, CO₂, foam, water mist, CEA-410™ Perfluorobutane, FM-200™ (HFC-227ea), FE-13™ (HFC-23), Inergen™ (IG-541), and any other clean agent recognized by the Environmental Protection Agency and the National Fire Protection Association. The 5-year minimum must be acquired within an 8-year period and at least 1 year of the 3½ years must have been acquired within the 3-year period just prior to the Level III certification award date. This information supplements the Technician Profile on page 7.

Minimum Work Experience Required for Level IV Certification: Work experience must include 7½ years working exclusively with 4 or more of the following types of systems: engineered dry chemical systems, automatic detection systems, Halon, CO₂, foam, water mist, CEA-410™ Perfluorobutane, FM-200™ (HFC-227ea), FE-13™ (HFC-23), Inergen™ (IG-541), and any other clean agent recognized by the Environmental Protection Agency and the National Fire Protection Association. The 10-year minimum must be achieved within a 14-year period and at least 1 year of the 7½ years must have been acquired within the 3-year period just prior to the Level IV certification award date. This information supplements the Technician Profile on page 7.

TECHNICIAN RECOMMENDATION FORM

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.

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.
## TECHNICIAN PROFILE FOR CERTIFICATION IN SPECIAL HAZARDS SUPPRESSION SYSTEMS

<table>
<thead>
<tr>
<th></th>
<th>Level I</th>
<th>Level II</th>
<th>Level III</th>
<th>Level IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education</strong></td>
<td>High school equivalency</td>
<td>Formal education not required, but expected level of education should be equivalent to an associate degree in electronics, fire systems technology, or closely related specialty.</td>
<td>Level II experience plus an additional 3 years of work experience in the design process and/or in two or more field activities (5 years total) <em>(see Note 2)</em></td>
<td>Level III experience plus an additional 5 years of work experience in the design process and/or in two or more field activities (10 years total) <em>(see Note 2)</em></td>
</tr>
<tr>
<td><strong>Minimum Work Experience (see Note 1)</strong></td>
<td>Limited work experience in special hazards and related fire protection activities</td>
<td>A minimum of 2 years work experience in special hazards and related fire protection activities</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **Level of Responsibilities** | Under direct supervision | Under general supervision | • Under little or no daily supervision  
• May supervise others | Independent performance, including delegated responsibilities |                                                                                                                                                                                                     |
| **Typical Activities** | Prepares basic drawings and assists in preparation of basic layouts and/or assists in field activities | Prepares standard shop drawings and performs field activities | • Prepares layouts for or engages in field activities for complex systems  
• Participates in project management | Manage ALL aspects of major projects |                                                                                                                                                                                                     |
| **Typical Job Titles** | Technician Trainee  
• Field Technician  
• Assistant Designer  
• Systems Sales Representative | • Lead Field Technician  
• Designer  
• Systems Sales Representative | • Design Manager  
• Project Manager  
• Operations Manager  
• Sr Systems Sales Representative |                                                                                                                                                                                                      |

*Note 1: Details of the minimum work experience requirements are given on page 6 of this manual.*

*Note 2: Acceptable field activities are defined as service, maintenance, testing, and installation.*
LEVEL IV MAJOR PROJECT

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 for a major special hazards suppression systems project should include such information as:
1. description of project (power plant, manufacturing facility, warehouse, etc.);
2. description of extinguishing agent(s) used and the suppression system(s) designed/installed;
3. scope of the project (how long did it take, how many manhours, contract start and end dates);
4. your supervisory responsibilities on the project; and
5. the range of your duties on the project as related to hazard analysis, design calculations, approvals, proposals, system installation and check-out, system final approval test, system service, and/or system maintenance.

** Do not submit copies of drawings, technical data sheets, etc. **

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. Level IV write-up guidelines are available for download on NICET’s website (www.nicet.org).

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.

PREPARATION FOR 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.

