Lindsay Transportation Solutions

ROAD ZIPPER MOVABLE BARRIER

Road Zipper Movable Barrier

PILOT PROJECT

- Would like to pilot this technology on a current or future project
  - Per Executive Management's direction
- Could be deployed on a project in 2-3 months
- Funding by CO as a No-Bid Item

Road Zipper Movable Barrier

Temporary Concrete Barrier

- Repositionable with Transfer Machine
  - After initial deployment
  - 1 mile in 12 minutes
- Initial deployment using forklift and flat bed semi
  - 200-300’ per hour

Road Zipper Movable Barrier

Temporary Concrete Barrier

- Best Uses
  - Moveable Median Applications
    - Crossover and Reversible Lane
  - Lane Closure
    - Flexible Barrier Separated Lane Closures
  - Safety & Mobility
  - Accelerated Construction

Moveable Median Applications

Utilizing a Crossover and Reversible Lane

These types of applications typically help to increase work zone safety by transitioning some or all travel lanes to the other bound of the roadway. Allowing for a larger work zone separated by remaining lanes with positive barrier separation or a complete roadway closure while maintaining the existing lane pattern for the peak direction of travel. Typical work utilizing this MOT pattern are:

- Roadway Reconstruction
- Pavement Reconstruction
- Bridge Work/Reconstruction
- Asphalt Echelon Paving, closing one bound of the interstate/roadway
- Roadway Widening
- Accelerated Construction Work

MN, I-94 St. Paul (2016-17)

- 3+2, 2+3 lane configuration
  - 3 lanes into St. Paul in the am
  - 3 lanes outbound in the pm
- Maintained access to interchanges by keeping one inbound lane on workzone side of barrier
- Flexible contraflow “express lanes” to provide the normal 3 lane pattern for the peak traffic flow
- Provides larger barrier separated workzone, while maintaining normal lane configuration in the peak direction

Lane Closure Applications

Providing Flexible Barrier Separated Lane Closures

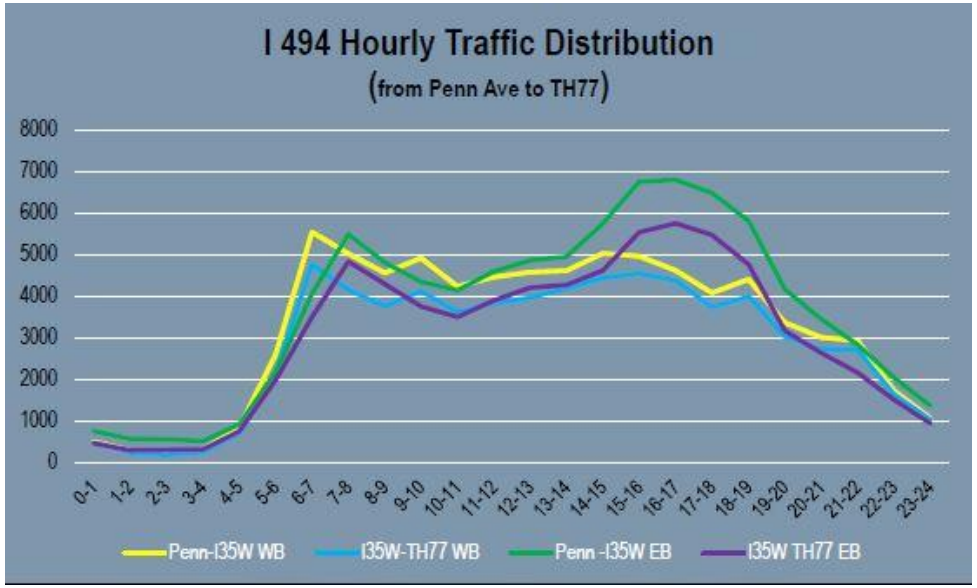
This application provides a flexible lane closure with barrier wall, replacing the typical plastic channelizing devices to increase work zone safety. These projects typically do not allow taking a lane closure with temporary concrete barrier due to user delay concerns. Consideration for Movable Barrier use for these projects include roads with high ADT, high speed, Drop-Offs, High Worker Exposure, Equipment or Materials storage within workzone, high percentage of heavy commercial vehicles, etc. Typical work utilizing this MOT pattern are:

- Median Barrier Work
  - Guardrail Upgrades
  - Concrete Barrier installation/upgrade
  - Median Lighting Projects
- Bridge Work
  - Reconstruction
  - Deck Replacement/Patching
  - Bridge Painting
  - Substructure Replacement/work
- Roadway Widening
- Roadway/Pavement Reconstruction

