

Design of Bat Gates and Culverts to Protect Bat Habitats on AML Reclamation Projects



June 8, 2026

American Society of Reclamation Sciences Conference



Today's Speaker



Aaron Pontzer PE
Abandoned Mine Program
Energy & Abandoned Mines Senior Civil Engineer
State College, PA

Protect Bats and Preserve Habitat



Left: Indiana Bat, listed endangered species (U.S. Geological Survey)

Right: Abandoned underground mine opening

- Many species of bats are classified as threatened, endangered, or vulnerable.
- Bats are threatened with widespread habitat destruction, invasive species, accelerating climate change, and other stresses.
- Bats sometimes use caves and mine openings, portals, and shafts left from abandoned mining operations as their habitat and for raising pups. These underground environments have the right conditions and year-round temperatures that bats need for survival.

Bats and the Ecosystem



- Bats are an important species in nature and for the environment.
- Bats are vital to ecosystems and agriculture everywhere in the world (except Antarctica), acting as highly efficient natural pest control by eating vast quantities of insects.
- They are critical pollinators for over 700 plants and help disperse seeds, assisting in forest regeneration.
- Bats are Agricultural All Stars (Bat Conservation International, www.batcon.org)

Stay Out! Stay Alive!



- Active and abandoned mine sites are dangerous, potentially fatal.
- There are approximately 14,000 active mines and about 500,000 abandoned mines throughout the nation. There are mines in every state. This makes the possibility of encountering an active or abandoned mine likely in those areas.
- Active and abandoned mine sites pose serious risks to people untrained and unfamiliar with the site. Each year, explorers, hikers, and off-roaders are injured or killed while exploring, swimming, or playing on a mine property.
- Stay Out, Stay Alive is a nationwide public awareness campaign to educate children and adults about the hazards of exploring and playing at active and abandoned mine sites. **Furthermore, the safety initiative's primary mission is to remind people of the one and only key safety practice when encountering an active or abandoned mine site. That is: STAY OUT - STAY ALIVE.**

Remove AML Hazards and Preserve Bat Habitat



Abandoned Underground Mine Portal



Bats sometimes use caves and mine openings, portals, and shafts left from abandoned mining operations as their habitat and for raising pups.

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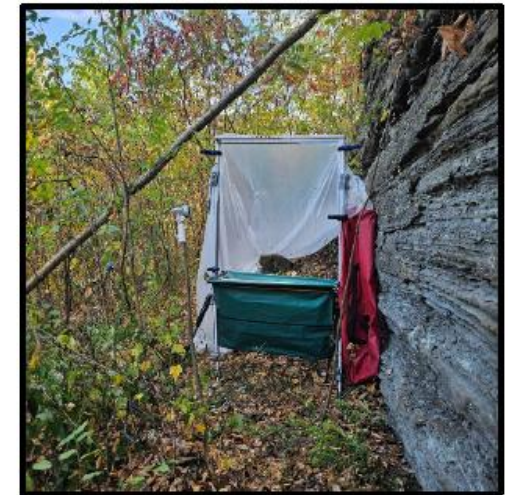
Permitting Process

- Run a “Natural Diversity Inventory (NDI)” search for the AOI of the site.
- NDI report will show if there are potential Threatened & Endangered (T&E) species or habitat and what agencies to coordinate with.
- Underground mine openings are almost always considered bat habitat that must be investigated to determine if bats are using them.
- Certified bat biologist will do field study to determine if there if bats are using habitat.



AMLF AB#1

This mine feature is a 1.5ft x 1.5ft opening. One federally endangered, adult reproductive male northern long-eared bat and one adult reproductive female tricolored bat was captured on 9/15/2025. 635 bat passes were recorded collectively over 15 complete survey nights. The majority of files recorded are likely bats foraging above the trench.



Bat Captures during Bat Study



Big Brown Bat



Tri-colored Bat

Bats captured at AML Reclamation site in Fayette County, PA. October 2023

Protocol for Assessing Bat Use of Potential Hibernacula



Protocol for Assessing Bat Use of Potential Hibernacula (PA Game Commission and U.S. Fish & Wildlife Service, 09/10/2012)

- Typical cave or mine portal survey is an attempt to determine presence or probable absence of bats.
- Although the capture of a T&E bat confirms its presence, failure to catch a bat does not absolutely confirm its absence.

