NFPA 1410
Standard on Training for Initial Emergency Scene Operations

2000 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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This edition of NFPA 1410, *Standard on Training for Initial Emergency Scene Operations*, was prepared by the Technical Committee on Fire Service Training and acted on by the National Fire Protection Association, Inc., at its November Meeting held November 14–17, 1999, in New Orleans, LA. It was issued by the Standards Council on January 14, 2000, with an effective date of February 11, 2000, and supersedes all previous editions.

This edition of NFPA 1410 was approved as an American National Standard on February 11, 2000.

Origin and Development of NFPA 1410

The first edition of this standard on initial fire attack was officially adopted as NFPA 197 at the 1966 NFPA Annual Meeting held in Chicago, Illinois, May 16–20. It was prepared by the Committee on Fire Service Training and was tentatively adopted at the 1964 Annual Meeting. The 1966 edition was revised in 1979. The 1995 edition included the results of comprehensive and extensive field tests that were performed to validate the recommended maximum times for fireground evolutions in Appendix A. In their deliberations during development of the 1995 edition of this standard, the committee did not choose the "best" times recorded in their field tests, but chose times that it felt are reasonably achieved with an appropriate effort of organization and training.

A new Chapter 7 entitled "Required Performance for Truck Company Operations" has been included in the 2000 edition of the standard.

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William E. Peterson, *Vice Chair*
Plano Fire Dept., TX [E]
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Gene P. Carlson, Oklahoma State University, OK [M]
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Jack L. Cottet, Utica Nat'l Insurance Co., NY [I]
Nicholas J. Cricenti, Jr., SFC Engr Partnership, Inc., NH [SE]
Robert F. Debrody, Symtron Systems, NJ [M]
David C. Grupp, Kemper Insurance Cos., IL [I]
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Craig H. Shelley, City of Rutland Fire Dept., VT [E]
James B. Straseske, Illinois Fire Service Inst., IL [U]
Phil Welch, Gaston College, NC [U]

Alternates

Carl Goodson, Fire Protection Publications, OK [M]
(Alt. to G. P. Carlson)
Kent W. Koelz, Palm Beach Fire/Rescue Dept., FL [E]
(Alt. to V. K. Elmore)
Steven J. Williamson, Symtron Systems Inc., NJ [M]
(Alt. to R. F. Debrody)

Nonvoting

Edward W. Bent, Sacramento, CA [SE]
(Member Emeritus)

Don LeBlanc, NFPA Staff Liaison

This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on all fire service training techniques, operations, and procedures to develop maximum efficiency and proper utilization of available personnel. Such activities can include training guides for fire prevention, fire suppression, and other missions for which the fire service has responsibility.

Contents

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Appendix A.

Information on referenced publications can be found in Chapter 8 and Appendix C.

Chapter 1 Administration

1-1 Scope.

1-1.1* This standard contains the minimum requirements for evaluating training for initial fire suppression and rescue procedures used by fire department personnel engaged in emergency scene operations.

1-1.2 This standard specifies basic evolutions that can be adapted to local conditions and serves as a standard mechanism for the evaluation of minimum acceptable performance during training for initial fire suppression and rescue activities.

1-2 Purpose.

1-2.1* This document is a training standard designed to provide fire departments with an objective method of measuring performance for initial fire suppression and rescue procedures using available personnel and equipment.

1-2.2 Nothing herein is intended to restrict any jurisdiction from exceeding these minimum requirements.

1-3 Definitions.

1-3.1 Apparatus, Aerial Fire. A vehicle that is equipped with an aerial ladder, an elevating platform, an aerial ladder platform or a water tower and that is designed and equipped to support fire-fighting and rescue operations by providing for positioning of personnel, handling of materials, continuous egress, or discharging of water at positions elevated from the ground.

1-3.2 Apparatus, Mobile Water Supply (Tanker, Tender). A vehicle designed primarily for transporting (pickup, transportation, and delivery) water to fire emergency scenes to be applied by other vehicles or pumping equipment.

1-3.3 Company. The basic fire-fighting organizational unit staffed by various grades of fire fighters under the supervision of an officer and assigned to one or more specific pieces of apparatus.

1-3.3.1 Company, Engine. A group of fire fighters who work as a unit and are equipped with one or more pumping engines having rated capacities of 2840 L/min (750 gpm) or more.

1-3.4 Effective Operation. The accomplishment or ability to accomplish the intended task.

1-3.5 Effective Stream. A fire stream that has achieved and sustained the proper flow.

1-3.6 Engine. A fire department pumper having a rated capacity of 2840 L/min (750 gpm) or more.

1-3.7 Evolution. A set of prescribed actions that result in an effective fireground activity.

1-3.8 gpm. Gallons per minute.

1-3.9 Hose, Large-Diameter. A hose 89 mm (3.5 in.) or larger that is designed to move large volumes of water to supply master stream appliances, portable hydrants, manifolds, standpipe and sprinkler systems, and fire department pumpers from hydrants and in relay.

1-3.10 Immediately Dangerous to Life or Health (IDLH). Any atmosphere that poses an immediate hazard to life or produces immediate irreversible debilitating effects on health.

1-3.11 kPa. Kilopascals.

1-3.12 Line. One or more lengths of connected fire hose.

1-3.12.1 Line, Attack. A hose line used primarily to apply water directly onto a fire and operated by a sufficient number of personnel so that it can be maneuvered effectively and safely.

1-3.12.2 Line, Backup. An additional hose line used to reinforce and protect personnel in the event the initial attack proves inadequate.

1-3.12.3 Line, Initial Attack. The first hose stream placed in service by a company at the scene of a fire in order to protect lives or to prevent further extension of fire while additional lines are laid and placed in position.

1-3.12.4 Line, Leader. A hose line supplying one or more smaller lines, as in a wyed line (A leader line may also be called a supply line).

1-3.12.5 Line, Preconnected. A discharge hose line already attached to an engine outlet.

1-3.13 L/min. Liters per minute.

1-3.14 Pressure, Residual. The pressure remaining in a system while fluid is flowing.

1-3.15 psi. Pounds per square inch gauge.

1-3.16 Rapid Intervention Team (RIT). Two or more fire fighters assigned outside the hazard area at an interior structure fire to assist or rescue at an emergency operation as required by 6-4.4 of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

1-3.17 Rescue. Those activities directed at locating endangered persons at an emergency incident, removing those persons from danger, treating the injured, and providing for transport to an appropriate health care facility.

1-3.18 Rescue Company. A group of fire fighters who work as a unit and are equipped with one or more rescue vehicles.

1-3.19 Rescue Vehicle. A special vehicle, also known as a heavy rescue or squad, equipped with tools and equipment to perform one or more types of special rescue such as building collapse, confined space, high angle, vehicle extrication, and water rescue.

1-3.20 Shall. Indicates a mandatory requirement.

1-3.21 Should. Indicates a recommendation or that which is advised but not required.

1-3.22 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for

mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

1-3.23 Supply Line. One or more lengths of connected fire hose, also called a leader line, used to provide water to wyed lines or to the intake of a pump.

1-3.24 Truck. A common fire service term for aerial fire apparatus.

1-3.25 Truck Company. A group of fire fighters who work as a unit and are equipped with one or more pieces of aerial fire apparatus.

