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DESIGN IMPROVEMENTS FOR GATING BAT CAVES

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ABSTRACT

The author will present updates on site selection, and the latest design and construction techniques for bat gates an endangered species bat caves.

INTRODUCTION

Since the introduction of the angle iron gate in the late 1970s and through the mid 1980s, the design underwent many changes. The low air flow restriction gate was introduced in 1982 and became known as the C.C.I. bat gate. This design was refined over the next few years, but has changed little since the mid 1980s. Construction techniques have improved greatly in recent years allowing easier and quicker construction.

The basic design criteria for bat gates have been the limiting factors in design development. The spacing of the horizontal bars must be such that bats will freely pass through the gate, but they also must prevent human passage. This requirement severely limits the range of horizontal bar placement. The strength of the material of the horizontal bars determines the spacing of the vertical columns.

The design of the mid-80s required a vertical spacing of 5 1/8 inches, and the maximum distance between columns was not to exceed four feet. This maximum distance has been increased to five feet by increasing the thickness of the horizontal bars from 1/4 inch to 5/16 inch. The use of greater spans also provided the vandal with a sufficiently long lever arm to break the welds at the connection point on the columns. This was the basic design until 1991.

DRAWBACKS OF THE OLD DESIGN

Bats have a greater sensitivity to vertical bars than to horizontal bars. It is desirable to have the vertical columns as far apart as possible. The previous design limits this spacing to a maximum of five feet. The amount of cutting and welding for this type of gate is time consuming. Closure of the distance between the end columns and the irregular walls of the cave is always difficult and time consuming.

Construction of this type of gate required a sill plate set into a concrete foundation. Concrete is a major problem in remote and inaccessible sites, usually requires many hours to construct, and was labor intensive.

THE NEW DESIGN

In May of 1991 a new design was used in the construction of a bat cave at Mountain View, Arkansas. This was a very large gate which was only a few square feet shy of being as large as the Hubbards Cave gate in Tennessee. Although not as high as the Hubbards gate, the Arkansas gate was wider. The Hubbards gate required over 10,000 man-hours to construct. Using the new design and new construction techniques, the Arkansas gate only required 405 man-hours to construct.

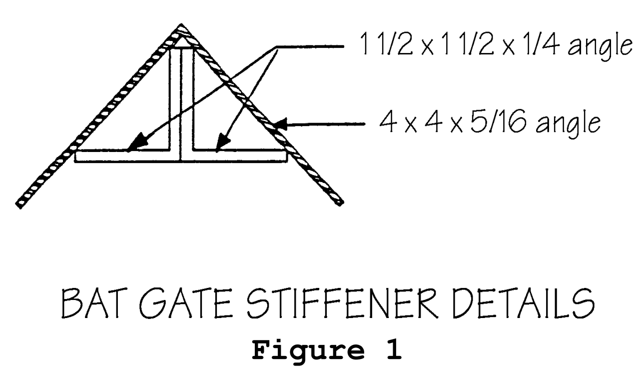

Figure 1

The Arkansas gate was constructed without concrete. Although this is not the first gate constructed in this manner, it is the largest. The sill plate which was a 6 x 6 x ½ inch angle, was leveled with jacks and supported by steel footers attached to bedrock. A steel skirt extended in front of the gate for several feet to prevent tunneling under the sill. The size of the horizontal bars has not increased from 4 x 4 x 5/16 inches, but 1½ x 1½ x ¼ inch angles (stiffeners), were placed inside them (Fig. 1). This allowed the distance between vertical supports to be increased to 10 feet. The distance between the horizontal bars was increased to 5¾ inches. The horizontal bars extended from one central column to each side, a maximum of thirty feet on the front of the gate and twenty five on the side. On the front section of the gate compression plates were used for each 10 foot span instead of rigid columns. This increases the available area for bat passage and greatly decreases the amount of cutting and welding required. The central column was increased in size from 5 x 5 x 5/16 to 6 x 6 x ½ angle. This prevents the horizontal bars from extending past the front and back of the column exposing sharp edges which must be removed. 6 x 6 x ½ angle was also used to frame the door. This allowed the entire locking mechanism to be protected inside the frame and greatly reduced the construction time of the door and locking mechanism.

On the side section of the gate two 4 x 4 x 5/16 inch columns were attached every ten feet to the back of the sill plate and the horizontal bars were attached to these posts with hangers. Compression plates were then installed to prevent levering of the bars (Fig. 2).

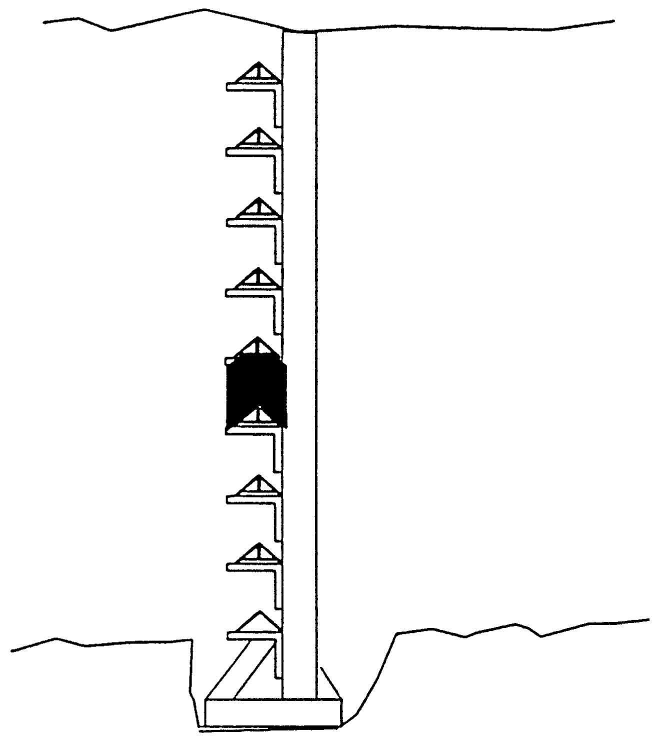

Figure 2: COMPRESSION PLATE DETAIL

From this experience in Arkansas it became apparent that the design and methods used were vastly superior to the old design and old construction methods. The amount of effort required to construct a gate now becomes mainly a function of the height instead of the height and the width. The distance between verticals has doubled. The problem of weld sheer has been eliminated. Closure has become automatic. Cutting and welding has been greatly reduced thereby reducing the amount of gasses and weld rods required. The overall strength of the gate has been increased.

In July of 1991, using Indiana Karst Conservancy personnel, a second gate of this design was constructed for the Indiana Park Service and Indiana Division of Natural Resources at Wyandotte Cave. This construction took place during the busiest weekend of the year. All tourists had to pass through the gate while it was under construction. Despite this handicap the construction was completed in record time with minimum personnel.