

# Utah Fire Service Certification System

## APPARATUS DRIVER / OPERATOR PUMPER



CERTIFICATION STANDARD

*MARCH 2015*



# Utah Fire Service Certification Council

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# **Apparatus Driver/Operator Pumper Technical Committee**

The Certification Council would like to recognize and extend a voice of appreciation to the following fire service professionals for their work on the ADO - Pumper certification standard. These individuals devoted many hours to reviewing the National Fire Protection Association (NFPA) 1002 standard, Certification Test Bank, curriculum text books, and developing the skills for this standard.

Thank You...

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## **INTRODUCTION**

The world we live in is changing so fast, and the many phases of the fire service are becoming so technical and complex that fire service training must be utilized to its maximum potential. Any overlap, fragmentation, and lack of basic structure must be eliminated. Standardization is the natural complement and necessity.

The fire service in Utah, through a state certification program, can meet the needs of future growth and establish uniformity by certification. We will then have more effective and efficient utilization of resources so as to provide the best possible fire protection service for all the citizens throughout the state of Utah.

The following certification requirements are based on the objectives listed in the National Fire Protection Association (NFPA) 1002 standard for *Fire Apparatus Driver/Operator Professional Qualifications*, 2014 Edition, Chapter 5, as verified and adopted by the Utah Fire Service Certification Council (UFSCC).

Through these national standards and certification, firefighters and fire departments have a tool to measure specific levels of skills, abilities and knowledge. The UFSCC believes that by participating in the certification program firefighters and fire departments will be better prepared to provide quality life safety and fire protection for their communities.

**In Memoriam,  
September 11, 2001**

We pay tribute to the 343 members of FDNY who gave their lives to save civilian victims on September 11, 2001, at the World Trade Center. They are true American heroes in death, but they were also American heroes in life. We will keep them in our memory and in our hearts. They are the embodiment of courage, bravery, and dedication. May they rest in peace.

# **CERTIFICATION REQUIREMENTS**

In order to certify within the Utah Apparatus Driver Operator (ADO) - Pumper Apparatus program, departments/firefighters must fulfill the following requirements:

- 1- Complete entrance requirements.
- 2- Meet pre-requisite, certified Firefighter I, Hazardous Materials Awareness, Hazardous Materials Operations with UFSCC.
- 3- Set up and maintain department records.
- 4- Train on the required written and practical objectives.
- 5- Pass a department "In House" practical skills examination.
- 6- Meet any other training requirements/prerequisites as defined by the certification Council.
- 7- Pass both written and practical skills examination administered by the certification Council.
- 8- Request ADO-Pumper certification.
- 9- Request re-certification.

## *Entrance Requirements*

The UFSCC acknowledges the importance of and need for entrance requirements as listed in the NFPA 1001 standard on *Firefighter Professional Qualifications*. Many agencies and departments have existing policies, regulations, etc. already in place regarding these requirements. The handling of entrance requirements is a **LOCAL MATTER**, outside the authority and jurisdiction of the UFSCC. The Council will not check, test, evaluate or determine how individual agencies meet these requirements. Some departments have found it necessary to waive any type of entrance requirements due to their own special needs. Since this is a local decision, this is permitted. However, due to the amount of physical, mental and emotional stress inherent in this profession. **The Utah Fire Service Certification Council strongly recommends very careful evaluation before altering or doing away with any entrance requirements.**

## *Physical Fitness Requirements*

The requirements listed in NFPA 1001, 2013 ed., Chapter 4 are:

- 1- Meet the minimum educational requirements established by the authority having jurisdiction.
- 2- The Utah Fire Service Certification Council Policy 11.3 requires that a candidate must be 18 years of age to test and be certified.
3. Meet the medical requirements of NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, chapter 5, subsection 5.1.1, as determined by the medical authority of the AHJ.
4. Physical fitness requirements for entry-level personnel shall be developed and validated by the authority having jurisdiction. Physical fitness requirements shall be in compliance with applicable Equal Employment Opportunity regulations and other legal requirements.

## *Additional Requirements*

In addition, NFPA 1002 standard for *Fire Apparatus Driver/Operator Professional Qualifications*, 2014 edition lists the following general requirements:

- 1- The Fire Apparatus Driver/Operator shall be licensed to drive all vehicles they are expected to operate in accordance with Utah State law.
- 2- The Fire Apparatus Driver/Operator shall be subject to periodic medical evaluations, as required by NFPA 1500 standard on *Fire Department Occupational Safety and Health Program*, Section 8-1, Medical requirements, to determine that the driver / operator is medically fit to perform the duties of a Fire Apparatus Driver/Operator (NFPA 1002, 1.4.2).

## *Department Training Officers*

In order for a department to enroll in the certification process, it is necessary for the department to assign training officers. It is recommended that the department assign at least two personnel as training officers to coordinate and provide certification training.

Department training officers shall be state certified at the level they are teaching. In addition, the certification Council strongly recommends that training officer be state certified as a Fire Service Instructor I.

Department training officers will be responsible for certification training. Their primary responsibility will be to teach, evaluate, and in-house test department personnel on the manipulative skill requirements for each level of certification training.

Departments who **do not** have certified personnel to act as training officers for certification training should contact the Utah Fire and Rescue Academy at (801) 863-7700 or 1-888-548-7816 for assistance in setting up and monitoring certification training.

The final entrance requirement is to complete the "Intent to Participate" form provided in Appendix F and return it to the certification Council. Remember, participation in the certification process is **VOLUNTARY**. Once you have enrolled, you can withdraw if desired.

**If a department is already participating in the Utah Fire Service Certification System, it will not be necessary to file another "Intent To Participate" form.**

## **DEPARTMENT** **TRAINING**

### *Written Objectives*

The position of an Apparatus/Driver is one that requires a high level of skill and knowledge. The training that is given to and received by ADO candidates should be of the highest quality and degree. All training received must meet the requirements of NFPA 1002; Chapters 5 (2014 edition) and the skills as approved by the UFSCC contained within the Utah standard. All training received must be documented and recorded on a training record (Appendix A). All testing for ADO-Pumper will be conducted following the policies and procedures of the UFSCC.

Training for ADO-Pumper is conducted at the department level or could be received through a joint training agreement between departments on a regional level. Regardless of where the training is received it must prepare the candidate to be a competent and effective apparatus operator.

The course material should be referenced to the following textbook to prepare the candidate to successfully pass the state certification examination. A comprehensive list of hydraulic information is found in Appendix D of this standard. These formulas are used on the written examination and will be available during the written examination.

Written objectives for ADO-Pumper Apparatus are covered in the following text:

- **IFSTA, Pumping and Aerial Apparatus Driver/Operator Handbook, 3rd Edition, 1st Printing**
- **NFPA 1002, Standard on Fire Apparatus Drive/Operator Professional Qualifications, 2014 Edition.**
- **NFPA 1500, Fire Department Occupational Safety and Health.**

These textbooks are available from various fire service bookstores. A current list of IFSTA textbook sources is available by calling the certification office at 1-888-548-7816.

There are numerous methods departments have used to help prepare their personnel for the written examination. Considering the high level of skill and knowledge that is required of an Apparatus Driver Operator, the Council recommends that the candidate participates in a comprehensive class and receive instruction on both manipulative and written requirements.

### *Manipulative Objectives*

Each of the manipulative skill objectives shall be completed swiftly, safely and with competence as defined below:

- **Swiftly** - Each manipulative skill objective must be completed within the allotted time.

*Department Training  
Record*

*Department "In House"  
Manipulative Skills  
Examination*

- **Safely** - Each manipulative skill objective must be completed safely. Conduct that could injure an individual or damage equipment is unacceptable. Equipment should be checked prior to skill testing or training to see that it is safe and functional.
- **Competence** - Each manipulative skill objective is performed in accordance with the Utah standard. This includes performing the proper steps in sequence. Competence will be measured in accordance with the UFSCS manipulative skill objectives.

Each participant shall have a current training record on file with the department which indicates that he/she has trained on all manipulative skill objectives. Training records must have the date and Instructors original signature and/or initials for each line. Departments may set up their own training records or use the one provided in Appendix A.

At the completion of the department's manipulative skills training, the department is required to hold an "in-house" skills examination for the level being trained. This is a comprehensive "in house" skill test conducted by the department training officers. This test is to ensure that skill mastery has been maintained from the beginning to the end of the training process, and to prepare participants for the state examination. Training officers may utilize other personnel to assist in administering the exam; however, they must be certified at the level they are in-house testing.

Proctor instructions for the examination are in Appendix E. In-house testers shall follow the proctor instruction sheet to provide for uniformity and fairness during the exam. It is recommended that participants be given two attempts at any skill. **If they fail on the second try, then they have failed the evaluation and are required to go through additional training by the department trainer.** No training, teaching, or coaching is allowed during the test. After the evaluation, using the test to teach and train is recommended.

If manipulative skill weaknesses are evident, the department should conduct additional training and hold a new department "in house" manipulative skill examination to ensure their personnel has fully mastered all required skills. Only those individuals who successfully pass the department skill test will be allowed to participate in the certification council's manipulative skill "spot check" examination. Department records must show that all participants have successfully passed the "in-house" exam.