1-4 Units. In this standard, values for measurements are followed by an equivalent in parentheses, but only the first stated value should be regarded as the requirement. Equivalent values in parentheses should not be considered as the requirement, since these values might be approximate.

Chapter 2 Methods of Evaluation

2-1 Standard Evolutions.

2-1.1* The evolutions specified in this standard shall be used to measure the initial capability of a department's first responding unit(s) and personnel.

2-1.2 The evolutions used shall be those the department normally uses in its regular fire suppression and rescue operations.

2-1.3 The hose layouts and hydrant connections used shall provide the flow necessary to adequately supply the requirements of each evolution, and proper hose connections shall be made between the hydrant(s) or other water source(s) and the engine(s) and inlets.

2-1.4 The engine and truck company operations shall provide a mechanism to measure the performance of routine tasks that are required to support an effective fire suppression operation in a structure.

2-2 Hose Loads and Layouts.

2-2.1 Hose shall be loaded in the manner utilized by the department, and hose lays and carries used during the evolutions shall be those normally used by the department.

2-2.2 The initial attack lines shall be preconnected to an engine outlet, supplied through a wye from another line, or connected to an engine outlet at the scene.

2-2.3* Direct hydrant streams shall not be used unless the desired flow is available at the hydrant with a residual pressure of 700 kPa (100 psi) or greater.

2-2.4 Depending on the size of the hose lines to be used and the quantity of water to be delivered, the proper number of personnel shall be assigned to ensure the safety of all personnel involved and shall be in compliance with 6-4.1 of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*. A minimum of two fire fighters shall be used on each hose line to keep interior attack lines under control.

2-3 Ground Ladders.

2-3.1 Ladders shall be loaded or carried on the apparatus in the manner utilized by the department, and ladder raises and carries used during the evolutions shall be those normally used by the department.

2-3.2* Depending on the size of the ladder to be used and the evolution to be performed, the proper number of personnel shall be assigned to ensure the safety of all personnel involved.

Chapter 3 Logistics

3-1 Facilities.

3-1.1 Evolutions shall be conducted in an area of sufficient size so that supply hose can be laid to or from the water source and attack lines can be laid from an engine or wye.

3-1.2 Where evolutions are not conducted at the fire department training facility or in another controlled area, non-fire department vehicular and pedestrian traffic shall be excluded from the area or shall be under the control of authorized traffic control persons.

3-1.3 Evolutions that involve the use of ladders shall be performed in an area free of overhead power lines and other obstructions.

3-2 Equipment and Personnel.

3-2.1 All personnel involved in evolutions shall wear proper protective clothing and equipment for their respective functions. All personnel participating in extending or operating handlines or extending support lines or who are involved in other operational functions of the evolutions shall wear full protective clothing, equipment, and self-contained breathing apparatus (SCBA) as specified in Section 5-2, Protective Clothing for Structural Fire Fighting, and Section 5-3, Respiratory Protection, of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*.

3-2.2* In addition to the requirements set forth in 3-2.1, the company officer shall ensure that the following are accomplished in interior structural fires:

(1) At least two fire fighters enter the immediately dangerous to life and health (IDLH) atmosphere and remain in visual or voice contact with each other at all times.
(2) At least two fire fighters are located outside the IDLH atmosphere.
(3) All fire fighters engaged in interior structural fire fighting use SCBA.

3-2.3* All drivers/operators of fire department vehicles participating in evolutions shall comply with the requirements of Section 4-2, Drivers/Operators of Fire Department Apparatus, of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*.

3-2.4 All personnel riding on fire department vehicles and participating in evolutions shall comply with the applicable requirements of Section 4-2, Drivers/Operators of Fire Department Apparatus, of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*.

3-2.5* The number of units and personnel normally assigned to respond on an initial alarm shall report to the evaluator at the assigned area. In volunteer or call departments, the number of personnel utilized shall be limited to the average staffing level that normally responds.

3-2.6* The number of apparatus to be deployed shall not exceed the total belonging to all companies that are normally assigned to respond on the initial alarm.

3-2.7 Nozzles and other equipment used shall be of the type provided on the apparatus.

3-3 Water Supply.

3-3.1 The water supply shall consist of a water source capable of supplying the required flow needed for operations.

3-3.2 The water supply shall be one or more of the following:

(1) One or more hydrants
(2) A drafting location
(3) A water supply apparatus

3-4* Communications. Communication equipment and methods used by the fire department shall be employed during the evolutions. Evaluations shall include the effectiveness of communication among members.

Chapter 4 Required Performance for Handlines

4-1 General.

4-1.1* The required performance for handlines shall consist of obtaining a water supply through one or two supply lines, placing one initial attack line into operation, and providing immediate backup with another line.

4-1.2 Handline evolutions shall be performed by the first arriving unit(s) staffed with the average number of personnel that ordinarily respond.

4-1.3* For evolutions involving two or more companies, there shall be a delay of at least 30 seconds between the arrival of each company.

4-2 Required Flow.

4-2.1 The total flow of the required streams shall be a minimum of 1000 L/min (300 gpm).

4-2.2 The initial attack line shall provide a minimum flow of 400 L/min (100 gpm) from the nozzle.

4-2.3 The required flow from the backup line shall be a minimum of 750 L/min (200 gpm).

4-2.4* The evaluator shall determine whether effective pressure and flows, per 4-2.1 through 4-2.3, are provided at each nozzle. Where solid stream nozzles are used, the nozzle pressure shall be at least 350 kPa (50 psi). Where spray nozzles as defined in NFPA 1964, *Standard for Spray Nozzles (Shutoff and Tip),* are used, the nozzle pressure shall be at least 700 kPa (100 psi). Pressures shall be within a range of ±10 percent.

Exception: Where the nozzle in use is designed for operation at a pressure other than 700 kPa (100 psi), the nozzle design pressure shall be permitted to be used.

4-3 Hose Evolutions.

4-3.1 The supply line(s) shall be laid by an engine for a distance of 90 m (300 ft) to or from the water source. Where large-diameter hose is used, a single line shall be permitted.

4-3.2* The initial attack line and backup line shall be advanced by hand for a minimum distance of 45 m (150 ft) before streams are activated.

4-3.3* Where an apparatus water tank supply is used to supply the initial attack line, the backup line shall not be charged until an adequate water supply is established.

4-4 Method of Evaluation.

4-4.1 When the order to begin the evolution is given, one or more supply lines, one initial attack line, and one backup line shall be advanced and placed in operation, using the required pressures and flows within the recommended time period.

4-4.2 The evaluation shall be based on the following considerations:

(1) The ability to place one or two supply lines, one initial attack line, and one backup line into service without delay
(2) The ability to deliver a minimum of 1135 L/min (300 gpm) through two handlines to produce effective streams

4-4.3 Once streams are placed into service, the flows shall continue until the evaluation is complete.

4-4.4* Failure to adequately supply an engine shall be considered a serious deficiency in operations.

4-4.5* Failure to maintain water pressure in any line until all lines are properly operating shall be considered an unacceptable interruption of the attack. Interruptions of less than 10 seconds shall be considered acceptable.

4-4.6 The evolution shall not be concluded until the evaluator is satisfied that an effective stream has been obtained at each nozzle.

