



# National Fire Academy

**R0263 – Commercial Fire Sprinkler System Plans Review  
Version: 1st Edition, 3rd Printing, May 2023**

**Quarter:**

**ACE Credit: In the upper-division baccalaureate degree category, 3 semester hours in fire engineering.**

**IACET Continuing Education Units: 3.6**

**Length of Course: 5 Days (36 hr., 15 min. contact hours, Monday – Friday)**

**Prerequisite: Yes**

**Curriculum: Fire Protection: Technical  
Training Specialist: Keith Heckler**

**Instructor:**

**Instructor email/phone:**

**Classroom: J-**

**Meeting Time: 8 AM – 5 PM**

## Table of Contents

Course Description	Course Resources
Primary and Secondary Audience	Evaluation Procedures
Course Scope	Course Outline
Course Objectives	Policies
Course Delivery Method	Grading Rubrics

## Course Description (Catalog)

R0263 – “Commercial Fire Sprinkler System Plans Review.” This 5-day course will enable students to perform commercial fire sprinkler system plan reviews to allow structured decision-making in the target audiences' real-life job-related situations and responsibilities. These skills are essential to meet code officials' needs so they may conduct reviews and approve plans for sprinkler fire protection systems in their jurisdiction. The scope of this course spans instruction in the knowledge and skill necessary to evaluate the soundness and code compliance of engineering and architectural plans for commercial fire sprinkler systems proposed as part of facility and occupancy construction plans. The course will enable students to perform a plan

review to evaluate the suitability of the fire sprinkler system calculations in accordance with nationally recognized standards for design and installation. In order to view online codes, students are required to bring a Wi-Fi ready laptop or tablet.

### **Student Qualifications (Primary and Secondary Audience)**

The target audience for this course includes fire service prevention and allied public officials who are responsible for the review of plans for sprinkler and standpipe systems in their jurisdictions. Applicants to this course should have familiarity with fire protection, codes/standards compliance, and fire protection systems and equipment.

### **Course Scope (Goal)**

The scope of this course spans instruction in the knowledge and skill necessary to evaluate the soundness and code compliance of engineering and architectural plans for commercial fire sprinkler systems proposed as part of facility and occupancy construction plans. The course will enable students to perform a plans review to evaluate the suitability of the fire sprinkler system calculations in accordance with nationally recognized standards for design and installation. Course content covers fire protection standards, plan reading, parts of a submittal package, classifying hazards, water supplies, sprinkler system components, remote areas and evaluating hydraulics calculations.

Students should be familiar with commercial fire sprinkler systems equipment and nomenclature, and have prior experience in fire prevention inspection programs and community goals and priorities. It is recommended that students meet the following minimum requirements:

- Incident Command System (ICS)-100-level and ICS-200-level training. Preferred courses are Q0462 and Q0463, available through NFA Online. Chief's signature attests that the applicant has completed this required training.
- Students in the fire service should not have less than three years' experience in either a code enforcement or fire safety inspection/plans review function.
- Allied professionals should possess an associate degree in engineering, architecture, building design or risk management from an accredited college.
- Required pre-application course work:
  - Q0218: Testing and Evaluation of Water Supplies for Fire Protection.

Priority enrollment will be given to applicants with one of the following:

- Completion of Fire Inspection Principles (FIP) I or FIP II.
- Completion of the "Plans Review for Fire and Life Safety" course.
- International Code Council (ICC) Fire Plans Examiner certification.

- ICC Commercial Plans Examiner certification.
- National Fire Protection Association (NFPA) Fire Plans Examiner certification.

The purpose of this course is to prepare qualified students to review and evaluate commercial fire sprinkler systems plans as part of the public code compliance and enforcement functions of the community fire prevention mission.

