In Utah, construction has recently been completed on 3500 South in West Valley City, which was completely reconstructed by (Utah Department of Transportation) UDOT Region 2 from the Bangerter Highway to 2700 West. This arterial carries traffic from West Valley toward downtown Salt Lake City and the University of Utah. The construction added two center lanes that are now the first dedicated Bus Rapid Transit lanes in Utah, and replaced sidewalks and added raised medians.

With a significant average daily traffic (ADT) that runs between 38,000 and 48,000 vehicles throughout the corridor, keeping traffic moving was the most important and the most difficult task during construction. The first phase of the project called for 2 lanes to be open for traffic in each direction, and plastic barrels were used to separate directional traffic and to delineate the work zone. The work zone area was confined and restricted, and it lacked positive protection, which created dangerous conditions as confused motorists occasionally turned into the work zone. In addition, accidents occurred when drivers made left turns into businesses through the barrels, which contributed to congestion. The contractor needed a larger, more protected work space, and the traffic management plan needed a way to limit the number of left hand turn options for motorists without restricting traffic flow.

For the second phase of the project, it was decided that a moveable barrier system would be used to create a larger work zone, while minimizing the impact on traffic and limiting left-hand turns. Moveable concrete barrier has historically been used only on highways and bridges, and this would be the first time that moveable barrier was used on a major arterial in the US.

TWO-PART SYSTEM

The moveable barrier that was implemented on 3500 South is a two-part system. The first part consists of one-meter sections of highly reinforced concrete that are pinned together at each end to form a continuous barrier wall. The barriers have a modified “T” top, which acts as a lifting surface for the transfer machine. The second part of the system is a Barrier Transfer Machine, which lifts the barrier and passes it through an inverted conveyor system, transferring the barrier from 4 to 18 feet in one pass. The ends of the barrier are protected with the ABSORB 350® crash cushion from Barrier Systems, Inc. The ABSORB 350 is a water-filled crash cushion that is also pinned together with a “T” top so that it can articulate through the transfer machine for seamless operation of the entire system.

SECTIONING TRAFFIC

It was determined that the moveable barrier could keep two lanes open to traffic in the peak direction by using a total of only three lanes, instead of the four lanes required when using barrels. This would give the contractor an extra lane to expand the work zone, keeping workers safe and accelerating construction, while still giving motorists two lanes in each direction. 1.7 miles of moveable barrier was deployed as a positive barrier separation between east and westbound traffic, and the barrier was moved multiple times daily to create a 1/2, 2/1 traffic pattern based on peak traffic needs. The barrier was transferred 12 feet, or one lane width, in one pass at 5 mph. The entire transfer took approximately 20 minutes, including repositioning the traffic control and signage.

EXPANDED WORK ZONE

With the expanded work zone, the contractor was able to use larger, more efficient equipment and work unimpeded.

ABOUT the AUTHOR

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for longer periods of time while the barrier was in place. This resulted in the elimination of one complete phase of construction, reducing the total number of phases from three to two. The accelerated construction schedule helped the contractor to finish the project 7 months early. In a report commissioned by UDOT and compiled by T.Y. Lin International, the user delay savings from the early completion were estimated at US$1.3 to $1.4 million (vehicle operating costs were not included). The benefits that were determined from the use of moveable barrier included reduced user costs, shorter travel distances, improved safety, lower impacts to businesses, early project completion, less fuel use, and reduced air emissions. The report conservatively estimated the total benefits of using moveable barrier on the project between US$1.7 to $2.4 million, with a benefit/cost of 4:1. The authors also stated that if all benefits were considered (such as the reduced air emissions and benefits of early completion for businesses), the benefit/cost for moveable barrier would be greater than 10:1.

The barrier limited left-hand turns except at five major intersections, which reduced accidents and helped keep traffic running smoothly. The report estimates that based on the average number of left-hand turns in the corridor, the barrier eliminated 20 to 25 left-turn crashes while in operation, with an estimated reduction in crash costs of an additional $1,000,000.

VERSATILITY IN APPLICATION

On 3500 South, moveable barrier was used as a “moveable median,” where the barrier is placed between directional traffic and shifted to change the number of lanes available in the peak traffic direction. Moveable barrier is also commonly used in edge-of-road applications, where construction is taking place on the shoulder or median. In this configuration, the barrier is used to expand and contract the work zone, giving more lanes to the contractor during off-peak hours, and returning lanes to traffic during peak hours to respond to peak demands. For “full-width” construction, the contractor can close one side of a divided road or highway completely and divert all traffic to the other side during off-peak hours, using the barrier as a moveable median while accelerating construction and maximizing safety for crews and motorists.

Quickchange® Moveable Barrier (QMB™) has been used in construction work zones in the United States and internationally for more than 25 years to improve traffic flow, increase safety, and accelerate construction. The QMB system reduces congestion by enabling more lanes to be open during peak hour traffic. The work zone is expanded during off peak periods for greater access for work crews. This speeds construction by reducing the number of stages and increasing construction efficiency. Regarding QMB moveable barrier on the 3500 South job, the T.Y. Lin report states: “Moveable barrier provides the ability to separate more of the highway corridor for use by the contractor, which aids in completing the work more quickly … moveable barrier is definitely beneficial in high volume corridors where the morning and evening traffic split vary significantly. This traffic control strategy should be considered for use to manage congestion and improve safety on future projects.”