4-5* Evaluation. Performance shall be evaluated as follows:

		Satisfactory	Unsatisfactory
(1)	Was a minimum of 1000 L/min (300 gpm) delivered?	_____	_____
(2)	Were nozzle pressures and flows correct?	_____	_____
(3)	Were effective streams in service within the recommended time?	_____	_____
(4)	Were the hose layouts from the water source adequate to supply engines?	_____	_____
(5)	Were streams operated without major interruption?	_____	_____

Chapter 5 Required Performance for Master Streams

5-1 General.

5-1.1* The required performance for master streams shall consist of laying one or more supply lines and placing a master stream appliance in operation.

5-1.2 Master stream evolutions shall be performed by the first arriving unit(s) staffed with the average number of personnel that ordinarily respond.

5-1.3* For evolutions involving two or more companies, there shall be a 30-second delay between the arrival of each company.

5-2 Required Flow.

5-2.1 The total flow of the required master stream shall be a minimum of 2000 L/min (500 gpm).

5-2.2* The evaluator shall determine that effective pressures and flows, per 5-2.1, are provided at the master stream appliance nozzle. Where solid stream nozzles are used, the nozzle pressure shall be at least 450 kPa (80 psi). Where spray nozzles as defined in NFPA 1964, *Standard for Spray Nozzles (Shutoff and Tip)* are used, the nozzle pressure shall be at least 700 kPa (100 psi). Pressures shall be within a range of ±10 percent.

5-3 Hose Evolutions.

5-3.1 Where engine supply lines are laid from a water source to supply an engine-mounted master stream appliance, two engine supply lines shall be laid by the engine for a distance of 90 m (300 ft). Where large-diameter hose is used, a single engine supply line shall be permitted.

5-3.2 Where master stream supply lines are laid from a demounted, portable master stream appliance to an engine at a water source, two master stream supply lines shall be laid by the engine for a distance of 90 m (300 ft). Where large-diameter hose is used, a single master stream supply line shall be permitted.

5-4 Method of Evaluation.

5-4.1 When the order to begin the evolution is given, one or more supply lines shall be laid to supply the engine(s), and, if required by the evolution, one or more supply lines shall be laid to supply the master stream appliance. The master stream appliance shall be placed into effective operation, with the stream at the required pressures and flows within the recommended time period.

5-4.2 The evaluation shall be based on the following considerations:

(1) The ability to supply the master stream appliance without delay

(2) The ability to deliver at least 2000 L/min (500 gpm) and produce an effective master stream

5-4.3 Once streams are placed into service, the flows shall continue until the evaluation is complete.

5-4.4* Failure to adequately supply an engine shall be considered a serious deficiency in operations.

5-4.5* Failure to maintain water pressure in any line until all lines are properly operating shall be considered an unacceptable interruption of the attack. Interruption of less than 10 seconds shall be considered acceptable.

5-4.6 The evolution shall not be concluded until the evaluator is satisfied that an effective stream has been obtained.

5-5* Evaluation. Performance shall be evaluated as follows:

		Satisfactory	Unsatisfactory
(1)	Was a minimum of 1900 L/min (500 gpm) delivered?	_____	_____
(2)	Were nozzle pressures and flows correct?	_____	_____
(3)	Were effective streams in service within the recommended time?	_____	_____
(4)	Were the hose layouts adequate to supply the nozzles?	_____	_____
(5)	Were streams operated without major interruption?	_____	_____

Chapter 6 Required Performance for Automatic Sprinkler System Support

6-1 General.

6-1.1* The required performance for automatic sprinkler system support shall consist of providing two supply lines to an automatic sprinkler connection.

6-1.2 Automatic sprinkler system support evolutions shall be performed by the first arriving unit(s) staffed with the average number of personnel that ordinarily respond.

6-1.3* For evolutions employing two or more companies, there shall be a 30-second delay between the arrival of each company.

6-2 Required Flow.

6-2.1 The total flow of the required lines to the sprinkler connection shall be 1900 L/min (500 gpm).

6-2.2* The evaluator shall determine that effective pressures and flows, per 6-2.1, are provided to the sprinkler connections. A minimum of 1035-kPa (150-psi) pump discharge pressure shall be used to supply the sprinkler system. Pressures shall be within a range of ±10 percent.

6-3 Hose Evolutions.

6-3.1 The supply lines shall be laid by an engine for a distance of 90 m (300 ft) to or from the water source, and for a distance of 30 m (100 ft) from an engine to the sprinkler connection.

6-3.2 Apparatus water tanks shall not be used as a water supply for these evolutions.

6-4 Method of Evaluation.

6-4.1 When the order to begin the evolution is given, a water supply shall be established for the engine(s) and two supply lines laid to the sprinkler connection.

6-4.2* The evaluation shall be based on the ability to deliver a minimum of 1900 L/min (500 gpm) through two supply lines to the sprinkler connections.

6-4.3 The flows shall continue until the evaluation is complete.

6-4.4 Failure to adequately supply the sprinkler system shall be considered a serious deficiency in operations.

6-4.5* Failure to maintain water pressure in any line until all lines are properly operating shall be considered an unacceptable interruption. Interruptions of less than 10 seconds shall be considered acceptable.

6-4.6 The evolution shall not be concluded until the evaluator is satisfied that the proper flows have been provided.

6-5* Evaluation. Performance shall be evaluated as follows:

		Satisfactory	Unsatisfactory
(1)	Was a minimum of 1135 L/min (300 gpm) delivered?	_____	_____
(2)	Was the pump discharge pressure correct?	_____	_____
(3)	Were flows obtained within the recommended time?	_____	_____
(4)	Were the hose layouts from the water source adequate?	_____	_____
(5)	Were flows obtained without major interruption?	_____	_____

Chapter 7 Required Performance for Truck Company Operations

7-1 General.

7-1.1 The required performance for truck company operations shall consist of raising ladders, transporting equipment, setting up lights and fans, and carrying out other routine truck company duties.

7-1.2 Truck company operations shall be performed by the first arriving company assigned truck company duties staffed with the average number of personnel that ordinarily respond.

7-1.3 If the unit assigned to perform truck company operations does not routinely arrive at the same time as the first engine company, a 30-second delay shall be implemented.

7-2 Ladder Evolutions.

7-2.1 The required performance for ground ladder evolutions shall consist of removing the appropriate ladder from the apparatus and properly positioning and raising a straight ladder, a 7-m (24-ft) extension ladder, and a 10-m (35-ft) extension ladder. The method used to raise a ladder shall be consistent with the method normally used by the department.

7-2.2 Ladder evolutions shall be performed by the first arriving unit(s) staffed with the average number of personnel that ordinarily respond.

7-2.3 For evolutions involving two or more companies, there shall be a 30-second delay between the arrival of each company.

7-2.4 Time measurement shall begin when the evaluator says "go" and shall conclude when the ladder is ready to be climbed.

7-3 Hoisting Tools and Appliances.

7-3.1 The ability of company members to tie the following knots and hitches shall be evaluated:

(1) Clove hitch
(2) Figure eight
(3) Figure eight on a bight
(4) Sheet bend
(5) Single overhand

7-3.2 The evaluator shall select a minimum of two hoisting evolutions. The evolution shall begin when the evaluator says "go" and conclude when the evaluator is satisfied that the knot or hitch has been properly tied and the tools/appliance has been hoisted a minimum of 5 m (14 ft).

