

Full Closure during Construction: A Tool for Reducing Overall Traffic Impact and Satisfying the Public

A full closure of a roadway or intersection is normally considered a drastic method of constructing a project. It is probably the last resort in the toolbox of most traffic engineers. However, in certain situations and if performed properly, this tool could prove popular with the public, expedite a project, save valuable funding, and reduce the overall impact to traffic. This paper will detail the planning, implementation and lessons learned from closure of a major intersection.

The Overall Project

The University/Josephine Improvement Project encompassed street and drainage improvements through the most affluent business district in the City and County of Denver, Colorado. In order to mitigate a history of flooding problems, a storm sewer system was installed which should handle a 50-year event. Six blocks of a one-way pair of arterials and one block of the combined, two-way arterial were fully reconstructed and paved in concrete which is expected to last 30 years. Seven traffic signals were rebuilt to current standards with mast arms and pedestrian countdown indicators. New ADA compliant pedestrian ramps were installed.

Purpose of full closure

It is an understatement to say that the project's most complicated paving challenge entailed the full depth reconstruction of the busy junction of University Boulevard and 1st Avenue. It is one of the busiest intersections in the City of Denver with approach volume totaling nearly 100,000 vehicles per day via 23 approach lanes. To complicate matters further, this intersection is located at the gateway to Cherry Creek, which is by far the most affluent business district and neighborhood in the region. One of the biggest challenges entailed satisfying the highly influential business and home owners.

In the design documents, the suggested phasing plan showed reconstruction occurring in seven phases, with each requiring shutdown of two or more lanes for at least one approach. The first two phases were built using the initial plan, with each phase being very unpopular with the traveling public and the local businesses. It was time for a new approach.

The retail business community lobbied for an accelerated completion of the project, which was initially scheduled to conclude just prior to Thanksgiving, on November 21, 2014. In order to eliminate impact to the early holiday shopping season, they wanted the project wrapped up by November 1.

The project team put their heads together and determined that, during a 57-hour full shutdown of the entire intersection, the remaining five phases could be completed in one, longer phase. In addition to accelerating the completion date by nearly three weeks and meeting the goal of the influential business community, several other major benefits could be gained. Ninety-five percent of paving was completed one week after the full closure which reduced the prolonged

impact to commuters. Because the major impacts ended much earlier than originally planned, the closure also accelerated the return of motorists and shoppers to the area. With full public notice, the overall congestion was substantially lower than it would have been if the remaining roadway improvements were constructed in five phases, as originally planned.

Public Outreach

Engagement of the public was absolutely essential. Weeks prior to the closure, the concept was presented to the business and neighborhood groups. With organized presentations and outreach, they were convinced that closure was the best option.

Four days prior to the event, a press conference was held. It was led by the City and County of Denver's Public Works communication team. The media was advised of the purpose and essential facts. One day prior to the closure, a media advisory was issued. The advisory provided a condensed summary of the impacts and alternate routes. The summary could be readily converted into sound bites and written articles.

During the closure, a viewing area was setup specifically for the media, with the City's communications team providing updates at prescheduled times.

During the closure, local access was maintained to all businesses and residences. Prior to the closure, variable message signs (VMS's) were installed on all approaches to the University/1st Avenue intersection.

The broad public outreach resulted in extensive notification and coverage by the media via television, radio and newspaper. This was a sign of success since the efforts of the outreach by the project team were magnified exponentially.

Coordination and Staffing

Prior to the closure, coordination meetings were held with the Regional Transportation District (RTD) since seven bus routes were affected. Also attending those meetings were Emergency services (police, fire, ambulance) and Denver Traffic Engineering. Everyone was made aware of the alternate routes.

During the event, the City's Traffic Engineering group monitored the closure and adjacent arterials from their Traffic Management Center. They also assisted by providing two signal timing changes in order to improve congestion at key intersections.

Additionally, the project team directly assigned to the event held internal planning meetings in order to discuss and hone their operations plan. All personnel who worked for the City were provided with an Operations Plan notebook which included assigned shifts and cell phone numbers of all personnel who would be on-duty during the closure, including employees from the contractors and Parsons Corporation. Parsons assisted the City by providing construction management services throughout the entire project.