# CERTIFICATION EXAMINATIONS

## *Written Examinations*

After completion of the training process, the Chief/Administrator can request testing for the candidate using the "Request for Examination" form in Appendix F. The candidate will then have three attempts to pass the written examination. A separate application must be sent to the Certification Council for each attempt. Request forms must reach the Certification Council no later than **30 days** prior to the examination date. The entire examination process must be completed within one year of the first written exam date.

The written examination is a randomly generated 100-question test covering the written objectives of the ADO - Pumper Apparatus standard. This is a closed book test. Calculators are allowed on the written exam and will be provided by the Certification office. No other calculators will be allowed. The comprehensive list of fire flow formulas provided in Appendix D will be allowed for use during the written examination and will be provided for by the Certification Tester.

A minimum score of 70% is required to pass the certification exam. Firefighters failing the first attempt of the written exam will be permitted to retest no sooner than 30 days from the date of the last exam. Three attempts are given to pass the exam. If a participant fails the written examination three times, he/she has failed the certification process and must wait 1 year from the date of the last failed exam before re-entering testing. Exam results are forwarded to the Chief/Administrator within 30 days following the receipt of the completed exam.

### SAMPLE WRITTEN EXAMINATION QUESTIONS:

Being aware of all that is happening at the sides and to the rear of the apparatus are techniques of:

- |                             |                       |
|-----------------------------|-----------------------|
| a- aggressive driving       | b- offensive driving  |
| <b>c- defensive driving</b> | d- responsive driving |

A reduced speed of \_\_\_\_\_ is suggested when crossing blind or heavily traveled intersections?

- |                      |               |
|----------------------|---------------|
| <b>a - 15-20 mph</b> | b - 25-30 mph |
| c - 20-25 mph        | d - 30-35 mph |

## *Manipulative Skills* *"Spot Check"* *Examination*

This is a two step examination. A department record check and the manipulative skills "spot check" examination. A Certification Tester appointed by the Utah Fire Service Certification Council conducts the examination.

Training records are checked. If records are inadequate, corrective action must be taken before proceeding to the next step. The records must meet minimum requirements and are checked for the following:

- 1- Participant has been trained in each manipulative skill for the level being evaluated.
- 2- A department training officer has signed off each manipulative skill.
- 3- Each trainee has passed a department "in-house" manipulative skills examination.

The manipulative skill "spot check" examination is graded on a 100% pass/fail basis. The test is graded in the following three areas:

- **Swiftly** - Each manipulative skill objective must be completed within the allotted time.
- **Safely** - Each manipulative skill objective must be completed safely. Conduct that could injure an individual or damage equipment is unacceptable. Equipment should be checked prior to skill testing or training to see that it is safe and functional.
- **Competence** - Each manipulative skill objective is performed in accordance with the Utah standard. This includes performing the proper steps in sequence. Competence will be measured in accordance with the UFSCS manipulative skill objectives.

Participants are "spot checked" on three manipulative skills. No prior notification of the skills being tested will be given. Participants are given two attempts if necessary to perform each skill. If they fail on the second attempt, the applicants must wait 30 days before the third and final attempt. Participants taking third attempts will test on the skill they missed plus an additional skill from the section of the standard they failed during the previous two attempts. **No training, teaching, or coaching is allowed during this state test.**

During the manipulative examination a SPOTTER will be used. The purpose of having a spotter assist while backing an apparatus is to protect life and property. The spotter should alert the driver if property damage could occur or damage the apparatus. The spotter will not DIRECT the driver when to stop during a test.

Participants who have failed the third attempt of the written examination or the manipulative skill examination then they have failed the certification process and must wait 1 year from the date of the failed third attempt to re-enter state testing. The participant will begin testing with a new 1st attempt of the written examination.

# ADO-PUMPER APPARATUS CERTIFICATION

When all requirements for certification have been met, applicants are eligible to be certified. The Chief/Administrator may apply to the Utah Fire Service Certification Council for certification for those participants who have successfully completed the certification training/testing process. Request for state certification will be submitted to the Council using the "Request for Certification" form provided in Appendix F. The names are then checked against the official state records to ensure that each individual listed has met all requirements and prerequisites.

Those applicants who have met the requirements are issued a wallet card and certificate. These are sent to the Chief/Administrator for disbursement. There is no cost for testing/certification if the candidate passes their written examination on the first attempt. A \$40 testing/certification fee will be assessed if the candidate passes their written exam on the 2nd attempt, and a \$60 fee will be assessed if the candidate passes their written exam on the 3rd attempt. This fee schedule is applicable as of July 1, 2013.

**\*The above fee table applies to Utah Fire Departments only. All other agencies will be assessed a testing/certification fee of \$40.00 per level.**

## *Prerequisites for Certification*

Applicants for certification at the Apparatus Driver Operator – Pumper level must be state certified by the Utah Fire Service Certification Council at the Firefighter I, Hazardous Materials Awareness level, and Hazardous Materials Operations level. ADO-Pumper level certification will not be issued until participants have fulfilled this requirement.

## *Re-certification*

Certification at ADO-Pumper level is valid for a three-year period. Each certified ADO-Pumper may renew certification by having the Chief/Administrator of the participating agency submit an "Application for Re-certification" provided in Appendix F.

Each certified ADO shall participate in at least 36 hours of structured class and manipulative training per year to maintain competency. A total of 108 hours of training is required during the previous certification period.

*For more information  
on Utah Firefighter  
Certification contact  
the:*

**Utah Fire Service Certification Council  
Utah Fire and Rescue Academy  
3131 Mike Jense Parkway  
Provo, Utah 84601  
1-888-548-7816  
[www.uvu.edu/ufra](http://www.uvu.edu/ufra)**

# **ADO/PUMPER** **CERTIFICATION** **CHECKLIST**

## **ENTRANCE REQUIREMENTS:**

Each participant has met requirements listed in NFPA 1001, Chapter 2 or those established by the authority having jurisdiction.

Each participant has met the additional requirements as required by NFPA 1002, Chapter 1:

- 1- Valid driver license.
- 2- Medical evaluation as required by NFPA 1500, Section 8-

Department has filed an "Intent to Participate" form with the UFSCC.

## **DEPARTMENT TRAINING RECORDS:**

Each participant has a training record on file with the department that shows:

- 1- A learning experience in each manipulative skill objective.
- 2- Dates of training.
- 3- Initials of instructors.

Each participant has trained on the ADO level written objectives.

## **DEPARTMENT "IN HOUSE" MANIPULATIVE SKILLS EXAMINATION:**

Each participant has successfully completed an "In House" manipulative skills examination.

Results of exam are documented in department training records.

## **ADDITIONAL TRAINING /PREREQUISITE REQUIREMENTS:**

Each participant is state certified through the UFSCC at the Firefighter I, Hazardous Materials Awareness level, and Hazardous Materials Operations level.

## **CERTIFICATION EXAMINATIONS:**

Each participant has passed the UFSCC written examination.

Each participant has passed the UFSCC manipulative skill

"Spot Check" examination administered by an approved Certification Tester.

## **ADO - PUMPER CERTIFICATION:**

Chief/Administrator request certification for participants using the "Request for Certification" form.

# ADO-PUMPING APPARATUS MANIPULATIVE SKILL OBJECTIVES

## PREVENTIVE MAINTENANCE

### 1. Perform and document routine tests, inspections, and servicing functions on specified systems and components.

#### A. For a fire department apparatus (Pumper).

REFERENCE: NFPA 1002, 2014 Edition, 4.2.1, 4.2.2, 4.3.7, 5.1.1

CONDITION: Given a fire department pumping apparatus, inspection form or check-off sheet. Sample check-off sheet provided in **Appendix B or a department check-off sheet that covers all items listed below.**

COMPETENCE:

- Check batteries for fluid level and corrosion (if **maintenance** free, check indicator for correct color).
- Check braking system for fluid level/drain air tanks of water.
- Check Suspension (clips, shackles, leaf springs, U-bolts, etc.)
- Check coolant system for fluid level, leaks, and cleanliness.
- Check electrical system for corrosion and tight connections.
  - Siren and other warning devices.
  - Headlights, running lights, and turn signal flashers.
  - Emergency warning lights.
- Check fuel level.
- Check hydraulic fluids for fluid level and leaks, if applicable.
- Check engine oil for fluid level and leaks.
- Check transmission for fluid level and leaks.
- Check power steering for fluid level and leaks.
- Check other fluid levels, as appropriate.
- Check tires for pressure and wear.
- Check steering system for range of motion and looseness.
- Check engine belts for tightness and wear.
- Check tools, appliances, and equipment, fixed equipment, lighting.
- Check windshield wiper blades and fluid.
- Start apparatus and monitor gauges and other control devices.
- Identify, document, and report deficiencies found.

**Time:** 20:00 Minutes

**B. Fire department pump system.**

REFERENCE: NFPA 1002, 2014 Edition, 5.1.1

CONDITION: Given a fire department pumping apparatus, maintenance and inspection form or check off sheet, determine readiness of fire pump on apparatus.

