NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES®
sponsored by the National Society of Professional Engineers

Fire Protection Engineering Technology

FIRE ALARM SYSTEMS

PROGRAM DETAIL MANUAL

Please check NICET's web site (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.

Field Code: 003
Subfield Code: 03

Eighth Edition
June 2010

Important Information

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

KEEP YOUR MANUALS CURRENT

This reprinted eighth edition of the Fire Alarm Systems program detail manual does not contain any substantive changes from the seventh edition. Only the following minor changes have been made:

- corrections to the Personal Tally Sheet
- deletion of Work Element 37001 and updating of the Examination Requirements Chart
- revisions to the "Relevant Standards" list and reference listings in work element descriptions
- updates to information on the "Selected General References" page
- revision to the description of work element 33014 (INSURANCE AUTHORITIES AND THEIR REQUIREMENTS).

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. This reprinted 8th edition manual does <u>not</u> inaugurate any program changes.

Field Of Fire Protection Engineering Technology

Subfield Of Fire Alarms

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General Information

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

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)
www.nicet.org

Program Description

This certification program was designed for engineering technicians working in the fire alarm industry who engage in a combination of the following fire alarm systems activities:

system layout (plan preparation), system equipment selection, system installation, system acceptance testing, system trouble-shooting, system servicing, and system sales.

Technical areas covered include applicable codes and standards, types of signaling systems, supervision requirements, types of fire and smoke detectors, building occupancy considerations, basic electricity and electronics, and physical science fundamentals.

This program became operational in 1988 with technical assistance provided by interested consultants working in the industry.

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
- appropriate employment history
- technician recommendation by an acceptable recommender (required at Levels III and IV)

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 Charts show how many elements must be passed to meet the exam requirement for Levels I, II, III, and IV.

Work Element Examination

Fire Alarm Systems

The typical job duties and associated responsibilities of Fire Alarm 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.

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):

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 003/35001:

Technical Field Code:	003	(Fire Protection Engineering Technology)
Subfield:	3	(Fire Alarm Systems)
Level/Type:	5	(Level III General)
Work Element Sequence:	001	(SURVEYS FOR FIRE DETECTION SYSTEMS)
Work Element Number:	003/35001	(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. In addition, you will be blocked from signing up for a work element a fourth time **if it has been previously failed three times.** For further information, read Policy #20, "Retesting of Failed Work Elements," available on the Website.
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.
- **N**o 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 can be ordered from NICET's web site:
    - **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.

Examination Requirements Chart

Fire Alarm Systems

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 - 6 Level I - Special - 2 TOTAL 8	You must pass this many work elements to complete the **Level I** exam requirement.

Level II

Level I - General - 6 a Level I - Special - 2 Level II - General - 18 Level II - Special - 4 TOTAL 30	You must pass this many work elements to complete the **Level II** exam requirement. **Read Note (a)**

Level III

Level I - General - 9 c Level I - Special - 3 Level II - General - 24 c Level II - Special - 6 Level III - General - 11 c Level III - Special - 1 TOTAL 54	You must pass this many work elements to complete the **Level III** exam requirement. **Read Notes (a), (b) and (c)**

Level IV

Level I - General - 9 c Level I - Special - 3 Level II - General - 26 c Level II - Special - 6 Level III - General - 15 c Level III - Special - 1 Level IV - General - 5 c Level IV - Special - 2 TOTAL 67	You must pass this many work elements to complete the **Level IV** exam requirement. **Read Notes (a), (b), (c) and (d)**

NOTES:

(a) Work Element #31011, "Basic Metric Units and Conversions," must be passed to achieve certification at Levels II, III, and IV.

(b) 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.

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

(d) Read very carefully the two sections applicable to Level IV certification in this manual before seeking Level IV certification.

GENERAL NOTES:

(1) Passed work elements that exceed the exam requirement for a particular type and level, and are needed 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.

Technician Recommendation Form

A valid Technician Personal Recommendation form MUST be on file for the applicant before NICET can award certification at Levels III and IV. The recommendation is valid for one year from the date shown next to the recommender's signature.

The recommendation form is available on NICET's website. It must be completed by a person who is familiar with the applicant's technical capabilities and background.

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 writeup 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 fire alarm systems project should include the following information:

1. **type of project (medical facility, warehouse, shopping mall, etc.);**
2. **scope of work (number and type of alarms, detectors, pull stations, etc. installed);**
3. **time involvement (start date, end date, number of hours worked);**
4. **your supervisory responsibilities; and**
5. **range of your involvement on this project -- hazard analysis, design calculations, approvals, proposals, system installation, check-out, and final approval test.**

(Do not submit copies of drawings, material/equipment data sheets, calculations, etc.**)**

Your writeup 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.

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; candidates may bring standards and other publications that comply with the guidelines in the document “Taking a NICET Examination” (found on NICET’s website). 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.

