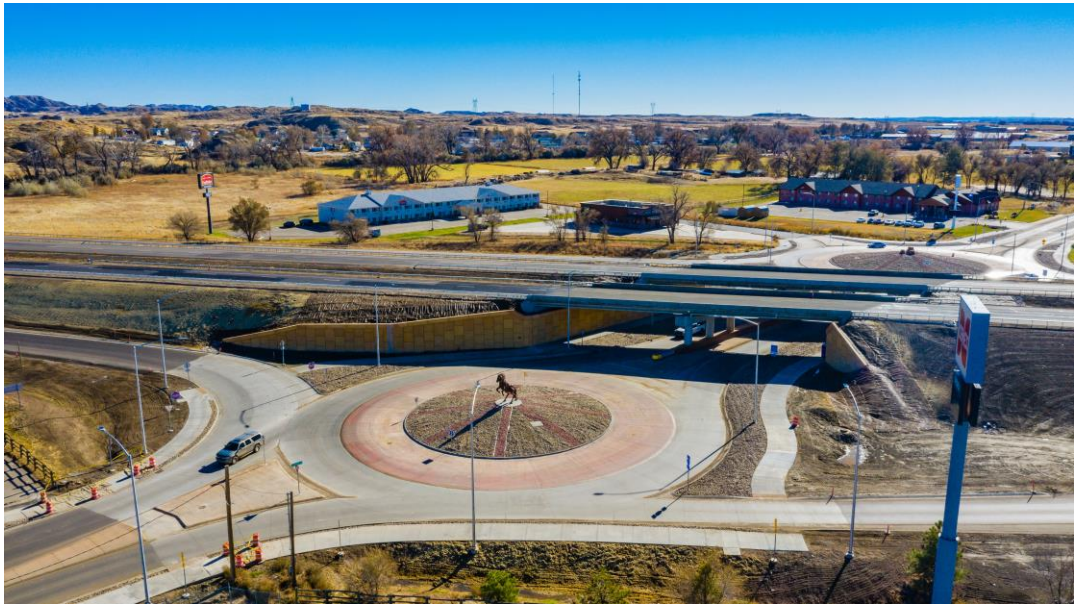
MDT Implementing Innovative Intersections to Improve Safety

Patricia Burke, PE, Safety Engineer
Montana Department of Transportation
2022 Annual Transportation Safety Meeting
October 11 & 12, 2022

zero deaths
zero serious injuries

Intersections

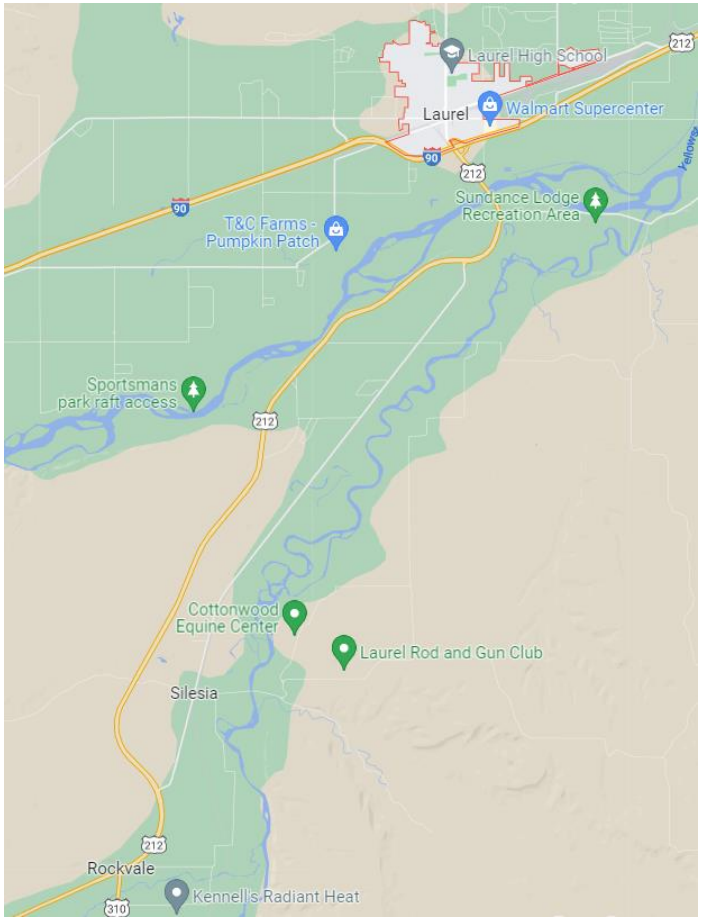


Traditional Intersections

- Safety Improvements
  - Stop Signs
    - 2-way stop
    - 4-way stop / All-way stop
  - Signals
    - Add additional cycles
    - Add turn lanes
    - Restrict movements
  - Roundabouts
    - Applicable in urban and rural environments
    - Pedestrian & bicycle safety
    - # of lanes – balancing safety and operations

Looking for more options

- Intersection Improvement Challenges
  - High speed roadways
  - Higher volumes of traffic
  - Balancing local needs versus through traffic needs
    - US 93 North (Missoula to Whitefish)
    - US 93 South (Hamilton to Missoula)
    - Highway 212 (Laurel to Rockvale)
  - Land uses
  - Right of way challenges
  - Environmental challenges



What solutions are available?