COMPETENCE:

- Check water tank for level and leaks in system.
- Check foam tank for level and leaks in system (if applicable).
- Check primer oil.
- Exercise all pump valves.
- Check and clean intake strainers/anode.
- Check pump gearbox/transfer case for proper oil level and traces of water.
- Start apparatus and place apparatus in pump gear.
- Operate the pump primer with all pump valves closed.
- Operate the transfer valve while pumping from booster tank or other water source (if applicable).
- Check pump shaft for excessive leaks.
- Operate the pump pressure control device(s). (Intake and discharge if applicable).

TIME: 20:00 Minutes

## DRIVING OPERATIONS

**NOTICE:** The driving skills in this standard are used to determine participant's qualifications to become certified by the Utah Fire Service Certification Council at the level of ADO-Pumping Apparatus. The passing of these skills does not qualify a participant for any other certification or licenser, such as a Commercial Drivers License (CDL) and is not intended to certify, verify or approve an individual's ability to drive fire apparatus on state or federal highways. The responsibility to determine who will drive fire apparatus resides with the local fire department or the authority having jurisdiction.

2. Operate a fire department pumper so that the vehicle is safely operated in compliance with all applicable state and local laws, departmental rules and regulations.

REFERENCE: NFPA 1002, 2014 Edition, 4.3.1, 4.3.6  
NFPA 1500, 2013 Edition, 4.2  
Utah Criminal and Traffic Code, Chapter 41-6.

CONDITION: Given a fire department pumping apparatus and a predetermined route that incorporates the maneuvers and features specified below, and that the driver/operator is expected to encounter during normal operations:

**NFPA 1002 4.3.1**

4.3.1(1) Four left turns and four right turns

4.3.1(2) A straight section of urban business street or a two-lane rural road at least 1.6 km (1 mile) in length.

4.3.1 (3) One through-intersection and two intersections where a stop has to be made.

4.3.1(4) One railroad crossing

4.3.1(5) One curve, either left or right

4.3.1(6) A section of limited-access highway that includes a conventional ramp entrance and exit and a section of road long enough to allow two lane changes.

4.3.1(7) A downgrade steep enough and long enough to require down-shifting and braking.

4.3.1(8) An upgrade steep enough and long enough to require gear changing to maintain speed

4.3.1(9) One underpass or a low clearance or bridge.

**Note:** Conditions 1 – 9 may be modified if the jurisdiction does not have a means to train on the skill due to geographic limitations, manufacturer's recommendations or department SOP's. In the absence of these limitations and prohibitions, all of the skills should be trained on and certified to:

COMPETENCE:

- Adjust and use mirrors.
- Use seat belts for all occupants.
- Observe all posted speed limits.
- Maintain safe following distances.
- Maintain control of the vehicle while accelerating, decelerating, and turning.
- Stop fully at all stop signs or stop lights.
- Use turn signals.
- Keep apparatus in correct lane of travel.
- Monitor all gauges so vehicle is operated within manufactures specifications.

TIME: As determined by route

**SPOTTER INSTRUCTIONS: Skills 3 through 6 will be tested on a controlled and unobstructed training ground. Duties of the spotter for testing purposes may be different from the spotter's duties during normal operations. The purpose of having a spotter assist while backing an apparatus is to protect life and property. The spotter should alert the driver if property damage could occur or damage the apparatus. Because the training ground is a controlled and unobstructed environment, the spotter will NOT direct the driver when to stop during a test unless damage might occur. Assisting the driver in completing the skill will result in an automatic fail for the driver. It is the intent of certification testing to assess whether the driver is aware of the dimensions of the apparatus.**

**3. Back a vehicle from a roadway into restricted spaces on both the right and left sides of the vehicle. (Alley Dock)**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.2, 4.3.6

CONDITION: Given a fire department pumping apparatus, spotter, cones, and a restricted space 12ft in width, requiring 90-degree right or left-hand turns from a 40ft wide roadway, so that the vehicle is parked within the restricted area without having to stop and adjust travel and without striking cones. A marker should be placed on the ground, on the left side of the apparatus, to mark where the front left tire should be spotted, and where to stop the apparatus and park.  
**\* See Appendix C for diagram of course and instructions.**

COMPETENCE:

- Adjust and use mirrors for backing.
- Driver/passengers wearing seat belts.
- Spotter used to back apparatus, for safety only.
- Stop apparatus so that the center of the left front wheel is within 6" of the center of the marker.
- Completed skill correctly without striking cones.

TIME: 5:00 Minutes

**4. Maneuver vehicle around obstructions on a roadway while moving forward and in reverse. (Serpentine)**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.3, 4.3.6

CONDITION: Given a fire department pumping apparatus, spotter, cones, and a roadway with obstructions, so that the vehicle is maneuvered through the obstructions without stopping and without striking cones. **\* See Appendix C for diagram of course and instructions.**

\*Spacing of cones should be measured 38 feet from base to base. For apparatus lengths that exceed 36 feet, the course may be modified to apparatus length plus 2 feet base to base.

COMPETENCE:

- Adjust and use mirrors for backing.
- Driver/passengers wearing seat belts.
- Spotter used to back apparatus for safety only.
- Completed skill correctly without striking cones.

TIME: 5:00 Minutes

**5. Turn a vehicle around 180 degrees within a confined space. (Confined Space Turnaround)**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.4, 4.3.6

CONDITION: Given a fire department pumping apparatus, spotter, cones, area where vehicle cannot make a U-turn without stopping and backing up, so that the vehicle is turned 180 degrees without crossing over or striking cones. \* **See Appendix C for diagram of course and instructions.**

COMPETENCE:

- Adjust and use mirrors for backing.
- Driver/passengers wearing seat belts.
- Spotter used to back apparatus for safety only.
- Completed skill correctly without crossing over or striking cones.

TIME: 5:00 Minutes

**6. Maneuver a vehicle in restricted horizontal clearances. (Diminishing Clearance)**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.5, 4.3.6

CONDITION: Given a fire department pumping apparatus, spotter, cones, course that requires the operator to move through areas of restricted horizontal clearances, so that the operator accurately judges the ability of the vehicle to pass through the openings without striking cones. \* **See Appendix C for diagram of course and instructions.**

COMPETENCE:

- Adjust and use mirrors.
- Driver/passengers wearing seat belts.
- Completed skill correctly without striking cones.
- Place the apparatus bumper within 18” of the cone at the finish line without crossing over it.

TIME: 5:00 Minutes

## PUMPING OPERATIONS

7. **Produce effective hand or master streams, given the source specified for the following, so that the pump is safely engaged, all pressure control and vehicle safety devices are set, the rated flow for the nozzle is achieved and maintained and the apparatus is continuously monitored.**

**A. Fire Hydrant Transition/Handline.**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.7, 5.2.1

CONDITION: Given a fire department pumping apparatus, supply hose (2 1/2" or larger), attack line minimum 100 feet 1 1/2" or 1 3/4" hoseline, appropriate fittings and tools, pre-established water supply not connected to the inlet, Operator plus 1-firefighter to assist with hydrant and 1-firefighter to assist with hoseline.

COMPETENCE:

- Stop apparatus, set brake.
- Engage pump.
- Chock wheels.
- Engage tank to pump (department standard).
- Open correct discharge valve and charge appropriate attack line.
- Gradually develop pump discharge pressure in attack line.
- Make supply line connection to intake.
- Signal hydrant for water.
- Smooth transition from tank water to hydrant supply (monitor valves, gauges, and throttle).
- Set discharge relief valve (department standard).
- Monitor discharge pressure.
- Establish and verbalize correct PDP (within +/- 10 psi) and the method used to determine PDP.

TIME: 5:00 Minutes

**B. Fire Hydrant – Master Stream Device.**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.7, 5.2.1

CONDITION: Given a fire department pumping apparatus, supply hose (2 1/2” or larger), appropriate fittings and tools, Mounted master stream device or portable. pre-established water supply not connected to the inlet, Operator plus 1-firefighter to assist with hydrant and 2 firefighters to assist with hoselines and Master stream device (if portable master stream device is used).

COMPETENCE:

- Stop apparatus, set brake.
- Engage pump.
- Chock wheels.
- Engage tank to pump (department standard).
- Make supply line connection.
- If using portable master stream device, set up device away from apparatus using a minimum of 100 feet of supply hose.
- Properly secure device.
- Signal for water from hydrant.
- Open appropriate discharge valve(s).
- Gradually develop pump discharge pressure to master stream device.
- Set discharge relief valve (department standard).
- Monitor discharge pressure.
- Establish and verbalize correct PDP (within +/- 10 psi) and the method used to determine PDP

TIME: 5:00 Minutes for Mounted Master Stream Device  
10:00 Minutes for Portable Master Stream Device

**C. Draft Supply Source – Handline.**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.7, 5.2.1

CONDITION: Given a fire department pumping apparatus, hard suction intake hose, appropriate fittings and tools, 10 ft. ladder, portable water tank (if being used as water source), 100 ft. of 1 1/2” or 1 3/4” attack line. Operator plus 2-firefighters to assist with setting up equipment.