### **Course Objectives (Course Learning Outcomes – TLOs)**

After successfully completing this course, you will be able to accomplish the following:

- Evaluate the materials for completeness and compliance with locally and nationally recognized design standards given a sample fire sprinkler plans submittal package.
- Evaluate if the proposed sprinkler design is suitable for the hazard classification given a nationally recognized design standard and description of building use and contents.
- Evaluate the water supply system's ability to supply a fire protection system given the performance capabilities of a water supply system and a set of plans.
- Evaluate the adequacy of sprinkler system components for the intended use and compliance with recognized listings, standards and manufacturer's specifications given a set of manufacturer's datasheets.
- Verify that sprinkler spacing and installation are in compliance with nationally recognized standards given fire protection system plans.
- Evaluate the arrangement of the hydraulically remote area given a set of design drawings.
- Evaluate if the calculation inputs are accurate given a set of plans with hydraulic calculations.

### **Course Delivery Method**

The National Fire Academy (NFA) offers specialized training courses and advanced management programs of national impact in an academic classroom environment [on campus at the National Emergency Training Center \(NETC\) in Emmitsburg, Maryland](#). This classroom course is designed for the national level fire service officer from State and local fire service organizations. During this 6-day delivery, students will reside in dormitories provided on campus with classes conducted in classrooms designed for critical student/instructor interaction. All course materials are designed for interactive classroom environments, in either paper notebook or electronic formats.

## Course Schedule

The purpose of the course schedule is to give you, at a glance, the required preparation, activities, and evaluation components of your course.

<b>DAY 1</b>	<b>DAY 2</b>
Introduction, Welcome and Administrative	Unit 3: Water Supplies and Delivery Systems
<i>Break</i>	<i>Break</i>
Unit 1: Preparing for Plans Review Activity 1.1: Drawing/Grid Details	Activity 3.1: Available Stored Water Supply
<i>Break</i>	<i>Break</i>
Activity 1.2: National Fire Protection Association 13 Working Plan Details	Activity 3.2: Verifying National Fire Protection Association 24 Compliance Activity 3.3: Water Supply Effective Point
<i>Lunch</i>	<i>Lunch</i>
Activity 1.3: Finding Gaps in Submittal Packages Unit 2: Hazard Classification Activity 2.1: National Fire Protection Association 13, Sprinkler Hazard Classifications (Part 1)	Activity 3.4: Water Supplies for Sprinkler Systems Unit 4: System Components and Materials
<i>Break</i>	<i>Break</i>
Activity 2.2: National Fire Protection Association 13, Sprinkler Hazard Classifications (Part 2) Activity 2.3: Density/Area Curves Activity 2.4: “Real World” Impacts Activity 2.5: Density/Area Verification	Activity 4.1: Verification Between Plans and Equipment Submittal Activity 4.2: Determining Sprinkler Water Flows

Note: This schedule is subject to modification by the instructors and approved by the training specialist.

<b>DAY 3</b>	<b>DAY 4</b>
Unit 5: Fire Sprinkler System Layout	Unit 6: Hydraulic Remote Design Areas
<i>Break</i>	<i>Break</i>
Activity 5.1: Building Construction	Activity 6.1: Verifying Adjusted Remote Areas
<i>Break</i>	<i>Break</i>
Activity 5.2: Verify Sprinkler Spacing	Activity 6.2: Determining the Minimum Length of Remote Area and the Minimum Number of Sprinklers in the Remote Area
<i>Lunch</i>	<i>Lunch</i>
Activity 5.3: Obstructed Construction	Unit 6: Hydraulic Remote Design Areas (cont'd) Unit 7: Evaluating Sprinkler Hydraulic Calculations
<i>Break</i>	<i>Break</i>
Activity 5.4: Compartments and Small Rooms	Unit 7: Evaluating Sprinkler Hydraulic Calculations (cont'd)

<b>DAY 5</b>
Activity 7.1: Formula Exercise
<i>Break</i>
Activity 7.2: Hydraulic Calculations
<i>Break</i>
Activity 7.2: Hydraulic Calculations (cont'd) Activity 7.3: Reviewing Calculations for Plans
<i>Lunch</i>
Activity 7.3: Reviewing Calculations for Plans (cont'd)
<i>Break</i>
Course Review Final Exam Course evaluation Course graduation

## **Course Resources (Instructional Materials)**

In order to be fully prepared, obtain a copy of the required textbooks and other instructional materials prior to the first day of class.

### **Required Readings**

The student must complete required readings during the course to be able to thoughtfully participate in discussions and activities.

None.

