NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

MINE SHAFT AND ADIT CLOSING

(No.)

CODE 457

DEFINITION

Closure of underground mine openings by filling, plugging, capping, installing barriers, gating or fencing.

PURPOSE

- Reduce hazards to humans and/or animals
- Maintain or improve access and/or habitat for wildlife
- Protect cultural resources
- Reduce subsidence problems
- Reduce the emission of hazardous gases
- Reduce or prevent contamination of surface and ground water

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to the investigation, design and treatment of locations where shafts, subsidence pits or adits of underground mines are open or where prior closures can be modified to accomplish one or more of the above purposes.

This practice may be associated with surface treatment to reclaim the area surrounding the mine opening.

CRITERIA

General Criteria Applicable to All Purposes

The closure of mines shall be planned, designed and constructed to comply with all local, state, federal and tribal laws and regulations. Fences or gates shall be used where it is essential to occasionally enter or gain access to shafts or adits.

Fences, gates or other closure techniques that maintain or enhance bat and other wildlife habitat shall be considered where habitat exists. Where bats or other wildlife inhabit the mine, and wildlife friendly closures are not feasible, an exclusion plan for the bats or other wildlife shall be written and implemented.

Fencing, gates, caps, and walls shall be used only where periodic inspection and maintenance is ensured through a maintenance agreement with a responsible government entity, landowner, or organization.

Stockpiled soil or rock materials shall be protected from erosion until used.

Safety. Teams consisting of a minimum of two persons each are required to conduct searches for concealed shafts and adits, leaving their specific schedule with others. Safety barriers, ropes, safety belts, gas detectors, and other equipment must be used as necessary during site reconnaissance, surveying and foundation investigation activities.

If hazardous gas is present, a person with United States Mine Safety and Health Administration (MSHA) certification for underground work shall be on site to monitor safety during the site investigation and practice installation.

During construction, a collapse zone shall be established, clearly marked with fencing and warning notices, and no person shall enter this zone without wearing proper safety equipment.

Bumper blocks or other devices must be used to keep machinery and trucks from falling into shafts and subsidence pits. If possible, equipment blades and buckets shall be larger

than the opening being filled.

If explosives or items that resemble explosives are found, do not handle them and report the findings to the local MSHA office.

At the completion of the closing, filled or plugged shaft or adit locations shall be marked in the field and an affidavit of mine closing shall be recorded with the local register of deeds to reduce the risk of future development over the shaft or adit.

Report. A site investigation report shall document the following information:

- Geology and groundwater conditions at the site
- Access conditions into mine
- Risks to life and property associated with the mine
- Equipment and trash within mine
- Presence of hazardous gases
- Presence of acid mine drainage
- Mine history including mine plan if available
- Inventory of plant or animal species using the mine
- Potential for surficial changes due to water table variation

Design References. Agricultural Engineering Note 1, January 1981, contains guidance on investigation, safety, design and construction and is to be used as a procedural guide with this standard. Agricultural Engineering Note 1 was developed specifically for coal mines and all information does not apply to other types of mines.

Guidance for enclosures and gates for bat conservation purposes is found in Bats and Mines by Merlin D. Tuttle and Daniel A.R. Taylor, Bat Conservation International, Inc., 1998 Revision.

Additional Criteria for Fences and Gates

Fences or gates shall be constructed to keep unauthorized persons out and shall be located where subsidence or caving will not break their integrity. Where applicable, fences and gates shall be designed to maintain or improve habitat and access for bats and other wildlife.

Fences or gates shall be made of steel, concrete, masonry, or "anti intruder" chain link and barbed wire fences or a combination of these materials.

Additional Criteria for Designed Filling or Sealing

Shafts and adits shall be cleaned of all trash, debris, metal, timber, wire and other materials that could hinder an effective designed filling or sealing.

The finished surface of the filled or plugged shaft or adit shall be graded to provide free drainage away from the opening and vegetation established in accordance with NRCS standards.

All materials removed shall be disposed of by burning or burying at approved sites or transported to approved landfills.

A. Designed Filling. Shafts or adits shall be filled to about 3 feet from the surface with a designed filter consisting of nonacid-forming, free-draining materials or polyurethane foam.

The remainder of the shaft or adit shall be filled with earth materials including a minimum of 3 feet of clay compacted in 9-inch lifts or other impervious materials that would retard the passage of water or gas. Shaft openings shall be overfilled 10 percent of the depth of the shaft, or 3 feet, whichever is less to allow for settlement.