Median Barrier Construction

MN, I-494 Median Guardrail removal & Concrete Barrier Installation

- 3+3 Existing lane pattern, 2.25 Miles long, 18-month construction 2012 – 2013. Heavily traveled corridor with all 3 lanes at or exceeding maximum capacity in peak travel periods
  - Safety Concerns
    - Previous project on this corridor was performed with Channelizing Devices for nightly lane closures
      - Contractor and DOT noted many safety concerns
      - Motorist intrusion into workzone resulted in a double fatality of the occupants
  - User Delay Concerns
    - Lane Closure with TCB (2+2 travel pattern) resulted in an estimated $5.4 Million user delay cost and back of queue collision concerns
    - Actual User Delay cost with movable barrier MOT, Nightly Barrier Separated Lane Closures = $66,570

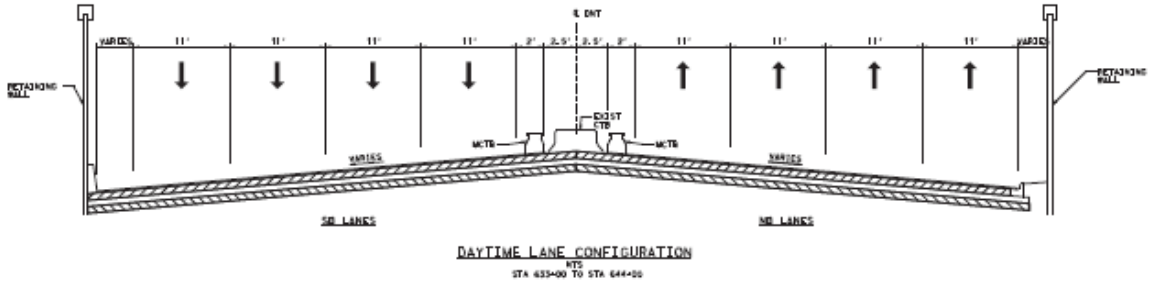


Median Barrier Construction

TX, Dallas North Tollway, NTTA 2020-2021

- 4+4 Existing lane pattern. Narrow lanes, narrow or non-existent shoulders
  - Safety Concerns
    - Heavy truck traffic and high daily traffic, narrow lanes coupled with high worker exposure for this work
  - Restricted Lane Closure Allowance
    - Single Lane Closure
      - 8:00 pm – 11:00 pm
    - Double Lane Closure
      - 11:00 pm – 4:00 or 5:00 am

**Some variation for different sections of the roadway, these are the general lane closure restrictions*



Safety & Mobility

HONOLULU, HI H-1

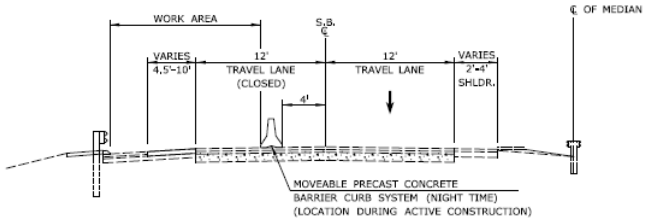
WIDENING PROJECT

- Efficiency
- Accelerated Construction
- Minimal traffic disruption
- Lower environmental impact

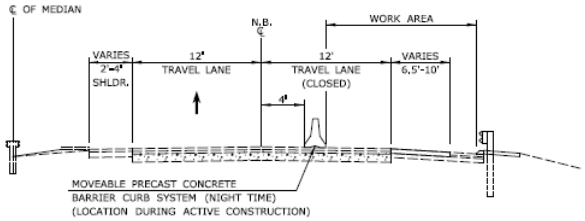
Resurfacing, Shoulder Reconstruction & Safety Improvements

I-95, East Lyme, CT. 2015

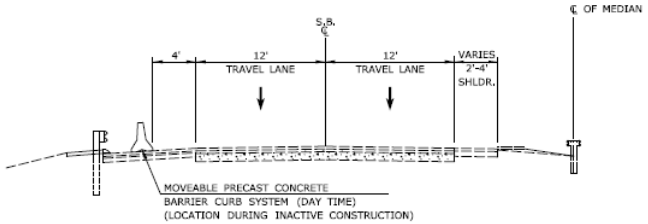
- 2+2 Existing lane pattern.
- Safety Concerns
  - Worker Exposure
  - High traffic volume with high heavy truck %
  - Heavy Equipment in Lane = Motorist Safety Concerns
- Nightly Lane Closures only, could not use static temporary concrete barrier



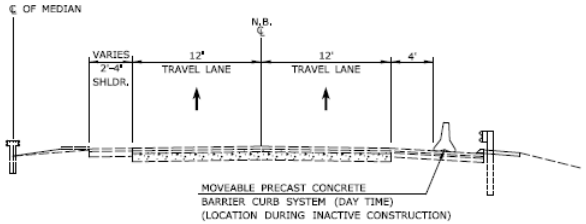
TYPICAL SECTION - SHOULDER RECONSTRUCTION (SB)
NIGHT TIME LANE OPERATION
NOT TO SCALE



