

A photograph of a rural road intersection. The road is paved and curves through a landscape of golden-brown fields and green grass. In the background, there are farm buildings and a white barn. The sky is clear and bright.

Alternative Intersection Designs

October 2023

Multidisciplinary Roadway Safety Series



Alternative Intersections - General

- “Why can’t we just build a stop light?”
- Conflict Points
- Severity of Crashes
 - Left turns
 - Traffic Signals
 - High-speed expressway intersections



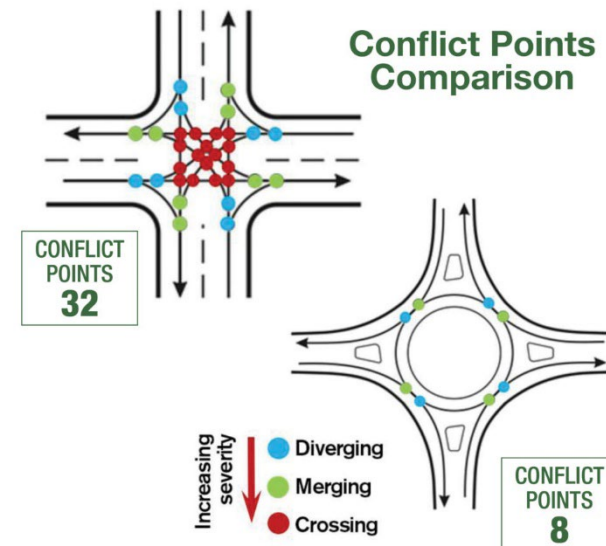
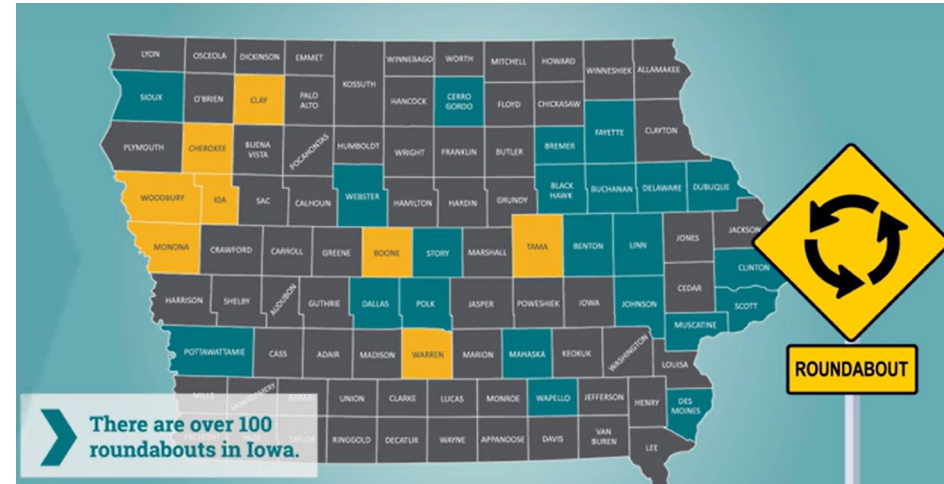
Alternative Intersections - General

- Why not?
 - Driver familiarity
 - Standard Designs
 - Cost
- Why?
 - Speed Management
 - Conflict Points
 - Crash Experience with “standard intersections”
- Where?
 - **Not everywhere!**
 - Additional analysis, education...
- Focus on Roundabouts and RCIs