7-4 SCBA.

7-4.1 The required performance shall consist of the company donning their SCBA correctly, and the designated evaluator shall determine whether they donned their protective gear correctly and within the prescribed time.

7-4.2 The evolution shall begin when the evaluator says "go" and conclude when the evaluator determines that each member's SCBA is operating properly, all belts and straps are fastened, the facepiece is properly sealed, and all protective clothing is being worn correctly and with no skin exposed.

7-5 Ventilation and Illumination of an Incident.

7-5.1 The required performance for this evolution shall consist of starting an auxiliary generator, advancing portable flood lights to the second floor of a building, illuminating the exterior of the structure, and setting up a fan or cutting a hole in a roof mock-up to simulate the evacuation of smoke from the structure.

7-5.2 The evolution shall begin when the evaluator says "go" and conclude when the evaluator determines that all of the assigned tasks have been properly performed.

7-6 Method of Evaluation.

7-6.1 When the order is given to begin the evolution, the appropriate ladder, tool, or piece of equipment shall be removed from the apparatus and shall be raised or deployed in the appropriate manner as prescribed for the evolution to be performed.

7-6.2 Evaluations of hoisting evolutions shall be based on the company's ability to properly perform the assigned task within the prescribed time period.

7-6.3 Evolutions shall not be concluded until the evaluator is satisfied that the proper tasks have been performed.

7-7 Evaluation. Performance shall be evaluated as follows:

		Satisfactory	Unsatisfactory
(1)	Were the ladders raised and set properly?	_____	_____
(2)	Was the SCBA donned properly?	_____	_____
(3)	Was the appropriate light, saw, fan, tool, or piece of equipment properly used?	_____	_____

(4)	Was the appropriate knot or hitch tied correctly?	_____	_____
(5)	Were the evolutions performed within the designated times?	_____	_____

Chapter 8 Referenced Publications

8-1 The following documents or portions thereof are referenced within this standard as mandatory requirements and shall be considered part of the requirements of this standard. The edition indicated for each referenced mandatory document is the current edition as of the date of the NFPA issuance of this standard. Some of these mandatory documents might also be referenced in this standard for specific informational purposes and, therefore, are also listed in Appendix C.

8-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* 1997 edition.

NFPA 1964, *Standard for Spray Nozzles (Shutoff and Tip),* 1998 edition.

Appendix A Explanatory Material

Appendix A is not a part of the requirements of this NFPA document but is included for informational purposes only. This appendix contains explanatory material, numbered to correspond with the applicable text paragraphs.

A-1-1.1 It is recognized that most successful emergency scene operations efforts involve a coordinated engine, ladder, and rescue company operation. When performing the evolutions included in this standard for the purpose of training, departments should use the number of personnel normally assigned to perform the initial operations at the scene of an emergency incident.

A-1-2.1 The following two aspects of initial fire attack are covered in this standard:

(1) Engine company operations, including handline operations, supply and operation of master streams, and automatic fire sprinkler system support
(2) Truck company operations, including ladder evolutions, the use of hoisting tools and appliances, the use of SCBA, and ventilation and illumination of an incident

Individual fire-fighting evolutions involving the placement and connection of hose lines, the operation of hose streams and apparatus, the setting of ground ladders, the use of hoisting tools and appliances, the use of SCBA, and ventilation and illumination of an incident are the essentials of good fire department procedures. This standard provides the fire chief and other department officers with a method of measuring the effectiveness of evolutions that involve fire suppression and related tasks based on their normal first alarm engine and truck company response.

With the exception of very small communities and isolated rural areas, the standard response to an emergency incident on the initial alarm is generally a minimum of two engine companies and a truck company. This practice is for several reasons. First, one engine company ordinarily cannot be expected both to operate the proper streams promptly for fast attack and to provide the necessary backup stream(s). Experience frequently has shown that small streams often prove to be inadequate. Second, fires commonly necessitate prompt application of hose streams from at least two positions. Finally, the possibility that an accident or mechanical failure will delay the arrival of one company is always present.

A-2-1.1 With the exception of those evolutions that use aerial trucks, only the number of personnel who normally respond on the initial alarm and are assigned to perform engine company operations should perform the evolutions required by this standard. Personnel normally assigned to perform ladder operations on alarms should also be included for evolutions involving aerial trucks.

A-2-2.3 The purpose of these evolutions is to test the fire department's ability to promptly place into service fire suppression streams with correct flows and nozzle pressures. Direct streams other than from high-pressure hydrants usually do not provide the proper flows and nozzle pressures. Where this practice is used, serious delays often are encountered before effective streams are in service. Therefore, this practice is not considered valid by this standard.

A-2-3.2 Departments should adopt standard operating procedures that identify the types of ladder raises to be used by the department and to specify the minimum number of personnel to raise the various ground ladders used by the department. For example, one person is required to raise a 5-m (14-ft) straight ladder, one person is required to raise a 7-m (24-ft) extension ladder, and three personnel are required to raise a 10-m (35-ft) extension ladder.

A-3-2.2 One of the two individuals located outside the IDLH atmosphere could be assigned an additional role, such as incident commander in charge of the emergency or safety officer, as long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any fire fighter working at the incident. Nothing in this section is meant to preclude fire fighters from performing rescue activities before an entire team has been assembled.

A-3-2.3 Conducting formal training for members assigned to drive apparatus is recommended for fire departments. A comprehensive training program is outlined in NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program.*

A-3-2.5 Limiting emergency scene operations to those that can be safely conducted by the number of personnel on the scene is intended to reduce the risk of fire fighter death or injury due to understaffing. Although members can be assigned and can arrive at an incident scene in many ways, it is strongly recommended that interior fire-fighting operations not be conducted without an adequate number of qualified fire fighters operating in companies under the supervision of company officers available on the scene.

The minimum recommended staffing level for a fire company responding to any type of fire consists of four members responding on or arriving with each engine or aerial ladder company. Companies responding in high fire risk areas should have a minimum acceptable staffing of six fire fighters on ladder companies and five fire fighters on engine companies. These recommendations are based on data from actual fires and in-depth fire simulations wherein fire company effectiveness was critically and objectively evaluated. These studies

indicate significant reductions in performance and safety when crews have fewer members than recommended. Overall, five-member crews were found to provide a more coordinated approach for search and rescue and fire suppression tasks. *(See A-6-4.1 of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program.)*

A-3-2.6 For example, where companies are equipped with two pieces of apparatus, they should operate in the normal manner, using both pieces.

A-3-4 Proper communication is essential to the efficiency and safety of fire department operations. Several methods are used by fire departments at incident scenes. These methods include two-way radios, hand signals, and audible devices. Communication is an integral component of training, and it should be included as part of the evaluation process.

A-4-1.1 Illustrations of handline evolutions that engine companies can use are given in Figures A-4-1.1(a) through A-4-1.1(f).

FIGURE A-4-1.1(a) Forward lay using one engine and one supply line — recommended maximum time is 3 minutes.