COMPETENCE:

- Position apparatus at drafting location.
- Connect sections of hard suction hose together (department standard).
- Connect strainer to hard suction hose, attach rope (department standard).
- Connect to apparatus, tighten all connections.
- Place ladder into static water source (if necessary).
- Lower intake hose into static source.
- Engage pump.
- Pick up draft.
- Gradually open appropriate valve to charge hand-line.
- Flow water from handline or master stream device for 1 minute at appropriate pressure.
- Establish and verbalize correct PDP (within +/- 10 psi) and the method used to determine PDP

TIME: 10:00 Minutes

**8. Establish a relay pumping evolution, produce an effective water supply, so that the pump is safely engaged, all pressure control and vehicle safety devices are set, the rated flow is achieved, and the apparatus is continuously monitored for potential problems.**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.7, 5.2.2

CONDITION: Given 2 fire department pumping apparatus with 200 feet 2 1/2" or larger hose, appropriate hose adapters and appliances, 4 firefighter team (2 firefighters per apparatus). With "Attack" pumper positioned 200 ft. from "Source" pumper. Candidate being evaluated will be at the Source Pumper.  
\* Relay Chart reference can be found in appendix E.

COMPETENCE:

- Position "Source" pumper at water source (hydrant or draft location).
- Ensure supply lines from Source pumper are connected to Attack pumper.
- Establish water supply to "Source" pumper intake.
- All pumpers except source pumper open a discharge to exhaust air from lines.
- Pump required discharge pressure from Source pumper to Attack pumper, based on max distance/constant pressure relay method.
- Through radio communication ensure that the Attack pumper has water flowing from discharge opening at an appropriate pressure (20 psi intake as a minimum).
- Correctly shut down relay (from attack to source)

TIME: 10:00 Minutes

9. **Produce a foam fire stream so that properly proportioned foam is delivered. (USE THE COMPETENCY THAT IS APPROPRIATE FOR THE TYPE OF FOAM EQUIPMENT THAT YOUR DEPARTMENT HAS).**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.7, 5.2.3

CONDITION: Given a fire department pumping apparatus, foam concentrate, **foam eductor**, foam nozzle, or other portable foam producing equipment, with hoseline set up, 2 firefighter team to manage the hose line.

COMPETENCE:

- Set concentrate percentage on the proportioner.
- Place pickup tube in foam container.
- Ensure nozzle flow rate and eductor flow rate match.
- Set appropriate pump discharge pressure.
- Ensure back pressure does not exceed 65% to 70% of eductor inlet pressure
- Deliver properly proportioned foam.
- Clean system when skill complete (not included in time limit).
- Establish and verbalize correct PDP (within +/- 10 psi) and the method used to determine PDP

**OR**

CONDITION: Given a fire department pumping apparatus, foam concentrate, **apparatus mounted foam system**, foam nozzle, with hoseline set up, 2 firefighter team to manage the hose line.

COMPETENCE:

- Set concentrate percentage on the proportioner.
- Set metering valve.
- Set appropriate pump discharge pressure.
- Deliver properly proportioned foam.
- Clean system when skill complete (not included in time limit).
- Establish and verbalize correct PDP (within +/- 10 psi) and the method used to determine PDP.

TIME: 5:00 Minutes

**10. Supply water to a fire sprinkler or standpipe system so that water is supplied to the system at the correct volume and pressure.**

REFERENCE: NFPA 1002, 2014 Edition, 4.3.7, 5.2.4

CONDITION: Given a fire department pumping apparatus, 2- lengths 2 ½” or 3” hose, additional hose tools or appliances, pre-established water supply not connected to the inlet, 2-firefighter team to make connection from apparatus to FDC.

COMPETENCE:

- Stop apparatus, set brake.
- Engage pump.
- Chock wheels.
- Open tank to pump (department standard).
- Open correct discharge valve and charge appropriate supply lines to FDC.
- Make supply line connection to intake.
- Signal hydrant for water.
- Gradually develop pump discharge pressure in supply lines.
- Set discharge relief valve (dept standard)
- Monitor discharge pressure.
- Establish and verbalize correct PDP (within +/- 10 psi) and the method used to determine PDP

TIME: 5:00 Minutes

**APPENDIX - A**  
**TRAINING RECORD**

**UTAH FIRE SERVICE CERTIFICATION SYSTEM  
 APPARATUS DRIVER OPERATOR - PUMPER**

*NFPA 1002, 2014 Edition*

*ADO - PUMPER  
 TRAINING RECORD – IN-HOUSE COMPREHENSIVE EXAM*

**NAME:** \_\_\_\_\_ **DEPARTMENT:** \_\_\_\_\_

**Training Records must have the date and instructor’s original signature and/or initials for each line.**

SECTION	TRAINING RECORD		IN-HOUSE COMP. EXAM			MANIPULATIVE SKILL DEMONSTRATE
	DATE	INST	DATE	INST	PASS	
<b>PREVENTIVE MAINTENANCE</b>						1A. Perform and document routine tests, inspections, and servicing functions for a fire department apparatus.
						1B. Perform and document routine tests, inspections, and servicing functions for the pumping system on apparatus.
<b>DRIVING OPERATIONS</b>						2. Operate a fire department pumper so that the vehicle is safely operated in compliance with all state and local laws, department rules and regulations.
						3. Back a vehicle from a roadway into restricted spaces on both right and left sides of the vehicle. (Alley Dock)
						4. Maneuver vehicle around obstructions on a roadway while moving forward and in reverse. (Serpentine)
						5. Turn a vehicle around 180 degrees within a confined space. (Confined Space Turnaround)
						6. Maneuver a vehicle in restricted horizontal clearances. (Diminishing Clearance)
<b>PUMPING OPERATIONS</b>						7A. Produce effective fire stream, hydrant – transition/handline.
						7B. Produce effective fire stream, hydrant – master stream.
						7C. Draft supply source – handline.
						8. Establish a relay pumping operation.
						9. Produce a foam fire stream so that properly proportioned foam is delivered.
						10. Supply a sprinkler/standpipe system.

**APPENDIX - B**  
**WEEKLY VEHICLE REPORT**

# Weekly Emergency Vehicle Report

Department \_\_\_\_\_

Station \_\_\_\_\_

Apparatus Number \_\_\_\_\_

Type \_\_\_\_\_

		Day of the week/Date	Mon	Tues	Wed	Thu	Fri	Sat	Sun
			___	___	___	___	___	___	___
Engine Comp.	1	Radiator Coolant							
	2	Engine Oil Level							
	3	Transmission Fluid							
	4	Power Steering Fluid							
	5	Belts/Pulleys							
	6	Hoses and Hydraulic Lines							
	7	Air Filter							
	8	Batteries							
	9	Other Hydraulic Fluids							
	10	Engine (loose wires, etc.)							
In the Cab	1	Fuel Level							
	2	Odometer Reading							
	3	Brakes							
	4	Air Pressure							
	5	Battery Voltage							
	6	Check Gauges							
	7	Check Switches							
	8	Siren/Horn/Siren Brake							
	9	Steering Wheel Play							
	10	Mirrors							
	11	Panel Lights							
	12	Interior Lights							
	13	Radio							
	14	Heater/AC Controls							
Walk Around	1	General Body Condition							
	2	Suspension							
	3	Steering Linkage							
	4	Listing/Fluid Leaks							
	5	Emergency Lights							
	6	Vehicle Lights							
	7	Spot/Scene Lights							
	8	Wiper Blades/Washer Fluid							
	9	Tires (Press/Tread)							
	10	Ground Ladders							
	11	Tools/ Fixed Equipment							
	12	<b>Start Apparatus/Monitor</b>							
	13	Driver Initials/Badge#							

Aerial Inspection	Day of the week	Mon	Tues	Wed	Thu	Fri	Sat	Sun
	1	Hydraulic Fluid Level						
	2	Hydraulic System/PTO						
	3	Stabilizers and Pads						
	4	Interlocks						
	5	Leveling Gauges						
	6	Aerial Control Stations						
	7	Operate Aerial						
	8	Visual Inspection						
	9	Slides/Slide Blocks/Rollers						
	10	Nozzle/Waterway						
	11	Communication System						
	12	Master Stream Controls						
	13	Spot Lights/Flood Lights						
	14	Lubrication						
	15	Cables						
	16	Pulleys						
	17	Rams/Cylinders						
	18	Hydraulic Hoses/Tubing						
	19	Breathing Air						
	20	Attached Tools/Equipment						
21	E.P.U. Operation (weekly)							

Pump Check	1	Tank Water Level						
	2	Foam Level						
	3	Primer Oil Level						
	4	Pump Transfer Case Oil Level						
	5	Intake Strainers/Anode						
	6	Relief Valve Strainer						
	7	Operate all Valves/Drains						
	8	Primer Operation						
	9	Operate Transfer Valve						
	10	Pump Operation						
	11	Relief valve/Governor Op.						
	12	LDH Bleeder						