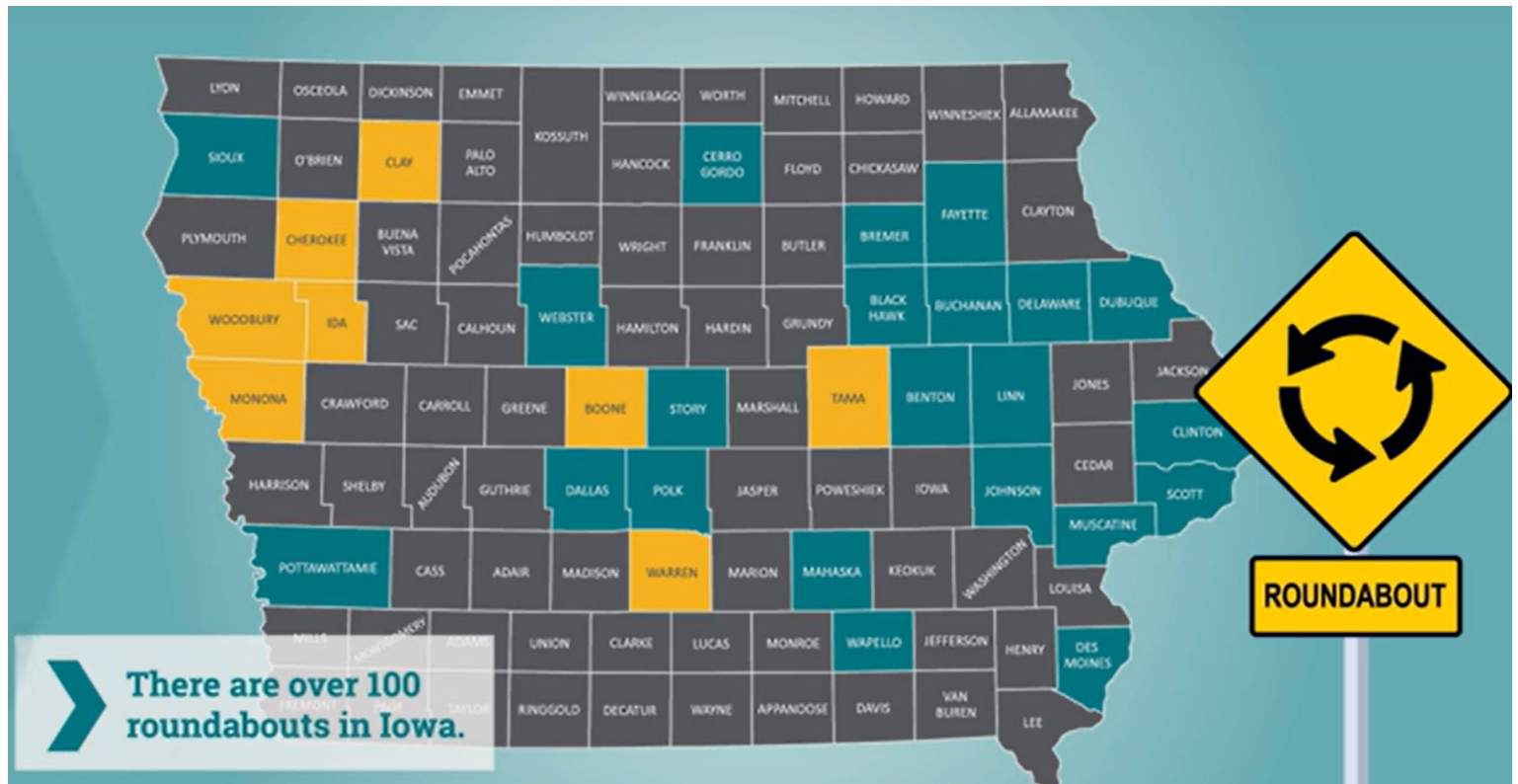
Roundabouts

- >100 Roundabouts in Iowa
- Reduced Conflict Points
 - 32 to 8 for single lane
 - Lower speeds, smaller angles
- Crash Reduction Factor (CRF)
 - 1x1 roundabouts
 - Overall -40%,
 - Fatal/Injury 70-80%
 - 2x1
 - Sometimes increase PDO
 - -75% Injury, -90% Fatal
- Operations
 - Off-peak
 - “Keeps traffic moving”
 - [Video link](#) (Utah DOT)