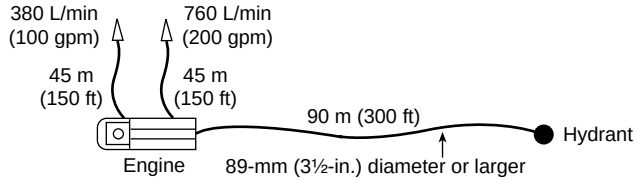


FIGURE A-4-1.1(b) Reverse lay from first engine to second engine — recommended maximum time is 4 minutes.

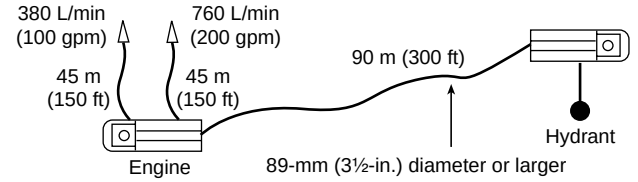


FIGURE A-4-1.1(c) Forward lays using two engines — recommended maximum time is 3.5 minutes.

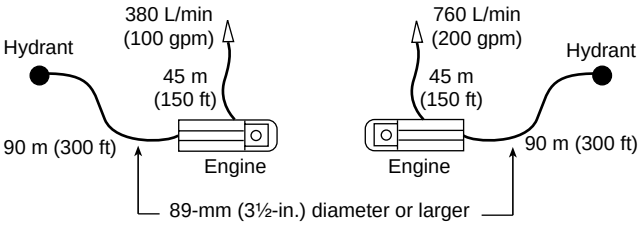


FIGURE A-4-1.1(d) Reverse lay with one engine using a wye — recommended maximum time is 4 minutes.

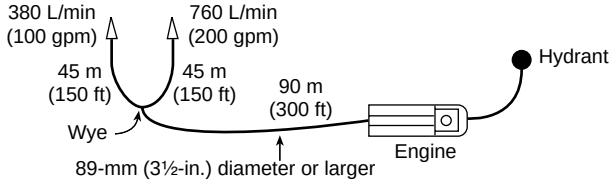


FIGURE A-4-1.1(e) Drafting operation using two engines — recommended maximum time is 6 minutes.

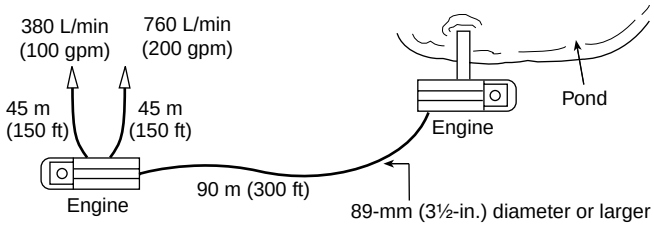
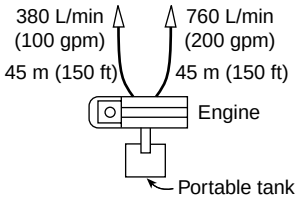


FIGURE A-4-1.1(f) Portable water supply tank using one engine and water supply apparatus — recommended maximum time is 5 minutes.



A-4-1.3 Delaying the placement of the second and additional companies into service recognizes the fact that, in many cases, the companies do not arrive simultaneously. Delay can be due to factors such as volunteer response and traffic conditions. Additionally, this delay provides the evaluator with a greater opportunity to check the operations of second and additional companies. The 30-second delay is a suggested time interval for the purposes of the test. The evaluator can increase the time interval to simulate conditions in which responding companies are located at great distances from one another.

A-4-2.4 Pressure and flow can be determined by either Pitot gauge measurement, piezometer gauge readings, flowmeter readings, or pump discharge gauge readings based on known pressure requirements for the particular nozzles. Spray nozzles can be estimated based on their rated delivery if the proper pump pressure is provided.

A-4-3.2 The purpose of this evaluation is to demonstrate the ability to advance hose lines to necessary positions of operation. The evaluator should designate the positions from which streams will be operated.

A-4-3.3 Establishing an adequate water supply is a primary consideration of the pump operator, and charging the backup line without an adequate water supply can jeopardize the safety of the initial attack crew. There could be instances when the backup line has to be charged from the booster tank; however, in these instances, the pump operator should be acutely

aware of the flow rates of the lines in service and the capacity of the booster tank. Where units have booster tanks of 4000 L (1000 gal) or more or where multiple units are available to provide additional water, charging the backup line from a booster tank could be permitted.

A-4-4.4 Failure to make adequate connections in order to promptly utilize the available water supply is one of the most serious errors made during an initial attack on a fire. Placing streams into service quickly when they lack adequate volume and pressure cannot be considered as furnishing a standard initial fire attack. The most common cause of failure is dependence on a single 65-mm ($2\ ^1/_2$-in.) supply line to provide the necessary flow.

A-4-4.5 Up to 10 seconds of interruption can be permitted in order to manage situations such as transferring from tank to water supply or shifting lines from hydrants to pumps. Failure to obtain water from a hydrant before the booster tank is empty or to maintain flow when transferring from tank to hydrant supply is unacceptable.

A-4-5 Evaluation results should be useful to the evaluator when determining which areas require additional training in order to provide a standard initial fire attack capability. It should not be surprising if the first test of these evolutions produces less than satisfactory performance. Effective teamwork between companies for initial attack develops with practice.

A-5-1.1 Illustrations of master stream evolutions are given in Figures A-5-1.1(a) through A-5-1.1(e).

A-5-1.3 Delaying the placement of second and additional companies into service recognizes the fact that, in many cases, the companies do not arrive simultaneously. Delay can be due to factors such as volunteer response and traffic conditions. Additionally, this delay also provides the evaluator with a greater opportunity to check the operations of second and additional companies. The 30-second delay is only a suggested interval for the purposes of the test. The evaluator can increase the time interval to simulate conditions in which responding companies are located at great distances from one another.

FIGURE A-5-1.1(a) Reverse lay from portable monitor nozzle using one engine — recommended maximum time is 5 minutes.

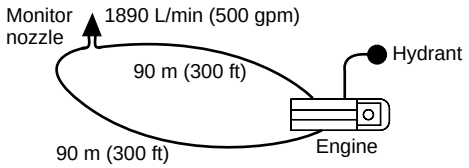


FIGURE A-5-1.1(b) Forward lay with one engine using engine monitor — recommended maximum time is 3 minutes.

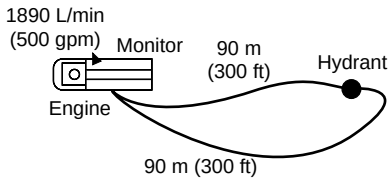


FIGURE A-5-1.1(c) Reverse lay from elevated master stream using one engine — recommended maximum time is 4 minutes.

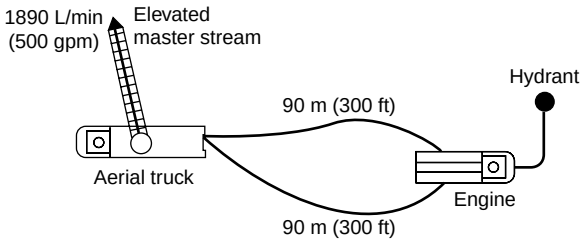


FIGURE A-5-1.1(d) Reverse lay from elevated master stream using one engine and supplying one handline — recommended maximum time is 5.5 minutes.