TYPICAL SECTION - SHOULDER RECONSTRUCTION (NB)
NIGHT TIME LANE OPERATION
NOT TO SCALE



TYPICAL SECTION - SHOULDER RECONSTRUCTION (SB)
DAY TIME LANE OPERATION
NOT TO SCALE

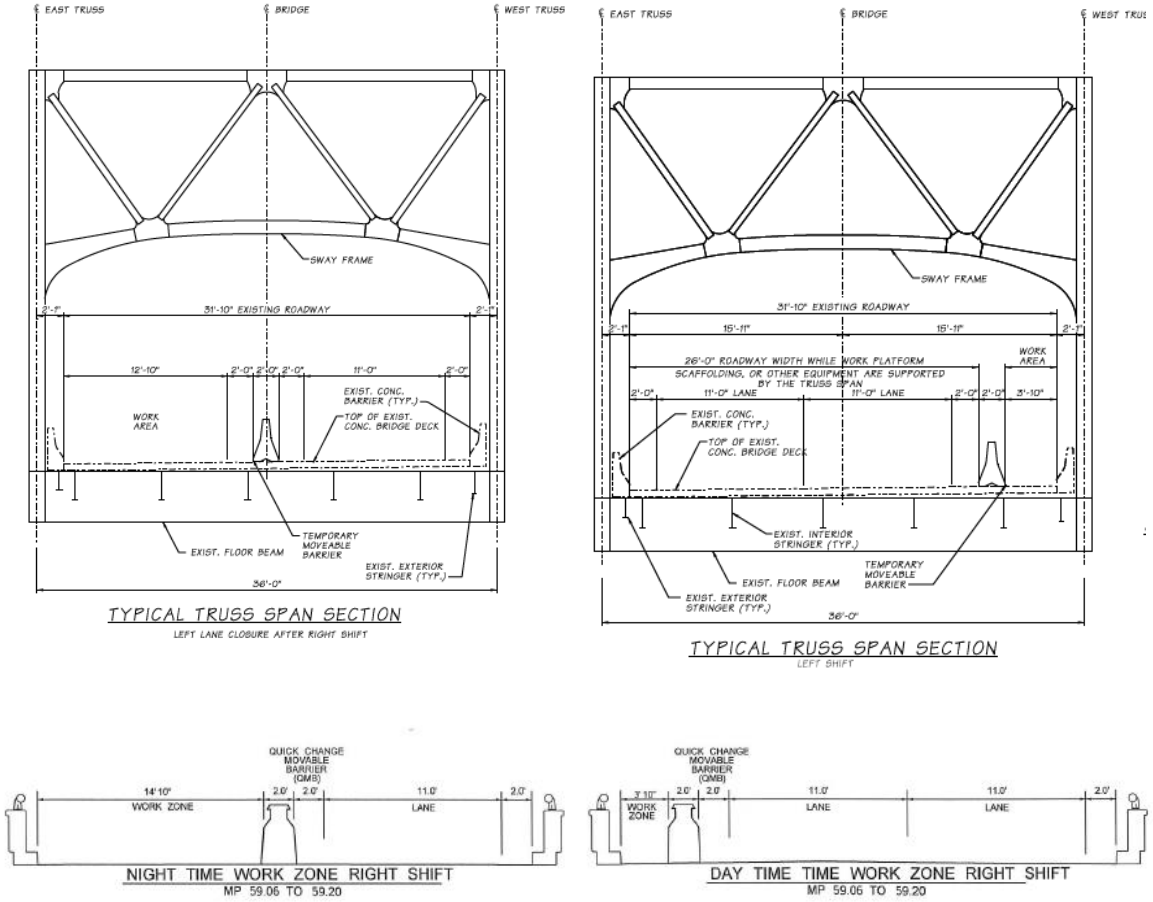


TYPICAL SECTION - SHOULDER RECONSTRUCTION (NB)
DAY TIME LANE OPERATION
NOT TO SCALE

Bridge Painting

Cowlitz River Bridge, Lewis City, Washington 2020

- 2+2 Existing lane pattern. Narrow lanes, twin bridge structure
  - Safety Concerns
    - Narrow Lanes, Narrow Shoulders
    - Worker Exposure
    - Heavy Equipment in Lane = Motorist Safety Concerns
  - Nightly Lane Closures only, could not use static temporary concrete barrier



Accelerated Construction Examples

- Richmond, VA – I-95 Bridges
- Boston, MA – “Fast 14”, I-93
  - Demolished and Replaced (14) Bridges in (10) weekends
  - Typical cross section 4 + 4, During Closures 2+2
  - Closed local roads Friday 6pm, I-93 traffic closure started at 8pm
    - Traffic crossed over by 10 pm Friday night
    - 55 hour work window
  - Traffic was returned to normal traffic pattern before the opening deadline (Monday 5 am)
- New Jersey – (3) Accelerated Bridge Const. Projects
- Minnesota – Echelon Paving project
  - Utilized a crossover to allow for full closure of ½ of I-494 for weekend paving