



Pennsylvania State Fire Academy

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Minimum Standard for Accreditation (MSA)

Date: August 1995

Last Revised: March 2001

Course Title: Silo Emergencies (FRSE)

Length of Course: 16 Hours

Lecture/Lab Breakdown: 8/8

Prerequisites: EBM, FAFI, FARR, REPR; RORE, CSR, ATRC are recommended

Referenced Texts: Extinguishing Silo Fire NRAES-18, 3rd revision 1/88; Farm Accident Rescue NRAES-10, reprinted 1/91; Hay and Silage Fires by Dr. D.J. Murphy, The P.S.U.; Fire Safety for Forage Silos by W.P. Jensen; Essentials Module I, Ropes and Knots; and D.O.T. Emergency Guide Book.

Course Goal: To train the Fire Service and EMS to be able to safely fight a silo fire and make a safe rescue from a silo by the use of rescue equipment, normally associated with the fire service. Students will know the reason for this program, program goals, local agricultural practices, pre-planning, silo responses, dealing with silo gases, silo fire and rescuing victims from silos by various different methods.

Description of Course: This course is designed to train fire fighters and EMS personnel the hazards they will encounter in silo fire fighting and silo rescue situations. This course teaches appropriate response actions for silo emergencies, such as handling silo gas victims, silo rescue procedures and silo fire fighting techniques.

Description of Methodology to be used: Lecture, discussion, demonstration and supervised student practices.

Student Equipment/Supply Needs: (one for each student) Class Registration Form, Text Book Extinguishing Silo Fires NRAES-18, Text Book Farm Accident Rescue NRAES-10, Handouts for Haylage and Silo Fires, Note Book and Pen/Pencil, SCBA or SCBA Work Masks, Turn Out Gear, and other items as designed (i.e. Silo Fire Fighting and Rescue Publications, Newspaper Articles).

Equipment/Audiovisual/Supply requirements: Classroom w/ usual amenities; 1/2" VHS, TV, VCR, Projector Screen, 35 mm slide projector with spare bulb, overhead projector with spare bulb, VHS 1/2" tape - Farm Medic Television News footage program (any other tapes or slides you may have on Silo Fires and Silo Rescue), Farm Medic Overhead Transparencies, and one (1) cassette tape recorder.

Special Notes and Conditions: N/A

Course Outline

<u>Time</u>	<u>Content</u>	<u>Notes</u>
:10	Introduction	NRAES-10 Pg.1 &
:15	Class Registration - Distribute Text Books and Other Handouts	NRAES-18 Pg.1
:05	Training Needs	(continued)

Course Outline (continued)

<u>Time</u>	<u>Content</u>	<u>Notes</u>
:05	Program Goal	
:25	Understanding Silo Emergencies; Fire & Rescue Procedures	NRAES-10 Pg.2 & NRAES-18 Pg.1&2
:30	Logistics/Pre-Planning	
:25	Silo Identification	NRAES-18 Pg.2
1:30	Silo Fire Fighting: Conventional and Oxygen Limited Silos, Bunker Silos and Plastic Bag Silage Storage	NRAES-18 Pgs.2-8
1:00	Ropes and Knots (review)	
1:00	Stretcher Lashing and Rigging	
3.00	Farm Visit	
:15	Conclusion of First and Second Sessions 1. Review of Balance of Program 2. Protective Gear Required for Future Sessions 3. Dismissal	
1:30	Aerial Ladder Operations at a Silo Rescue TOG required	NRAES-10 Pg.24
1:30	Probing a Silo to Check Temperature Readings & Using Heat Detection Devices Outside of the Silo (Safety Officers assigned)	NRAES-18 pgs.5-6
1:00	Demonstrate Rope and Rigging Procedures to the Class. <u>NO Fire Fighters will be Lowered from any Silo</u>	
3:45	Silo Rescue Exercises <u>STATIONS</u> Aerial Ladder Rescue Operations Removing a victim from the roof opening of a conventional silo	
:15	Conclusion	

Competency Evaluation Mechanism (Brief description-attach copy): Practical Exercise.

Course Objectives (specific):

1. This course is designed to reduce the danger of death and injury to farm workers and rescue personnel by familiarizing rescue workers with the proper procedures in fighting all types of silo fires and knowing how to properly rescue victims from a silo.
2. General
 - 2-1. The fire fighter will have a better understanding of silo fires and why they occur.
 - 2-2. The fire fighter will have better understanding of logistics and pre-planning silo emergencies.
 - 2-3. The fire fighter will know more about agricultural rescue requirements.
 - 2-4. The fire fighter will know the need to carry different size and lengths of rope and related pulleys used in silo rescue.

