



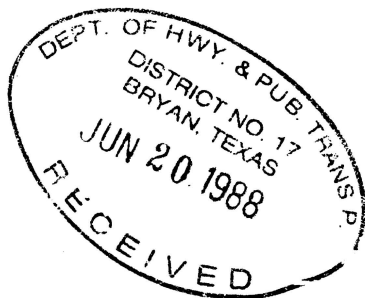
**DEPARTMENTAL
INFORMATION
EXCHANGE**

**APPLICATION OF ARTICULATED
(SNAKE) CONCRETE BARRIERS IN
WORK ZONES**

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Problem Statement

Problems often occur when it is necessary to change lane closure configurations during construction activities. An articulated concrete barrier has been developed by private industry that shows promise as a convenient device for making the transition between lane closure configurations safer and much more convenient. There is a need to evaluate the articulated barrier from an operational standpoint to assess the utility of the device in various types of work zones. In addition to its practical use in work zones, information is needed to determine (1) the type of work zones in which the can device be used and (2) the work stages for which the device can be used.



Definition

The Quickchange™ MCB (movable concrete barrier) System is a segmented concrete barrier that can be manufactured to any of the "New Jersey" barrier shapes. Continuous lengths of the barrier are lifted from the road (up to 18 inches), conveyed through an elongated 's'* configuration across the road, and set down to form a new lane by the TTV (transfer and transport vehicle). The TTV is capable of making transfers of from six (6) to sixteen (16) feet in one-inch increments and does so at speeds between five (5) and ten (10) miles per hour.

REPORT

Initial Test Results

Initial crash tests were performed in February 1984, near Sydney, Australia, by Quick-Steel and by Carson Manufacturing (Barrier Systems, Inc.) of Sausalito, California, who is the North American licensee for the Quick-change™ system. The crash tests, which used 3,000 and 4,000-pound automobiles similar to American-made mid-sized cars of the late 1970's, were favorable, i.e., none of the cars rolled, became airborne, or were redirected into a traffic lane.

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Recent Incident (Crash Report)

An 18-wheeler, traveling at approximately 65 mph on I-77 in North Carolina, went through barrels and a truck-mounted impact attenuator and, with no apparent skid marks, went onto and rode the barrier for 550 feet but never penetrated the barrier. There was about a six-foot deflection but only superficial damage. It was possible that the snake-like linked construction of the barrier caused it to act like an impact attenuator in some respects thereby reducing the damage.

Usage (United States and France)

The MCB is a fairly new system and as such has not been widely implemented. Information was obtained from (or about) three states and France and is discussed below.

Fort Worth, Texas: Fort Worth is using the system as a "temporary, permanent" barrier and has not yet utilized its mobility. Work zone safety has been achieved and there have been no major work problems.

Pennsylvania Turnpike: Approximately six-miles of the barrier are being manufactured for the turnpike project, but it has not yet been implemented. Pennsylvania has the following agreement with Barrier Systems, Inc.: The Turnpike Commission will purchase the barrier and lease the machine. Barrier Systems, Inc. will operate the machine, and then, at the end of the project, buy back the barriers if Pennsylvania no longer wants them.

North Carolina: The barrier is being used on a pavement rehabilitation project on I-77, a main North to South-bound connection between North and South Carolina. The rehabilitation project consists of cutting out the slab, replacing the rebar, and pouring new concrete. This is being done on about 15% of a seven and one-half mile stretch.

There is only a three-quarter mile lane closure allowed in each direction. Drums, flashing signs, etc. guide the traffic around the barrier. A truck-mounted impact attenuator is placed at the head of the MCB and the truck is chained to the barrier.

The barrier is only allowed on the road six days a week, everyday but Friday. This is to accommodate weekend travelers with full lane usage and also to serve as an incentive to the contractor to keep the work on schedule. On Friday, the barrier is placed onto the shoulder until the next working day. With this situation, the contractor must determine the last allowable pouring time, usually Tuesday or early Wednesday, to allow the concrete to set enough for Friday's traffic. The project should terminate around July 1, 1988.

Traffic-related problems and general system problems have been discovered during the course of this project. Firstly, the traffic tends to shy away from the barriers, especially 18 wheelers. This problem may be due partially to the fact that the barrier must be placed on or near the lane stripes thereby reducing the lane width to about 10 ft. in some areas. The traffic uses part of the median shoulder and tears it up. A possible solution is complete repair of the shoulder before lane closure.

Some general problems are: (1) To transport the barrier down the road, the barrier must first be placed on the road (this leads to an added lane closure), then moved in 50 ft. sections. (2) The machine does not work well on wet dirt. It has plenty of power but no traction. (3) A full shift of 16 ft. makes the machine 17 ft. wide, thus classifying it as an oversized load when transporting (yard to site, etc.). (4) Transfer width adjustments require an almost complete machine breakdown which may take more than 2 hours in some cases.

Some of the advantages of the machine are: (1) It has had no real maintenance problems (it has only needed some upgraded welding in areas). (2) Transportation and movement of the barrier requires only about four men and the machine (no cranes and/or big crews are needed).

Recommendations regarding further implementation of the system were made by Bill Scenner of the North Carolina Highway Department and are as follows: (1) Set the barrier more than 3 ft. from the shoulder when not in use and adjust the machine to make the lane closure in two shifts. This will result in a more efficient operation of the machine because the crab-like character associated with wide shifts is awkward. (2) If possible, conduct practice sessions on disassembling and assembling the machine, moving the barrier, etc. for on-site efficiency. The operator needs to have some experience because the barrier needs to enter and leave the machine as straight as possible to avoid kinking.

(*Aside — The machine cost was \$185,000.
Another project is utilizing the barrier system, i.e., I-85 road widening.)

Paris, France: The system was first used in Paris to regulate contraflows during peak and off-peak hours. This is a computerized process and it proportions lane usage accordingly on a six-lane facility.

Paris has also used this system on a freeway construction site. A barrier section approximately eight-tenths of a mile long was used as work zone protection. When no work was being done, the barrier was moved to the right shoulder, allowing traffic full freeway lane usage. During work periods, it was moved and placed one lane to the left, thereby providing positive protection to the workers and motorists.

Conclusion

The Quickchange™ MCB Barrier System has proved to be an effective and efficient protector. Crash tests have proved its effectiveness and field experiences have proved its work zone safety capabilities and efficiency. The ability to move work zone barriers during and after a construction process saves man-hours and road-user time (cost). As a result, total construction costs are reduced.