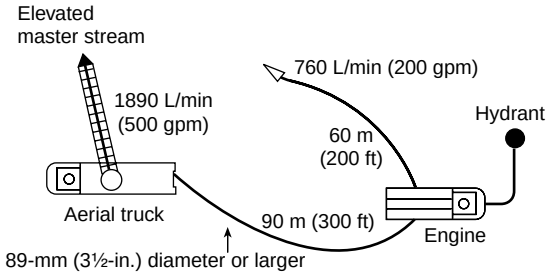
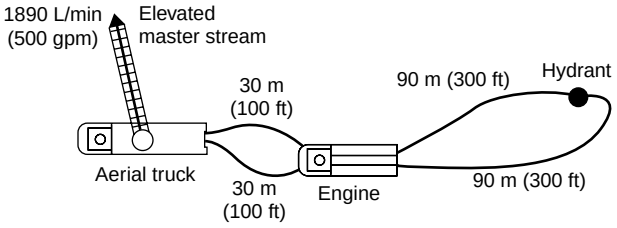


FIGURE A-5-1.1(e) Forward lay using one engine to supply an elevated master stream with two lines — recommended maximum time is 5 minutes.



A-5-2.2 Pressure and flow can be determined by either Pitot gauge measurement, piezometer gauge readings, flowmeter readings, or pump discharge gauge readings based on known pressure requirements for the particular nozzles. Spray nozzles can be estimated based on their rated delivery if the proper pump pressure is provided.

A-5-4.4 Failure to make adequate connections in order to promptly utilize the available water supply is one of the most serious errors made during an initial attack on a fire. Placing streams into service quickly when they lack adequate volume and pressure cannot be considered as furnishing a standard initial fire attack. The most common cause of failure is dependence on a single 66-mm ($2^1/_2$-in.) supply line to provide the necessary flow. At least two 66-mm ($2^1/_2$-in.) supply lines or one large supply hose would be necessary to carry the needed flows at the necessary pressures.

A-5-4.5 Up to 10 seconds of interruption can be permitted in order to manage situations such as transferring from tank to water supply or shifting lines from hydrants to pumps. Failure

to obtain water from a hydrant before the booster tank is empty or to maintain flow when transferring from tank to hydrant supply is unacceptable.

A-5-5 Evaluation results should be useful to the evaluator when determining which areas require additional training in aerial ladder setup or in providing a high-volume, limited-duration offensive attack (i.e., a blitz attack). It should not be surprising if the first test of these evolutions produces less than satisfactory performance. Effective teamwork between companies for a blitz attack develops with practice.

A-6-1.1 Illustrations of evolutions for automatic sprinkler system support are given in Figures A-6-1.1(a) through A-6-1.1(c).

FIGURE A-6-1.1(a) Forward lay to the sprinkler connection using two supply lines — recommended maximum time is 3.5 minutes.

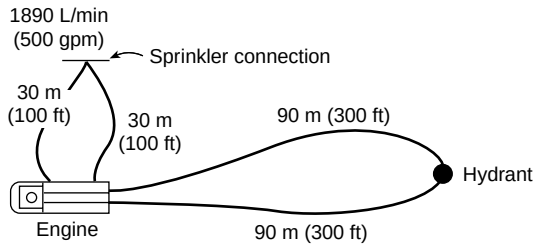


FIGURE A-6-1.1(b) Reverse lay from the sprinkler connection using two supply lines — recommended maximum time is 3.5 minutes.

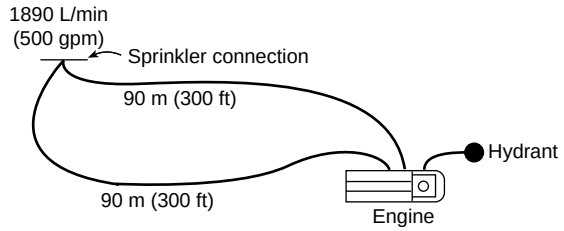
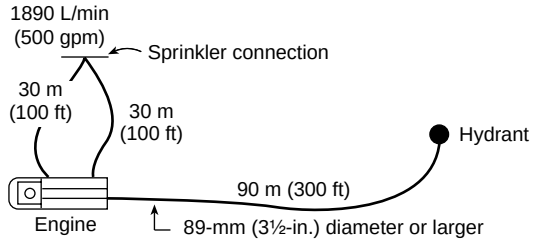


FIGURE A-6-1.1(c) Forward lay to the sprinkler connection using large-diameter hose — recommended maximum time is 3.5 minutes.



A-6-1.3 Delaying the placement of the second and additional companies into service recognizes the fact that, in many cases, the companies do not arrive simultaneously. Delay can be due to factors such as volunteer response and traffic conditions. Additionally, this delay provides the evaluator with a greater opportunity to check the operations of second and any additional companies. The 30-second delay is only a suggested interval for the purposes of the test. The evaluator can increase the time interval to simulate conditions in which responding companies are located at great distances from one another.

A-6-2.2 Pressure and flow can be determined by either Pitot gauge measurement, piezometer gauge readings, flowmeter readings, or pump discharge gauge readings.

A-6-4.2 Failure to make adequate connections in order to promptly utilize the available water supply is one of the most serious errors made when supplying an automatic sprinkler system. The most common cause of failure is dependence on a single 66-mm ($2^1/_2$-in.) supply line to provide the necessary flow.

A-6-4.5 Up to 10 seconds of interruption can be permitted in order to manage situations such as transferring from tank to water supply or shifting lines from hydrants to pumps. Failure to obtain water from a hydrant before the booster tank is empty or to maintain flow when transferring from tank to hydrant supply is unacceptable.

A-6-5 Evaluation results should be useful to the evaluator when determining which areas require additional training in order to provide water supply to an automatic sprinkler system. It should not be surprising if the first test of these evolutions produces less than satisfactory performance. Effective teamwork between companies for initial attack develops with practice.

Appendix B Evaluation Guide Sheets and Instructions

This appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.

B-1 Guidelines for Use of Sheets in Evolutions. The guide sheets are provided to assist training personnel when using the evolutions illustrated in Appendix A. All personnel involved in the evolutions should be properly clothed in the appropriate safety gear or fire-fighting protective clothing and equipment as specified in 3-2.1.

The total number of personnel used for each evolution should not exceed the number of persons who normally respond on the initial alarm in accordance with 4-1.2, 5-1.2, and 6-1.2. For those evolutions that use one engine company, the number of personnel assigned should be limited to a single engine company, unless more than one unit responds as part of that engine company on the initial alarm. All personnel over the number that normally staff the first engine company should be delayed 30 seconds before entering the evolutions.

B-1.1 Evolution No. 1. Evolution No. 1 *(see Figure B-1.1)* uses one engine company, one supply line, and two handlines. If the number of personnel used to perform this evolution exceeds the normal single-engine company staffing, the additional personnel should be delayed 30 seconds before becoming involved in the evolution. The procedures are as follows:

(a) Stage engine company and assigned personnel away from the hydrant. When personnel are ready, give signal for engine to proceed to hydrant.

(b) Start recording time when engine stops at the hydrant. (Do not allow additional personnel to start for 30 seconds.)