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 three-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

Fire Alarm Systems

LEVEL I - GENERAL WORK ELEMENTS

(Work at Level I Is Performed Under Direct Supervision)

CORE WORK ELEMENTS (See Note 1)

ID No. Work Element Title and Description

31001 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, NFPA 101, Fire Alarm Signaling Systems)

31002* NFPA STANDARDS
Understand the basic application of NFPA standards to fire alarm systems. Understand basic NFPA standards terminology, including "shall" and "should" and the role of the "authority having jurisdiction." Understand the basic concept of "approved," "listed," etc. in regard to the acceptance of materials, components, and devices, and the role of testing laboratories in relation to the use of NFPA standards. Select and use appropriate NFPA standards. (See "Definition" and "Scope" sections of the standards)

31003 BASIC WIRING
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, U.L. Fire Protection Equipment Directory

31004 DEVICES AND COMPONENTS
Understand the operation and use of manual fire alarm boxes, automatic fire detectors, audible and visible signaling appliances, annunciators, and other basic components of a fire alarm system. (NFPA 72, Training Manual on Fire Alarm Systems, Fire Protection Handbook, Fire Alarm Signaling Systems)

31005 PERIODIC TESTS
Know periodic equipment and circuit testing procedures, including frequency of tests and method of testing each component and circuit of a fire alarm system. (NFPA 72)

31006 BASIC ELECTRICITY
Understand D.C. circuits, use of Ohm's Law, series and parallel circuits, resistance of wires, voltage drop calculations, use of VOM (volt-ohm-milliammeter), and A.C. circuits.

31011^ BASIC METRIC UNITS AND CONVERSIONS
Perform conversions to and from basic metric (SI) units. (IEEE/ASTM SI 10)

Note 1: General work elements are categorized as either Core or Non-Core Work Elements. Work element #31011, "Basic Metric Units and Conversions," is mandatory for certification at Levels II, III and IV. All other Level I General Core Work Elements constitute a mandatory requirement for achieving certification at Levels III and IV.

General Note: See "Selected General References" section (page 19) for information on all listed publications. We do not provide these publications; you must obtain them from the listed publishers.
(^) Generic crossover credit exists in other fields/subfields for this work element. Read information on crossover work elements on page. 3.
(*) Crossover credit exists in selected other fields/subfields for this work element. Read information on crossover work elements on page 3.

NON-CORE WORK ELEMENTS

31007* BASIC WORKING DRAWINGS
Understand the basic requirements of fire alarm system working drawings. Demonstrate good drafting techniques. Prepare simple layouts by use of good standard practice with proper line widths and letters. Produce work that meets standards of the employer and is of good standard practice in the industry. Calculate quantity and type of automatic fire detectors required and prepare job material lists. (NFPA 72, NFPA 170, drafting texts)

31008^ 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)

31009 INSTALLATION PRACTICES
Understand installation methods, proper connections to maintain circuit integrity, proper location of initiating devices, indicating appliances, control panels, annunciators and other system components to comply with fire alarm codes and standards, and assure proper operation of the system. (NFPA 72)

31010^ BASIC COMMUNICATION SKILLS
Use proper punctuation, vocabulary, spelling, and sentence structure. Follow written instructions. (See basic grammar references)

LEVEL I - SPECIAL WORK ELEMENTS

32001* PLANS, SPECIFICATIONS, AND CONTRACTS
Be familiar with architectural, mechanical, electrical, structural, and site plans. Review general and special architectural and mechanical specifications. Understand existence of and relationship among contracting parties in the construction industry. Use standard plans and specifications of jobs to determine dimensions, types of materials, elevations, locations, and other information needed for a building fire alarm system. Calculate required information from dimensions and other data on the plans and specifications. (See general construction texts and references)

32002 **Work element renumbered as #31011.**
Credit is retained by all those who previously passed it; however, in all cases, credit was changed to a **Level I General** effective June 1, 1994.

32003^ BASIC PHYSICAL SCIENCE
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)

32004 FIRE WARNING EQUIPMENT FOR DWELLING UNITS
Have basic understanding of fire warning equipment for dwelling units, its required protection, power supplies, performance, spacing and location of detectors and alarm sounding devices. (NFPA 72)

32005^ BASIC INDIVIDUAL SAFETY
Follow standard safety practices in performing job tasks. Recognize and call attention to improper safety practices at the work site. (OSHA Safety & Health Standards, Title 29 CFR Part 1910 Occupational Safety and Health Standards, Part 1926 Safety and Health Regulations for Construction)

32006^ FIRST AID PROCEDURES
Understand the basic rules and procedures of first aid. (See general handbooks on first aid)

LEVEL II - GENERAL WORK ELEMENTS

(Work at Level II Is Performed Under General Supervision)

CORE WORK ELEMENTS (See Note 2)

33001 FIRE PROTECTION PLANS AND SYMBOLS
Know the standard design symbols common to the fire alarm industry. (NFPA 170)

33002 BASICS OF SYSTEM LAYOUT
Know the basic principles of NFPA 72, including requirements for extent of protection, system alarm initiating devices, control functions, alarm indicating appliances, etc. (NFPA 72)

33003* ELECTRICAL INSTALLATION STANDARDS
Know the National Electrical Code as it applies to installation of fire alarm systems, including automatic fire detection systems, and fire suppression systems. Understand power-limited and nonpower-limited circuits and wiring. (NFPA 70, NFPA 72)

33004 BASIC FIRE ALARM SYSTEMS
Know the various types of fire alarm signaling systems. Understand the operation and differences between noncoded, zone noncoded, coded, master coded, march time coded, selective coded, zone coded, voice alarm communication and evacuation signaling systems. (NFPA 72)