Remarks By Person Completing Form	Date	Name

**APPENDIX - C**  
**DRIVING SKILLS DIAGRAMS / INSTRUCTIONS**

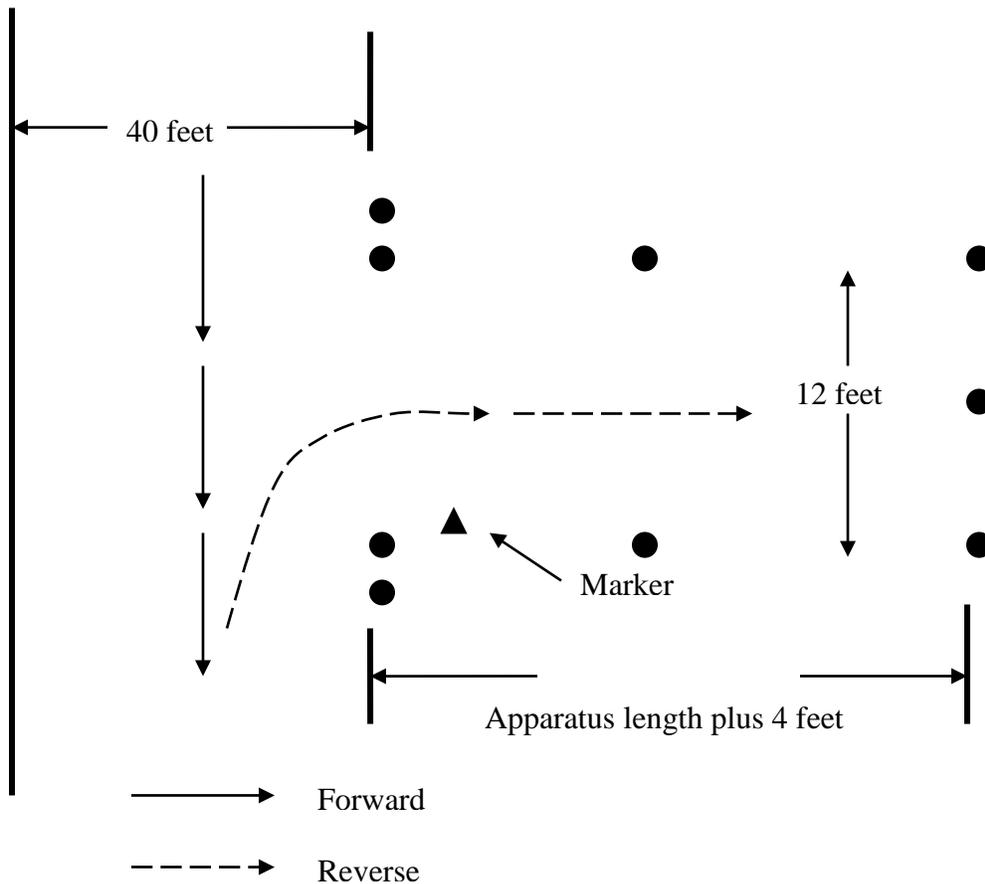
## ALLEY DOCK

The Alley Dock measures a driver's ability to drive past a simulated dock or stall, back the apparatus into the space provided, and stop smoothly.

**Instructions:** Drive past the stall on either the left or right, then back the apparatus into the restricted area without having to stop and pull forward and without striking cones. Front bumper may not pass over the border of the 40ft roadway.

**NOTE:** Always use a spotter when backing fire apparatus. When apparatus is moving forward, the spotter must be either properly seated in the apparatus with all safety restraints fastened or outside of the coned area.

\*Measure distance between cones from the base of the cones.



## SERPENTINE

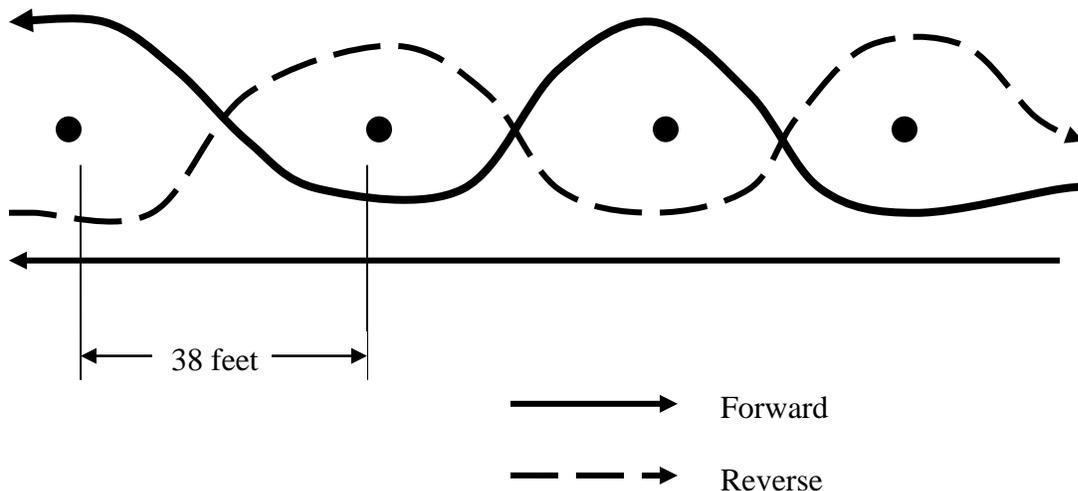
The Serpentine exercise measures a driver's ability to steer the apparatus in close limits without stopping.

Instructions: The driver will drive the apparatus along the left side of the cones in a straight line and stop just beyond the last cone. The driver then should back the apparatus between the markers by passing to the left of cone #1, to the right of cone #2, to the left of cone #3, and to the right of cone #4. At this point the driver should stop the vehicle and then drive it forward between the markers by passing to the left of cone #4, to the right of cone #3, to the left of cone #2 and to the right of cone #1.

NOTE: Always use a spotter when backing fire apparatus. When apparatus is moving forward, the spotter must be either properly seated in the apparatus with all safety restraints fastened or outside of the coned area.

\* Measure distance between cones from the base of the cones.

\* Spacing of cones should be measured 38 feet from base to base. For apparatus lengths that exceed 36 feet, the course may be modified to apparatus length plus 2 feet base to base.



## DIMINISHING CLEARANCE

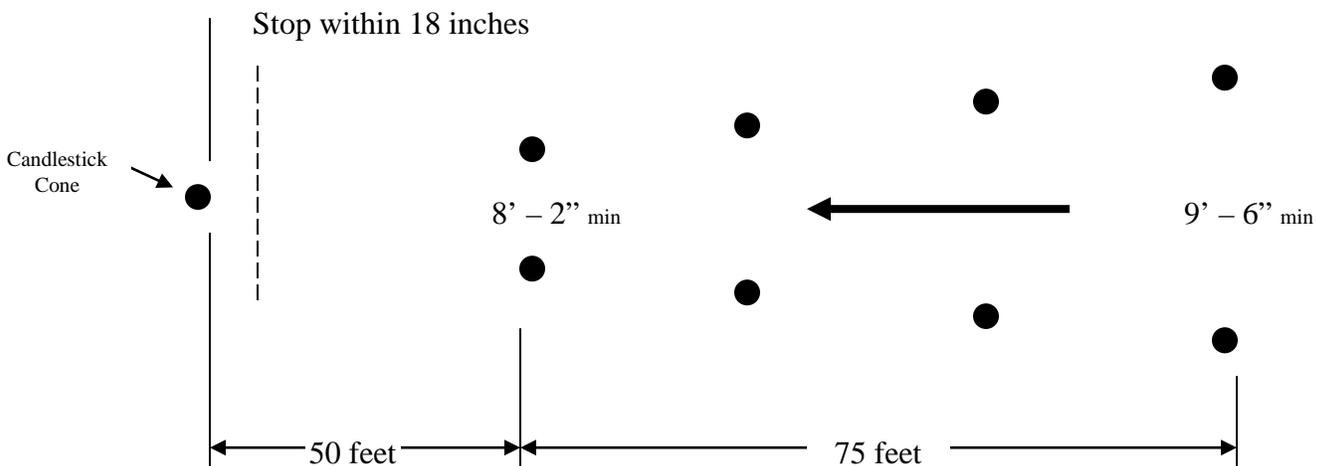
The Diminishing Clearance exercise measures a driver's ability to steer the apparatus in a straight line, to judge distance from wheel to object, and to stop at a finish line.

Instructions: The course is created by arranging 2 rows of cones to form a lane 75ft long. The lane varies in width from 9ft 6in. to a diminishing clearance of 8ft 2in. The finish cone should have an extended flag/candlestick cone so the driver can see the finish cone from cab. The driver should maneuver the apparatus through this lane without touching the cones. The apparatus should be stopped at a finish cone 50ft beyond the last cone within 18in of the finish cone. No portion of the vehicle should protrude beyond this point.

**NOTE: Width measurements for this skill may be modified due to the varying widths of apparatus. Modification should be based on the track width of the apparatus being used for training. To obtain a final width, measure the apparatus being used and add 2 inches on each side the track width (from bulge to bulge on the widest axle) and that will be the final width for training and testing purposes. For example, if an apparatus has a track width of 8 feet 4 inches wide then the final set of cones should be 8 feet 8 inches.**

\* Establish a centerline, mark off 75 feet, set the two ends of the Alley up and then sight in the middle cones to line them up. The Alley is in a "V" shape, one side is not straight with the other side angled.