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Objectives (continued)

- 2-5. The fire fighter will be taught the proper use of various equipment used in silo rescue and silo fire fighting.
- 2-6. The fire fighter will demonstrate the use of various tools and rope in silo fire fighting, the probe, the thermometer, use of charts for temperature testing, heat detector guns, how to properly apply water using the probe in conventional silos, knowing when a steam explosion is likely to occur. Fire Fighters will never use water or foam on an oxygen limited silo, due to the dangers of a hydrogen gas explosion. The proper way of extinguishing an oxygen limited silo fire is the use of nitrogen gas or CO-2, or close all openings and smother the fire.
3. Silo Fire Fighting
 - 3-1. The fire fighter will be able to identify the following silos. Conventional silo, oxygen limited silo. Plastic bag silo storage, bunker silo dug in the ground or with cement side walls.
 - 3-2. The fire fighter will know how to identify the gases formed in silage at least three (3) weeks after a silo is filled or bunker area filled.
 - 3-3. The fire fighter will be able to explain each type of gas formed around silos, knowing nitrogen dioxide is the most dangerous gas. This gas can be identified by it's dark orange color heavier than air gas smells like chlorine bleach. This gas can kill you up to two or three weeks after you breathe it.
 - 3-4. The fire fighter will know what type extinguishment to use on conventional silos and how to temperature test the silo with a probe and thermometer to find the hot spots.
 - 3-5. The fire fighter will know how to properly extinguish a conventional silo fire, probe it to find the hot spots and apply water through the probe.

NOTE: Being careful not to cause a steam explosion. Direct water fog over the top of the silage, just enough to knock the fire down. Overloading the Silo with water may cause the silo to come down if the blocks start to give away. Also, the water can run down a hole and cause a steam explosion. Fire Fighter will know how to inject carbon dioxide gas CO-2, Dry Ice, or injecting nitrogen gas. Grounding all gas bottles to the silo due to static electricity being formed by the gas being injected.
 - 3-6. If the unloader works unload the silo. NOTE: Most of the time the motors are burned out.
 - 3-7. Always disconnect any electricity going to the unloader when working in a silo.
 - 3-8. Always find out if the silage was treated with any chemicals that become corrosive when temperature of 240 degrees are reached.
 - 3-9. The fire fighter will always place a roof ladder or boards on top of the silage when walking on top of it, due to burn out spots underneath.
 - 3-10. SCBA masks will be worn at all times at silo fires due to the smoke and there may be mold in the silo. Mold can cause farmers lung disease.

NOTE: When using the 30 minute air bottle, you may be too large to crawl up the inside chute area. You can also run out of air due to the time limit of the bottle.
 - 3-11. Fire Fighters will never work with the silo unloader over their heads, due to the cable breaking.
 - 3-12. The fire fighter will know how to properly make a high angle rescue from both the oxygen limited silo and conventional silo by using the aerial ladder or roof ladder and using available ropes and pulleys on hand with their Fire Company.

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Objectives (continued)

4. Oxygen Limited Silos
 - 4-1. The fire fighter will know how to identify the different types of oxygen limited silos the metal and cement types by the bottom unloaders. They only have outside ladders.
 - 4-2. The fire fighter will know the dangers of entering this type of structure, due to the lack of oxygen. They must wear masks or the CO-2 gas in the silo.(will suffocate you)
 - 4-3. The fire fighter will know how to properly fight the oxygen limited silo fire by using nitrogen gas. Not to be injected over 40 psi into this structure. It could explode due to the pressure building up inside.
 - 4-4. The fire fighter will know, when injecting any type of gas, static electricity will occur. So you must ground the tanks to the silo.
 - 4-5. The fire fighter will know how to read the charts on how much gas to inject into a silo.
 - 4-6. The fire fighter will know you never use water or foam on any oxygen limited silo. This will cause an immediate hydrogen gas explosion.
 - 4-7. The fire fighter will know to never crawl up an oxygen limited silo when it is smoking heavily or making a rumbling noise or fire coming out of the top hatches. It could explode, due to pressure build up inside. When the fire and smoke subsides, then it is safe to crawl up.
 - 4-8. Lay the hatches down (don't tighten them down) in case there is a pressure build up inside. Close the bottom unloader door and let it closed for 2 to 3 weeks. The fire should go out. Then unload some silage to see if you have any hot material coming out. If you do, inject nitrogen or CO-2 into the silo.
 - 4-9. The fire fighter will know how to rescue a victim from an oxygen limited silo by the use of aerial trucks and rope and various pulleys, or by tying the roof ladder to the outside of the silo ladder.
 - 4-10. The fire fighter will know the four methods of removing an injured victim from inside of a silo.
 - a. Fire Department Aerial
 - b. Quickdrop
 - c. Making a hole on the side of a silo
 - d. High angle method (This can be dangerous if not trained properly)