When appropriate, the work element description specifies the applicable standards or procedures. The standards and other references cited in the work element descriptions are permitted (and encouraged) at the test site.

TRAINING COURSES

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.

EXPIRATION OF CERTIFICATE

The first certificate(s) awarded 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 certificate that is not renewed at the end of 3-year period will expire. A consequence of the certificate going into Expired Status will be deletion of all records, 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.
WORK ELEMENT LISTING

Special Hazards Suppression Systems

LEVEL I - GENERAL WORK ELEMENTS

(Work at Level I Is Performed Under Direct Supervision)

CORE WORK ELEMENTS (See Note 1)

<table>
<thead>
<tr>
<th>ID No.</th>
<th>Work Element Title and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>51001</td>
<td>SIMPLE PLANS AND SPECIFICATIONS</td>
</tr>
<tr>
<td></td>
<td>Use simple plans and specifications of standard jobs to determine dimensions, types of materials, elevations, locations, and other information. Calculate required information from dimensions and other data on plans and specifications. (See general construction texts and references)</td>
</tr>
<tr>
<td>51002</td>
<td>NFPA STANDARDS</td>
</tr>
<tr>
<td></td>
<td>Understand the basic application of NFPA standards to suppression systems layout. Understand basic NFPA standards terminology, including “shall” and “should” and concept of the “authority having jurisdiction.” Understand basic concept of “approved,” “listed,” etc. as regards acceptance of materials and components. (See “Definition” and “Scope” sections of the NFPA standards)</td>
</tr>
<tr>
<td>51003</td>
<td>SPRINKLER SUPPRESSION SYSTEMS</td>
</tr>
<tr>
<td></td>
<td>Understand the basic types of sprinkler and fire suppression systems. Understand basic system terminology. (NFPA 13, Guide for Sprinkler Plan Review)</td>
</tr>
<tr>
<td>51005</td>
<td>STANDARD SYMBOLS</td>
</tr>
<tr>
<td></td>
<td>Know and use the standard design symbols common to the fire suppression industry. (NFPA 170)</td>
</tr>
<tr>
<td>51006</td>
<td>BASIC WIRING</td>
</tr>
<tr>
<td></td>
<td>Understand the wiring requirements and protection of wiring for fire alarm systems. Select outlet and junction boxes, cable and conduit. Calculate proper wire size, and overcurrent protection for the system. (NFPA 70, NFPA 72, Electrical Construction Materials Directory)</td>
</tr>
</tbody>
</table>

NON-CORE WORK ELEMENTS

<table>
<thead>
<tr>
<th>ID No.</th>
<th>Work Element Title and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>51004^</td>
<td>BASIC METRIC UNITS AND CONVERSIONS</td>
</tr>
<tr>
<td></td>
<td>Perform conversions to and from basic metric (SI) units. (IEEE/ASTM SI 10)</td>
</tr>
<tr>
<td>51007^</td>
<td>BASIC MATHEMATICS</td>
</tr>
<tr>
<td></td>
<td>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)</td>
</tr>
<tr>
<td>51008^</td>
<td>BASIC PHYSICAL SCIENCE</td>
</tr>
<tr>
<td></td>
<td>Apply terms, definitions, and concepts from mechanics, electricity, heat, and chemistry. (Solutions may involve simple formulas found in basic physics textbooks, but will not involve algebraic manipulations or trigonometry)</td>
</tr>
<tr>
<td>51009^</td>
<td>BASIC COMMUNICATION SKILLS</td>
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<td>Use proper punctuation, vocabulary, spelling and sentence structure. Follow written instructions. (See basic grammar reference books)</td>
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<td>Draw free-hand sketches to describe hazards which might need special hazard protection.</td>
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Note 1: All General work elements are categorized as either Core or Non-Core Work Elements. Read the Examination Requirements Chart on page 5 and the Personal Tally Worksheet on page 17 carefully to see which Core elements are mandatory for certification.