\* Measure distance between cones from the base of the cones



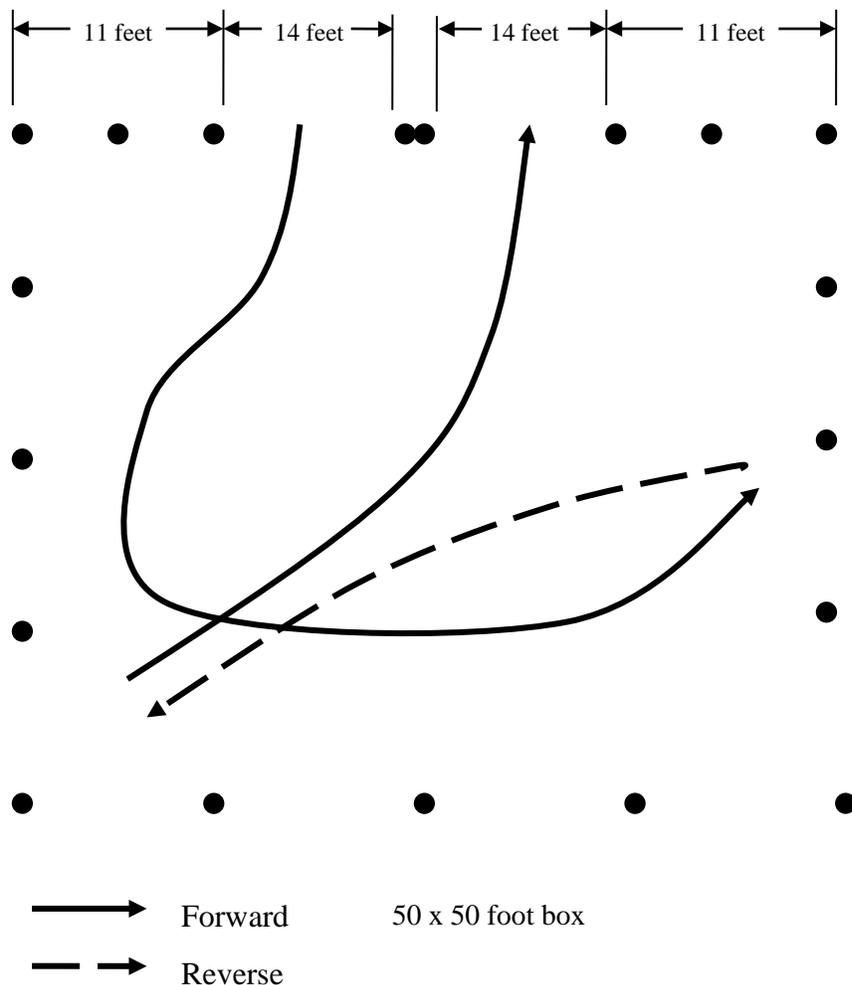
## CONFINED SPACE TURNAROUND

This exercise measures the driver's ability to turn the vehicle around in a confined space without striking obstacles.

Instructions: The course is created by making a 50ft square area with a 14ft wide entry and exit. The driver moves into the area from the entry point, turns the vehicle 180 degrees, and leaves the area through the exit. There is no limitation on the number of times the driver has to maneuver the vehicle to accomplish this skill, but no portion of the vehicle should extend over the boundary lines of the space and no cones shall be hit.

NOTE: Always use a spotter when backing fire apparatus for safety purposes. When apparatus is moving forward, the spotter must be either properly seated in the apparatus with all safety restraints fastened or outside of the coned area.

\* Measure distance between cones from the inside base of the cones.



**FIRE FLOW FORMULAS  
APPENDIX - D**

## Friction Loss and Nozzle Flow Reference

**Friction Loss per 100' Fire Hose**  
 $FL = CQ^2$

<b>GPM</b>	<b>1 1/2" hose</b>	<b>1 3/4" hose</b>	<b>2 1/2" hose</b>	<b>3" hose w/ 2 1/2" coups</b>	<b>4" hose</b>	<b>5" hose</b>	<b>6" hose</b>
100	24.0	15.5	2.0				
125	37.5	24.2	3.1	1.2			
200		62.0	8.0	3.2			
250		96.8	12.5	5.0			
300			18.0	7.2	1.8		
350			24.5	9.8	2.4		
400			32.0	12.8	3.2	1.3	
450				16.2	4.1	1.6	
500				20.0	5.0	2.0	1.2
600				28.8	7.2	2.9	1.8
700				39.2	9.8	3.9	2.4
800				51.2	12.8	5.1	3.2
900				64.8	16.2	6.5	4.0
1000					20.0	8.0	5.0
1100					24.2	9.7	6.0
1200					28.8	11.5	7.2
1300					33.8	13.5	8.4
1400					39.2	15.7	9.8
1500					45.0	18.0	11.2

**Solid Stream Nozzle Flow Rates**  
 $GPM = 29.7 d^2 \sqrt{NP}$

<b>Tip Size (inches)</b>	<b>Tip Size (decimal)</b>	<b>Handline Flow @ 50 psi</b>	<b>For field use Round to</b>	<b>Master Stream @ 80 psi</b>	<b>For field use Round to</b>
1/2	0.5	52	50		
5/8	0.625	82	80		
3/4	0.75	118	120		
7/8	0.875	161	160		
15/16	0.9375	184	180		
1	1	210	200		
1 1/8	1.125	266	250		
1 1/4	1.25	328	325	415	400
1 3/8	1.375			502	500
1 1/2	1.5			597	600
1 5/8	1.625			701	700
1 3/4	1.75			814	800
1 7/8	1.875			933	900
2	2			1,063	1,000

### Fire Hose Friction Loss Coefficients – Single Line

<u>Hose diameter and type</u>	<u>coefficient (C)</u>
¾" booster	1,100
1" booster	150
1 ¼" booster	80
1 ½"	24
1 ¾" with 1 ½" couplings	15.5
2"	8
2 ½"	2
3" with 2 ½" couplings	0.8
3" with 3" couplings	0.677
3 ½"	0.34
4" hose	0.2
4 ½" hose	0.1
5" hose	0.08
6" hose	0.05

### Standpipe Friction Loss Coefficients

4" pipe	0.374
5" pipe	0.126
6" pipe	0.052

### Nozzle Pressures

Solid stream nozzles – handline	50 psi
Solid stream nozzles – master streams	80 psi
Fog nozzles – all types	100 psi

### Friction Loss Allowances – Appliances, Apparatus, Systems

Master stream appliances flowing at capacity	25 psi
Aerial devices	25 psi
Wye and manifold appliances flowing >350 GPM	10 psi
Standpipe system	25 psi

### Fire Hose Friction Loss Coefficients – Siamese Lines of Equal Length

<u>Hose diameter and type</u>	<u>coefficient (C)</u>
Two 2 ½"	0.5
Three 2 ½"	0.22
Two 3" with 2 ½" couplings	0.2
One 3" with 2 ½" couplings, one 2 ½"	0.3
One 3" with 3" couplings, One 2 ½"	0.27
Two 2 ½", one 3" with 2 ½" couplings	0.16
Two 3" with 2 ½" couplings, one 2 ½"	0.12

### Additional Water Available from Hydrant

Percent drop =  $\frac{\text{static pressure} - \text{residual pressure}}{\text{Static pressure}} \times 100$

### Percent decrease of pump intake pressure

0-10%  
11-15%  
16-25%  
25% +

### Additional Water available

3 times amount being delivered  
2 times amount being delivered  
same amount as being delivered  
less than the amount being delivered

### First Digit Method

Get the static pressure, open the line, get the residual pressure  
Subtract the residual pressure from the static pressure = psi drop  
Multiply the first digit of the static by 1, 2, or 3 = volumes available  
If the psi drop is = or < 1<sup>st</sup> digit x 1 = 3 like volumes are available  
If the psi drop is = or < 1<sup>st</sup> digit x 2 = 2 like volumes are available  
If the psi drop is = or < 1<sup>st</sup> digit x 3 = 1 like volume is available  
Any psi drop greater than 1<sup>st</sup> digit x 3 = no additional water available

### Area, Volume and Weight

Capacity = 7.5 gallons x cubic feet

Capacity = volume in gallons

7.5 = number of galls per cubic foot

cubic feet = area filled with water

Capacity = L x W x D x 7.5

Capacity = volume in gallons of rectangular storage

L = length in feet

W = width in feet

D = depth in feet

7.5 = number of gallons per cubic foot

Capacity =  $\pi \times r^2 \times D \times 7.5$

Capacity = volume in gallons of cylindrical storage

r = radius in feet

D = average depth in feet (or length of horizontal tank)

7.5 = number of gallons per cubic foot

Weight = 62.5 lbs. x cubic feet

Weight = total weight of water

62.5 = pounds per cubic foot of water

cubic feet = area filled with water

$A = \pi r^2$

A = area of circle in square inches

R = radius of circle in inches

$\pi$  = the constant pi = 3.1416

### Velocity, Flow and Friction loss

$V = 12.1 \sqrt{NP}$

V = flow velocity in feet per second

12.1 = a constant

NP = nozzle pressure in pounds per square inch

$GPM = 29.7 \times d^2 \times \sqrt{NP}$

GPM = discharge in gallons per minute

29.7 = a constant for fire protection nozzles

d = nozzle diameter in inches

NP = nozzle pressure in pounds per square inch

$FL = CQ^2L$

FL = friction loss in pounds per square inch

C = friction loss coefficient for type and size of hose(s)