33005 SUPERVISION AND SUPERVISORY SERVICE
Know the terms supervision, monitoring integrity, supervisory service, alarm signal, supervisory signal and trouble signal. Understand the basic electrical supervision requirements of a fire alarm system, its purpose, the parts of the system requiring electrical supervision, those excluded and why, how electrical supervision is achieved, which supervisory services are available, their purpose, and the type and location of each of the indicating signals listed above. (NFPA 70, NFPA 72, NFPA 101, Fire Alarm Signaling Systems)

33006 DETECTION METHODS
Know the basic principles of automatic fire detectors listed in NFPA 72. Select the best type of detection for the application and ambient conditions. (NFPA 72, NFPA 101)

33007* DETECTOR SPACING
Know the spacing and location rules for heat, smoke, and flame sensing automatic fire detectors and spot, projected beam, and aspiration type automatic fire detectors, including spacing on smooth ceilings, in irregular shaped areas, high ceilings, ceilings with joists or beams, and peaked ceilings. Determine the number of each type of detector to protect a given building area. (NFPA 72, U.L. Fire Protection Equipment Directory)

33008 POWER SUPPLIES
Know the required primary (main), secondary (standby) and trouble power supply sources for each type of fire alarm system. Calculate the size storage battery needed to supply a given system for various standby times. (NFPA 70, NFPA 72, NFPA 101, NFPA 110, Fire Alarm Signaling Systems)

33009 SYSTEM ACCEPTANCE AND PERIODIC TESTS
Understand the requirements and related procedures for conducting and documenting proper fire alarm system acceptance tests. Procedure includes (1) documentation of plans and acceptance test reports; (2) indicating approval authorities; (3) instructing owners as to the location of all alarm initiating, alarm indicating, and all other related components of the system; (4) care and maintenance of the system; and (5) providing owner with appropriate technical data sheets and maintenance manuals issued by the equipment manufacturer. Know the periodic equipment and circuit testing procedures, including frequency of tests and method of testing each component and circuit of a fire alarm system. (NFPA 72)

Note 2: General Work Elements are categorized as either Core or Non-Core Work Elements. All Level II General Core Work Elements constitute a mandatory requirement for achieving certification at Levels III and IV.

NON-CORE WORK ELEMENTS

33010* CONSTRUCTION PLANS
Understand construction plan symbols and terminology. Determine use and sizes of various building areas from plan information. Determine location of structural obstructions and other mechanical systems. (See general construction texts and references)

33011* SPECIFICATIONS AND COST ESTIMATES
Read and interpret standard specs and become familiar with the existence of General Conditions, General Mechanical Conditions, and those specifications pertaining to the fire alarm system. Distinguish those fire protection requirements often found in the heating, ventilating and air conditioning, or mechanical or electrical specifications. Be aware of the interface responsibility among fire detection devices, electrical interface requirements, and alarm indicating appliances. Know cost estimate details as they relate to the preparation of working drawings. (NFPA 70, NFPA 90A, NFPA 90B, AIA A201)

33012* CONTRACTS
Understand contractual relationships in the construction industry. (Building Professional's Guide to Contract Documents)

33013* BUILDING CODES
Understand building codes and their enforcement. Know the inter-relationship of building codes and installation standards. Review building codes to determine NFPA standards adoption and special requirements for fire alarm systems. Understand options of "trade-offs" available with regard to the elimination of sprinklers when automatic smoke detection systems are provided. For a particular building, compile information in tabular form that describes all trade-offs available under a model building code. (NFPA 101, International Building Code, Fire Protection Through Modern Building Codes, Fire Protection Handbook, NEMA Guide to Code Requirements for Fire Protective Signaling and Detection Systems)

33014 INSURANCE AUTHORITIES AND THEIR REQUIREMENTS
Understand terminology of the insurance industry as related to fire protection. Understand the role and functions of Factory Mutual Global and Insurance Services Office.

33015 GOVERNMENTAL AGENCIES
Know special fire alarm installation requirements of government agencies such as DOD, VA, state, city, and others and their relationship to national installation standards. Prepare shop drawings for submittal to government authorities.

33016 PROTECTIVE PREMISES FIRE ALARM SYSTEMS
Understand a local fire alarm system, including its purpose, types of signaling service available, basic requirements, primary and secondary power supply sources, supervision, signal appliances, and signal capacity of circuits. (NFPA 72, NFPA 101, Fire Alarm Signaling Systems)

33017 AUXILIARY FIRE ALARM SYSTEMS
Understand an auxiliary protective signaling system, including its purpose, types of auxiliary alarm systems, its application, basic requirements, special wiring requirements, power supply sources, and types of signaling services available. (NFPA 72, Fire Protection Handbook, Fire Alarm Signaling Systems)

33018 REMOTE STATION PROTECTIVE SIGNALING SYSTEMS
Understand a remote station protective signaling system, including its purpose, system operation, general requirements, power supplies at protected premises and the remote station, signal transmission, operation under fault condition, and types of services available. (NFPA 72, NFPA 101, Fire Alarm Signaling Systems)