### **Suggested Reading/Resources**

Suggested readings and resources are not evaluated, but may enhance the student's understanding, serve as additional sources for citation and promote discussion of course material.

None.

### **Required Resources (Course Textbook)**

Student Manual.

### **Supplemental Resources (Supplemental Course Textbook)**

None.

## **Grading Methodology (Evaluation Procedures)**

The students' final grades will be computed using the final exam. The final exam will include 46 multiple-choice questions (46% of the total grade). The exam covers all the information in the Student Manual (SM), as well as the concepts presented during presentations and class discussions. In addition, eight activities in the course will be evaluated using points (54 pts. total, 54% of the total grade).

The required performance to successfully complete the course is attained by completing the class with at least a “C” or higher.

<b>Assessment Tool</b>	<b>Point Score</b>	<b>Final Grade %</b>
Precourse Assignment	10	54%
Activity 1.3	3	
Activity 2.3	5	
Activity 2.5	4	
Activity 3.4	6	
Activity 6.1	6	
Activity 6.2	5	
Activity 7.2	15	
Final Exam	46	46%
<b>Totals</b>	<b>100</b>	<b>100%</b>

<b>Score Range</b>	<b>Letter Grade to be Assigned to Student</b>
90-100	A
80-89	B
70-79	C
69 or less	F

### **Required Reading Assignments**

Student completion of reading assignments will be done via evaluation of their class participation and will not be a separately graded activity.

### **Suggested Readings**

Suggested readings are not evaluated, but may enhance the student’s understanding and promote discussion of course material.



## **Course Outline**

### **Unit 1: Preparing for Plans Review**

#### **Objectives**

##### **Terminal Objective**

The students will be able to:

- 1.1 Evaluate the materials for completeness and compliance with locally and nationally recognized design standards given a sample fire sprinkler plans submittal package.

##### **Enabling Objectives**

The students will be able to:

- 1.1 Conclude if the appropriate National Fire Protection Association (NFPA) standards specific to sprinkler and standpipe systems are selected.
- 1.2 Explain plan symbols, notes and details found on the site drawings and the shop drawings.
- 1.3 Validate the basic submittal package for compliance with locally adopted rules and standards, or special rulings.
- 1.4 Identify special supplemental information that may be required.
- 1.5 Evaluate the basic submittal package completeness to approve or reject the submittal.

### **Unit 2: Hazard Classification**

#### **Objectives**

##### **Terminal Objective**

The students will be able to:

- 2.1 Evaluate if the proposed sprinkler design is suitable for the hazard classification given a nationally recognized design standard and description of building use and contents.

## **Enabling Objectives**

The students will be able to:

- 2.1 Describe elements that establish hazard classification for design.
- 2.2 Evaluate use and storage conditions identified in National Fire Protection Association (NFPA) 13, Standard for the Installation of Sprinkler Systems.
- 2.3 Describe special hazards in NFPA 13 that would require additional protection levels.
- 2.4 Interpret design density curves from NFPA 13.
- 2.5 Determine if the submittal provides the appropriate level of protection for the hazard.

## **Unit 3: Water Supplies and Delivery Systems**

### **Objectives**

#### **Terminal Objective**

The students will be able to:

- 3.1 Evaluate the water supply system's ability to supply a fire protection system given the performance capabilities of a water supply system and a set of plans.

#### **Enabling Objectives**

The students will be able to:

- 3.1 Compare the volume, reliability, functionality and features of the water sources available to supply sprinklers.
- 3.2 Conclude if the specific sample water supply system components comply with National Fire Protection Association (NFPA) 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
- 3.3 Determine if the underground piping configuration meets nationally recognized standards.
- 3.4 Evaluate the water supply test point data using a site plan.
- 3.5 Evaluate the calculations for the water storage capacity of a cylindrical suction tank and a water storage reservoir.
- 3.6 Verify the minimum required water supply for a sprinkler system.
- 3.7 Verify the minimum required water supply for a combined sprinkler system.

## **Unit 4: System Components and Materials**

### **Objectives**

#### **Terminal Objective**

The students will be able to:

- 4.1 Evaluate the adequacy of sprinkler system components for the intended use and compliance with recognized listings, standards and manufacturer's specifications given a set of manufacturer's datasheets.