Q = flow rate in hundreds of gallons per minute

L = hose length in hundred of feet

$Q = GPM / 100$

Q = flow rate in hundreds of gallons per minute

GPM = actual flow through hose

100 = a constant

$L = \text{hose length} / 100$

L = hose length in hundred of feet

Hose length = actual length of hose

100 = a constant

$C = FL / Q^2$

C = friction loss coefficient for hose

FL = friction loss in pounds per square inch

Q = flow rate in hundreds of gallons per minute

L = hose length in hundred of feet

Elevation Pressure = 0.5 H

Elev. Press. = Elevation pressure in psi

0.5 = a constant

H = height in feet

Elevation Pressure = 5 psi x (number of stories - 1)

PDP = NP + TPL

PDP = Pump discharge pressure in psi

NP = Nozzle pressure in psi

TPL = Total pressure loss in psi (appliance, friction and elevation losses)

NR = 1.57 d<sup>2</sup>NP

NR = solid stream nozzle reaction in pounds

1.57 = a constant for solid stream nozzles

d = nozzle diameter in inches

NP = nozzle pressure in pounds per square inch

NR = 0.0505 GPM √ NP

NR = fog nozzle reaction in pounds

0.0505 = a constant for fog nozzles

GPM = actual flow in gallons per minute

NP = nozzle pressure in pounds per square inch

L = 1.13 Hg

L = height of lift in feet

1.13 = a constant

HG = inches of mercury

Pressure correction =  $\frac{\text{lift} + \text{total intake friction loss}}{2.3}$

NPDP<sub>PPS</sub> = PDP – intake pressure

NPDP<sub>PPS</sub> = net pump discharge pressure at positive pressure source

Intake Pressure = intake pressure from positive pressure source

NPDP<sub>Draft</sub> = PDP + pressure correction

NPDP<sub>Draft</sub> = net pump discharge pressure at draft

Pressure correction = pressure correction for draft

FL per 100 feet = Q<sup>2</sup>

FL = friction loss in 100 feet of 3" hose

Q = flow in hundreds of gallons per minute

FL per 100 feet = Q<sup>2</sup> / 5

FL = friction loss in 100 feet of 4" hose

Q = flow in hundreds of gallons per minute

FL per 100 feet = Q<sup>2</sup> / 10

FL = friction loss in 100 feet of 5" hose

Q = flow in hundreds of gallons per minute

**APPENDIX - E**  
**RELAY CHART**

# Maximum Distance Relay

## Implementing a Maximum Distance Relay operation

- Step 1, Determine relay distance
- Step 2, Determine required flow
- Step 3, Determine maximum distance between pumpers
- Step 4, Divide relay distance by maximum distance from table 1, round result up and add one additional pumper
- Step 5, Position Attack Pumper
- Step 6, Position Source at "Key" hydrant
- Step 7, Lay out hose and place Relay Pumpers at intervals determined by Table 1
- Step 8, All pumpers except source pumper open a discharge to exhaust air from the lines
- Step 9, Source pumper throttles up to proper PDP
- Step 10, 1st Relay pumper closes unused discharge once a steady stream of water flows through it, then throttles up to proper PDP
  - All successive Relay pumpers follow the same procedure
- Step 11, All Driver/Operators set their intake relief valves
- Step 12, Attack pumper adjusts PDP to supply attack lines.
  - Maintain water flow during temporary shutdowns by using one or more discharges as waste or dump lines

**Example:** (1,000 gpm relay over 10,000 feet using 5" LDH)  $10000 \div 2050 = 4.87(5) + 1 = 6$  Pumpers total

**Table 1 - Maximum distance relay lengths in feet**

Flow in gpm	One 2 1/2	One 3	One 4	One 5	Two 2 1/2's	One 2 1/2 & one 3	Two 3's
<b>250</b>	1,440	3,600	13,200	33,000	5,760	9,600	14,400
<b>500</b>	360	900	3,300	8,250	1,440	2,400	3,600
<b>750</b>	160	400	1,450	3670	640	1050	1,600
<b>1000</b>	90	225	825	2,050	360	600	900
<b>1250*</b>	50	140	525	1,320	200	375	500

### Maximum distance relay pump discharge pressure

2 1/2 & 3 inch - Maintain 200 psi PDP

4 & 5 inch - Maintain 185 psi PDP

*\*1,250 gpm requires a 1,750 gpm pump to achieve. \* PDP accounts for 20 psi residual pressure for the next pumper in the relay*

### Key positions in a relay operation

**Source Pumper** - Positioned at the "Key" hydrant

**Relay Pumper/Pumpers** - Spaced evenly throughout the relay at intervals determined from Table 1

**Attack Pumper** - Placed at a forward "Key" attack position

**1 mile = 5280 Feet**

# Constant Pressure Relay (Maximum Volume)

## Implementing a constant pressure relay operation

- Step 1, Position Attack Pumper
- Step 2, Position Source Pumper at "Key" hydrant
- Step 3, Lay out hose and place Relay Pumpers at 750 foot intervals
- Step 4, All pumpers except source pumper open a discharge to exhaust air from the lines
- Step 5, Source pumper throttles up to 175 psi
- Step 6, 1st Relay pumper closes unused discharge once a steady stream of water flows through it, then throttles up to 175 psi.  
  - All successive Relay pumpers follow the same procedure
- Step 7, All Driver/Operators set their intake relief valves
- Step 8, Attack pumper adjusts PDP to supply attack lines.  
  - Maintain water flow during temporary shutdowns by using one or more discharges as waste or dump lines

## Maximum volume at 750 feet by hose layout

	One 2 1/2	One 3	One 4	One 5	Two 2 1/2's	One 2 1/2 & one 3	Two 3's
Max flow	321 gpm	508 gpm	1017 gpm	1607 gpm	643 gpm	830 gpm	1017 gpm

## Maximum volume relay pump pressure

- Source and Relay pumpers - Maintain 175 psi
- Attack Pumper - adjust PDP as needed making sure to dump excess pressure
- \* PDP accounts for 20 psi residual pressure for the next pumper in the relay

## Key positions in a relay operation

- Source Pumper - Positioned at the "Key" hydrant
- Relay Pumper/Pumpers - Spaced evenly throughout the relay at intervals of 750 feet
- Attack Pumper - Placed at a forward "Key" attack position

1 mile = 5280 Feet

**APPENDIX - F**  
**IN-TAKE HOSE DRAFTING CHART**

ALLOWANCES FOR FRICTION LOSS INTAKE HOSE			
RATED CAPACITY OF THE PUMP IN GPM	DIAMETER OF THE INTAKE HOSE IN INCHES	FOR EVERY 10' OF INTAKE HOSE	ALLOWANCE IN FEET FOR EACH ADDITIONAL 10' OF INTAKE HOSE
500	4	6	Plus 1
	4 ½	3 ½	Plus ½
750	4	7	Plus 1 ½
	5	4 ½	Plus 1
1000	4 ½	12	Plus 2 ½
	5	4 ½	Plus 1 ½
	6	4	Plus ½
1250	5	12 ½	Plus 2
	6	6 ½	Plus ½
<b>1500</b>	<b>5</b>	<b>4 ½</b>	<b>Plus 1</b>
	<b>6</b>	<b>9</b>	<b>Plus 1</b>
1750	5	6 ½	Plus 1
	6	3	Plus ½
<b>2000</b>	<b>5</b>	<b>8</b>	<b>Plus 1 ½</b>
	<b>6</b>	<b>4</b>	<b>Plus ½</b>

FROM TABLE 12.2A IFSTA ADO-P CH. 12

### DRAFTING GUIDELINES

It is important to know the difference in elevation between the pump and the water source when drafting water from a pond or stream. When drafting water, the air at atmospheric pressure is removed from the hose line, creating a vacuum (negative pressure) within the pump chamber. The atmospheric pressure (weight of air) on the water's surface forces the water up through the suction hose to the pump.

The maximum height to which an engine or pump can lift water is determined by the atmospheric pressure. At sea level, the atmosphere exerts an average pressure of 14.7 pounds per square inch (psi). Atmospheric pressure will vary due to changes in the weather. However, these changes tend to moderate themselves so that the average pressure will tend to go back toward 14.7 pounds per square inch. That is why it is safe to use this value of 14.7 pounds per square inch as a constant for calculations.

Maximum Lift:  $14.7 \times 2.304$

Attainable Lift: Current Elevation  $\times 2.304$

Retrieved from, [http://math.fire.org/index.php?option=com\\_content&view=article&id=32&Itemid=46](http://math.fire.org/index.php?option=com_content&view=article&id=32&Itemid=46)

**APPENDIX - G**  
**7 -STEP BRAKE SYSTEM CHECK GUIDE**

# Seven Step Brake System Check Guide:

(Adapted from the Utah CDL handbook)

## 1. Test low-pressure warning

With the engine off, electrical power on, and enough air pressure that the low-pressure signal is not on. Step on and off of the brake pedal to reduce air pressure to the point that the low air alarm activates. This should be before the air pressure drops below 60 psi.

## 2. Testing the spring brakes

Continue to step on and off the brake pedal to reduce the air pressure. The yellow parking brake knob should pop out when the air pressure reaches the 20-40 psi range.

## 3. Test air pressure build up

Start the engine and engage the fast idle (900-1100 RPM). Air pressure should build into the 85-100 psi range within 45 second in a dual air system.