33019 PROPRIETARY SUPERVISING STATION SYSTEMS
Understand a proprietary fire alarm system, including its purpose, system operation, general requirements, power supplies at central proprietary station and remotely located control equipment, signal transmission and processing, types of service available, performance capacities of initialing device and signaling line circuits, and alarm retransmissions. (NFPA 72)

33020 CENTRAL STATION FIRE ALARM SYSTEMS
Understand fire alarm systems for central station service, including purpose, operation, basic requirements, power supply sources at the supervising station and protected premises, signal capacity of circuits, types of signaling services available, active multiplex systems, digital alarm communicator systems, and alarm retransmission. (NFPA 72)

33021 MANUAL FIRE ALARM SYSTEMS AND GUARD'S TOUR SERVICE
Understand a manual fire alarm system, including location, mounting, and distribution of manual fire alarm boxes, and use and operation of combination manual fire alarm and guard's tour stations. Understand special requirements for guard's tour supervisory service. Lay out a combination manual fire alarm and guard's tour system based on code requirements. Know the operating principles of noncoded, coded, breakglass, nonbreakglass, pre-signal, general alarm, single action, and double action fire alarm stations, and the type of system in which each would be used. (NFPA 72, International Building Code)

33022* HEAT SENSING FIRE DETECTORS
Understand the basic principles of operation of fixed temperature, rate-of-rise, rate compensation, and combination heat sensing fire detectors, their temperature classifications, listed spacing, and the effect of thermal lag. Lay out a system of heat sensing fire detectors of both the line and spot type. (NFPA 72, Fire Alarm Signaling Systems, U.L. Fire Protection Equipment Directory)

33023* SMOKE SENSING FIRE DETECTORS
Understand the basic principles of operation of ionization, aspiration, projected beam, photoelectric obscuration, photoelectric scattering, and cloud chamber smoke sensing fire detectors, and the effect of stratification on response time. Lay out a system of smoke sensing fire detectors of line type, spot type, duct type, and sampling type, including smoke detectors for use as area smoke detectors, air duct smoke detectors, and smoke detectors for door release service. (NFPA 72, NFPA 80, NFPA 90A, Fire Alarm Signaling Systems, Fire Protection Equipment Directory, NEMA Guide for Proper Use of System Smoke Detectors, NEMA Guide for Proper Use of Smoke Detectors in Duct Applications)

33024* FLAME SENSING FIRE DETECTORS
Understand the basic principles of operation of flame flicker, infrared, photoelectric, and ultraviolet flame sensing fire detectors and the particular location and spacing requirements for flame detectors when used on indoor and outdoor applications. (NFPA 72)

33025 SPRINKLER WATERFLOW AND SUPERVISORY DEVICES
Understand the operation, location, use, and interconnection to a fire alarm system of various sprinkler wet and dry pipe alarm devices such as water flow, pressure, temperature, and level, retarding devices, gate valve supervisory switches, and fire pumps. (NFPA 13, NFPA 72, Fire Protection Handbook, Fire Alarm Signaling Systems)

33026 ALARM NOTIFICATION APPLIANCES
Understand the operation, selection, location, spacing, mounting, and use of audible and visible alarm notification appliances. (NFPA 72, NFPA 101, Fire Alarm Signaling Systems, manufacturers' text, Americans with Disabilities Act Accessibility Guidelines)

33027 BASICS OF SIGNAL TRANSMISSION
Know the types of signaling circuits on a fire alarm system, the types of signals transmitted over these circuits, and the limitations on the capacity of the signaling circuits. (NFPA 72)

33028^ 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)

33029^ INTERMEDIATE MATHEMATICS
Perform mathematical calculations utilizing basic algebra (fundamental laws, algebraic expressions), geometry, and the trigonometric functions of triangles. (See basic textbooks on algebra and trigonometry)

LEVEL II - SPECIAL WORK ELEMENTS

34001 EMERGENCY VOICE/ALARM COMMUNICATION SYSTEMS
Understand an emergency voice/alarm communication system, including its purpose, operation, basic requirements, power supply sources, survivability, and types of voice communication services available. (NFPA 72, NFPA 101)

34002 SIGNAL PROCESSING
Understand the processing of alarm signals which originate in an alarm initiating device and are processed at the control panel to operate the alarm notification appliance. Understand the basic schematic drawings of noncoded and coded fire alarm systems. (Training Manual on Fire Alarm Systems, Fire Protection Handbook, Fire Alarm Signaling Systems, electrical and electronic textbooks)

34003 SURVEYS FOR FIRE ALARM AND DETECTION SYSTEMS
Know the items required to achieve a complete survey of property for layout of and preparation of plans for an automatic fire detection and alarm system, including type of automatic fire detection devices and alarm notification appliances that are best suited for the application in keeping with applicable building and fire codes. (NFPA 72, NFPA 101, NEMA Guide to Code Requirements for Fire Protective Signaling and Detection Systems, Fire Alarm Signaling Systems, International Building Code)

34004 FIRE ALARM SYSTEM MAINTENANCE
Maintain a fire alarm system. Know the tests and inspections that identify components that have become undependable or inoperative. Know which components are field serviceable. Know methods of cleaning, checking, operating, and adjusting the system and its components to keep the system in an operative condition. (NFPA 72, electrical textbooks)