Alternative Intersections

Roundabouts



Alternative Intersections

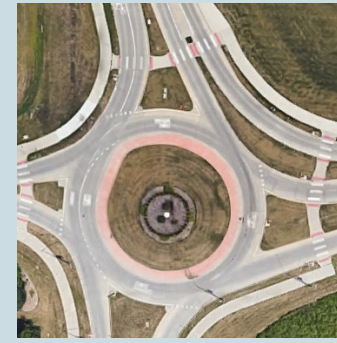
Roundabout Types

1x1

 US 52/IA 3 & Holy Cross Rd,
 Dubuque County

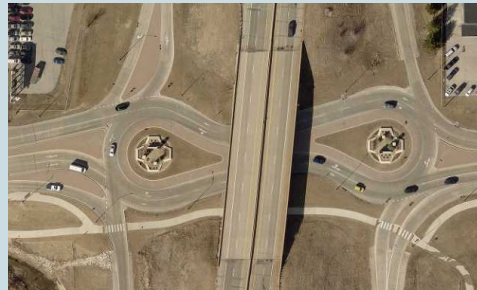
1x1 – rural, unique

 1st Ave W & Co Rd X49,
 Delaware County

2x1 - hybrid

 University Blvd & Airport Rd,
 Ames, IA

2x1

 NW 70th Ave & NW 100th St,
 Johnston, IA

Interchange

 IA 58 & University Ave,
 Cedar Falls, IA

Mini-roundabout


 29th Ave & 35th St,
 Marion, IA

Roundabouts


- Public Meetings
 - Flyers/Mailers
 - Meeting Exhibits

ROUNDBABOUTS
DON'T HAVE TO MAKE YOUR HEAD SPIN


HOW DO I DRIVE THROUGH A ROUNDBABOUT?




SLOW DOWN
Prepare to yield or stop.




LOOK
Check crosswalks for pedestrians.



YIELD
Look to your left and yield to vehicles inside the roundabout.



STAY RIGHT
Travel to your right to your exit.



LARGE VEHICLES
Large vehicles can use the truck apron – the brown colored, raised center island – for extra room for their rear wheels when turning.

PEDESTRIANS
Pedestrian crosswalks may be added with future sidewalk/trail projects. Pedestrians should cross one direction of traffic at a time.
1. At the crosswalk, look left for traffic before entering the roundabout.
2. At the raised splitter island, stop and look right, then finish crossing.

EMERGENCY VEHICLES
Always yield to emergency vehicles in the roundabout.
If you have already entered the roundabout, continue to your exit, then pull over and allow emergency vehicles to pass.
Do not stop in the roundabout.

For more information visit: IOWADOT.GOV/TRAFFIC/ROUNDBABOUTS
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IOWA DOT

IOWA HAS MORE THAN 100 ROUNDBABOUTS. WHY?

SAFETY
Roundabouts reduce severe crashes.

- Speed and severity of potential crashes are reduced.
- The overall risk of crashes is reduced by 40%.
- The risk of fatal and injury crashes is reduced by 70-80%.
- There has never been a fatal crash at an Iowa roundabout.

EFFICIENCY
Roundabouts reduce delays.

- Traffic moves more efficiently during peak traffic times compared to a traffic signal.
- State Street wait times are reduced compared to a stop sign since roundabouts create easier gaps in IA 17 traffic.
- Drivers don't need to wait for traffic signals during busy times.

VERSATILITY
Roundabouts benefit everyone:

- Raised islands are designed for farm vehicles and semi- and fire trucks.
- Pedestrians only need to cross one direction of traffic at a time.
- Roundabouts are commonly built near schools and recommended by the American Association of Retired Persons (AARP).