At all times, the City staffed one engineer and three inspectors on site (two right-of-way and one civil inspector). Parsons also staffed engineers and inspectors on every shift.

Traffic Management

Below, the traffic control utilized during the event is described in the following order: beginning at the outer radius and working toward ground zero, i.e., from farther away toward the closed intersection.

During the event, VMS's located at key decision points up to three miles from the intersection stated that University/1st was closed until Tuesday at 7 am. On the east side of the closure, two VMS's announced "All Business Open, No Access to Speer", i.e., no (convenient) access to the other side of the closure. Up to two miles from the closed intersection, detour signage was placed at key intersections.

The detour signage helped facilitate local circulation and guide motorists to alternate routes. Nearer to the closure, signage directed visitors to the Cherry Creek Shopping Center, Cherry Creek North dining and shopping, and adjacent commercial areas.

"Soft" closures were utilized with the presence of uniformed traffic control officers (UTC) in order to funnel traffic to one lane for the purpose of allowing local access only to businesses and/or residential areas, i.e., no through traffic. Nearer to the University/1st intersection, "hard" closures blocked all access except at a few specific locations where the route was the only means of accessing a property. At the hard closures, flaggers were present in order to allow only those few motorists who truly required access.

Pedestrians and cyclists were routed around the intersection with detours of no more than two blocks. The Cherry Creek trail, a popular multi-use, paved path, remained open with minor re-routing.

Work Completed During Construction

Beginning at 10:00 pm on the night of Saturday, September 20, the intersection was closed with a promise to the public that it would open 57 hours later by 7:00 am on Tuesday, September 23. With millions of people watching, there was a bit of pressure to get the job done on time(!). With about one hour to spare, the intersection re-opened.

During those 56 hours, the following tasks were completed:

- Asphalt removal
- Survey and fine grading
- Installation of traffic signal conduit
- Subgrade preparation and testing
- Concrete paving
 - 500 cubic yards total
 - Three passes using a slip-form paver
 - Four sections utilizing hand pouring

- Sawcut new concrete
- Asphalt tie-ins to existing, adjacent pavement
- Temporary striping
- Sawcut and seal concrete
- Removal of traffic control

Lessons Learned

Following the closure, the project team received positive feedback from the community, including the affected business owners, residents and commuting public. Despite this good news, the project team focused on learning where improvements could be made for future events of this nature.

Two of the soft closures, which were staffed by uniformed traffic control (UTC), did not sufficiently filter motorists, therefore causing traffic to queue downstream at the hard closures. In order to mitigate the queuing, the hard closures were moved upstream, thus eliminating the soft closures at those two locations. In the future, the presence of flaggers at the soft closures in addition to UTC would improve the filtering of motorists.

Two days prior to the closure, a City inspector should double check all signs (static and VMS). During the event, it was discovered that two VMS's were not installed and a few other signs were placed at incorrect locations.

Inclusion of bus detour routes in the Operations Plan notebook would have allowed employees to assist bus patrons in finding the nearest, open stops.

In the future, require the contractor to have a backup concrete supplier. On Sunday, the lone supplier ran out of cement, therefore delaying the remaining paving until Monday when cement could be obtained.

Although entry and exit routes for trucks were provided to the contractor, there was a miscommunication between the contractor and the trucking companies. In the future, the route maps could be printed by the City and given to the contractor for dissemination to the trucking companies.

If a drastic measure such as a full closure is planned, be certain that all of the contractors will provide sufficient manpower. One of the subcontractors surprised everyone else by providing a severe lack of labor, contrary to their stated plan.

Perhaps, it would have been possible to plan work such that westbound (i.e., inbound) was paved first in order to open that direction before one of the Monday peak periods of commuter traffic.

Despite rain showers, a supply issue with cement, and an additional section of reconstruction added by the contractor after the closure began, the intersection opened on time.

Conclusion

The full closure of one of the busiest intersections in the City and County of Denver was successful since it proved popular with the public. The popularity of the closure stems from the fact that it reduced overall delay to road users in comparison with conventional means which would have entailed multiple, partial closures. Public outreach in addition to appropriate detour routes and signing are essential components of a successful strategy. Another factor which was essential to the success of the project was keeping the promise made to the public by re-opening the intersection within the stated deadline.