THE J-TURN INTERSECTION

Design Concept Basics

Iowa Department of Transportation

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IOWA STATE UNIVERSITY

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

MTC
MIDWEST TRANSPORTATION CONSORTIUM

DEFINING THE PROBLEM
With Traditional Expressway Intersection Design

- **Typical Problem: Far-Side Right-Angle Collisions**
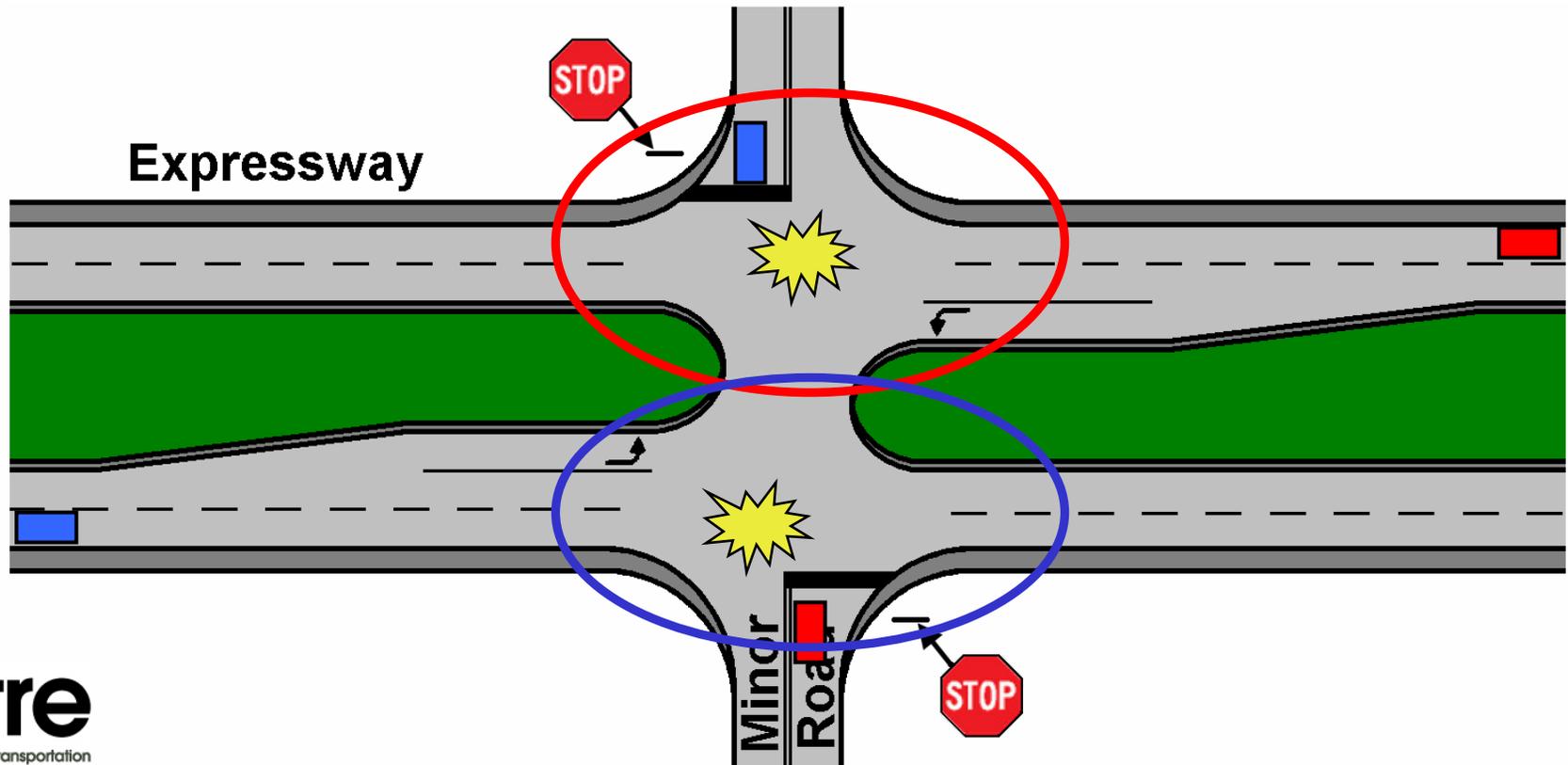
DEFINING THE PROBLEM
With Traditional Expressway Intersection Design

Typical Far-Side Right-Angle Collision

*** Courtesy of University of Minnesota Intersection Surveillance System Test Bed at US-52 & CSAH-9, Goodhue County, MN**

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springville, ia

US-151 &
Springville Rd.