PROJECT SCHEDULE

Design 2023	Letting March 2024	Construction Begins March 2024	Construction Ends November 2024
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Roundabouts

- Opened August '23
 - New Elementary School and sport fields to south
 - IA 10 AADT
 - ~ 6,000-8,000 veh/day
 - Timelapse (12.5x)
 - <https://www.youtube.com/watch?v=ZFEW-ApSdqQ>



IA 10 & Jay Avenue
Orange City, IA

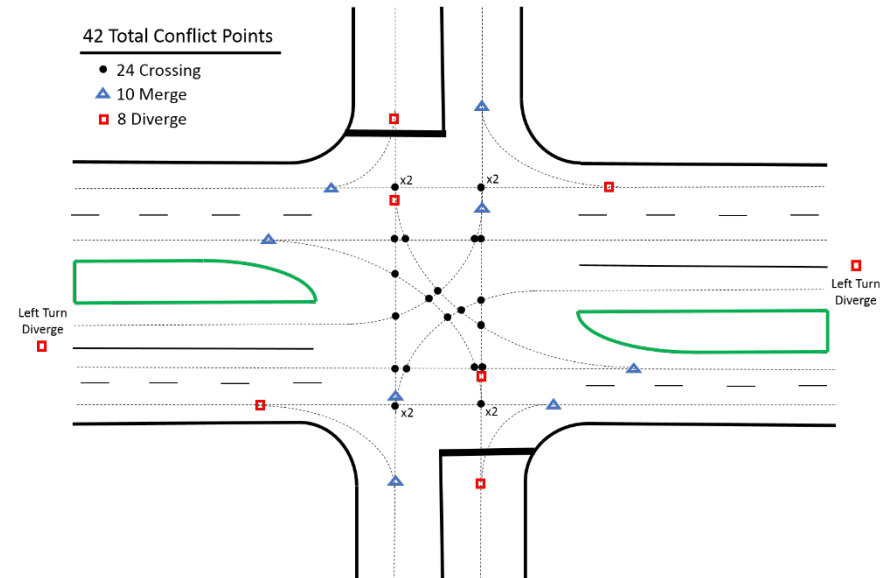
Reduced Conflict Intersections (RCI)

- Also called J-Turn, RCUT
 - Left turn “in” at crossover
 - U-turn approx. 600-800 ft away
 - Simplifies driver decisions
- Safety
 - **42% reduction Injury Crashes**
 - **70% Reduction Fatal Crashes**



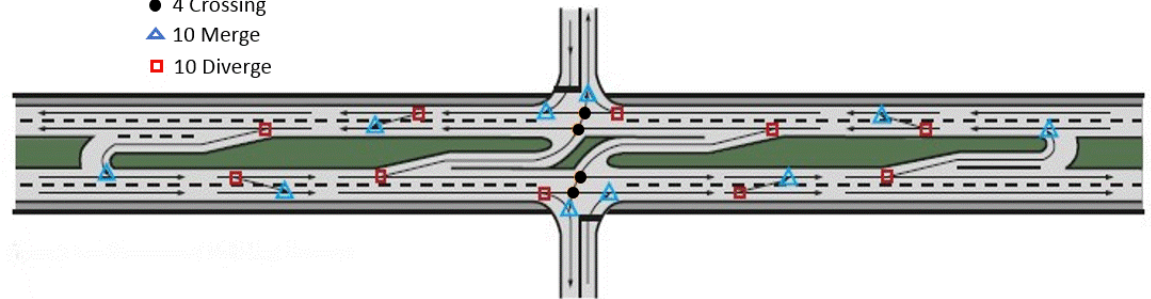
Reduced Conflict Intersections (RCI)

- Conflict Point Reduction
 - 42 to 24
- Comparable delay
 - Time waiting at main intersection, vs time to make turn at crossover
 - Simpler movements, less 'driver stress'



