THE LINDSAY TRANSPORTATION ADVANTAGE
Moveable Concrete Barrier Systems
QMB
QUICKCHANGE MOVEABLE BARRIER SYSTEMS
“The Road Zipper®”

Concrete Barrier Sections  Barrier Transfer Machine

Variable Length Barriers  ABSORB 350
3 Standard Barrier Configurations...
Standard 24” Concrete Barrier
18” Reactive Tension System
“RTS Barrier”
18” Reactive Tension System (RTS) QMB
13” Steel Reactive Tension Barrier
WHY QMB?

- Cost Effective Method of Increasing Capacity on Existing Roads
- Rapid Deployment
- Positive Barrier Protection at all Times

WHAT IS THE COST OF ADDING CAPACITY?

- Tunnel: $188 million
- Bridge
- Urban Freeway
- Rural Freeway
- The Road Zipper System
- Reversible Lanes Using Traffic Lights
- Reversible Lanes Using Cones
- Do Nothing (With Higher Deferred Cost at a Later Date)

Long Term Reversible Managed Lane Applications

Moveable Median

Contraflow Lanes
- HOV
- HOT
- Value Price Toll
CONTRAFLOW LANE
DALLAS I-30 CONTRAFLOW/HOV

• Saves 14 Mins /Day
  = 1 Million Hours Yearly

• Carpools up 300%

• Bus use increased 38%

• 15,000 AM / PM Commuters

• Meeting Dallas Air Quality Goals

• Benefit – Cost Ratio 6.5 : 1
MOVEABLE MEDIAN
Existing Fixed Wall Case – Actual cross section I-69
Houston, TX

Single Reversible Lane with Wide Separation Zones

- This Cross section is taken from the actual I-69 roadway with 158’ total width
- The total width of travel lane and shoulders in the reversible lane is sufficient to allow traffic to bypass a disabled vehicle
- Total number of lanes is limited to 4+4 general purpose plus one reversible managed lane,

**Total = 9 lanes**

- Roadway utilization efficiency for active lanes is 67% (106’/158’)
Single Moveable Wall (Moveable Median) Solution

Single Reversible Lane with Moderate Separation Zones

- Using the same Roadway as shown in the two previous cases this alignment *yields two additional general purpose lanes*
- Total number of lanes is 5+5 general purpose plus one reversible managed lane,
- **Total = 11 lanes**
- While the total space allotted to the managed lane and center shoulders is only 24 feet, adequate incident management capability is retained because there is only one isolating barrier wall and therefore there is free access to the lane at all times.
- **Roadway utilization efficiency is increased to 82% in this case (130’/158’)**
Single Moveable Wall (Moveable Median) Solution

**Dual Reversible Lanes with Wide Separation Zones**

- Using the same Roadway as shown in the three previous cases, this **alignment yields two managed lanes**
- Total number of lanes is 4+4 general purpose plus two reversible managed lanes
  
  **Total = 10 lanes**

- The total space allotted to the managed lane and center shoulders is 48 feet, providing more than adequate incident management capability with one full 12 foot shoulder between the general purpose and managed lanes, and with only one isolating barrier wall there is free emergency access to the lane at all times.

- **Roadway utilization efficiency is increased to 75% in this case** (118’/158’) compared to the fixed wall case
Single Moveable Wall (Moveable Median) Solution

Dual Reversible Lanes with 5 Peak Direction Lanes

- This option utilizes overhead signage/lights in conjunction with Moveable Barrier to yield two reversible managed lanes separated by a 12 foot shoulder/gore area from 5 peak general purpose lanes.
- This option allows increased capacity in the managed lanes yet still provides congestion relief in the general purpose lanes.
- The off peak direction maintains 4 lanes and is positively separated from the opposing flow by the moveable barrier.
- The peak period lane count is 4+5 plus 2, with a **Total = 11 lanes**
- **The roadway utilization efficiency** with this concept is **82%** (130/158)
Designing for Future Flexibility...
**QMB Permanent System Cost**

$1.5M per Barrier Transfer Machine
$1.5M per Mile of New Barrier

*1/10th the Cost of New Urban Lane Miles According to FHWA*

**Operating Costs??**

<table>
<thead>
<tr>
<th>Build 2 Lanes -- QMB 2 Lanes</th>
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</thead>
<tbody>
<tr>
<td>Capital Investment -- $28M</td>
</tr>
<tr>
<td>20yr Operating Cost -- N/A</td>
</tr>
<tr>
<td>Roadway Maint. -- $4.3M</td>
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<tr>
<td>Cost of Capitol -- $12.7M@4%</td>
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<tr>
<td>Total 20yr Cost -- $45M</td>
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</tbody>
</table>