Sampling Dates, Times, and Temperature Criteria (Pennsylvania)

- Sampling will be conducted between September 15 and October 15.
- Sampling will start ½ hour before sunset and continue for at least 5 hours.
- During each sampling period, weather must provide for:
 - Temperatures > 50 F (10 C) for first 2 hours of sampling and must not fall below 35 F (1.7 C) before the end of the first 5 hours of sampling.
 - At least 3 hours free of rain.
 - At least 3 hours free of high wind.
- Sampling will be conducted for at least 3 evenings (don't have to be consecutive), with at least 1 sampling event occurring between September 25 and October 10.
- Noise and the shining of lights will be kept to a minimum. No smoking. The use of radios, campfires, running vehicles, punk sticks, citronella candles, or other disturbances will not be permitted within 300 feet of the site during surveys.
- Before conducting surveys, local residents and/or law enforcement agencies should be informed of the scheduled nighttime activities.

Protocol for Assessing Bat Use of Potential Hibernacula



Assessing Suitability of Caves/Abandoned Mines for Bat Surveys (PA Game Commission and U.S. Fish & Wildlife Service, 09/10/2012)

In general, a cave or mine opening can be dismissed from bat surveys under any of the following circumstances:

- There is only one horizontal opening, and it is less than 6 inches in diameter, and no or very little airflow is detected.
- The opening is a vertical shaft less than 1 foot in diameter.
- The passage continues less than 50 feet and terminates with no fissures that bats can access.
- The mine is prone to flooding, collapsed shut and completely sealed, or otherwise inaccessible to bats.
- It is a “new” opening, which has occurred recently (less than 1 year old) due to subsidence.

Additional notes: Bats can access mines via old, open buildings. Foliage and other vegetation in front of mine openings do not stop use by bats. They can navigate through foliage. Collapsed entrances with multiple crevices between boulders, etc. are accessible to bats and should be sampled. Collapses completely sealed with fine soil are inaccessible to bats.



BAT HIBERNACULA ASSEMENT FORM

Assessed By:
Date: Time: AM/PM
Location:
AML Feature ID:
Coordinates: Latitude: Longitude:
Weather:

Hibernacula Checklist:

- 1: How many openings are found -
- 2: Does the opening appear to have been formed in the last year - Yes ☐ No ☐
- 3: Is airflow detected- Yes ☐ No ☐
- 4: Is the opening Smaller than six (6) inches - Yes ☐ No ☐
- a: If yes to question 4; estimate the approximate size of opening- "
- 5: Is the passage less than 50 feet in length until termination, with no fissures that bats may access? Yes ☐ No ☐
- 6: Does the opening appear to be prone to flooding? Yes ☐ No ☐
- Notes:

Bat Gate Types and Locations

This presentation will discuss three different styles of bat gates:

1. Mine Openings that won't be backfilled. Mine portal bat gates.
2. Horizontal Mine Openings in pits that will be backfilled and graded. Bat culverts.
3. Vertical Mine Openings in pits that will be backfilled and graded. Chimney style bat culverts with cupola bat gate.

1.



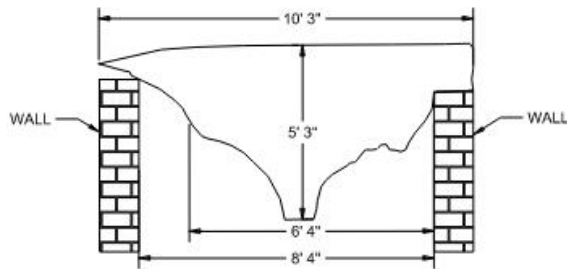
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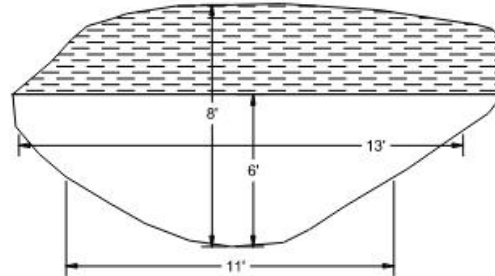
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Mine Portal Bat Gates