US-151 & Springville Road (X-20) Collision Diagram

LOCATION: Linn County
TIME PERIOD: 1-1-2001 To 12-31-2007
ANNUAL CRASH FREQUENCY = 3.57
TOTAL CRASHES = 25

N

CRASH SEVERITY SUMMARY:

Fatal = 1
Injury A (Major) = 4
Injury B (Minor) = 2
Injury C (Possible) = 7
PDO = 11
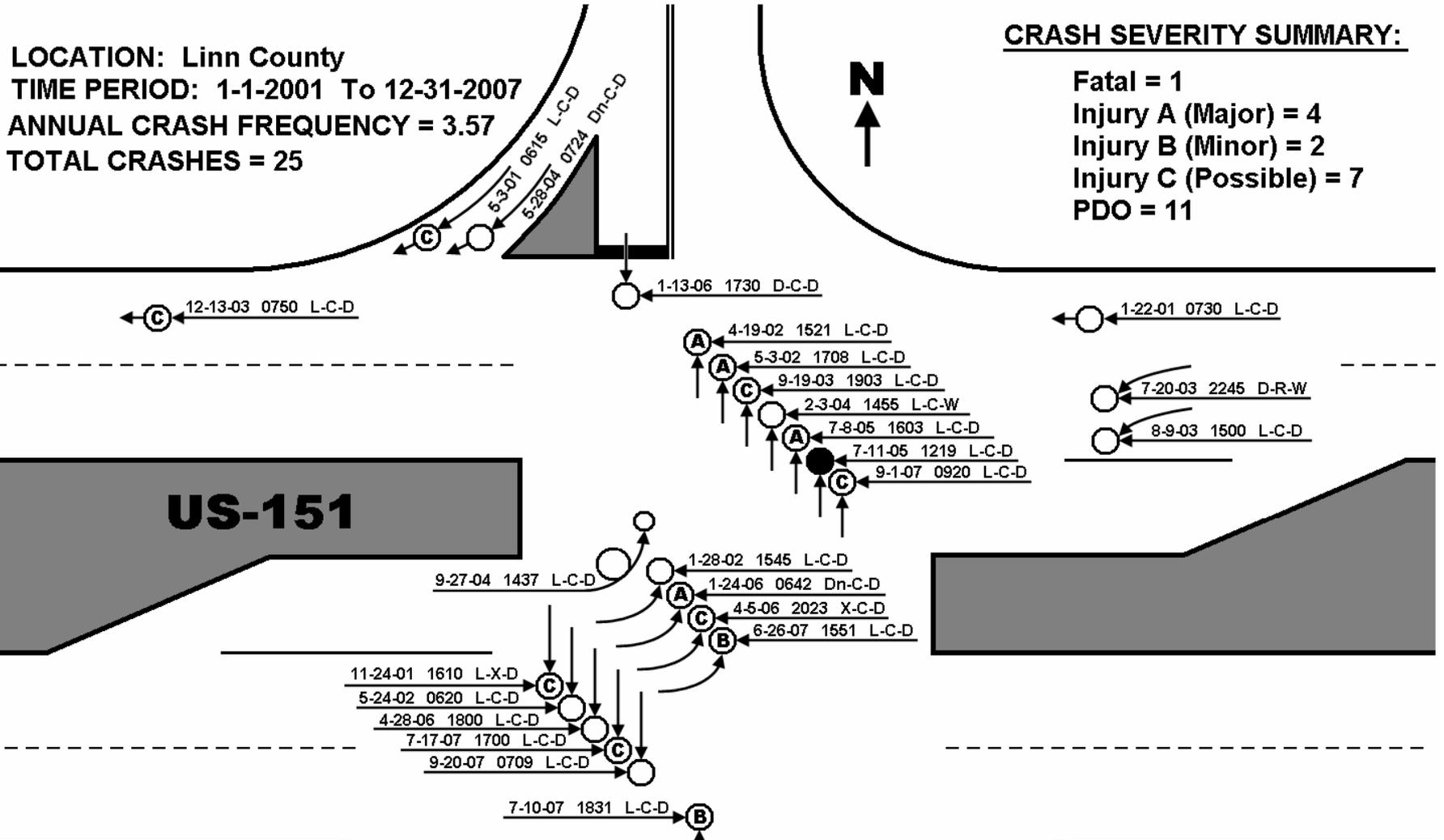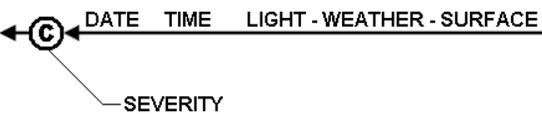
5-3-01 0615 L-C-D
5-28-04 0724 Dn-C-D

1-13-06 1730 D-C-D

12-13-03 0750 L-C-D

1-22-01 0730 L-C-D

4-19-02 1521 L-C-D
5-3-02 1708 L-C-D
9-19-03 1903 L-C-D
2-3-04 1455 L-C-W
7-8-05 1603 L-C-D
7-11-05 1219 L-C-D
9-1-07 0920 L-C-D

7-20-03 2245 D-R-W
8-9-03 1500 L-C-D

US-151

9-27-04 1437 L-C-D

1-28-02 1545 L-C-D
1-24-06 0642 Dn-C-D
4-5-06 2023 X-C-D
6-26-07 1551 L-C-D

11-24-01 1610 L-X-D
5-24-02 0620 L-C-D
4-28-06 1800 L-C-D
7-17-07 1700 L-C-D
9-20-07 0709 L-C-D

7-10-07 1831 L-C-D

EXAMPLE

DATE   TIME   LIGHT - WEATHER - SURFACE

SEVERITY

LEGEND:

SEVERITY
- ● Fatal
- Ⓐ Major Injury
- Ⓑ Minor Injury
- Ⓒ Possible Injury
- ○ PDO

LIGHT
- L = Daylight
- Dn = Dawn
- Du = Dusk
- D = Dark
- X = Unknown

WEATHER
- C = Clear or Cloudy
- R = Rain
- S = Snow or Sleet
- X = Unknown

SURFACE
- D = Dry
- W = Wet
- S = Snow or Ice
- X = Unknown

CRASH TYPES: US-151 & Springville Road

Far-Side Right-Angle Crashes ARE a Problem!

Chart: Percentage of All Collisions vs. Crash Type

Legend:
- Iowa Rural TWSC Expressway Intersections (1996-2000)
- US-151 & Springville Road (2001-2007)

Crash Type	Iowa Rural TWSC Expressway Intersections (1996-2000)	US-151 & Springville Road (2001-2007)
RIGHT-ANGLE	51.91	56.00
REAR-END	28.00	16.00
SIDESWIPE	2.14	8.00
OTHER	17.95	20.00

86% of Right-Angle are "Far-Side" at US-151 & X20
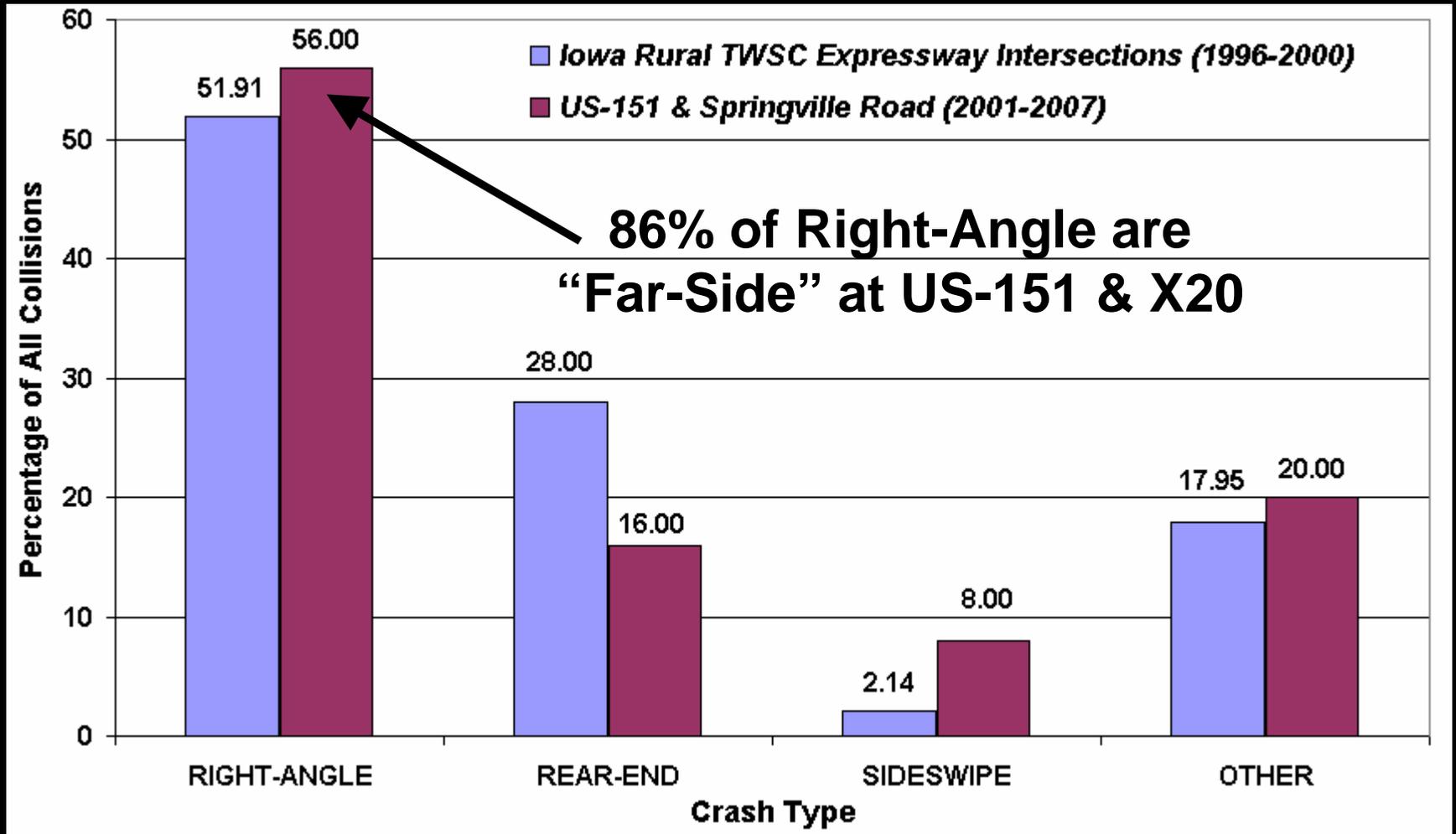
62% of Right-Angle Crashes are "Far-Side" Collisions Statewide (Iowa)
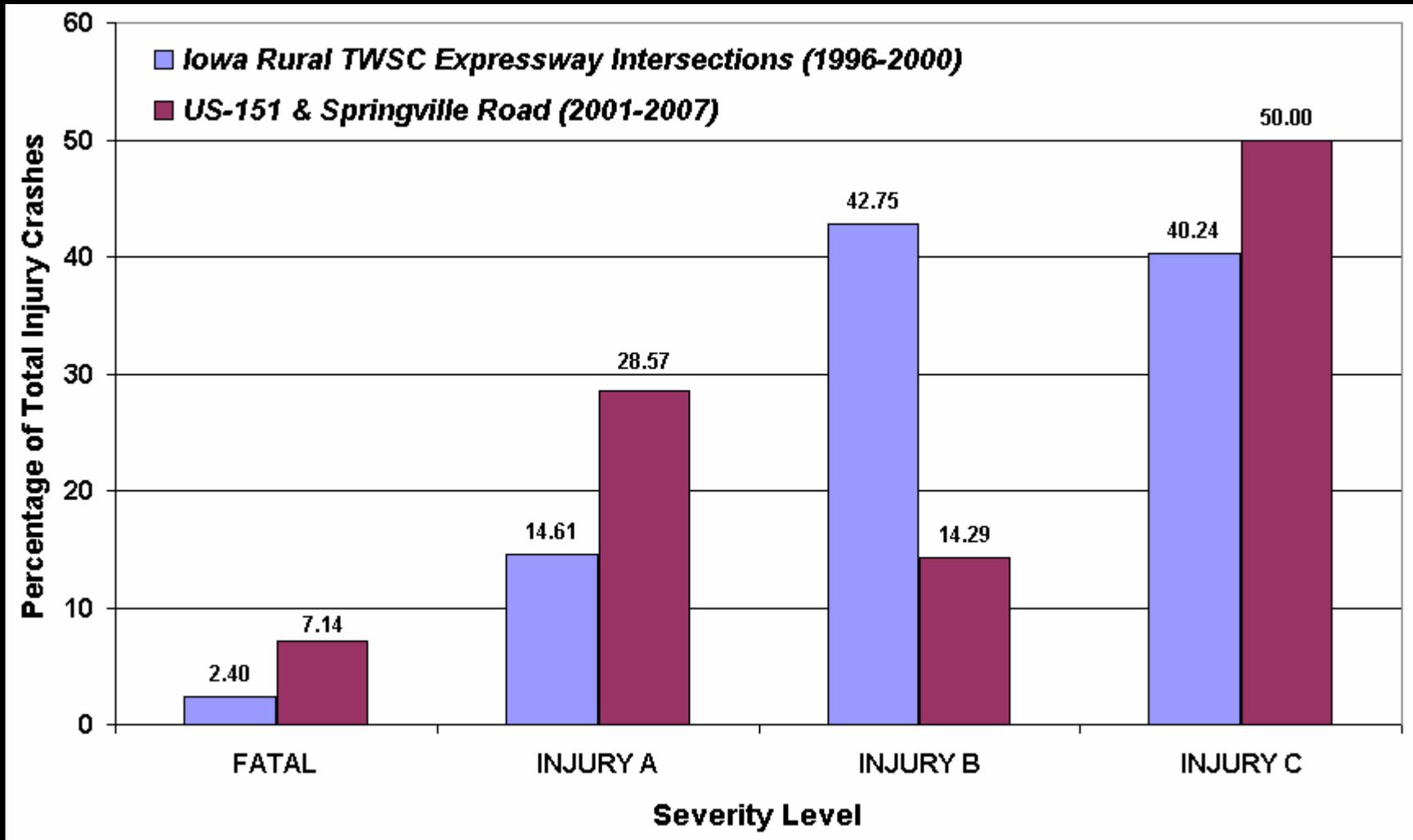
DEFINING THE SOLUTION
Problems with Traditional Approaches:

INTERCHANGES

1) Expensive

2) Years to Develop
(Planning to Construction)

3) Not Enough Traffic Volume to Warrant

SIGNALIZATION

1) Reduce Expressway Mobility

2) Not Anticipated by Expressway Drivers

3) Don't Necessarily Improve Safety (Change Crash Types)