24 Total Conflict Points

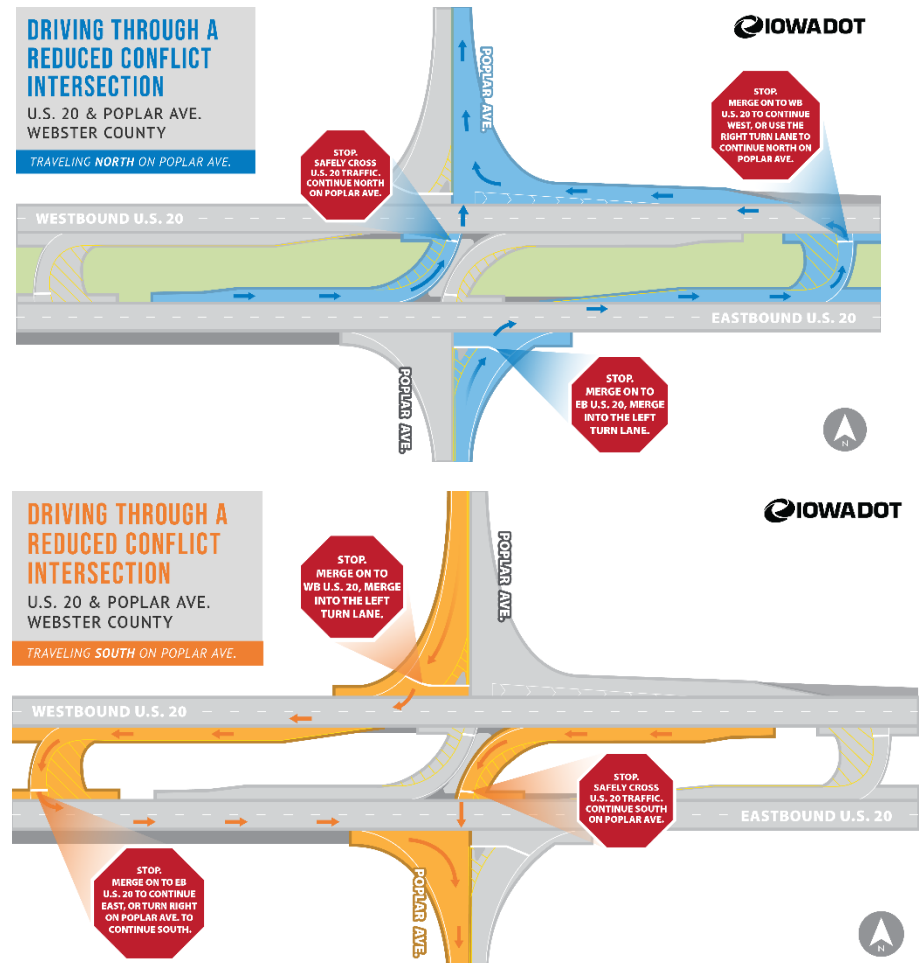
- 4 Crossing
- ▲ 10 Merge
- 10 Diverge



Alternative Intersections

Reduced Conflict Intersections

- First in Iowa recently opened east of Fort Dodge on US 20
 - Modifications summer 2023
- Second – US 61
 - Wapello bypass
- Similar Midwest agricultural states
 - MN – 75+
 - WI – 21+
 - MO – 47+
 - IL, IN...



Iowa DOT Resources

- More updates will be coming to DOT Traffic & Safety website
 - <https://iowadot.gov/traffic/Safety-Engineering-and-Planning>
- TEAP Studies
 - 100 hr – consultant – No cost to agency
 - <https://iowadot.gov/traffic/traffic-and-safety-programs/traffic-engineering-assistance-program-teap>
- TSIP Funding
 - Up to \$500,000 – Site-Specific, Benefit/Cost Ratio
 - <https://iowadot.gov/traffic/traffic-and-safety-programs/tsip/tsip-program>
- Roundabout Review
 - No Cost
 - <https://iowadot.gov/traffic/roundabouts/Roundabout-Design-Review-Service.pdf>