**TOTAL ANNUAL COST--**

$2.25M $0.7M
PERMENANT QMB SYSTEM:

Increases Available Capacity

Increases Flexibility, Safety & Mobility on Texas Roadways

• Deploys & is Operational in Months vs. Years
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• Is a Re-useable Asset, Can be Redeployed When Required
• Reduces Congestion While Stretching Transportation $$ - 1/10^{th} the Cost of New Urban Lane Miles According to FHWA
Improving Work Zone Safety and Mobility
Construction System Components
Partial Closure
Moveable Conc Barrier (MCB) - (3) Lanes

Option 3:
One side of the road is closed. Traffic is moved to the other side. Moveable barrier is deployed on the traffic side as a “moveable median” to create 2-1 or a 1-2 configuration to maintain 2 lanes in the peak traffic direction at all times while using only 3 lanes.
Camden, NJ. IH-30 Partial Closure

- **Type Project:** Widening Hwy Reconst.
- **Contractor:** Agate Construction Co.
- **Length of Project:** 2 Miles  ADT: 225,000
- **Innovative Strategies:** Used MCB to expand work space during off peak periods and positively separate opposing traffic.
- **Results:** Shaved 4 months off completion. Reduced congestion, and traffic disruptions. Eliminated one stage, Bridge widening. VE recommendations w/ MCB saved NJ DOT $7 M (1/3 of estimate) on a $23 M project. “Without MCB it would have required demolishing & rebuilding overheard structures”

Source- Parsons Brinckerhoff-FG, Inc.
**Inside Shoulder Work**

Moveable Concrete Barrier (MCB) - (3) Lanes

- Barrier similarly positioned to maintain 3 lanes in each direction
- During peak hrs, barrier remains stored or positioned on shoulder.
- During off-peak hrs, barrier moved out to expand the WZ
- More efficient equipment & methods, accelerates const. process
- Delivery & removal of materials safely behind positive protection

**Outside Shoulder Work**

Moveable Concrete Barrier (MCB) - (3) Lanes

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- Delivery & removal of materials safely behind positive protection
Wash. DC IH-395 Beltway Reconstruction

- Type Project: Pavement Reconst.
- Contractor: Cianbro Construction
- Length of Project: 5 Miles  ADT: 200 K
- Innovative Strategies: Employed MCB and contraflow lane concept to keep traffic moving smoothly on this critical WDC corridor.
- Results: Flexible scheduling helped to reduce construction stages, reduce congestion, Shaved 81 days (almost 3 months) off completion. Received AGC Build America Award.
Moveable Barrier - Where has it been used

Over 200 projects throughout the U.S. and 12 other countries
Texas Work Zone Projects w/ QMB

- Austin, TX IH-35 at Yager Lane - Bridge Replacement
- El Paso, TX IH-10 at Lee Trevino - Pavement Rehab
- Austin, TX IH-35 at Parmer Lane - Median Replacement
- Dallas, TX NTTA Toll Rd - South End Widening Project
- Austin, TX Loop 1 – Bridge Widening Project
- Dallas, TX US 67 at IH-20 - Widening Project
- Ft. Worth, TX - North Tarrant Expressway (NTE) Project

- San Antonio – IH-35 Bridge Rehab Static Barrier (Completed)
- Austin – IH-35 Stassney Rd. Widening/Bridge Replacement (In Progress)
- Austin – IH-35 Oltorf Rd. Widening/Bridge Replacement (In Progress)
- Dallas – NTTA Toll Rd – DNT Widening Project (In Progress)
- Austin, - MOPAC Design Build Project (In Progress)
- Dallas – NTTA Barrier Rehab project (In Progress)
Work-zone QMB Cost...

Case studies show QMB:
- Reduces congestion
- Lowers road user costs
- Better haul lane protection
- Reduced risks delivering / removing
- Higher production rates
- Enhanced safety
- Lower temporary asphalt costs
- Faster completion
- **Lower project costs!**

$25 to $35 lf

$55 to $75 lf
Work Zone QMB

- QMB Allows Extra Lanes During Peak Traffic & Unrestricted Work Zone During Off-Peak Hours
Work Zone QMB

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- Accelerates Construction... Reduces Traffic Congestion
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• Accelerates Construction... Reduces Traffic Congestion

• Can Reduce, Combine or Eliminate Entire Construction Phases
Work Zone QMB

- QMB Allows Extra Lanes During Peak Traffic & Unrestricted Work Zone During Off-Peak Hours
- Accelerates Construction... Reduces Traffic Congestion
- Can Reduce, Combine or Eliminate Entire Construction Phases
- Provides Positive Barrier Protection for the Workers and for The Traveling Public at All Times
QUESTIONS?