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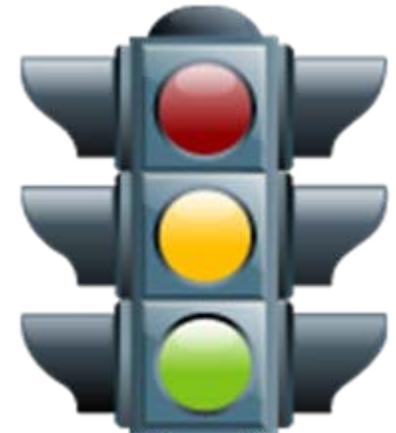
DEFINING THE SOLUTION:
The J-Turn Intersection
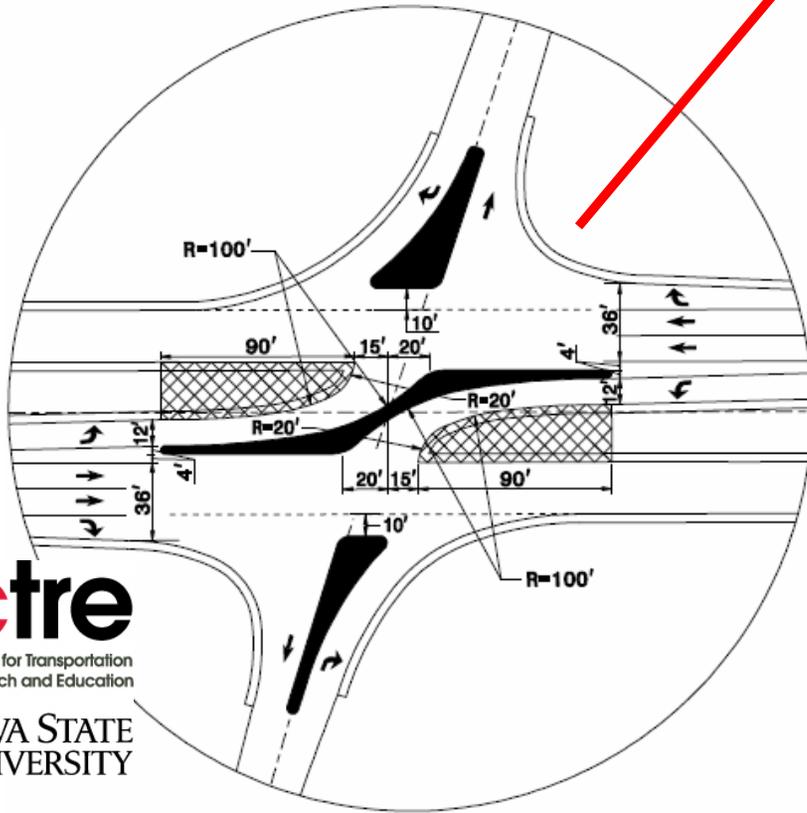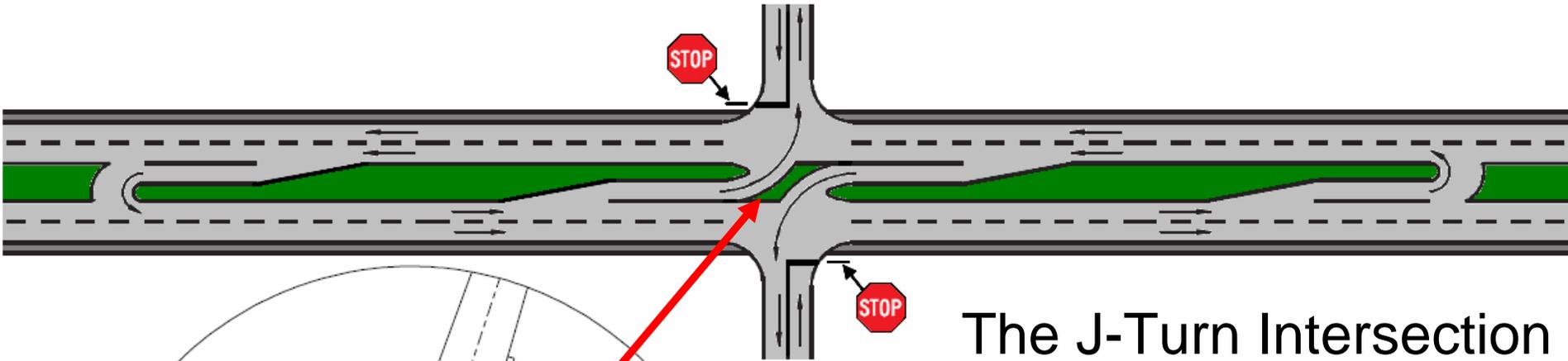
The J-Turn Intersection utilizes a directional median opening which closes the median to minor road traffic, but still allows all maneuvers (including left-turns) from the expressway.