TRAFFIC ENGINEERING

SAFETY ENGINEERING AND PLANNING

▼ HIGHWAY SAFETY FEATURES

ROUNDAOBOUTS

REDUCED CONFLICT INTERSECTION

▶ 4-TO-3-LANE CONVERSION






SPEED FEEDBACK SIGNS

Alternatives Analysis

- CMFs/CRFs
 - Iowa DOT Planning Level Crash Reduction Factor List
 - <https://iowadot.gov/traffic/pdfs/CRFListVersion.pdf>
- CAP-X
 - FHWA tool
 - Input “standard volumes”, screen for basic feasibility
 - SPICE – CAP-X + Safety
 - Predicted Crashes, CMFs
- Intersection Control Evaluation (ICE) Policies
 - More extensive
 - Objective process
 - Iowa DOT – Guidance *In-Process*
- Life Cycle Cost Analysis
 - Benefit/Cost
 - Construction/ROW, Operations, Delay, Crash/Safety, Maintenance

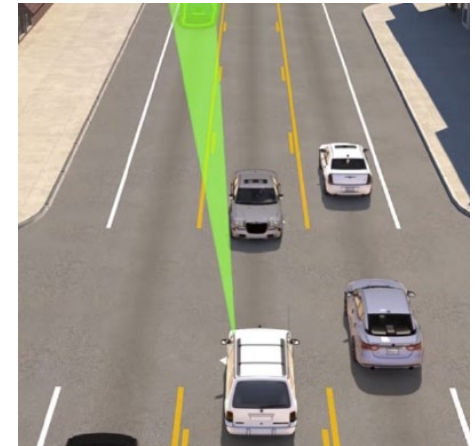
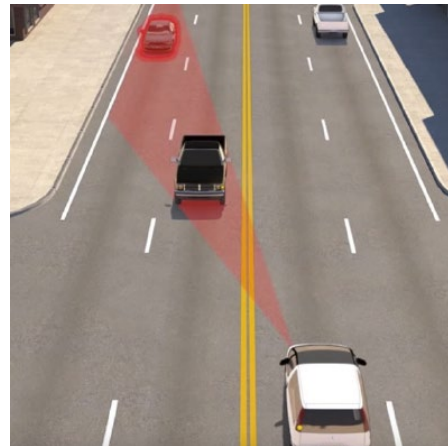
Alternative Intersections

Alternatives Analysis

Time Period	Intersection Control	Example	Crash Potential	Delay	Timeline to Design & Construct	Cost
Existing	Two-way & All-way STOP		↑	Current Intersection. Delay will increase with traffic growth.	Existing	\$
Short Term	Traffic Signal		↑	US 30 delay increase due to new stops, high speed/stopped traffic.	2-3 Years	\$\$
Short Term <i>(Preferred)</i>	Reduced Conflict Intersection (RCI)		↓	Out of distance travel-time comparable to time waiting for left turn.	2-3 Years	\$\$\$
Short Term <i>(Preferred)</i>	Roundabout		↓	All traffic decreases speed and yields or stops as needed.	2-3 Years	\$\$\$
Long Term	Interchange Full Access Control		↓	Added travel time along ramps; less for side road.	> 10 Years	\$\$\$\$\$ \$\$\$\$\$