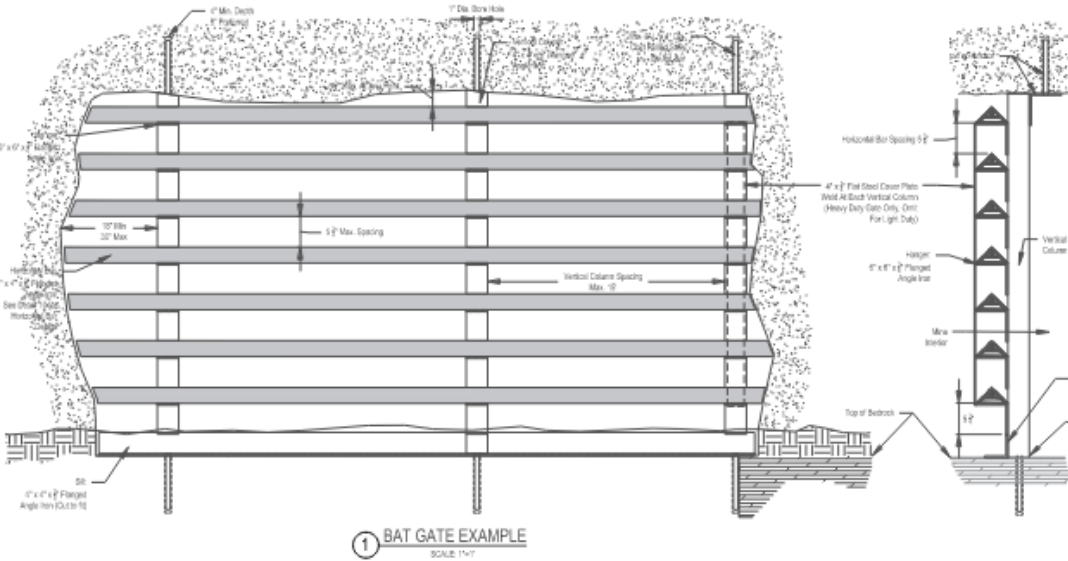
MINE PORTAL 3051-05-01
NOT TO SCALE



MINE PORTAL 3051-05-02
NOT TO SCALE

- Underground mine portals at AML site in Fayette Co., PA.
- Much of this work will need to be fabricated on site due to the irregularity of the openings.
- Contractor will use these dimensions and images to plan the materials needed.
- Contractor to field adjust bat gate configuration based on field conditions.
- As-builts will be provided upon completion of the bat gates.

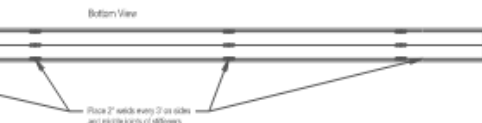
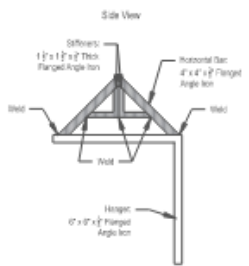
Mine Portal Bat Gate Design



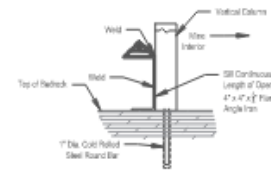
① BAT GATE EXAMPLE
SCALE 1/4\"/>

Materials:

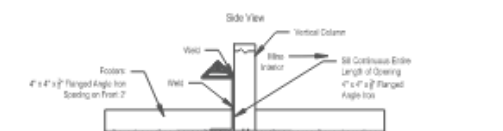
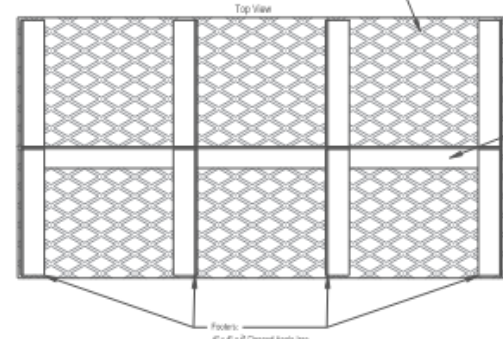
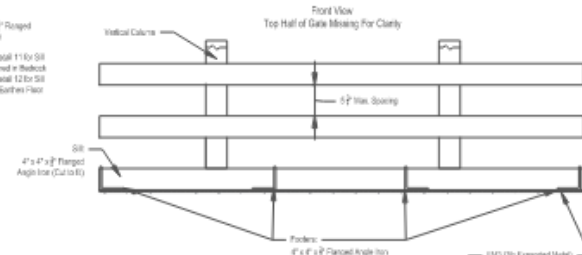
- All gate material is mild steel.
- Thick flanged angle iron for bars, stiffeners, columns, sill, footers of different dimensions.
- Horizontal bars: 4"x4"x 3/4"