(^) Generic crossover credit exists in other fields/subfields for this work element. Read information on crossover work elements on page 4.

General Note: See “Selected General References” page in this manual for information on listed publications.
LEVEL I - SPECIAL WORK ELEMENTS

52001  BASIC PRINCIPLES OF COMBUSTION
Understand basic fire behavior.  (NFPA 1, Fire Suppression and Detection Systems, Fire Protection Handbook)

52002  BASIC INDIVIDUAL SAFETY
Know safety practices as they apply to tasks performed.  Recognize improper safety practices at work site.  (See general industry safety standards)

52003^  FIRST AID PROCEDURES
Understand the basic rules and procedures of first aid.  (See general handbooks on first aid)

52004  LAYOUT SIMPLE DESIGNS
Understand the basic requirements of suppression systems working drawings. Use good drafting techniques, including proper line widths and lettering, to prepare simple layouts. Produce work that meets standard practice in the industry. Perform math computations necessary to provide quantity estimates and materials lists.  (NFPA 13, NFPA 72, drafting texts)

LEVEL II - GENERAL WORK ELEMENTS

CORE WORK ELEMENTS

53001  MATERIALS AND COMPONENTS

53002  HAZARD ANALYSIS
Know the basic principles involved in analyzing a special hazard.  (NFPA 12, NFPA 12A, NFPA 17, NFPA 70, NFPA 101, NFPA 2001)

53003  DETECTION METHODS
Know the basic principles of automatic fire detection. Know how to select the best type of detection for the hazard and ambient conditions.  (NFPA 72, NFPA 75)

53004  FUNDAMENTALS OF FIRE EXTINGUISHMENT
Know the principles involved in the extinguishment and suppression of fire as well as the processes involved in combustion.  (Fire Suppression and Detection Systems)

53005  EXTINGUISHING AGENTS I
Be familiar with all of the extinguishing agents and their unique characteristics which make them applicable to certain hazards and unsuitable for others.  (NFPA 11, NFPA 11A, NFPA 12, NFPA 12A, NFPA 13, NFPA 17, NFPA 17A, NFPA 101, NFPA 230, NFPA 409, NFPA 750, NFPA 2001)

53006  SMOKE-SENSING DETECTORS
Know the basic principles used in selecting and locating smoke detectors.  (NFPA 72)

53007  ELECTRICAL INSTALLATION STANDARDS
Be familiar with the National Electrical Code as it applies to the installation of alarm systems, detection systems, and fire suppression systems.  (NFPA 70, NFPA 72)

53008  SPECIAL HAZARDS SYSTEMS INSPECTION
Supervise the inspection of a complete special hazards system.

53009  CYLINDER HANDLING
Understanding the proper handling and DOT transporting requirements for pressurized fire suppression system cylinders (Guide for Service, Maintenance, Inspection, Test, and Re-qualification of Fire Suppression Systems Containers, Hazardous Materials Compliance Pocketbook)
NON-CORE WORK ELEMENTS

53010 HEAT-SENSING DETECTORS
Know the basic principles used in selecting and locating heat detectors. (NFPA 72)

53011 FOAM WATER I
Know the rules pertaining to the application of this suppression agent. (NFPA 11, NFPA 16)

53012 CARBON DIOXIDE I
Know the rules pertaining to the application of this suppression agent. (NFPA 12)

53013 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)

53014 DETECTION SYSTEMS INSPECTION
Perform and/or supervise the inspection of a fire detection system and report findings. (NFPA 72)

53015 BASIC FIRE ALARM SYSTEMS
Understand the various types of fire alarm systems. Understand the electrical requirements, the alarm initiating devices, the control functions, the alarm indicating appliances and the power requirements of a fire alarm system. Know the types of signaling services that can be provided and the automatic fire detectors in common use. (NFPA 72, Fire Alarm Signaling Systems)