34005 FIRE ALARM SYSTEM WIRING
Understand the proper types of wire, cable, or conduit used on a fire alarm system, 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)

34006 EMERGENCY EVACUATION SIGNALS
Understand the recommended fire alarm evacuation signal, its purpose, where it is used, the recommended sound pressure level in various occupancies and modes, and how to determine the sound pressure level needed. (NFPA 72, ANSI S1.4 with Amd.S1.4A)

34007 COMBINATION SYSTEMS
Understand the combination systems that are permitted by the codes, such as paging, music, burglar alarm, energy management, and process monitoring, their purpose, restrictions, basic requirements, supervision, and priority of signals. (NFPA 72, Fire Protection Handbook, Fire Alarm Signaling Systems)

LEVEL III - GENERAL WORK ELEMENTS

CORE WORK ELEMENTS (See Note 3)

35001 SURVEYS FOR FIRE DETECTION SYSTEMS
Know the items required to achieve a complete survey of property for layout of automatic fire detection systems plans. Determine which classification of fire detectors (heat, smoke, etc.) is most suitable for each section of the protected property and determine the quantity required. Determine the best location and most suitable type of alarm signals for the property and the best location for the controls, annunciators, etc. (Fire Alarm Signaling Systems, Fire Protection Handbook)

35002 SHOP AND RISER DRAWINGS
Review shop and riser drawings prepared by others for compliance with both the manufacturers' requirements and contract specifications regarding detector classification, type, operating principles, and quantities required. Check drawings for completeness of detail and consistency with codes, including accuracy of detector spacing. (AIA A 201, Construction Contracting)

35003 AS-BUILT DRAWINGS
Understand what must be included in a proper as-built drawing and how the changes are made from the original submittal to as-built, including distribution of the final copies. (NFPA 72, Fire Alarm Signaling Systems)

35004 PRINCIPLES OF SMOKE MOVEMENT IN BUILDINGS
Understand the principles of smoke generation, expansion of gases, smoke movement in tall buildings, stack effect, influence of floors and partitions, and influence of ventilation systems. (Fire Protection Handbook, SFPE Handbook of Fire Protection Engineering)

35005 SUPPLEMENTARY CIRCUITS
Understand supplementary functions and circuits permitted by the code, such as fan shutdown, elevator capture, and smoke management systems, their purpose, location, operation, restrictions, and supervision requirements. (NFPA 72, NFPA 101, ANSI/ASME A 17.1)

35006 PREMISES SIGNAL TRANSMISSION
Understand how signals and system power are transmitted within a system at the protected premises in local, auxiliary, remote station, proprietary, and central station systems. Know which power and alarm signals can and cannot be transmitted over the same transmission path, and understand why. (NFPA 72)

35007 BASIC ELECTRONICS
Understand basic electronic circuits, components, and concepts, including inductance, capacitance, relays, LED's, transistor switches, diodes, oscillators, and amplifiers.

35008 ALARM NOTIFICATION APPLIANCES
Understand audible, visible, and combination alarm notification appliances and their application, including such concepts as alarm by zone, alarm signal coordination with other systems in the building, visual and tactile alarm appliances for the handicapped, attenuation of audible signals by distance and building partitions, background noise considerations, and recommended signal levels above ambient. (NFPA 72, NFPA 101, ANSI S 12.31)

Note 3: General Work Elements are categorized as either Core or Non-Core Work Elements. All Level III General Core Work Elements constitute a mandatory requirement for achieving certification at Levels III and IV.

NON-CORE WORK ELEMENTS

35009 BASIC PRINCIPLES OF COMBUSTION
Understand fire signatures as they relate to fire detection. (Fire Alarms Signaling Systems)

35010 STYLES OF CIRCUITS
Based upon their ability to indicate alarm and trouble at the central control equipment during specified abnormal conditions, identify the different styles of initiating device, signaling line, and notification appliance circuits, and know how they work. Understand the relationship between styles of circuits and Class "A" and "B" circuits. (NFPA 72)

35011 SYSTEM AND COMPONENT COMPATIBILITY
Understand the need for system compatibility between components, such as two-wire smoke detectors and a two-wire initiating circuit, supplementary smoke detector relays, and the system control equipment. Know whether all components of the fire alarm system have been properly tested for compatibility by a testing lab. (UL 217, UL 268, UL 268A, UL 864, Fire Alarm Signaling Systems)

35012 TRANSIENT AND 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 Standards, Fire Alarm Signaling Systems, basic electronic textbooks)

35013 ADDRESSABLE SYSTEMS
Understand the concept of addressable devices, their benefits, wiring methods, and how circuit integrity is verified. 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)

35014 MULTIPLEXING
Understand the concept of multiplexing, how active and passive multiplexing circuits operate, types of active and passive systems and components, wiring methods, and the function of microprocessor units. (Fire Alarm Signaling Systems)

35015 INTERCONNECTION WITH EXTINGUISHING SYSTEMS
Understand how automatic fire alarm systems are used to actuate extinguishing systems, including sprinkler, halon 1301, carbon dioxide or CO_2, FM-200, Intergen, FE-13, wet and dry chemical, foam and hi-ex foam. Know which 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. (NFPA 2001, Fire Protection Handbook, Fire Alarm Signaling Systems)

35016^ TECHNICAL PRESENTATIONS AND REPORTS
Organize and deliver oral presentations and prepare technical reports and correspondence.