② HORIZONTAL BAR DESIGN



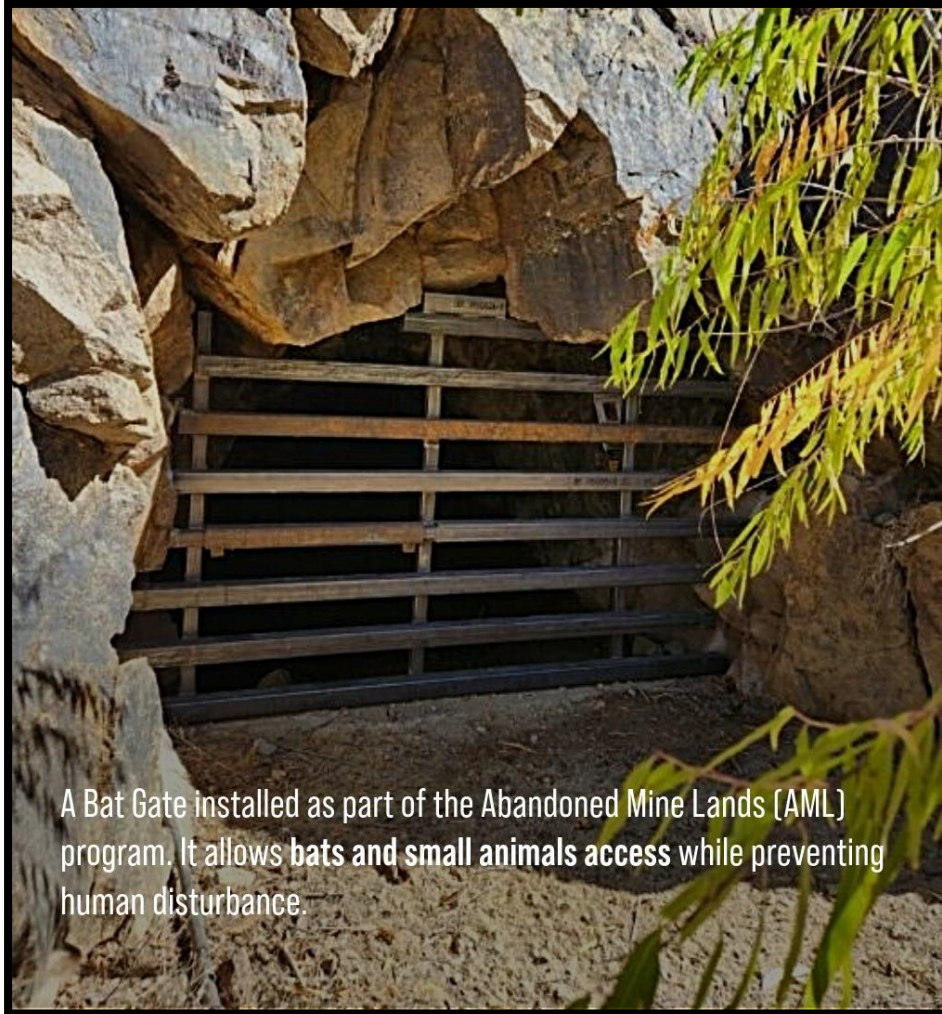
③ SILL WITH BEDROCK ANCHOR



Procedure

- Install Bat Gates to meet specifications and locations shown on the drawings in accordance with the American Cave Conservation Association and Bat Conservation International designs using field dimensions.
- Install Bat Gates between May 15th and August 30th.
- Bat Gates shall rest on solid bedrock floor, if possible. If not possible, the sill and columns will rest on an EM3 (3-lb Expanded Metal) skirt.
- Flanged iron footers will be used to support the columns.
- Columns and certain horizontal bars shall be attached to the mine walls with pins, which are then welded to pin plates that are welded to the gate.
- The placement of stiffeners within the horizontal bars will be determined in the field since the irregularity of the mine openings will make field fabrications