53016 INTERCONNECTION WITH EXTINGUISHING SYSTEMS
Understand how automatic fire alarm systems are used to actuate extinguishing systems, including sprinkler, Halon 1301, carbon dioxide or CO₂, dry chemical, foam and hi-ex foam. Know what type of detectors are used and know how they are spaced for each type of extinguishing system and know the uses of “cross zoning” for these systems. (Fire Protection Handbook, Fire Alarm Signaling Systems)

53017 FIRE RISK ASSESSMENT
Recognize the limitations of special hazard fire systems. Demonstrate ability to review the hazards within a protected space. Understand issues regarding the health and safety issues associated with gaseous and other special hazard agents. Demonstrate an understanding of process and equipment shutdowns. (NFPA 11, NFPA 12, NFPA 12A, NFPA 17, NFPA 72, NFPA 2001)

53018 AREA, VOLUME, AND WEIGHT CALCULATIONS
Calculate areas, volumes, and weights, including those of standard structural member shapes.

LEVEL II - SPECIAL WORK ELEMENTS

54001 CONTROLS, ALARMS AND SYSTEMS SUPERVISION
Know the various types of system controls, alarms and supervision. (NFPA 72)

54002 SURVEYS FOR FIRE PROTECTION
Know the items required to achieve a complete survey of property for layout of special hazards fire suppression system plans.

54003 OSHA AND OTHER SAFETY REQUIREMENTS
Know OSHA requirements pertaining to jobs being performed. Know authority of OSHA inspectors. (29 CFR Part 1910)

54004 SPECIFICATIONS AND COST ESTIMATES
Read and interpret standard specifications and become familiar with the existence of General Conditions, General Mechanical Conditions, and those specific fire protection specifications pertaining to the fire protection design responsibility. Distinguish those fire protection requirements often found in the mechanical and electrical specifications. Know the interface responsibility among fire protection devices, electrical interface requirements, and alarm characteristics. Know and understand cost estimate details as they relate to the preparation of working drawings and design criteria.
54005 FLAME DETECTORS
Know the basic principles in selecting and locating this type of detector. (NFPA 72)

54006 FIRE GAS DETECTORS
Know the basic principles in selecting and locating this type of detector. (NFPA 72)

54007 HALON 1301 I
Know the rules pertaining to the application of this suppression agent. (NFPA 12A)

54008 DRY CHEMICAL I
Know the rules pertaining to the application of this suppression agent. (NFPA 17)

54009^ TRIGONOMETRY AND GEOMETRY
Use trigonometric functions, laws, and identities to solve problems involving right and oblique triangles, and vector addition. Recognize the properties of lines and planes, circles and spheres, ellipses, parabolas, and hyperbolas. Calculate distances, slopes, and intersections involving straight lines.

54010^ ALGEBRA
Solve linear and exponential algebraic equations and systems of equations. Evaluate determinants.

54011 VISUAL INSPECTION OF CYLINDERS
Understand the requirements for the visual inspection of cylinders. Know when visual inspections are required and how to perform them. Be familiar with the requirements for documenting inspections. (NFPA 12A, NFPA 2001, 49 CFR Parts 170-179, CGA C-6)

54012 POWER SUPPLIES
Understand the required primary (main), secondary (standby), and trouble power supply sources for each type of fire suppression systems. Demonstrate ability to calculate the size storage battery needed to supply a given system for various standby times. (NFPA 72, UL 864, Fire Protection Handbook, Fire Alarm Signaling Systems)

54013 WET CHEMICAL
Know the rules pertaining to the application, maintenance, and testing of wet chemical suppression agents. (NFPA 17A)

54014 INERGEN (IG-541)
Understand the rules as they pertain to the application and limitations of IG-541. (NFPA 2001, U.S. EPA SNAP)