(c) Steps of operation are as follows:

(1) Lay one supply line from the hydrant a distance of 90 m (300 ft).
(2) Advance one attack line from the engine a distance of 45 m (150 ft).
(3) Advance one backup line from the engine a distance of 45 m (150 ft).
(4) Operate all lines at proper pressures and flows.

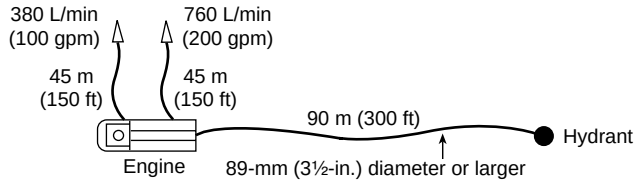
(d) Stop time when all lines are supplied properly. [Record time in B-1.1(f).]

(e) Equipment and personnel used in test are as follows:

(1) Size of supply line used?
(2) Size of attack line used?
(3) Size of backup line used?
(4) Number of persons used?

(f) Total time of evolution?

FIGURE B-1.1 Forward lay using one engine and one supply line.



B-1.2 Evolution No. 2. Evolution No. 2 *(see Figure B-1.2)* uses two engines, one supply line, and two handlines. A 30-second delay should be used to start the second engine company and all personnel over the normal staffing of the first engine company.

(a) Stage engines and assigned personnel away from the simulated fire area. When personnel are ready, give signal for first engine company to proceed to the fire area.

(b) Start time when first engine stops at the fire area. (Do not allow second engine and additional personnel to start for 30 seconds.)

(c) Steps of operation:

(1) At the fire area, remove and advance one attack line and one backup line a minimum distance of 45 m (150 ft) from the first engine.
(2) After a 30-second delay, give signal for second engine to proceed to location of first engine.
(3) When second engine is stopped at first engine, supply hose is removed from second engine and second engine proceeds to hydrant location.
(4) Supply hose is connected to first engine and either supply hose or second engine is connected to hydrant.
(5) Operate all lines at proper pressures and flows.

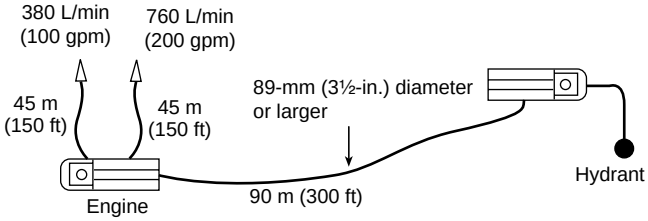
(d) Stop time when all lines are supplied properly. [Record time in B-1.2(f).]

(e) Equipment and personnel used in test:

(1) Size of supply line used?
(2) Size of attack line used?
(3) Size of backup line used?
(4) Number of persons used?

(f) Total time of evolution?

FIGURE B-1.2 Reverse lay from first engine to second engine; connecting second engine to hydrant is optional.



B-1.3 Evolution No. 3. Evolution No. 3 *(see Figure B-1.3)*uses two engines, two hydrants, two supply lines, and two handlines. A 30-second delay should be used to start the second engine company and all personnel over the normal staffing of the first engine company.

(a) Stage engine companies and assigned personnel away from the hydrants. When personnel are ready, give signal for first engine company to proceed to hydrant.

(b) Start time when engine stops at the hydrant. (Do not allow additional personnel to start for 30 seconds.)

(c) Steps of operation:

(1) First engine lays one supply line from the hydrant a distance of 90 m (300 ft).
(2) One attack line is advanced from the first engine a distance of 45 m (150 ft).
(3) Second engine lays one supply line from the hydrant a distance of 90 m (300 ft).
(4) One backup line is advanced from the second engine a distance of 45 m (150 ft).
(5) Operate all lines at proper pressures and flows.

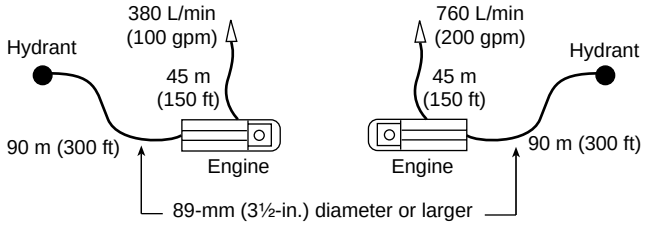
(d) Stop time when all lines are supplied properly. [Record time in B-1.3(f).]

(e) Equipment and personnel used in test:

(1) Size of supply line used?
(2) Size of attack line used?
(3) Size of backup line used?
(4) Number of persons used?

(f) Total time of evolution?

FIGURE B-1.3 Forward lays using two engines.



B-1.4 Evolution No. 4. Evolution No. 4 *(see Figure B-1.4)* uses one engine company, one supply line, and two handlines operated from a wye. If the number of personnel used to perform this evolution exceeds the staffing for a normal single-engine company, the additional personnel should be delayed 30 seconds before becoming involved in the evolution.

(a) Stage engine company and assigned personnel away from the simulated fire area. When personnel are ready, give signal for engine to proceed to the fire area.

(b) Start time when engine stops at the fire area. (Do not allow additional personnel to start for 30 seconds.)

(c) Steps of operation:

(1) At the fire area, remove two attack lines, wye, and leader line from the engine.
(2) Lay leader line to hydrant a distance of 90 m (300 ft) and connect engine to hydrant.
(3) At the fire area, connect attack line and backup line to wye and advance 45 m (150 ft).
(4) Operate all lines at proper pressures and flows.

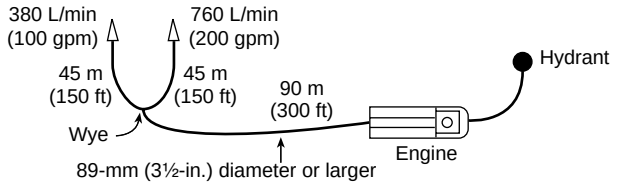
(d) Stop time when all lines are supplied properly. [Record time in B-1.4(f).]

(e) Equipment and personnel used in test:

(1) Size of supply line used?
(2) Size of attack line used?
(3) Size of backup line used?
(4) Number of persons used?

(f) Total time of evolution?

FIGURE B-1.4 Reverse lay with one engine using a wye.



B-1.5 Evolution No. 5. Evolution No. 5 *(see Figure B-1.5)* uses two engines, one supply line, and two handlines. A 30-second delay should be used to start the second engine and all personnel over the normal staffing of the first engine.

(a) Stage engines and assigned personnel away from the simulated fire area. When personnel are ready, give signal for engine to proceed to the fire area.

(b) Start time when engine stops at the fire area. (Do not allow additional personnel to start for 30 seconds.)

(c) Steps of operation:

(1) At the fire area, remove and advance one attack line and one backup line a minimum distance of 45 m (150 ft) from the first engine.
(2) After a 30-second delay, give signal for second engine to proceed to location of first engine.
(3) When second engine is stopped at first engine, supply hose is removed from second engine and second engine proceeds to water source and sets up for drafting operations.
(4) Operate all lines at proper pressures and flows.