Underground Mine Portal Bat Gate



A Bat Gate installed as part of the Abandoned Mine Lands (AML) program. It allows **bats and small animals access** while preventing human disturbance.



Left: U.S. Forest Service – Coronado National Forest

Right: Pennsylvania DEP Bureau of Abandoned Mine Reclamation

Abandoned Coal Surface Mine with Underground Mine Openings.



Browns Run, Clearfield County, Pennsylvania

- 5,000 LF highwall and pit to be backfilled and reclaimed.
- Approximately 40-feet high.
- Several mine openings in highwall.
- Seven mine openings selected for bat habitat preservation.



Abandoned Coal Surface Mine with Underground Mine Openings.

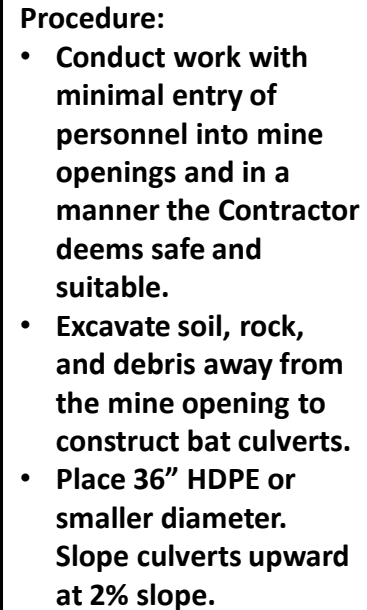


Browns Run, Clearfield County, Pennsylvania

- 5,000 LF highwall and pit to be backfilled and reclaimed.
- Approximately 40-feet high.
- Several mine openings in highwall.
- Seven mine openings selected for bat habitat preservation.
- Bat study consultant selected mine openings with good air flow, bat presence, spaced across the length of highwall.
- Length of culverts from 30' to 300'.

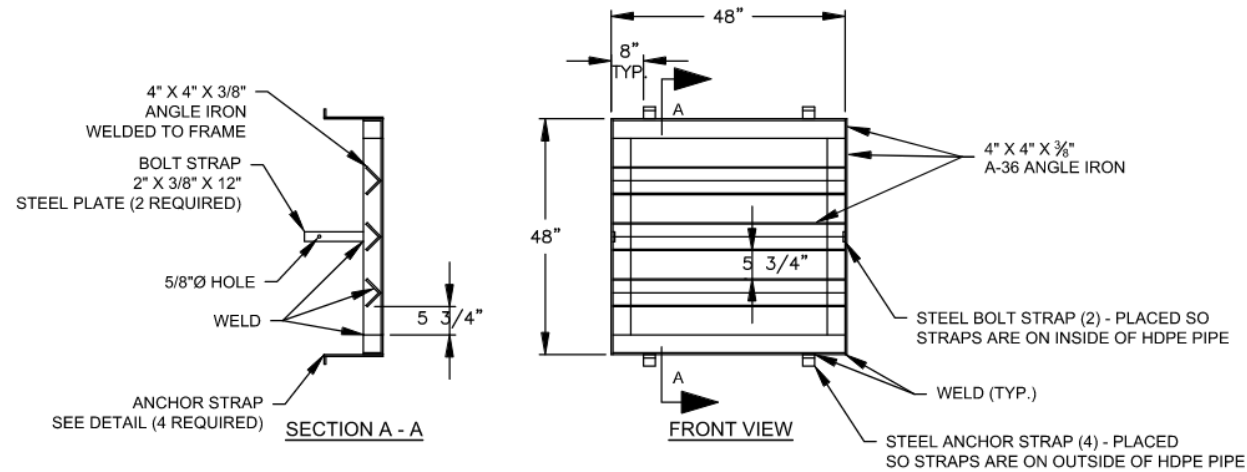
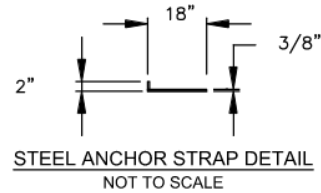