54015 FM-200 (HFC-227ea)
Understand the rules as they pertain to the application and limitations of FM-200. (NFPA 2001)

54016 FE-13 (HFC-23)
Understand the inspection, testing, and maintenance of FE-13 Clean Agent Fire extinguishing systems. (NFPA 2001)

54017 ROOM INTEGRITY/FAN TESTING
Understand the principles and procedures involved in fan testing. Know the definitions of general terms commonly used in fan testing. Understand how to identify leakage points in a room, and prepare and seal the room for fan testing. (NFPA 2001)

54018 ENGINEERING DRAWINGS AND SUBMITTALS
Know the information required to prepare fire suppression system drawings. Included are as-builts, operation/maintenance manuals and flow calculations. (NFPA 12, NFPA 2001)

54019 PERSONNEL PROTECTION FOR THE JOB SITE
Understand basic OSHA safety requirements as they apply to working safely on the job site. Be familiar with basics of personal protection systems and equipment, electrical safety, electrical lockout/tag out requirements, and confined space entry. Be familiar with OSHA regulations (29 CFR Part 1926)
LEVEL III - GENERAL WORK ELEMENTS

CORE WORK ELEMENTS

55001 CONSTRUCTION PLANS
Be familiar with architectural, mechanical, electrical, structural, symbols, and site plans used in the construction industry. (See general construction texts and engineering drawing texts.)

55002 CONTRACTS
Understand contractual construction relationships in the construction industry. (See general construction texts)

55003 SYSTEM PIPING REQUIREMENTS
Know the various piping configurations, pipe size, structural considerations, and schedule requirements. (NFPA 11, NFPA 12, NFPA 13, NFPA 12A, NFPA 17, NFPA 2001)

55004 NOZZLE AND TANK LOCATION
Understand proper nozzle location, tank location and protection of tanks from damage. Know the pressure, temperature and other limitations placed on tank locations. (NFPA 12, NFPA 12A, NFPA 17, NFPA 2001)

55005 BUILDING CODES
Understand building codes and their enforcement. Know the relationship between building codes and installation standards. Review building codes to determine NFPA standards adoption and special requirements for system design. Understand design options on use of automatic sprinklers in conjunction with special hazards agents and the possibility of substituting a special hazard agent for a sprinkler system. (NFPA 101, relevant building codes)

55006 INSURANCE AUTHORITIES AND AHJ
Understand terminology of the insurance industry as related to fire protection. Understand the role and functions of Factory Mutual Global and Insurance Services Office.

55007 FIRE ALARM SYSTEM WIRING
Understand the proper types of wire, cable or conduit used on a fire alarm system and where, in compliance with the codes, each is permitted and the correct and incorrect method of field wiring system components. Prepare an electrical riser and plan view diagram of a multi-zone, multi-story fire alarm system consisting of manual fire alarm boxes, heat detectors, four wire smoke detectors and a variety of audible and visible appliances. The diagrams are to show the number and size of conductors and conduit and the location of each system component. (NFPA 70)

55008 No longer available for testing.
Effective May 8, 2003, “Automatic Fire Detector Spacing” is no longer available for testing. Credit is retained by all those who previously passed it.

55009 PIPING PRESSURIZATION & PUFF TESTING
Know the information required to install carbon dioxide and clean agent system piping. Also know how to perform a piping pressurization and a puff test. Knowledge is needed on piping inspection as required by code. (NFPA 12, NFPA 2001)

55010 EXTINGUISHING AGENTS II
Be familiar with all of the extinguishing agents and their unique characteristics which make them applicable to certain hazards and unsuitable for others. (NFPA 11, NFPA 11A, NFPA 12, NFPA 17, NFPA 121, NFPA 2001)

55011 FINAL ACCEPTANCE TEST FOR AN AHJ
Know the information required to prepare for a clean agent final acceptance test for an authority having jurisdiction. Know the testing requirements, the method of inspecting the protected area and the final reporting procedures. (NFPA 12, NFPA 2001)