- Looking for solutions
  - FHWA proven safety countermeasures
    - https://highways.dot.gov/safety/proven-safety-countermeasures
  - Looking to other states
  - Research (Transportation Research Board, AASHTO, FHWA)

- Newer options being explored in Montana
  - Reduced conflict intersections (RCUT, RCI, J-turn, etc)
  - Diverging Diamond Interchanges

Reduced Conflict Intersections

- Overview
  - Eliminates through movements for side streets
  - Redirects traffic to designated turn lanes
- Candidate Locations
  - Multi-lane facilities
  - Higher speed locations
  - Mainline high volume routes

Reduced Conflict Intersections

- Main Elements
  - Eliminates high risk straight through or left turn conflicts
  - Requires side-street traffic to turn right – merge with traffic to a u-turn location
  - Placement of the u-turn location is based on traffic volumes and highway speed. Varies based on location.

Reduced Conflict Intersections

Crossing a rural divided highway using a
Reduced Conflict Intersection

Left hand turn onto divided highway using a
Reduced Conflict Intersection

Reduced Conflict Intersections

- Safety Benefits
  - Reduces high severity right angle crashes
  - Significant reduction in fatal (70%) and injury (42%) crashes
  - Traffic deals with one direction of traffic at a time
  - Successful in high-speed rural environments AND high-volume suburban environments
- Cost-Benefits
  - Significantly less cost than building an interchange

Reduced Conflict Intersections

https://youtu.be/Op22DR2ah-8

Reduced Conflict Intersections

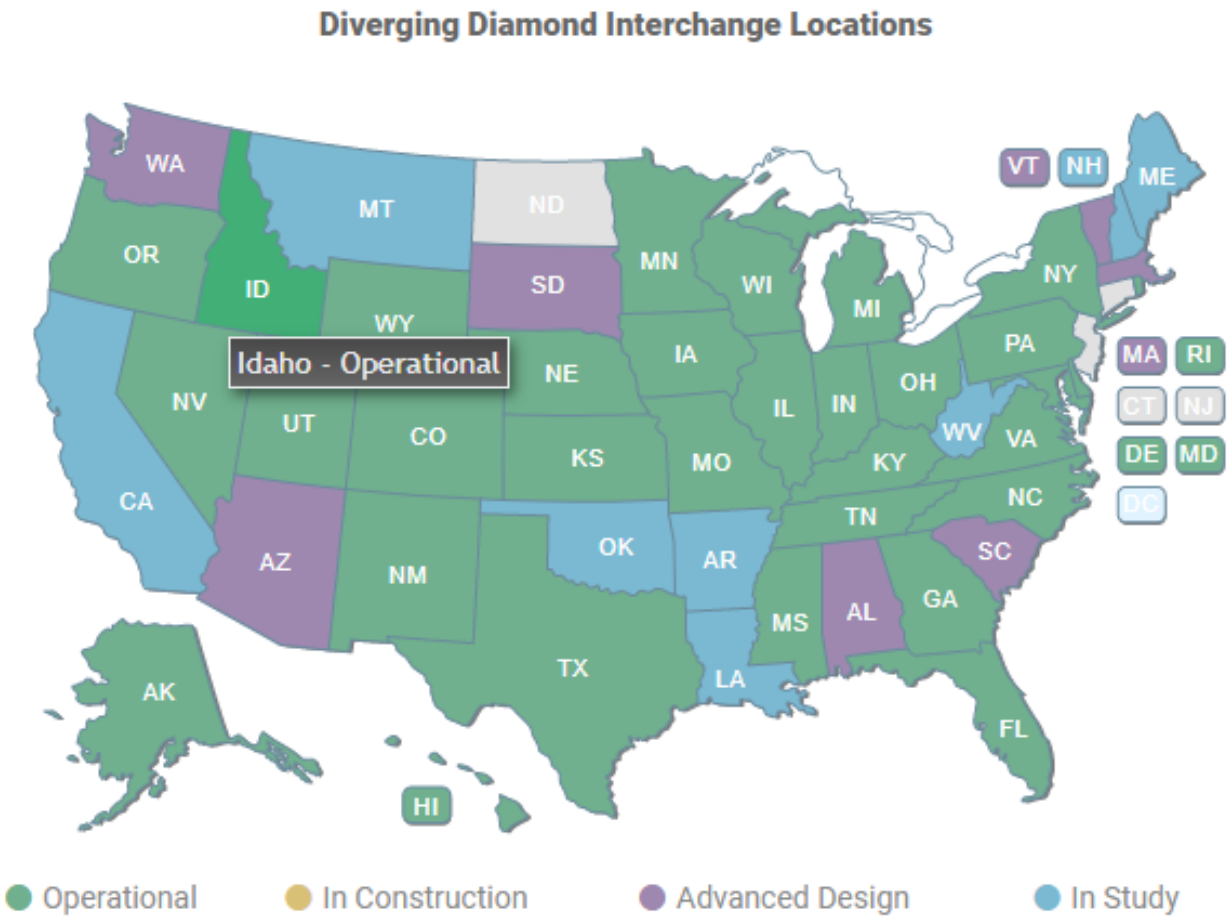
- Frequently Asked Questions
  - Wrong Way Driving?
  - U-Turn - Sight distance challenge?
  - Weaving crash potential?
  - Unfamiliar driver?
  - Night-time driving?