#### **Enabling Objectives**

The students will be able to:

- 4.1 Identify the corresponding components and equipment on system design drawings using provided data sheets.
- 4.2 Conclude if a specified pipe meets all requirements and listings for its intended use and installation in accordance with recognized codes and standards.
- 4.3 Determine the characteristics and limitations of various types of pipe in accordance with the listings and approvals.
- 4.4 Determine hanger and riser bracing requirements.
- 4.5 Interpret the information on a product data sheet in relation to listings intended for use as a part of a sprinkler system design.

## **Unit 5: Fire Sprinkler System Layout**

### **Objectives**

#### **Terminal Objective**

The students will be able to:

- 5.1 Verify that sprinkler spacing and installation are in compliance with nationally recognized standards given fire protection system plans.

#### **Enabling Objectives**

The students will be able to:

- 5.1 Conclude if the design of the sprinkler system provides compliant coverage for all areas as required.

- 5.2 Determine if the spacing of the sprinklers is compliant.
- 5.3 Evaluate proposed sprinklers for application suitability.
- 5.4 Evaluate sprinkler positioning with respect to construction configuration.

## **Unit 6: Hydraulic Remote Design Areas**

### **Objectives**

#### **Terminal Objective**

The students will be able to:

- 6.1 Evaluate the arrangement of the hydraulically remote area given a set of design drawings.

#### **Enabling Objectives**

The students will be able to:

- 6.1 Identify the appropriate design method for the intended use area (room/area/storage).
- 6.2 Determine the most hydraulically demanding area based upon the use, occupancy and location of the space.
- 6.3 Determine the size and orientation of the most hydraulically remote area.
- 6.4 Identify sprinkler design area modification as prescribed in National Fire Protection Association (NFPA) 13, Standard for the Installation of Sprinkler Systems.
- 6.5 Calculate the minimum length required for the remote area.
- 6.6 Determine the spacing of sprinklers within the remote area.
- 6.7 Determine the minimum number of sprinklers required to be in the remote area.
- 6.8 Determine the minimum number of sprinklers on a branch line.
- 6.9 Determine the appropriate water flow rate to satisfy required levels of protection based on design density or area application as per recognized standards.
- 6.10 Conclude whether the remote area provides compliant protection for the intended hazard classification.

## **Unit 7: Evaluating Sprinkler Hydraulic Calculations**

### **Objectives**

#### **Terminal Objective**

The students will be able to:

- 7.1 Evaluate if the calculation inputs are accurate given a set of plans with hydraulic calculations.

#### **Enabling Objectives**

The students will be able to:

- 7.1 Conclude if minimum flow quantities from sprinkler meet density requirements.
- 7.2 Conclude if minimum sprinkler pressure is provided at most remote sprinkler.
- 7.3 Distinguish the computer calculation's flow path, as indicated by shop drawing nodes.
- 7.4 Conclude if sprinkler piping diameter on plans matches diameter used in calculations.
- 7.5 Conclude if C-value used in calculations matches piping characteristics.
- 7.6 Conclude if elevation changes are incorporated into calculations.
- 7.7 Conclude if fixed loss influences are included in calculations.
- 7.8 Conclude if hose streams are incorporated into calculations in the appropriate location.
- 7.9 Conclude if total pressure and flow for sprinkler system is less demanding than water supply provided.
- 7.10 Compare and contrast system demand curve including safety margin with the water supply curve.

### **Policies**

#### **Class Attendance and Cancellation Policy**

##### **Attendance**

- You are required to attend all sessions of the course. If you do not, you may not receive a certificate, and your stipend may be denied.

- If you need to depart campus early and miss any portion of the course and/or graduation, you must make the request in writing to the NFA training specialist. The training specialist, in collaboration with the superintendent, may waive the attendance requirement in order to accommodate you with extraordinary circumstances as long as you complete all course requirements. If you receive approval for departing early, you must forward the approval to the Admissions Office so your stipend reimbursement is not limited.

### **Student Substitutions**

Substitutions for NFA courses are made from waiting lists; your fire department can't send someone in your place.