LEVEL III - SPECIAL WORK ELEMENTS

36001 OFF-PREMISES TRANSMISSION CIRCUITS
Know the basic characteristics of signaling transmission technologies and circuits (wire, wireless, fiber optics, etc.) and how signals are transmitted through each system. Know the advantages and limitations of each type and where each is permitted in the codes and standards. (NFPA 70, NFPA 72, Fire Alarm Signaling Systems)

36002 LOW POWER WIRELESS LOCAL SIGNALING SYSTEMS
Understand low power wireless systems. where they are permitted, and the supervision, power supply, alarm transmission, and special signaling required for their use. (NFPA 72, Fire Alarm Signaling Systems)

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 at least one major fire alarm systems project. There are no exceptions to this requirement. See "Level IV Major Project" section in this manual.

CORE WORK ELEMENTS (See Note 4)

37001 **No longer available for testing.**
Effective April 1, 2003, "Automatic Fire Detector Spacing" is no longer available for testing. Credit is retained by all those who previously passed it**.**

37002 SYSTEM FEATURES FOR HOSTILE ENVIRONMENTS
Understand system design features needed for applications subject to severe environments, including structures that are unheated or subject to vandalism or physical abuse (for example, prisons or mental hospitals), high humidity, or corrosive or salty atmospheres. (NFPA 70, NFPA 72, NFPA 101)

37003 SYSTEM RELIABILITY
Know the methods of installation that will help increase the reliability and survivability of a system. Understand how to locate the equipment in a suitable environment, how to provide physical protection of wiring and components, and how to use proper wiring methods. Lay out an evacuation system to assure that attack, by fire, on one paging zone will not cause the loss of communication on other paging zones. (NFPA 70, NFPA 72)

37004 HAZARD ANALYSIS
Analyze the fire threat in a given facility and select the optimum alarm equipment to deploy against that threat. (NFPA 72, SFPE Handbook of Fire Protection Engineering)

37005 AVOIDANCE OF NUISANCE ALARMS
Understand the importance of proper location of fire detectors and the need for an ongoing maintenance program for automatic fire alarm systems. Understand available system features to reduce unwanted alarms from smoke detectors and other initiating devices, including alarm verification for spot type smoke detectors, positive alarm sequencing, cross zoning, electronic and pneumatic retard mechanisms for sprinkler water flow switches, and presignal systems (where permitted by the AHJ). (NFPA 72, NFPA 101, UL 864, ANSI A17.1, Training Manual on Fire Alarm Systems, Fire Protection Handbook.)

NON-CORE WORK ELEMENTS

37006 SPECIAL PROTECTION
Lay out a fire detection system for protection of an electronic computer data processing facility. Show the proper location, mounting and spacing of smoke detectors, and the interconnection of the smoke detection system with various extinguishing systems. Understand the concept of cross zoning and proper sequential shutdown for a computer facility. Lay out a fire detection system in a hi-rack storage facility showing the proper location, mounting and spacing of the detectors, and the interconnection of the fire detection system with various extinguishing systems. (NFPA 12A, NFPA 13, NFPA 72, NFPA 75, NFPA 230, Fire Protection Handbook, Fire Alarm Signaling Systems)

37007 REQUIREMENTS FOR LISTING
Understand how fire alarm signaling equipment is reviewed and tested by testing laboratories before being listed. Understand the requirements for the general construction, the components, performance and manufacturing follow-up by the testing laboratories. (U. L. Fire Protection Equipment Directory, Fire Alarm Signaling Systems)

LEVEL IV - SPECIAL WORK ELEMENTS

38001 PUBLIC FIRE ALARM REPORTING SYSTEMS
Understand the general requirements for communication centers and fire stations. Know the various types of dispatching systems, including wired, radio, telephone, and computer aided dispatch (CAD) systems. Understand the fundamentals of public reporting systems and know the types of systems used. (NFPA 72, NFPA 1221, Fire Protection Handbook, Fire Alarm Signaling Systems)

Note 4: General Work Elements are categorized as either Core or Non-Core Work Elements. All Level IV General Core Work Elements constitute a mandatory requirement for achieving certification at Level IV.

38002 PROJECT SCHEDULING AND 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)

38003 CONTRACTUAL REQUIREMENTS AND INTERPRETATIONS

Interpret contractual requirements and the specific effects of various clauses on the contractor's performance. Understand the element of "liability" and its application to performance and payment bonds, liquidated damages, "hold harmless" phrases, and insurance coverage. Establish procedures to report on and conform to the requirements of federal and state regulations, including affirmative action, Copeland and Davis-Bacon, payroll affidavits, minority subcontracting, Executive Orders 11246 and subsequent 11375, Small Business programs, women-owned business programs, OSHA, and tax considerations. Meet the obligations of contract administration, including preparation of project cost breakout for billing purposes, equipment submittals, purchase orders, project meetings, and coordination requirements. Prepare timely and accurate requisitions. Consider revenue factors, including retention and progress payments. Review punch list items and final job completion with consideration of release of liens. (Building Professional's Guide to Contract Documents)