J-TURN INTERSECTION
MARYLAND TESTIMONY

DEFINING THE SOLUTION:
The J-Turn Intersection
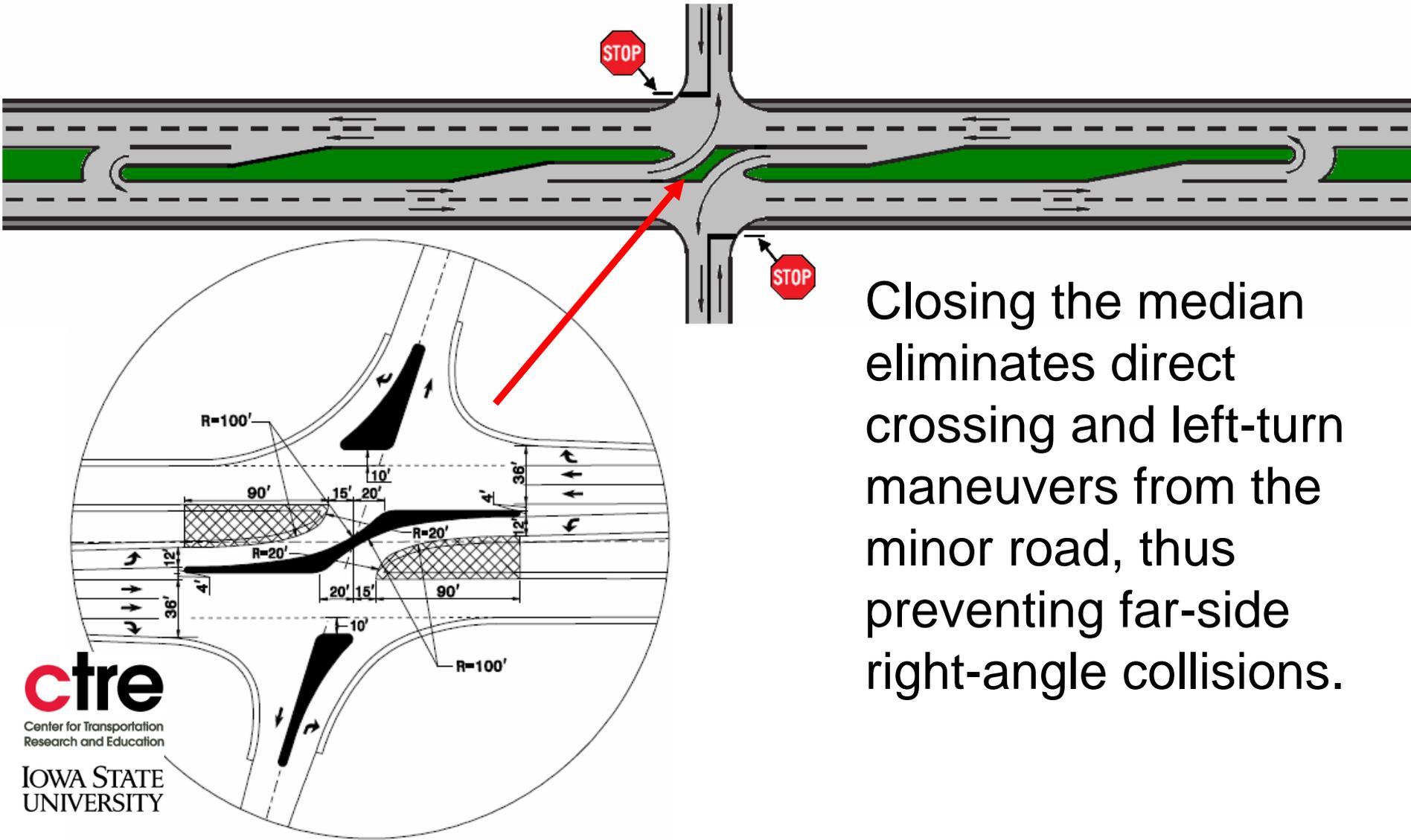
Closing the median eliminates direct crossing and left-turn maneuvers from the minor road, thus preventing far-side right-angle collisions.