55012 FIRE RISK ASSESSMENT
Recognize the limitations of special hazard fire systems and knowledge of the need to review the hazards within a protected space. Understand issues regarding the health and safety limitations associated with gaseous and other special hazard agents when a designer must select which agent to propose for use. Demonstrate an understanding of the design sequence of operations for fire systems including: process and equipment shutdowns, fuel loading, and risk analysis. Review of requirements to apply performance based design criteria (NFPA 11, NFPA 12, NFPA 12A, NFPA 17, NFPA 70, NFPA 72, NFPA 2001, Fire Protection Handbook)
NON-CORE WORK ELEMENTS

55013^ TECHNICAL PRESENTATIONS AND REPORTS
Organize and deliver oral presentations and prepare detailed technical reports and correspondence.

55014 ALARM INDICATING APPLIANCES
Understand the operation, selection, location, spacing, mounting and use of audible and visible alarm indicating (notification) appliances. (NFPA 72, NFPA 101, Fire Alarm Signaling Systems, manufacturer’s product literature)

55015 ADDRESSABLE SYSTEMS
Understand the concept of addressable devices, their benefits, wiring methods, and how supervision is achieved. Know the various methods of signal transmission with addressable detectors such as ripple through, sequential counting and digitally addressable. (NFPA 72, Fire Alarm Signaling Systems)

55016 CHANGE ORDERS
Gather information from subordinates or from personal inspection and review. Prepare, in final format, complete contract change order with clear justifications and cost estimates for approval of a contracting officer.

55017 WORKING RELATIONSHIPS
Understand how to interact with the various parties on a construction project. This includes interfacing with architects and engineers, general contractors and construction managers, subcontractors, and property owners.

LEVEL III - SPECIAL WORK ELEMENTS

56001 HEAT-SENSING PROTECTION SYSTEMS
Understand the layout and detailing of a heat-sensing fire detecting system. Make appropriate selection of devices for application, alone or in conjunction with other devices. (NFPA 72, Fire Protection Handbook)

56002 SMOKE-SENSING PROTECTION SYSTEMS
Understand the layout and detailing of a smoke-sensing fire detecting system. Make appropriate selection of devices for application, alone or in conjunction with other devices. (NFPA 72, Fire Protection Handbook)

56003 FLAME-SENSING PROTECTION SYSTEMS
Understand the layout and detailing of a flame-sensing fire detecting system. Make appropriate selection of devices for application, alone or in conjunction with other devices. (NFPA 72, Fire Protection Handbook)

56004 FIRE DETECTING SYSTEMS
Understand the layout and detailing of a fire detecting system utilizing several types of sensing devices and provide for activation of a fire suppression system. Make appropriate selection of devices for application, alone or in conjunction with other devices. (NFPA 72)

56005 FOAM WATER II
Understand the layout and detailing of a foam water fire suppression system. (NFPA 11)

56006 HALON 1301 II
Assist in the layout and detailing of a Halon 1301 system. Hand-calculate system parameters at least to the extent of corroborating the computer results and hydraulic calculations. (NFPA 12A)

56007 CARBON DIOXIDE II
Assist in the layout and detailing of a carbon dioxide system. Hand-calculate system layout at least to the extent of corroborating the computer results and hydraulic calculations. (NFPA 12)

56008 DRY CHEMICAL II
Assist in the layout and detailing of a dry chemical system. (NFPA 17)
56009 EXPLOSION PREVENTION AND VENTING
Recognize the accepted means of preventing explosions in vapors and dusts. Recognize the limitations of venting and explosion suppression equipment as well as the proper applications of these procedures. (NFPA 68, NFPA 69, manufacturer’s installation manuals.)