38004 BID INVITATION PACKAGE AND BID PROPOSAL

Review and analyze the contents of the typical bid package, including the project manual, all specifications, contract drawings, addenda, modifications, and special instructions to bidders. Identify and resolve any conflicts between General Specifications, Mechanical Specifications, and Fire Protection requirements. Interpret requirements of all local building codes and standards as they apply to the project. Detail and consider all special requirements that may affect cost and company liability such as bonds, federal and state labor standard requirements, affirmative action, and "Buy American" clauses. Review insurance requirements and their possible effect on project costs. Examine liability potential on project performance such as scheduling, completion dates, and penalties. Compute quantities of materials, applying appropriate standard cost factors. Analyze labor requirements for each job operation, applying appropriate time element and unit cost factors. When all costs have been compiled and appropriate "overhead" items have been applied, complete the bid form to comply with instructions and perform final review to ensure conformance to all requirements. (Building Professional's Guide to Contract Documents)

38005 SMOKE CONTROL SYSTEMS

Understand smoke control systems; understand the purpose, operation, methods of controlling smoke spread, basic requirements, types, and location of smoke detectors used to help achieve smoke control in smoke compartments, air duct systems, and door release service. (NFPA 72, NFPA 90A, NFPA 92A, Fire Protection Handbook, SFPE Handbook of Fire Protection Engineering, Fire Alarm Signaling Systems)

38006 HEAT DETECTORS

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, the way each type of heat detector responds to a fire, and the methods used by testing labs to determine the suitability of a heat detector for listing. (NFPA 72, UL-521, Fire Protection Handbook)

38007 SMOKE DETECTORS

Understand the theory of operation of smoke detectors of the ionization, projected beam, aspiration, photoelectric, and cloud chamber operating principle of operation. Know the proper and improper applications of smoke detectors, the way each type of smoke detector responds to a fire, and the methods used by testing labs to determine the suitability of a smoke detector for listing. (NFPA 72, UL-268, Fire Protection Handbook)

38008 RADIANT ENERGY SENSING FIRE DETECTORS

Understand the theory of operation of flame detectors of the infrared and ultraviolet principle of operation. Know the proper and improper application of flame detectors, the way each type of flame detector responds to a fire, and the methods used by testing laboratories to determine the suitability of a flame detector for listing. (NFPA 72, Fire Protection Handbook)

38009 COMPUTER/MICROPROCESSOR 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)

Personal Tally Sheet

Passed Work Elements in Fire Alarm Systems

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

LEVEL I GENERAL

_31001 **(Core)**
_31002 **(Core)**
_31003 **(Core)**
_31004 **(Core)**
_31005 **(Core)**
_31006 **(Core)**
_31007
_31008
_31009
_31010
_31011 (Core) *Read footnote

LEVEL I SPECIAL

_32001
_32003
_32004
_32005
_32006

LEVEL II GENERAL

_33001 **(Core)**
_33002 **(Core)**
_33003 **(Core)**
_33004 **(Core)**
_33005 **(Core)**
_33006 **(Core)**
_33007 **(Core)**
_33008 **(Core)**
_33009 **(Core)**
_33010
_33011
_33012
_33013
_33014
_33015
_33016
_33017
_33018
_33019
_33020
_33021
_33022
_33023
_33024
_33025
_33026
_33027
_33028
_33029

LEVEL II SPECIAL

_34001
_34002
_34003
_34004
_34005
_34006
_34007

LEVEL III GENERAL

_35001 **(Core)**
_35002 **(Core)**
_35003 **(Core)**
_35004 **(Core)**
_35005 **(Core)**
_35006 **(Core)**
_35007 **(Core)**
_35008 **(Core)**
_35009
_35010
_35011
_35012
_35013
_35014
_35015
_35016

LEVEL III SPECIAL

_36001
_36002

LEVEL IV GENERAL

_37001 **** (Deleted – see note)**
_37002 **(Core)**
_37003 **(Core)**
_37004 **(Core)**
_37005 **(Core)**
_37006
_37007

LEVEL IV SPECIAL

_38001
_38002
_38003
_38004
_38005
_38006
_38007
_38008
_38009

*** This work element was formerly numbered #32002. Effective July 1, 1994, everyone who passed it as #32002 had their credit changed to #31011. As a result, some applicants are now short one element in the Level I Special category.**

**** Effective April 1, 2003, Work element 37001 is no longer available for testing. Credit is retained by all those who previously passed it.**

All General Work Elements are categorized as either Core or Non-Core Work Elements.

- **Work Element #31011 is mandatory for achieving certification at Levels II, III, and IV.**
- **All Level I, II, and III General Core Work Elements are <u>mandatory</u> for achieving Level III certification.**
- **All Level I, II, III, and IV General Core Work Elements are <u>mandatory</u> for achieving Level IV certification.**

1016-04-03

Relevant Standards

The following organizations issue standards appropriate to this certification program. The standards below are specifically referenced in the work element listing. On NICET's web site is a table, "Fire Standards Referenced in NICET Exams," that lists the edition year of the NFPA standard used in writing the test questions. Examinees are strongly recommended to bring the indicated standard editions to the test center.