DEFINING THE SOLUTION:
The J-Turn Intersection
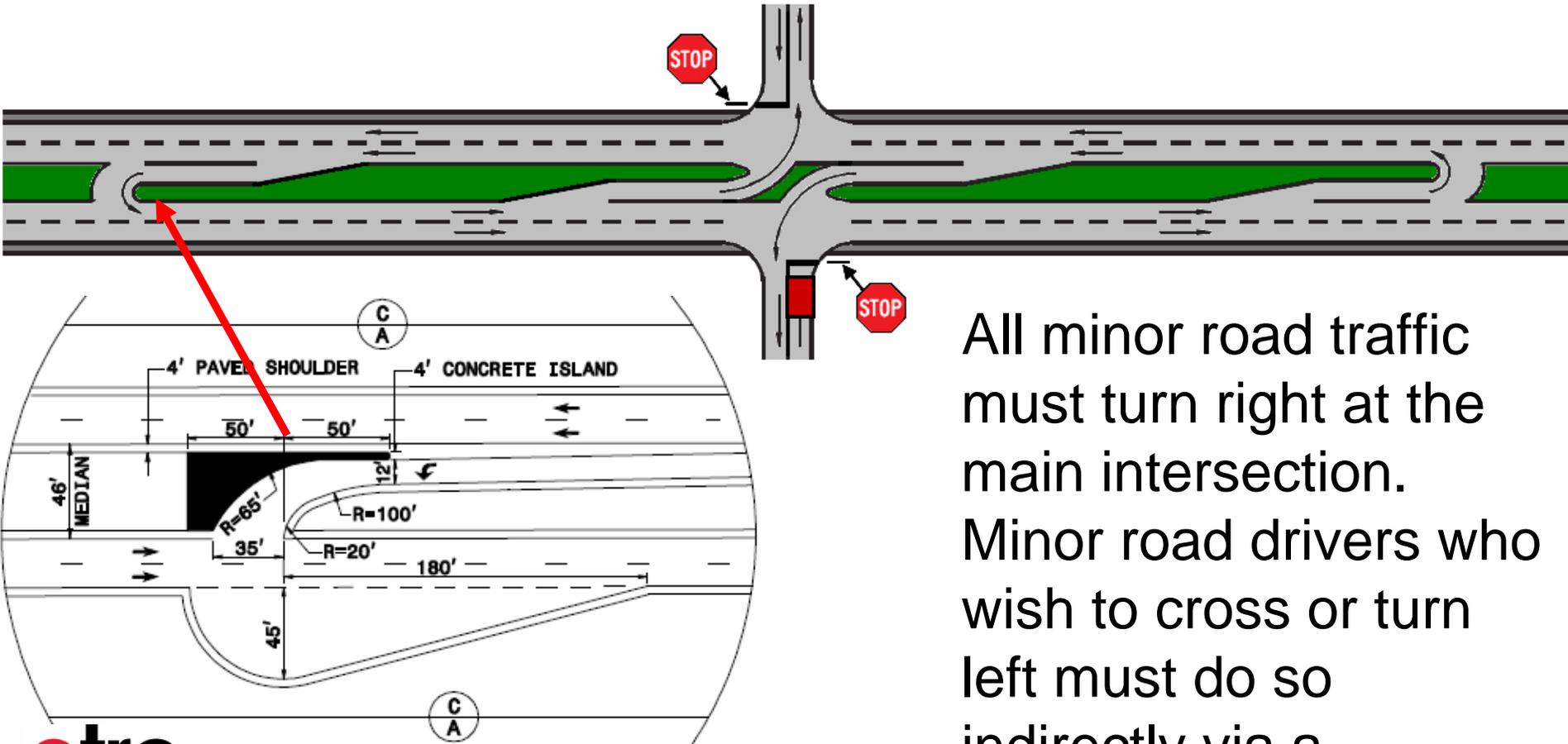
All minor road traffic must turn right at the main intersection. Minor road drivers who wish to cross or turn left must do so indirectly via a downstream U-turn.

DEFINING THE SOLUTION:
The J-Turn Intersection

Typical Rural 4-Legged, 4-Lane Divided Expressway Intersection

42 Total Conflict Points
- 24 Crossing
- 10 Merge
- 8 Diverge
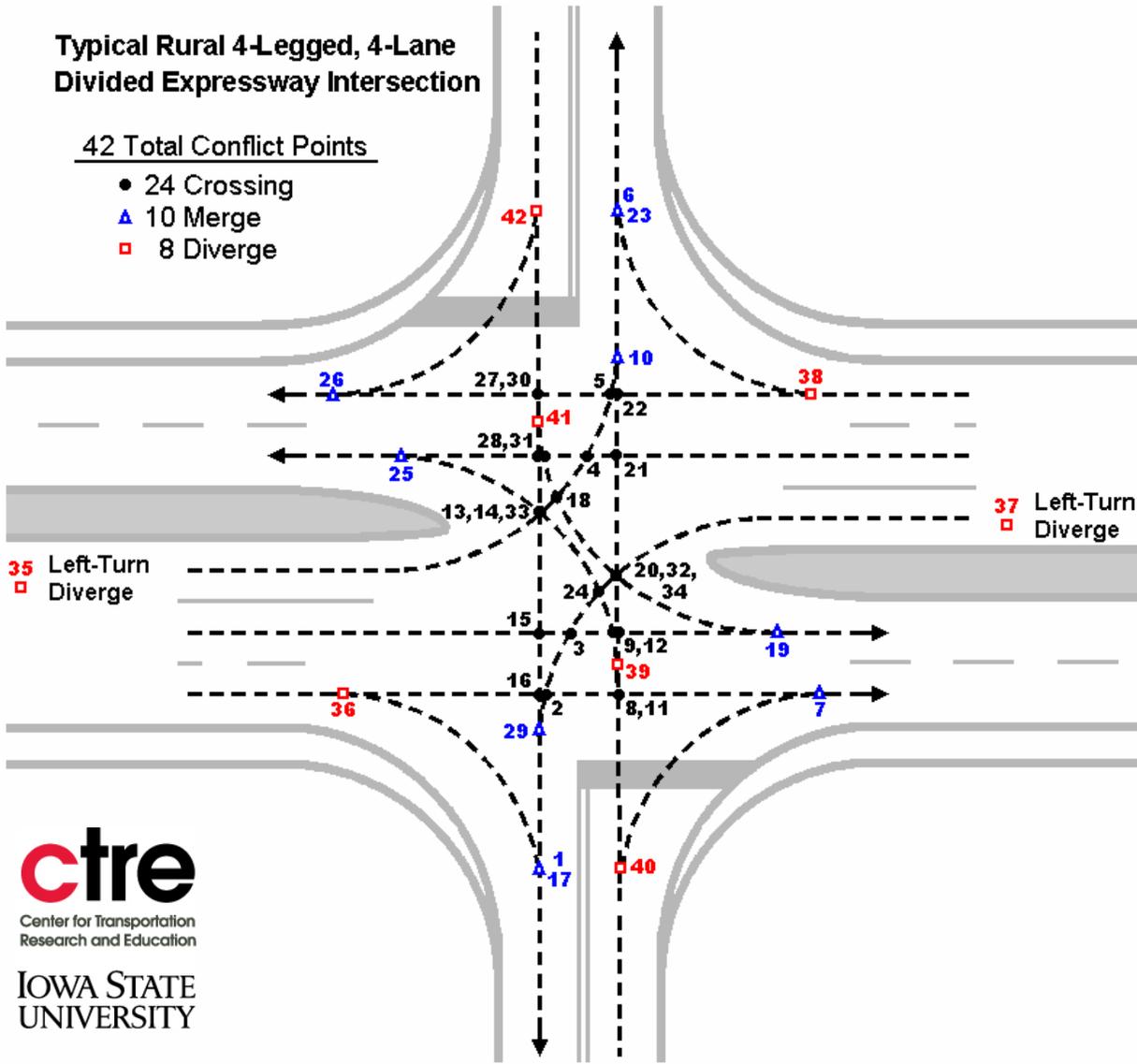
The J-Turn Intersection reduces the total number of intersection conflict points from 42 to 24.