Diverging Diamond Interchange

- Overview
  - Changes traffic flow direction through an interchange
  - Improves operations and safety
- Candidate Locations
  - Higher volume cross-roads
  - High volume left turning movements

Chubbuck, Idaho (Pocatello area)

Diverging Diamond Interchange



Diverging Diamond Interchange

https://youtu.be/NPS8nSx_Mrw

Diverging Diamond Interchange

https://youtu.be/pHXhOILb3Gc

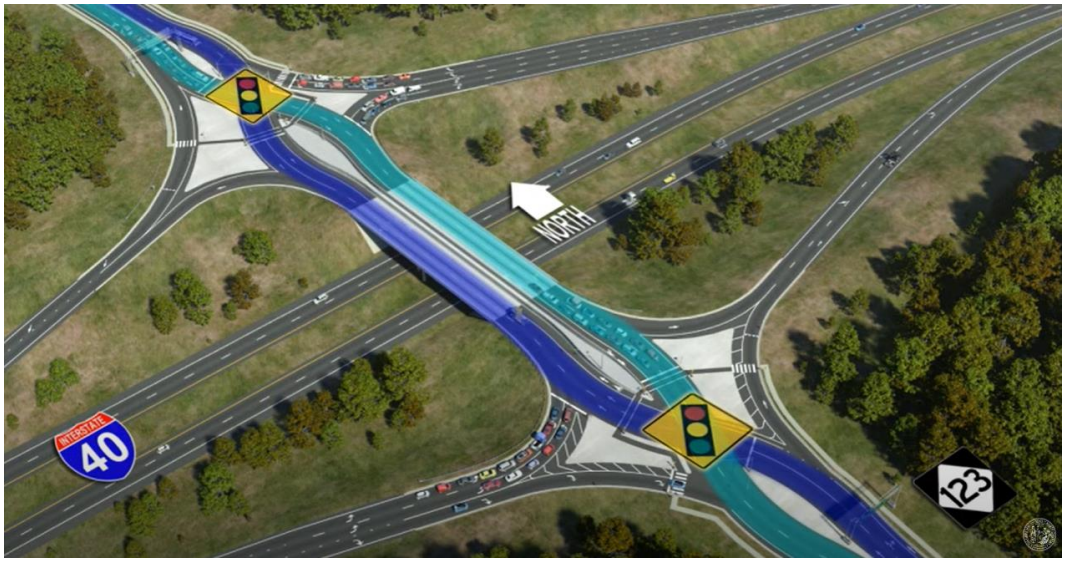
Diverging Diamond Interchange

- Operational Benefits
  - Only two (2) signal phases needed, shorter cycle length
  - Increases left turn lane capacity without needing additional lanes
  - “Free” or simple left and right turns from all directions
  - Better car queuing storage between the ramp terminals

- Safety Benefits
  - Fewer conflict points for collisions,
  - Minimizes left turning movements
  - Better sight distance at turns
  - Wrong way entry to ramps is extremely difficult
  - Pedestrian crossings are shorter

Diverging Diamond Interchange

- Cost Benefits
  - Retro-fit
    - Existing bridges can be utilized
    - Additional right of way rarely needed
  - New construction
    - Less bridge structure is needed (high-cost item)
    - Few lanes are needed than traditional interchanges
    - Less right of way is required



MDT Moving Forward

- Intersection Control Evaluation (ICE)
  - MDT currently developing guidelines for MDT's ICE Process
  - ICE allows us the ability to balance operations, safety and maintenance needs
  - Process also keeps MDT abreast with new innovative intersection options

- Intersection Design
  - Improving safety
  - Maintaining or improving operations
  - Investing funds in the best long-term solution

Contact Information/Questions

Patricia Burke, PE, Safety Engineer
Traffic & Safety Bureau
Montana Department of Transportation
Phone: 406-444-9420
Email: pburke@mt.gov

zero deaths
zero serious injuries