National Fire Protection Association (NFPA)

NFPA 12A	Halon Fire Extinguishing Systems
NFPA 13	Installation of Sprinkler Systems
NFPA 70	National Electrical Code
NFPA 72	National Fire Alarm Code
NFPA 75	Protection of Electronic Computer/Date Processing Equipment
NFPA 80	Fire Doors and Windows
NFPA 90A	Air Conditioning and Ventilating Systems
NFPA 90B	Warm Air Heating and Air Conditioning Systems
NFPA 92A	Smoke Control Systems
NFPA 101	Life Safety Code
NFPA 110	Emergency Power Supplies
NFPA 170	Fire Safety Symbols
NFPA 230	Fire Protection of Storage
NFPA 1221	Installation, Maintenance and Use of Public Fire Service Communication Systems
NFPA 2001	Fire Extinguishing Systems, Clean Agent

American Society for Testing and Materials (ASTM)

IEEE/ASTM SI 10	Use of the International System of Units (SI): The Modern Metric System

American Institute of Architects

A201	General Conditions of the Contract for Construction 1997

American National Standards Institute (ANSI) and American Society of Mechanical Engineers (ASME)

ANSI/ASME A17.1	Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks
ANSI S12.31	Precision Methods for the Determination of Sound Pressure Loss of Wideband Noise Sources in Reverberation Rooms
ANSI S1.4 with Amd.S1.4A	Specification for Sound Level Meters

Underwriter's Laboratories

UL-217
UL-268
UL-268A
UL-521
UL-864

Selected General References - Fire Alarm Systems

The following publications are cited in the Work Element descriptions. Candidates may bring these publications to the test center:

Clough, Richard H., Glenn A. Sears, S. Keoki Sears. Construction Contracting. John Wiley & Sons, Inc. New York, NY.

Fire Alarm Signaling Systems (FASS-94). National Fire Protection Association. Quincy, MA.

Fire Protection Handbook. National Fire Protection Association. Quincy, MA.
Fire Protection Through Modern Building Codes. American Iron and Steel Institute. Washington, DC.

International Building Code. International Code Council. Birminham, AL

NEMA Guide to Code Requirements for Fire Protective Signaling and Detection Systems. National Electrical Manufacturers Association, Alexandria, VA.

NEMA Guide for Proper Use of System Smoke Detectors. National Electrical Manufacturers Association. Alexandria, VA.

NEMA Guide for Proper Use of System Smoke Detectors in Duct Applications. National Electrical Manufacturers Association. Alexandria, VA.

OSHA Safety & Health Standards Title 29 CFR Part 1910 Occupational Safety and Health Standards, Part 1926 Safety and Health Regulations for Construction.

Poage, Waller S. Building Professional's Guide to Contract Documents. RS Means Co. Kingston, Massachusetts.

SFPE Handbook of Fire Protection Engineering. Available from National Fire Protection Association. Quincy, MA.

Training Manual on Fire Alarm Systems. National Electrical Manufacturers Association. Alexandria, VA.

U. L. Fire Protection Equipment Directory. Underwriters Laboratories, Inc. Northbrook, IL.

General textbooks or handbooks on first aid, basic grammar and writing, math, algebra, trigonometry, physics, computers, drafting, electronics, electrical engineering, and electrical engineering technology, construction

The following publications were recommended by the committee who developed and/or updated the program. Candidates may bring these publications to the test center:

Americans with Disabilities Act Accessibility Guidelines. www.jan.wvu.edu/links/adalinks.htm

Bryan, John L. Fire Suppression and Detection Systems. MacMillan. New York, NY.

Gagnon, Robert M. Design of Special Hazard and Fire Alarm Systems. Delmar Publishers. Albany, NY.

General Conditions of the Contract for Construction. American Institute of Architects. Washington D.C.

NFPA Inspection Manual. National Fire Protection Association. Quincy, MA.

Guidelines for First Aid. American Red Cross. Washington, D.C.
www.redcross.org/static/file_cont4913_lang0_1727.pdf

Other Resources

Manufacturers' test manuals related to system acceptance and periodic tests

Manufacturers' data related to signal processing

Important Note:
References will be allowed in NICET test centers ONLY if they meet NICET's published guidelines. Please view the document "Taking a NICET Examination" on NICET's website.

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1-888-476-4238
www.nicet.org

EXAMINATION SCORE REPORT

SAMPLE

Exam No. 99999
Examinee: JOHN EXAMINE

Test Date: 06/17/97
Report Date: 07/11/97

Work Element Number and Title	Score (%)	Pass/Fail
FIRE ALARM SYSTEMS		
3031001 Basic Fire Alarm Systems	75.00	P
3031002 NFPA Standards	80.00	P
3031003 Basic Wiring	35.00	F*
3031004 Devices and Components	65.00	P
3031005 Periodic Tests	80.00	P
3031006 Basic Electricity	100.0	P
3031007 Basic Working Drawings	20.00	F**
3031008 Fundamentals of Mathematics	90.00	P
3031009 Installation Practices	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 of 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 of this work element. A request to retest it will not be considered until you have complied with NICET Policy #20.**

JOHN DOE
1420 King Street
Alexandria, Virginia 22314-2794