DEFINING THE SOLUTION:
The J-Turn Intersection

The J-Turn Intersection reduces the total number of intersection conflict points from 42 to 24.

24 Total Conflict Points
- ✳ 4 Crossing
- ● 20 Merge/Diverge (10 Each)

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J-TURN INTERSECTION
SAFETY EVALUATION

MARYLAND (US-301 & MD-313)

4 Years Before, 6 Years After

- 92% crash reduction overall (8.25 to 0.67 crashes/year)

- 100% reduction in right-angle collisions (22 to 0)

- 100% reduction in fatal/injury crashes (23 to 0)

All statistically significant reductions (90% confidence).

J-TURN INTERSECTION
SAFETY EVALUATION

## North Carolina (3 Site Average)

Site #1
6 years before & after

Sites #2 & #3
3 years before & after

- 57% Crash reduction overall

- 97% reduction in right-angle collisions

- 100% reduction in far-side right-angle collisions

- 55% reduction in fatal/injury crashes

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DEFINING THE SOLUTION:
The J-Turn Intersection
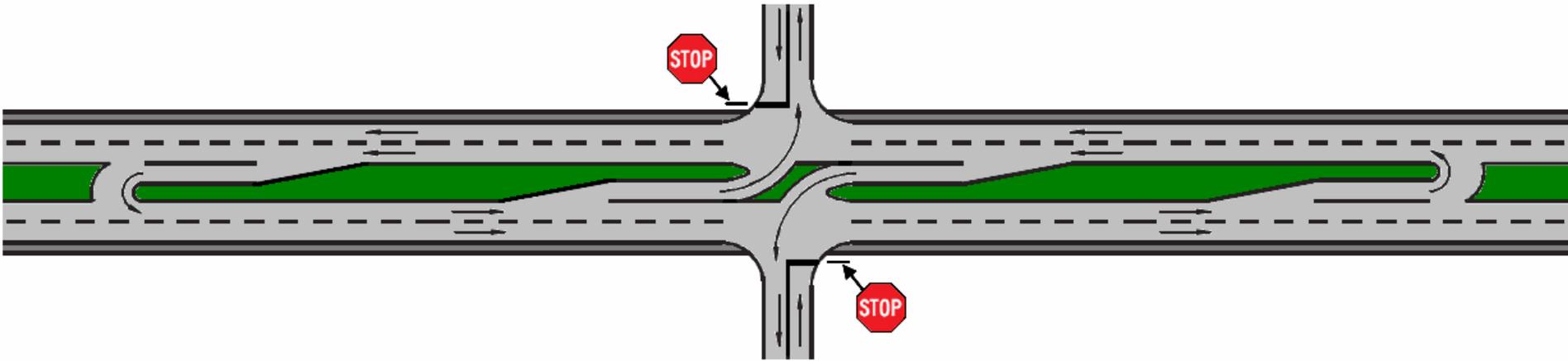
At US-151 & Springville Road, a J-Turn Intersection could potentially prevent 72% (18/25) of the collisions which occurred there over the last 7 years, including ALL of the most severe collisions (1 fatal, 4 major injury, and 2 minor injury).