### **Cancellations or No-Shows**

NFA's mission for delivery of courses is impaired significantly by cancellations and no-shows. It is very difficult and costly to recruit students at the last minute. Currently there is a two-year ban on student attendance for students who are no-shows or cancel within 30 days of the course start date without a valid reason. If you receive such a restriction, your supervisor needs to send a letter to our Admissions Office explaining the cancellation/no-show.

### **Course Failure**

If you fail an on-campus course, you will not be issued a stipend for that course. You can reapply for the failed course or any other NFA course and go through the random selection process. You don't have to successfully complete the failed course before attending another NFA course.

### **Student Code of Conduct Policy**

Students, instructors and staff are expected to treat each other with respect at all times. Inappropriate behavior will not be tolerated and may result in removal from campus and denial of stipends.

### **Writing Expectations**

Student writing will conform to the generally accepted academic standards for college papers. Papers will reflect the original work of the student and give appropriate credit through citations for ideas belonging to other authors, publications or organizations. Student written work should be free of grammatical and syntax errors, free of profanity or obscene language or ideas, and reflect critical thinking related to the course subject matter.

### **Citation and Reference Style**

Attention Please: Students will follow the APA, Sixth Edition as the sole citation and reference style used in written work submitted as part of coursework to NFA. Assignments completed in a narrative essay, composition format, abstract, and discussion posts must follow the citation style cited in the APA, Sixth Edition.

## **Late Assignments**

Students are expected to submit classroom assignments by the posted due date (11:59 p.m. EDT/EST) and to complete the course according to the published class schedule. As adults, students, and working professionals, you must manage competing demands on your time. Discussion board postings submitted within 3 days after the submission deadline will receive up to a 20% deduction. Those that do not submit their discussion board postings within this timeline will receive a “0” grade for the week. Final assignment papers will not be accepted after the deadline. Any paper submitted after the deadline will receive a “0” grade for that assignment.

## **Netiquette**

Online learning promotes the advancement of knowledge through positive and constructive debate – both inside and outside the classroom. Forums on the Internet, however, can occasionally degenerate into needless insults and “flaming.” Such activity and the loss of good manners are not acceptable in a professional learning setting – basic academic rules of good behavior and proper “Netiquette” must persist. Remember that you are in a place for the rewards and excitement of learning which does not include descent to personal attacks or student attempts to stifle the forum of others.

- Technology Limitations. While you should feel free to explore the full-range of creative composition in your formal papers, keep e-mail layouts simple. The NFA Online classroom may not fully support MIME or HTML encoded messages, which means that bold face, italics, underlining, and a variety of color-coding or other visual effects will not translate in your e-mail messages.
- Humor Note. Despite the best of intentions, jokes and especially satire can easily get lost or taken seriously. If you feel the need for humor, you may wish to add “emoticons” to help alert your readers: ;-), : ), ☺ .

## **Disclaimer Statement**

Course content may vary from the outline to meet the needs of this particular group.

## **Grading**

Please review the following rubrics that explain how grades will be awarded.

Students who do not complete the entire course will be awarded an Incomplete (I) grade. In accordance with National Fire Academy academic policies, an Incomplete (I) grade must be removed by the end of the next semester following the course, or it automatically becomes a Failing (F) grade.

If you fail an on-campus course, you will not be issued a stipend for that course. You can reapply for the failed course or any other NFA course and go through the random selection process. You don't have to successfully complete the failed course before attending another NFA course.

[http://www.usfa.fema.gov/training/nfa/admissions/student\\_policies.html](http://www.usfa.fema.gov/training/nfa/admissions/student_policies.html)

## **Academic Honesty**

Students are expected to exhibit exemplary ethical behavior and conduct as part of the NFA community and society as a whole. Acts of academic dishonesty including cheating, plagiarism, deliberate falsification, and other unethical behaviors will not be tolerated.

Students are expected to report academic misconduct when they witness a violation. All cases of academic misconduct shall be reported by the instructor to the Training Specialist.