*Larger air systems may take longer, check the manufacturer's specs.*

## 4. Test for air leaks

With the air system fully charged, turn off the engine and release the parking brake. After the initial pressure drop, observe air pressure for one minute. Pressure drop of >2 psi in one minute may be a problem or indicate a leak.

Apply moderate braking pressure and hold for one minute, after the initial pressure drop, observe air pressure for one minute. Pressure drop of >3 psi in one minute may be a problem or indicate a leak.

## 5. Test air compressor governor operation

Start engine and engage the fast idle. (900-1100 RPM). Observe air pressure rise until the compressor cuts out. (Typically 125 psi.). With the engine still running, slowly step on and off the pedal to reduce the air pressure to the point where the air compressor starts building air again. (Typically 100 psi.)

*Check manufacturer's specs for exact pressures.*

## 6. Test parking brake

Apply the parking brake and remove the wheel chocks. Place transmission in gear and gently raise engine RPM's to a fast idle to see if the parking brake holds. The apparatus should not move.

## 7. Test service brakes

Release the parking brakes, move the apparatus forward at about 5 mph.

Firmly apply the brakes, note any pull to one side, unusual feel or delay in stopping.

**APPENDIX - H**  
**PROCTOR INSTRUCTIONS**

## **Proctor Instructions for “IN-HOUSE” Comprehensive Examination**

As the training officers for your department you are authorized by the Certification Council to conduct the 100% skills test for this level of certification. You must be certified to the level that you are testing, i.e....If you're FF2 you can test both FF1 and 2, Awareness and Operations.

### **\*PRIOR TO CONDUCTING THE TEST, REVIEW TRAINING RECORDS**

It is important that before doing this “IN-HOUSE” exam that the candidate has completed training in all areas for the level being tested.

### **\*SAFETY OFFICER SELECTED AND BRIEFED**

Select a Safety Officer to assist you during the test. This person, if possible, should not be taking the same test that is being given. The Safety Officer will not assist with the testing process. The Safety Officer is there to protect the Candidates from injury during the testing process.

By using the following instructions you will be able to evaluate the skills being tested and determine the candidate's readiness for the State “Spot Check” exam.

1 - Keep in mind that this is a TEST and there should be NO COACHING or TRAINING during the testing process. If a candidate fails to perform a skill, that skill will count as a first attempt failure and they will be given a second attempt. If they fail a second attempt, time they need to be retrained on that skill and tested again. Only **qualified** candidates that have passed with **100%** should be allowed to take the state SPOT CHECK Exam.

2 - Before beginning that testing process conduct a meeting with all candidates and review the testing process. Explain that this is a test and that the same process being used for the “In-House” will be used during the state exam.

3 - If possible, designate two separate areas for students testing: One area for those who are in the testing process and one area for those who have not yet begun the testing process. If separate areas are not available, make sure someone is in the room to ensure that students do not discuss the testing material. Make sure these areas have no training manuals, or other reference materials for students to look at while waiting testing.

4 - To evaluate a candidate's performance use the following as a guide.

- a. The skill is completed in the allotted time,
- b. Competence is shown by completing all performance criteria,
- c. Safety is shown while completing the skill

5 - At each test station the Tester will read the Skill to be demonstrated, the Condition to be met and the Time limit to complete each skill. This information is contained in the skill section of each standards packet. Do this with each student as they come to each testing stations. Ask for any questions. As each skill is tested and completed, sign it off in the section provided on the candidates training record.

By conducting the “In-House” test in the manner, you will prepare your candidates to successfully pass the State “Spot Check” exam. This will also assure that training records are current and that only those who are truly prepared take the Certification Examination.

**APPENDIX - I**  
**CERTIFICATION FORMS**

**Utah Fire Service Certification Council**



**INTENT TO PARTICIPATE**

**Organization Information**

**The following organization intends to participate in the Utah Fire Service Certification Program:**

**Department/Organization Name:** \_\_\_\_\_

**Department/Organization Type:** Fire  EMS  Other  \_\_\_\_\_

**Address:** \_\_\_\_\_ **Dept. /Org Phone Number:** \_\_\_\_\_

**City:** \_\_\_\_\_ **State:** \_\_\_\_\_ **Zip Code:** \_\_\_\_\_

**Chief/Administrator:** \_\_\_\_\_ **Email:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**City:** \_\_\_\_\_ **State:** \_\_\_\_\_ **Zip Code:** \_\_\_\_\_

**Daytime Phone #:** \_\_\_\_\_ **Evening Phone #:** \_\_\_\_\_

**Training Officer:** \_\_\_\_\_ **Email:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**City:** \_\_\_\_\_ **State:** \_\_\_\_\_ **Zip Code:** \_\_\_\_\_

**Daytime Phone #:** \_\_\_\_\_ **Evening Phone #:** \_\_\_\_\_

**Chief/Administrator Signature**

By signing below, I certify that the information listed is true and correct. I also certify that the above listed department/organization will follow all policies and procedures of the Utah Fire Service Certification system.

**Chief/Administrator Signature:** \_\_\_\_\_

**Utah Fire Service Certification Council  
C/O Utah Fire and Rescue Academy  
3131 Mike Jense Parkway  
Provo UT 84601  
Fax: 801-374-0681**

Certification Office Use Only

**Utah Fire Service Certification Council**  
**EXAMINATION REQUEST**

Department/Agency Name(s): \_\_\_\_\_ Date: \_\_\_\_\_

Check this box if there is more than one department testing. List each candidate and department on reverse side of form.

Please complete all information on **both** sides/pages of this form and submit it to the certification office **at least 30 days prior to the requested examination date**. A separate request **MUST** be made for each level of certification exam desired and for each exam date.

**EXAM TYPE** (Place an "X" in the boxes that apply)

Certification exam level requested: \_\_\_\_\_

\* Departments who choose not to use an authorized, in-house tester will be required to conduct the written examination two (2) hours before the manipulative examination. If an in-house tester tests their own department's written exams, the written and manipulative exams can be taken on different days.

<input type="checkbox"/> WRITTEN	<input type="checkbox"/> 1 <sup>ST</sup> ATTEMPT	<input type="checkbox"/> 2 <sup>ND</sup> ATTEMPT	<input type="checkbox"/> 3 <sup>RD</sup> ATTEMPT	_____ / _____
				Exam Date      Exam Time
				*Please allow 2 hours for each written exam

<input type="checkbox"/> MANIPULATIVE	<input type="checkbox"/> 1 <sup>ST</sup> ATTEMPT	<input type="checkbox"/> 2 <sup>ND</sup> ATTEMPT	<input type="checkbox"/> 3 <sup>RD</sup> ATTEMPT	_____ / _____
				Exam Date      Exam Time
Number of persons taking <b>WRITTEN</b> Exam		Number of persons taking <b>MANIPULATIVE</b> Exam		

**EXAM LOCATION**

Examination requested to be conducted at (location): \_\_\_\_\_

Street Address: \_\_\_\_\_ City: \_\_\_\_\_ Zip: \_\_\_\_\_

**AUTHORIZATION**

By signing below I acknowledge that each candidate is currently affiliated with an agency approved by the UFSCC. I also acknowledge that completed training records exist for each candidate testing. The record states that each candidate testing has received a learning experience in each subject area required for testing and has met all other requirements as specified in the Certification Policy and Procedures. For manipulative (skills) testing to occur, the completed training record(s) **must** be present at the test site.

Department/Agency requesting the above exam will have appropriate space and safe accommodations and equipment for all written and manipulative skills.

Chief or Training Officer Signature \_\_\_\_\_ Contact Daytime Telephone # \_\_\_\_\_

Chief or Training Officer (typed or printed) \_\_\_\_\_ Contact Evening Telephone # \_\_\_\_\_

Department/Agency Mailing Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**ACCOMMODATIONS**

If a candidate needs reasonable accommodations for learning disabilities or other conditions affecting the candidate's ability to complete the written examination, accommodations can be made. Please contact the certification office if accommodations are necessary.





**Utah Fire Service Certification Council**  
**~REQUEST FOR CERTIFICATION / RECERTIFICATION~**

Department/Organization Name \_\_\_\_\_

Date \_\_\_\_\_

Please type or print names as they should appear on each applicant's card and/or certificate. If this is for recertification, print "RECERT" on the level requested line.

Applicant Name	Social Security # (last four digits)	Date of Birth (mm/dd/yyyy)	Level Requested
1 _____	_____	____/____/____	_____
2 _____	_____	____/____/____	_____
3 _____	_____	____/____/____	_____
4 _____	_____	____/____/____	_____
5 _____	_____	____/____/____	_____
6 _____	_____	____/____/____	_____
7 _____	_____	____/____/____	_____
8 _____	_____	____/____/____	_____
9 _____	_____	____/____/____	_____
10 _____	_____	____/____/____	_____
11 _____	_____	____/____/____	_____
12 _____	_____	____/____/____	_____
13 _____	_____	____/____/____	_____
14 _____	_____	____/____/____	_____
15 _____	_____	____/____/____	_____
16 _____	_____	____/____/____	_____
17 _____	_____	____/____/____	_____
18 _____	_____	____/____/____	_____
19 _____	_____	____/____/____	_____
20 _____	_____	____/____/____	_____