Subsidence pits that are open, active, and/or passing a significant quantity of water require a designed filter of nonacid-forming, free-draining material. Sufficient soil covering shall be placed to sustain planned vegetation.

Subsidence pits that are closed, inactive and not passing a significant quantity of water shall require only backfilling with suitable soil material.

Sinkhole openings shall be overfilled 10 percent of the fill depth, or 3 feet, whichever is less to allow for settlement.

B. Sealing with Plugs. Shafts shall be closed with plugs only if another practical solution is not available. Installed below the ground surface, plugs are used where the shaft is to be filled to the surface but the shaft below is to remain open.

Plugs shall be constructed of reinforced concrete designed to support anticipated loads. The reinforced concrete shall be placed on firm bedrock. Plugs may be designed to be watertight and gastight or to allow drainage and venting of gases.

Shaft above the plug shall be filled to about 3 feet from the surface with a designed filter consisting of nonacid-forming, free-draining materials or polyurethane foam.

The remainder of the shaft above the plug shall be filled with earth materials including a minimum of 2 layers of clay, approximately 2 feet thick, or other impervious materials that would retard the passage of water or gas. Shaft openings shall be overfilled 10 percent of the depth of the shaft above the plug to allow for settlement.

The finished surface of the plugged shaft shall be graded to provide free drainage away from the opening and vegetation established in accordance with NRCS standards.

C. Sealing with Caps and Walls. Caps and walls shall be constructed of reinforced concrete or steel beams and grates or solid steel plates to completely close shaft or adit openings.

Caps and walls shall be designed with sufficient strength to support anticipated loads and shall be securely anchored.

The cap, wall, fittings, access holes and vent pipe shall be reasonably vandal proof. The surface of a cap over a shaft must be raised not less than 1 foot above the surrounding terrain to provide good visibility and positive drainage away from the cap installation.

D. Sealing with Barriers. Barriers shall be constructed to restrict humans and animals from entering adits, and may be used to prevent lateral spreading of backfill material and to support fill used to cover adit openings.

Barriers shall be constructed of stones, crushed rock, quarry-run rock, gravel or similar nonacid-forming, free-draining materials.

The minimum filled length of the barrier shall be three times the maximum adit height or width within the barrier section, whichever is greatest.

Concrete or masonry wall may be used to support the barrier. Barriers not supported by concrete or masonry walls shall have 3 horizontal to 1 vertical or flatter slopes.

Barriers at the ground surface shall be covered with soil materials to a minimum vertical thickness of 4 feet and vegetation shall be established in accordance with NRCS standards.

Where needed, a permanent drainage system using pipe or rock toes shall be installed through this covering. Traps to prevent air or gas passage shall be used where necessary.

E. Sealing with Dams. Dams are constructed to prevent water flow into or out of adits.

Dimensional requirements are those stated for barriers in the previous section.

The fill shall be essentially watertight and designed to support anticipated structural and hydraulic loads. Designed filters shall be incorporated to prevent piping of the fill material.

CONSIDERATIONS

Consider the impact of this practice on cultural resources.

Consider the impact of this practice on endangered or threatened species.

Consider the following for maintaining or enhancing bat and other wildlife habitat:

- Species using the mine.
- Seasons and purpose mine is used by bats or other wildlife.
- Effects on airflow and temperature of the mine caused by a closure. Small changes in environment can have significant negative or positive effects on suitability for bat use.

PLANS AND SPECIFICATIONS

Plans and specifications for closing shafts and adits shall be in keeping with this standard and shall describe the requirements for applying the practice to the specific site to achieve its intended purpose or purposes.

OPERATION AND MAINTENANCE

Barriers, fences, gates and caps are to be maintained to accomplish their purpose.

Maintenance is essential because of the strong likelihood of additional subsidence, water drainage, failure of vegetation, vandalism, and other problems associated with mine closures.

A site-specific operation and maintenance plan shall be developed for all gated, fenced and capped closures. Regular inspections shall take place and prompt repair and follow-up shall be carried out. Additional maintenance activities shall be outlined in the maintenance plan.

REFERENCES

Tuttle, M.D., and Taylor, D.A.R., 1998, Bats and Mines: Bat Conservation International Resource Publication 3.

USDA-SCS, January 1981, Treatment of Abandoned Mine Shafts and Adits, Based on Material from the National Coal Board, London England: Agricultural Note1, 3 chapters plus appendix.

APPROVAL AND CERTIFICATION

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PRACTICE STANDARD APPROVED:

John W. Mueller

State Conservation Engineer

3/8/06

Date

NRCS, TEXAS

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