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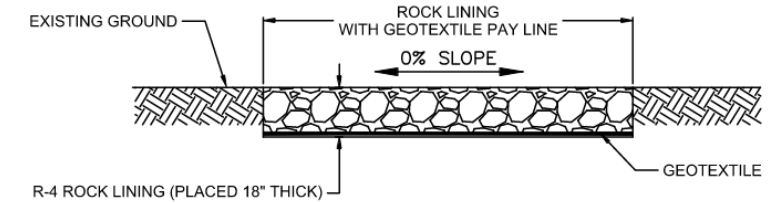
19

Bat Culvert Gate and Rock Filled Trench Depression



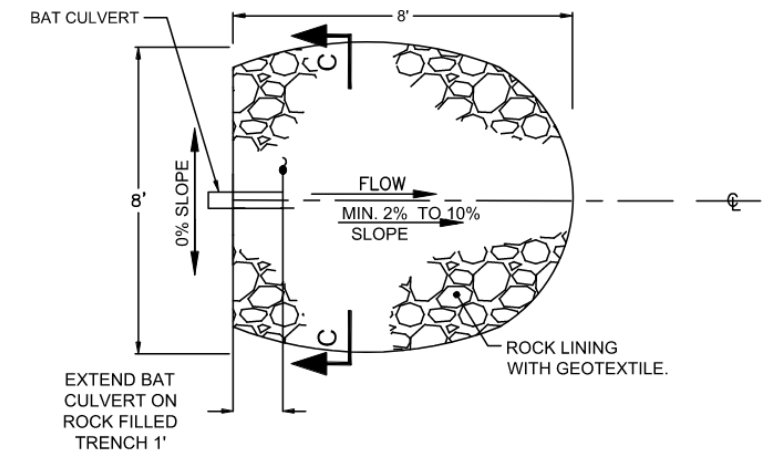
11 BAT GATE DETAIL
SCALE: 1" = 2'

NOTES:
1. CHECK 36" PE PIPE DIMENSIONS PRIOR TO PLACEMENT OF BOLT STRAPS AND STEEL ANCHOR STRAPS.



SECTION C-C
NOT TO SCALE

NOTES:
1. ROCK FILLED TRENCH DEPRESSION SHALL BE CONSTRUCTED AT THE OUTLETS OF THE BAT CULVERTS.



12 ROCK FILLED TRENCH DEPRESSION DETAIL
NOT TO SCALE

Procedure:

- The bat gate shall be bolted to the 36" HDPE pipe using the steel bolt straps.
- Concrete shall be poured around the 36" HDPE pipe and the bat gate at the outlet of the bat culvert to a minimum thickness of 1'.

Rock Filled Trench Depression designed to draw cold air into bat culvert and into hibernacula. Line with geotextile and R4 riprap.

Bat Culvert with Gate



***Pennsylvania DEP Bureau of
Abandoned Mine Reclamation***

Vertical Openings/Shfts



- Abandoned Vertical Openings in Schuylkill County, PA.
- Very hazardous.



Vertical Concrete Shaft with Cupola Bat Gate



***Left: Bat Conservation International
Right: Citizens for Safe Water Around Badger***



Design and build rectangular, concrete, vertical structure with cupola gate on top. Like a chimney.

Cupola – small dome-like structure perched on top of larger roof or dome.

Bat Box



Questions and Comments



Protect the bats! Design your reclamation plans to preserve bat habitat and build good bat habitat structures on your AML reclamation sites!

Acknowledgments



- PA DEP Bureau of Abandoned Mine Reclamation (BAMR) – Ray Seese and Mike Stayrook
- Bat Conservation International (<https://www.batcon.org/>)

Speaker Contact Information



Aaron Pontzer, PE

Senior Civil Engineer

State College, PA



apontzer@kleinfelder.com



814.364.2262





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