56010 TRANSIENT & RFI/EMI PROTECTION
Understand the possible effects that transients and RFI/EMI may have on fire alarm systems, the possible sources of such interference, and measures that can be taken during design and installation to minimize the probability of such interference. (NFPA 70, UL 268, UL 864, Fire Alarm Signaling Systems, Transient Voltage Suppression, basic electronic textbooks)

56011 PROJECT SCHEDULING & COORDINATION
Read and interpret construction schedules such as the critical path method. Separate a fire protection project into categories to conform to the General Construction schedule. Provide scheduling information suitable for input to CPM, PERT, or bar schedule. Establish communication channels of fire protection work with other trades to determine most appropriate drafting procedures, including scale of drawings and type of process (mylar, linen, etc); and to determine schedule of meetings. Maintain updated drawing file including change orders and field installation changes. In accordance with coordination responsibility, communicate all changes to the other trades. (See general construction texts and references)

56012 HEAT DETECTOR OPERATION
Understand the theory of operation of heat detectors of the fixed temperature, rate compensation and rate-of-rise principle of operation. Know the proper and improper applications of heat detectors; how each type of heat detector responds to a fire; and methods used by testing labs to determine the suitability of a heat detector for listing. (NFPA 72, Fire Alarm Signaling Systems)

56013 COMPUTER/MICRO PROCESSOR BASED FIRE ALARM SYSTEMS
Understand how computers and microprocessor/integrated circuits are used in fire alarm systems. Know the methods used to assure the integrity of processed data and the suitability of various types of integrated circuits for fire alarm applications. Know the fundamentals of Boolean logic. Know the various types of memories used in fire alarm systems. (Fire Alarm Signaling Systems, general computer texts)

56014 INERGEN (IG-541)
Understand the advanced design, application, and operation of IG-541 Clean Agent Fire extinguishing systems. (NFPA 12, NFPA 2001)

56015 FE-13 (HFC-23)
Understand the design, application, and operation of FE-13 Clean Agent Fire extinguishing systems. (NFPA 2001)

56016 FM-200 (HFC-227ea)
Understand the design, application, and operation of FM-200 Clean Agent Fire extinguishing systems. (NFPA 2001)
LEVEL IV – GENERAL WORK ELEMENTS

NOTE: Certification at Level IV requires that the candidate must have occupied a senior position of responsibility throughout the duration of one major special hazards suppression systems project. There are no exceptions to this requirement.

57001  HYDROSTATIC TEST FACILITY
Understand the various codes, federal regulations, DOT standards, NFPA standards, and techniques necessary for the safe operation of a DOT-approved hydrostatic test facility. (NFPA 12, NFPA 17, NFPA 2001, 49 CFR)

57002  HALON FILLING FACILITY
Supervise a Halon 1301 or 1211 filling facility. Know the safety precautions, standards, and recognized hazards associated with the operation of the facility. (NFPA 12A, CGA C-6, UL listing requirements, manufacturers’ documentation)

57003  CARBON DIOXIDE FILLING FACILITY
Supervise a carbon dioxide cylinder filling facility. Know the necessary safety precautions, standards, and the recognized hazards inherent in the operation. (NFPA 12, CGA C-6)

57004  DISCHARGE TEST
Supervise a discharge test of carbon dioxide, Halon, or dry chemical, knowing the requirements of IRI, FM and other AHJs which may apply.

57005  AS-BUILT DRAWINGS
Know what must go into a proper As-Built drawing. Know how the changes are made from the original submittal to As-Built. Know the proper distribution of the final copies. (NFPA 12A, NFPA 2001)

57006  COMPUTER SYSTEMS
Be familiar with basic computer terminology/equipment, computer operations and procedures, and the protection of information systems inside a facility. (See general computer texts)

57007  ADVANCED FIRE RISK ASSESSMENT
Ability to review the information supplied by a risk assessment and qualitative risk analysis. Knowledge pertaining to Risk assessment, Qualitative calculations, Preventative Risk Reduction Measures, Fire and explosion assessment, Quantitative Risk Analysis. (Guidelines For Evaluating Process Plant Buildings for External Explosions and Fires)