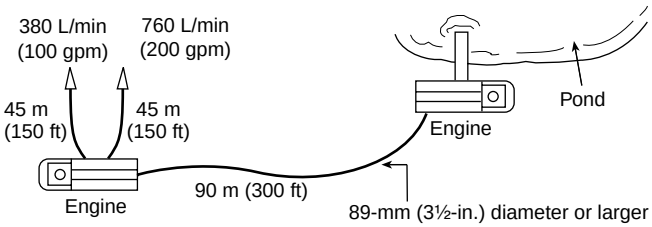
(d) Stop time when all lines are supplied properly. [Record time in B-1.5(f).]

(e) Equipment and personnel used in test:

(1) Size of supply line used?
(2) Size of attack line used?
(3) Size of backup line used?
(4) Number of persons used?

(f) Total time of evolution?

FIGURE B-1.5 Drafting operations using two engines.



B-1.6 Evolution No. 6. Evolution No. 6 *(see Figure B-1.6)* uses one engine operating from a water supply tank, two handlines, and water supply apparatus. If the number of personnel used to perform this evolution exceeds the staffing for a normal single-engine company and a water supply apparatus, the additional personnel should be delayed 30 seconds before becoming involved in the evolution.

(a) Stage engine company, water supply apparatus, and assigned personnel away from the simulated fire area. When personnel are ready, give signal for engine to proceed to fire area.

(b) Start time when engine stops at the fire area. (Do not allow additional personnel to start for 30 seconds.)

(c) Steps of operation:

(1) At the fire area, remove and advance one attack line and one backup line a minimum distance of 45 m (150 ft) from the engine.
(2) After a 30-second delay, locate water supply tank at fire area, fill tank, and establish water supply to engine.
(3) Maintain water supply through continuous tanker operations.
(4) Operate all lines at proper pressures and flows.

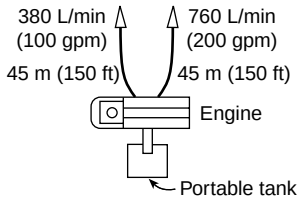
(d) Stop time when all lines are supplied properly. [Record time in B-1.6(f).]

(e) Equipment and personnel used in test:

(1) Size of supply line used?
(2) Size of attack line used?
(3) Size of backup line used?
(4) Number of persons used?

(f) Total time of evolution?

FIGURE B-1.6 Portable water supply tank using one engine and water supply apparatus.



B-1.7 Evolution No. 7. Evolution No. 7 *(see Figure B-1.7)* uses one engine, one portable master stream appliance, and two supply lines. If the number of personnel used to perform this evolution exceeds the normal single-engine staffing, the additional personnel should be delayed 30 seconds before becoming involved in the evolution.

(a) Stage engine company and assigned personnel away from the simulated fire area. When personnel are ready, give signal for engine to proceed to fire area.

(b) Start time when engine stops at the fire area. (Do not allow additional personnel to start for 30 seconds.)

(c) Steps of operation:

(1) At the fire area, remove two supply lines from engine, locate the monitor device, and connect supply lines to the demounted, portable master stream appliance.

(2) Lay two supply lines a distance of 90 m (300 ft) and connect engine to the hydrant.

(3) Supply the master stream appliance at proper pressures and flows.

(d) Stop time when the master stream appliance is supplied properly. [Record time in item B-1.7(f).]

(e) Equipment and personnel used in test:

(1) Size of supply line used?

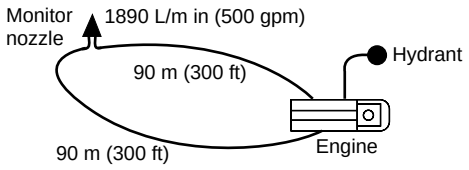
(2) Size of attack line used?

(3) Size of backup line used?

(4) Number of persons used?

(f) Total time of evolution?

FIGURE B-1.7 Reverse lay from portable master stream appliance using one engine.



B-1.8 Evolution No. 8. Evolution No. 8 *(see Figure B-1.8)* uses one engine, an engine-mounted master stream appliance, and two supply lines. If the number of personnel used to perform this evolution exceeds the normal single-engine staffing, the additional personnel should be delayed 30 seconds before becoming involved in the evolution.

(a) Stage engine company and assigned personnel away from the hydrant. When personnel are ready, give signal for engine to proceed to the hydrant.

(b) Start time when engine stops at the hydrant. (Do not allow additional personnel to start for 30 seconds.)

(c) Steps of operation:

(1) Lay two supply lines from the hydrant a distance of 90 m (300 ft).

(2) Place engine-mounted master stream appliance in operation and operate at proper pressures and flows.

(d) Stop time when the master stream appliance is supplied properly. [Record time in B-1.8(f).]

(e) Equipment and personnel used in test:

(1) Size of supply line used?

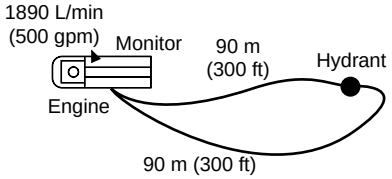
(2) Size of attack line used?

(3) Size of backup line used?

(4) Number of persons used?

(f) Total time of evolution?

FIGURE B-1.8 Forward lay using one engine and an engine-mounted master stream appliance.



B-1.9 Evolution No. 9. Evolution No. 9 *(see Figure B-1.9)* uses one aerial truck with an elevated master stream appliance, one engine, and two supply lines. The number of personnel used to perform this evolution should not exceed the normal engine and ladder company staffing.

(a) Stage all apparatus and assigned personnel away from the simulated fire area. When personnel are ready, give signal for engine to proceed to the fire area.

(b) Start time when first vehicle stops at the fire area. (Do not allow additional personnel to start for 30 seconds.)

(c) Steps of operation:

(1) Position apparatus and prepare elevated master stream for service.

(2) Lay two supply lines a distance of 90 m (300 ft) and connect engine to the hydrant.

(3) Connect supply lines to elevated master stream appliance intake and operate the master stream at proper pressures and flows.

(d) Stop time when the elevated master stream appliance is supplied properly. [Record time in B-1.9(f).]

(e) Equipment and personnel used in test:

(1) Size of supply line used?

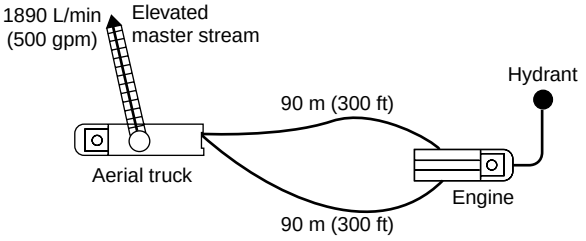
(2) Size of attack line used?

(3) Size of backup line used?

(4) Number of persons used?

(f) Total time of evolution?

FIGURE B-1.9 Reverse lay from apparatus equipped with an elevated master stream appliance using one engine.



B-1.10 Evolution No. 10. Evolution No. 10 *(see Figure B-1.10)* uses one apparatus equipped with an elevated master stream device, one engine company, one large-diameter supply line, and one handline. The number of personnel used to perform this evolution should not exceed the normal engine and ladder company staffing.

(a) Stage all apparatus and assigned personnel away from the simulated fire area. When personnel are ready, give signal for engine to proceed to the fire area.

(b) Start time when first vehicle stops at the fire area. (Do not allow additional personnel to start for 30 seconds.)