If a student is found to have engaged in misconduct and the allegations are upheld, the penalties may include, but are not limited to one or a combination of the following:

- expulsion,
- withholding of stipend or forfeiture of stipend paid,
- exclusion from future classes for a specified period; depending on the severity it could range from 1-10 years, and/or
- forfeiture of certificate for course(s) enrolled in at NETC.

Refer to NFA-specific Standard Operating Procedure 700.1 – *Academic Code of Conduct and Ethics* for more information.



## GRADING RUBRICS

### PRE-COURSE ACTIVITY GRADING RUBRIC

Assignment: In not more than 500 words, compare and contrast your jurisdiction's code enforcement process to the readings. Where is your system better or worse? Why do you think that? Where can you make or recommend improvements?

The table below details the point distribution for the pre-course activity. (Maximum points: 10.)

Element of performance	No submission 0 points	Deficient 1 to 2 points	Developing 3 to 4 points	Acceptable 5 to 6 points	Excellent 7 to 8 points	Exemplary 9 to 10 points
Pre-course activity write-up.	No write-up submitted.	Provides no connection to the reading nor to the student's jurisdiction's code enforcement process.  Does not include an evaluation nor recommendation of the student's jurisdiction's code enforcement process.	Attempts to react to the reading but without making connections to the student's jurisdiction's code enforcement process.  Does not include an evaluation nor recommendation of the student's jurisdiction's code enforcement process.	Provides comparison and contrast between the student's jurisdiction's code enforcement process and the reading.  Provides a vague evaluation of the student's jurisdiction's code enforcement process, and lacks any recommendations for improvement.	Provides clear comparison and contrast between the student's jurisdiction's code enforcement process and the reading.  Provides an evaluation of the student's jurisdiction's code enforcement process with at least one recommendation for improvement to the student's jurisdiction's process.	Provides clear comparison and contrast between the student's jurisdiction's code enforcement process and the reading.  Provides an evaluation of the student's jurisdiction's code enforcement process with more than one recommendation for improvement with clear explanation on how to achieve the improved process.

### ACTIVITY 1.3: FINDING GAPS IN SUBMITTAL PACKAGES GRADING RUBRIC

Assignment: Students will be provided with a sample submittal package, which they will review and find any existing gaps. Each student will write a letter outlining deficiencies (if any), or provide a letter explaining that the plans have been accepted for further review if there are no deficiencies identified.

The table below details the point distribution for Activity 1.3. (Maximum points: 3.)

<b>Element of performance</b>	<b>No submission 0 points</b>	<b>Deficient 1 point</b>	<b>Acceptable 2 points</b>	<b>Exemplary 3 points</b>
Letter to contractor.	No letter submitted.	Does not outline any deficiencies.	Outlines some deficiencies based on the evaluation of the submittal package.	Clearly outlines the deficiencies based on the evaluation of the submittal package.

### ACTIVITY 2.3: DENSITY/AREA CURVES GRADING RUBRIC

Assignment: Use NFPA 13, *Standard for the Installation of Sprinkler Systems*, density/area curves to fill in the blanks of the five following examples, plus compute a rough estimate of water demand for the described conditions.

The table below details the point distribution for Activity 2.3. (Maximum points: 5.)

Element of performance	No submission 0 points	Deficient 1 point	Developing 2 points	Acceptable 3 points	Excellent 4 points	Exemplary 5 points
Water demand estimates (gallons per minute (gpm)).	No submission.	One of the estimates is within a margin of plus or minus 5% error.	Two of the estimates are within a margin of plus or minus 5% error.	Three of the estimates are within a margin of plus or minus 5% error.	Four of the estimates are within a margin of plus or minus 5% error.	All five of the estimates are within a margin of plus or minus 5% error.

### ACTIVITY 2.5: DENSITY/AREA VERIFICATION GRADING RUBRIC

Assignment: Each small group will be assigned a scenario in which students will approve or reject the submittals and justify their decisions.

The table below details the point distribution for Activity 2.5. (Maximum points: 4.)

<b>Element of performance</b>	<b>No submission 0 points</b>	<b>Deficient 1 point</b>	<b>Acceptable 2 points</b>	<b>Excellent 3 points</b>	<b>Exemplary 4 points</b>
Approval or rejection decisions for five scenarios.	No approval or rejection decisions submitted.	No reasonable justifications are provided.	Decision for the assigned scenario is appropriate but justifications do not support the decision.	Decision and justifications for the assigned scenario are appropriate, but additional explanation is required.	Decision for the assigned scenario is appropriate and reasonable justifications are provided.