57008  EXTINGUISHING AGENTS III
Be familiar with all of the extinguishing agents and their unique characteristics which make them applicable to certain hazards and unsuitable for others. (NFPA 11, NFPA 11A, NFPA 12, NFPA 17, NFPA 120, NFPA 2001)

57009  FE-13 (HFC-23)
Understand the advanced design, application, and operation of FE-13 Clean Agent Fire extinguishing systems. (NFPA 2001)
PERSONAL TALLY WORKSHEET

Passed Work Elements in Special Hazards Suppression Systems

- Put a checkmark 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/subfield of certification (see information on page 3).

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* See Note (b) on page 18 for an explanation of these numbers.
** Effective May 8, 2003, Work Element 55008 is no longer available for testing. Credit is retained by all those who previously passed it.
### Conversion of Work Element Numbers from Old Program to New Program

#### Level I/General to Level II/Specified

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**NOTES:**

(a) These work elements came from the Fire Alarm Systems program and did not exist in the old Special Hazards Systems Layout program.

(b) Work elements 23116, 25108, and 26109, which were active elements in the old Special Hazards Systems Layout program, are not active elements in the Special Hazards Suppression Systems program. However, all examinees who passed the element(s) in the old program will retain credit for passing them. If you passed 23116 (Halon 1211 Systems), 25108 (Governmental Agencies), or 26109 (Halon 1211 System), you may check off the corresponding numbers on the Personal Tally Worksheet on page 17. THESE ELEMENTS ARE NO LONGER AVAILABLE FOR TESTING IN EITHER PROGRAM.
RELEVANT STANDARDS

The following organizations issue standards appropriate to this certification program. The standards below are specifically referenced in the work element listing. The edition of the NFPA standard used in writing the test questions is given in parentheses. Examinees are strongly recommended to bring the indicated standard editions to the test center. Back editions of standards can be acquired from the NFPA library by calling 617-984-7445.

National Fire Protection Association (NFPA)
68 Venting of Deflagrations (1998 edition)
70 National Electrical Code (1999 edition)
120 Coal Preparation Plants (1999 edition)
121 Fire Protection for Self-Propelled and Mobile Surface Mining Equipment (1996 edition)
409 Aircraft Hangars (1995 edition)

ASTM International, formerly known as the American Society for Testing and Materials (ASTM)

Compressed Gas Association (CGA)
C-6 Visual Inspection of Steel Compressed Gas Cylinders

Underwriters Laboratories (UL)
UL 268 Smoke Detectors for Fire Alarm Signaling Systems
UL 864 Control Units for Fire Protective Signaling Systems
SELECTION GENERAL REFERENCES


Code of Federal Register


IRI Information Sheets & Interpretive Guides.  Industrial Risk Insurers.  Hartford, CT.

Transient Voltage Suppression (DB-450.5).  Harris Semiconductor Division of Harris Corporation. Melbourne, FL. (Call 1-800-442-7747)

WARNING

On its website, NICET maintains a complete listing of references that are allowed in the paper-and-pencil testing centers. Please view the document “Reference Material Allowed in NICET Paper and Pencil Test Centers” at www.nicet.org/candidates/allowable_reference_material.pdf.

Nicet does not stock these publications. You must contact the publisher directly for purchasing information.
This listing is not intended to be complete or representative.
We suggest in all cases that the most current edition of the publication be used.
### SAMPLE SCORE REPORT

Exam No. 99999  
Examinee: JOHN EXAMINE

<table>
<thead>
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<th>Work Element Number and Title</th>
<th>Score (%)</th>
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<td>3051003 NFPA Standards</td>
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<td>3052002 Basic Individual Safety</td>
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Asterisks (*, **, ***,***) indicate the number of times a work element has been failed. Additional information can be found on our website: http://www.nicet.org/about/policies.cfm#policy20.

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Alexandria, Virginia  22314-2715