2. Conduct a daily on-site safety and health session before climbing. Discuss all factors, including environmental hazards, that might affect the day's work, such as inclement weather, rock/ice fall, avalanche, and impending darkness.

3. Inspect climbing equipment before each climb.

4. Establish a communication system and make sure everyone understands it and what is expected of them.

5. ***Do not permit solo climbing (climbing alone with safety equipment) except by individuals competent in the technique who are capable of using extreme caution.*** Documented prior approval by the appropriate line officer is required.

22.36e – Safety Practices. In most cases, the climbing party shall consist of a minimum of two qualified climbers.

1. After every climb, conduct a debriefing. Review the safety aspects of the climb and inspect all equipment for repairs or replacement.

2. Store climbing ropes in a cool, dry, dark place (direct sunlight rapidly deteriorates rope fibers). Untie all knots before storage, and never hang a rope over a nail, small diameter peg, or hook. Ideally, rope should be coiled and stored in a tightly closed rope bag.

3. Maintain a written history on each rope: date purchased, type, date placed in service, and a complete usage record (where, when, how, inspection date, and comments).

4. Damage to climbing equipment (especially ropes and slings) may occur without showing visual evidence. Always follow the manufacturer's replacement guidelines. Immediately take out of service ropes that sustain severe shock from a fall. Whenever there is uncertainty about a rope's condition, take it out of service.

22.37 – Caving.

22.37a – Standards. The standards for the selection criteria of caving equipment are in American National Standards Institute (ANSI) Standard A10.14.

22.37b – Qualifications. In addition to providing applicable training listed in section 22.07, train employees in caving and mountaineering techniques. Teach and practice techniques on the surface under the supervision of a qualified instructor. Caving organizations, such as the National Speleological Society, can help identify local training opportunities and assist with other cave management needs. Ensure that employees receive training about special safety gear for caves.

22.37c – Personal Protective Equipment. In the JHA, identify what PPE is required for cave-related activities. Where applicable, equipment shall meet ANSI or OSHA requirements, whichever is stricter. Required PPE may include:

1. First aid kit (refer to the Glossary).
2. Food and drinking water.
3. Gloves.
4. Climbing helmet with a non-elastic chin strap.
5. Electric or carbide headlamp.
6. Two additional light sources, extra bulbs, and batteries. (Each member of the party shall carry a total of three dependable light sources.)
7. Pack with no external protrusions for transporting equipment.
8. Appropriate communication system, such as a cellular phone.
9. Appropriate clothing for the specific cave environment:
   a. **Warm, dry caves.** Lightweight clothing.
   b. **Cold caves.** Coveralls and layered clothing.
   c. **Wet caves.** Waterproof coveralls or drysuits.
10. Appropriate boots.
11. Additional PPE as identified in the JHA.

22.37d – Procedures. Prepare and discuss the JHA with all members of the cave exploration party for specific caving activities and before entering any cave (sec. 22.08).

22.37e – Safety Practices.

1. **General.**
   a. Never jump across openings or down drops since a fall can lead to serious injury. Distances underground are hard to judge and are often greater than they appear.
   b. When climbing, always maintain three points of contact with the rock, moving only one hand or one foot at a time.
   c. Prior to initial entry into a wild cave, assess the cave in accordance with OSHA's permit-required confined space program requirements (sec. 38.2).

2. **Cave Exploration Party.**
   a. The party leader shall consider the experience and capabilities of individuals when selecting members for the cave exploration party.
   b. The party leader shall keep the party together while moving through the cave. Solo exploration is not permitted.
   c. The party leader shall ensure that a belay is provided when necessary. Use fixed lines or belays in exposed areas, using appropriate cave climbing techniques and equipment.
   d. If the cave requires technical climbing, the party shall consist of at least four members, two of whom are qualified technical rock climbers. In case of injury, one member shall stay with the victim, while two go for help.
   e. In a cave where the use of climbing equipment is not necessary, a party of three is acceptable.

3. **Weather.**
   a. Caves subject to flooding, such as those in canyon bottoms and in run-off pits, shall not be visited during periods of heavy precipitation or unsettled weather.
   b. In the winter ice often forms on cliffs and in cave entrances. In the spring or during periods of warming, ice masses can detach and fall without warning. Cavers

shall avoid walking beneath ice masses and crossing winter snow that has blown into and plugged the tops of pits.

4. **Biological Hazards.**
   a. When entering caves, be aware of hazards associated with insects, reptiles, and mammals (sec. 53).
   b. When traveling through dusty areas within caves, wear dust masks. In desert areas and warm climates, cave dust can act as a vector for histoplasmosis, a serious lung ailment.

5. **Gases and Oxygen Deficient Atmospheres.**
   a. Determine that any wild cave designated for entry by employees is safe by assessing the air quality and abating any hazardous condition as identified in the JHA.
   b. Regularly test and monitor for radon and other gas levels in commercialized caves. Establish safe and healthful working levels (time spent in the cave) and ensure adherence by employees.

      Radon is not a hazard to persons who infrequently visit caves; it is a health hazard for people exposed to high concentrations over long periods of time. It is only necessary to monitor caves where employees are required to work underground for hundreds of hours each year.

      A naturally occurring colorless and odorless radioactive gas, radon is a by-product of decaying radioactive minerals. Radon is found in nearly all basements, homes, and caves.
      (1) Monitoring radon and establishing safe working levels should be done with the assistance of a knowledgeable industrial hygienist.
      (2) Radon concentrations vary widely from region to region and between caves due to factors such as rock composition, degree of natural ventilation, and season. As a result, monitoring programs should include air testing every month for at least 2 years to establish safe working levels.

c. Carbon dioxide is a colorless, odorless gas, occasionally found in caves, which may reduce oxygen levels at the bottoms of pits or near stumps where it is produced by the biological decomposition of organic material, such as wood or leaves, which are washed into caves by floods. Carbon dioxide, in lethal concentration, is extremely rare and may never be encountered by a caver. Being heavier than air, carbon dioxide can concentrate in invisible pools near the floor or in depressions where it displaces air and reduces the availability of oxygen. Be aware of situations where organic material has collected in areas of poor air circulation. At any sign of reduced oxygen (dimming of carbide lamp flames and candles or rapid breathing) leave the area immediately by moving upslope.

22.4 – Forest Management.

1. **Qualifications.** In addition to providing the applicable training and certification listed in section 22.07, employees involved in timber-related activities shall be trained to recognize and abate associated hazards.

22.41 – Thinning and Girdling.

22.41a – Qualifications. Train employees in the use of tools needed for specific projects and work activities. Refer to sections 22.48, 41, and 43.

22.41b – Personal Protective Equipment. The following PPE is required for thinning and girdling:

1. Forest Service-approved hardhat.
2. Gloves.
3. Eye protection.
4. First aid kit (refer to the Glossary).
5. Nonskid boots. Material and height of boot shall be determined by the specific tool or tools to be used.

For chain saw-specific PPE requirements, refer to section 22.48c.