**ACTIVITY 3.4: WATER SUPPLIES FOR SPRINKLER SYSTEMS GRADING RUBRIC**

Assignment:

- Identify the duration (in minutes) of the required water supply.
- Calculate the total volume (in gallons) of the required water supply.

The table below details the point distribution for Activity 3.4. (Maximum points: 6.)

<b>Element of performance</b>	<b>No submission 0 points</b>	<b>Deficient 1 point</b>	<b>Developing 2 to 3 points</b>	<b>Acceptable 4 points</b>	<b>Excellent 5 points</b>	<b>Exemplary 6 points</b>
Determining the total water supply needed in five examples.	No submission.	Calculations were submitted, but none of the calculations are within a margin of plus or minus 5% error.	One or two of the calculations are within a margin of plus or minus 5% error.	Three of the calculations are within a margin of plus or minus 5% error.	Four of the calculations are within a margin of plus or minus 5% error.	All five of the calculations are within a margin of plus or minus 5% error.

### ACTIVITY 6.1: VERIFYING ADJUSTED REMOTE AREAS GRADING RUBRIC

Assignment: Students will read five scenarios to verify the appropriateness of the adjusted remote areas and provide calculations for new remote area size.

The table below details the point distribution for Activity 6.1. (Maximum points: 6.)

<b>Element of performance</b>	<b>No submission 0 points</b>	<b>Deficient 1 point</b>	<b>Developing 2 points</b>	<b>Acceptable 3 to 4 points</b>	<b>Excellent 5 points</b>	<b>Exemplary 6 points</b>
Calculation of new remote area size.	No submission.	Calculations are attempted but no correct remote area sizes are provided.	One of the calculations is within a margin of plus or minus 5% error.	Two or three of the calculations are within a margin of plus or minus 5% error.	Four of the calculations are within a margin of plus or minus 5% error.	Five of the calculations are within a margin of plus or minus 5% error.

**ACTIVITY 6.2: DETERMINING THE MINIMUM LENGTH OF REMOTE AREA AND THE MINIMUM NUMBER OF SPRINKLERS IN THE REMOTE AREA GRADING RUBRIC**

Assignment: Given the remote areas (five) in a list, students will calculate the minimum length in feet and calculate the minimum number of sprinklers required in the remote area.

The table below details the point distribution for Activity 6.2. (Maximum points: 5.)

<b>Element of performance</b>	<b>No submission 0 points</b>	<b>Deficient 1 point</b>	<b>Developing 2 points</b>	<b>Acceptable 3 points</b>	<b>Excellent 4 points</b>	<b>Exemplary 5 points</b>
Minimum length and number of sprinklers required.	No submission.	Calculations are attempted but no correct data is provided.	Minimum length and number of sprinklers required are correctly calculated for one remote area size.	Minimum length and number of sprinklers required are correctly calculated for two remote area sizes.	Minimum length and number of sprinklers required are correctly calculated for three remote area sizes.	Minimum length and number of sprinklers required are correctly calculated for four or more remote area sizes.

### ACTIVITY 7.2: HYDRAULIC CALCULATIONS GRADING RUBRIC

Assignment: Students will evaluate the provided calculations.

The table below details the point distribution for Activity 7.2. (Maximum points: 15.)

<b>Element of performance</b>	<b>No submission 0 points</b>	<b>Deficient 1 to 3 points</b>	<b>Developing 4 to 6 points</b>	<b>Acceptable 7 to 9 points</b>	<b>Excellent 10 to 12 points</b>	<b>Exemplary 13 to 15 points</b>
Hydraulic calculations.	No submission.	One to two incorrect calculation entries are appropriately identified.	Three to four incorrect calculation entries are appropriately identified.	Five to seven incorrect calculation entries are appropriately identified.	Eight to 10 incorrect calculation entries are appropriately identified.	Eleven or more incorrect calculation entries are appropriately identified.