Two-way Left Turn Lane (TWLTL) 4-lane–3-lane Conversions

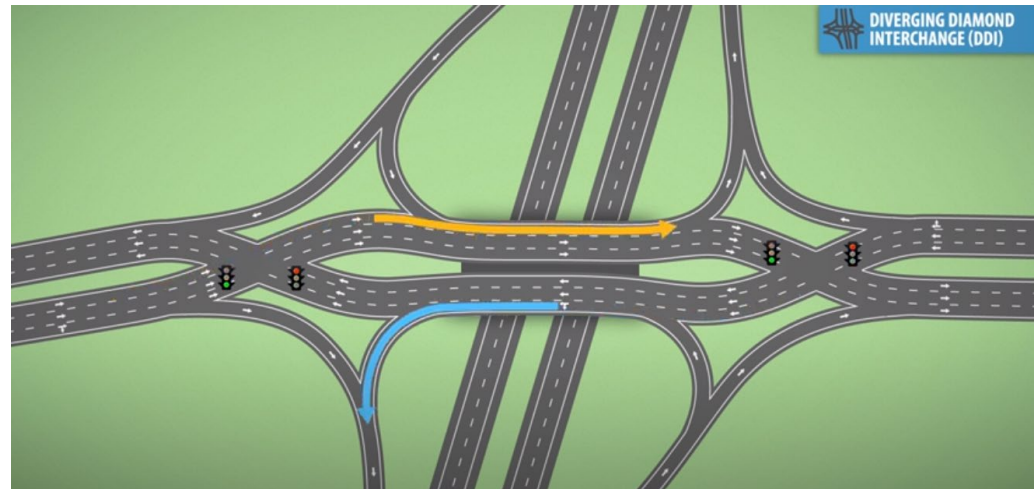
- Crash Reductions
 - >40%
 - Rear End, Oncoming left turn, Sideswipe...
- Corridor Considerations
 - Traffic signals
 - Timings, mast arm length, signal heads, cabinet/FYA
 - Access Consolidation
 - Truck turning movements
 - Moves the through lane turning “target”
 - Signal poles
- Public concerns
 - Travel Time
 - Emergency response
 - Cannot “back out” of driveway – queue



- Iowa DOT Screening Tool
 - <https://iowadot.gov/traffic/4-to-3-Lane-Conversion/3-Lane-Roads>

Diverging Diamond Interchanges (DDI)

- Background
 - Conflict Points
 - Left Turns...
 - Fewer Signal Phases, Reduced Delay
- Inventory - Iowa
 - 3 Existing
 - I-380 & Tower Terrace Rd
 - 4 Programmed
 - MoDOT – 20+
 - WisDOT – 5+
 - MnDOT – 10+



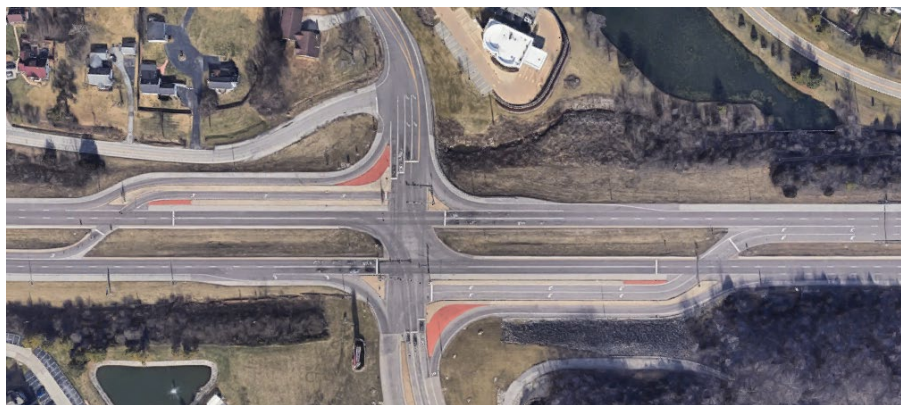
Iowa DOT Video

<https://www.youtube.com/watch?v=bxkur5WI4Ok>

Alternative Intersections

Displaced Left Turn (DLT) (aka Continuous Flow Intersection (CFI))

- Background
 - Conflict Points
 - Signal Phasing
 - Protected Left Turns...
 - Increased Flow/Level of Service
 - Simultaneous Through and Left-turn Movements
 - Reduced Crash Severity
- Inventory
 - None in Iowa
 - Missouri DOT (KC/STL)





THANK YOU FOR YOUR TIME AND ATTENTION



<https://iowadot.gov/traffic>

<https://iowadot.gov/traffic/Contacts-and-location/Contact-Information>