

Data-Driven Safety Training

Urban 4-Leg Signalized Intersection

Part 1 Required Data

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Outline

1 U4SG required data

2 Landing observed intersection crashes

3 Desired/optional data

4 Predictive structure

5 Salem MO-32/MO-19 example

HSM Data Needs

- Required data
 - site configuration
 - crash
 - traffic
- Desired/optional data, e.g.
 - ped
 - bus stops
 - alcohol sales establishments
 - educational facilities

Number of Approaches with Left-Turn Lanes

- Exclusive lanes for left-turn operations
 - not through lanes
- Includes an entering taper with sufficient storage length to accommodate queued vehicles
- Range between 0 and 4 for 4-leg intersections

Number of Approaches with Left-Turn (LT) Lanes

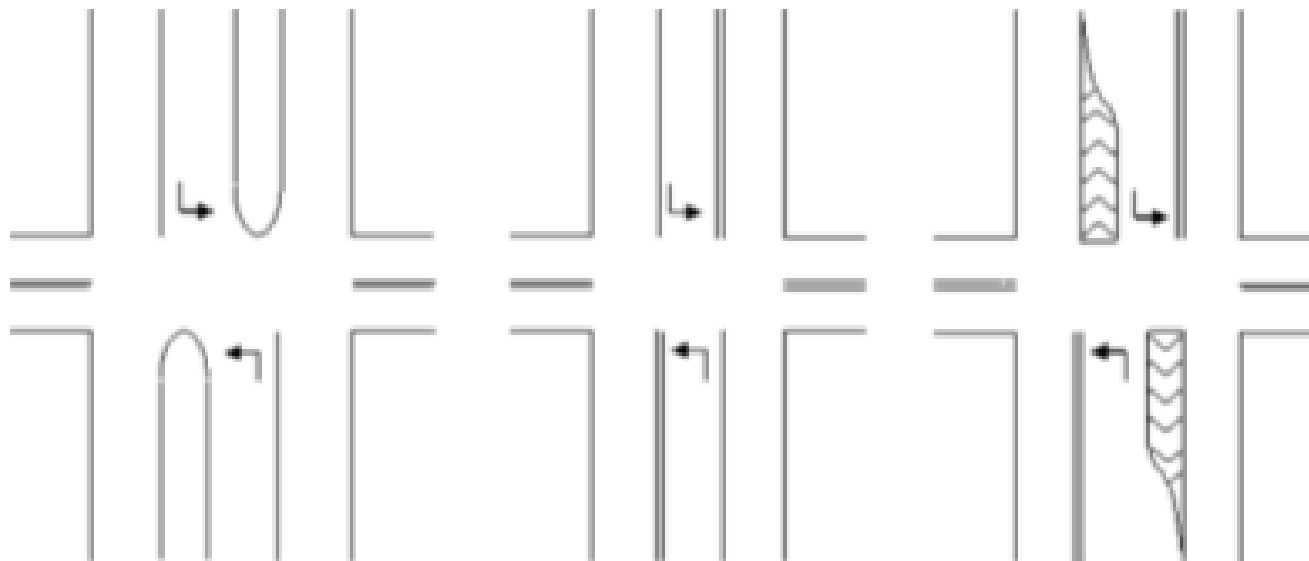
- example of 2 major approaches with LT lanes



ODOT 2012

Number of Approaches with Left-Turn (LT) Lanes

- Examples of various LT offsets



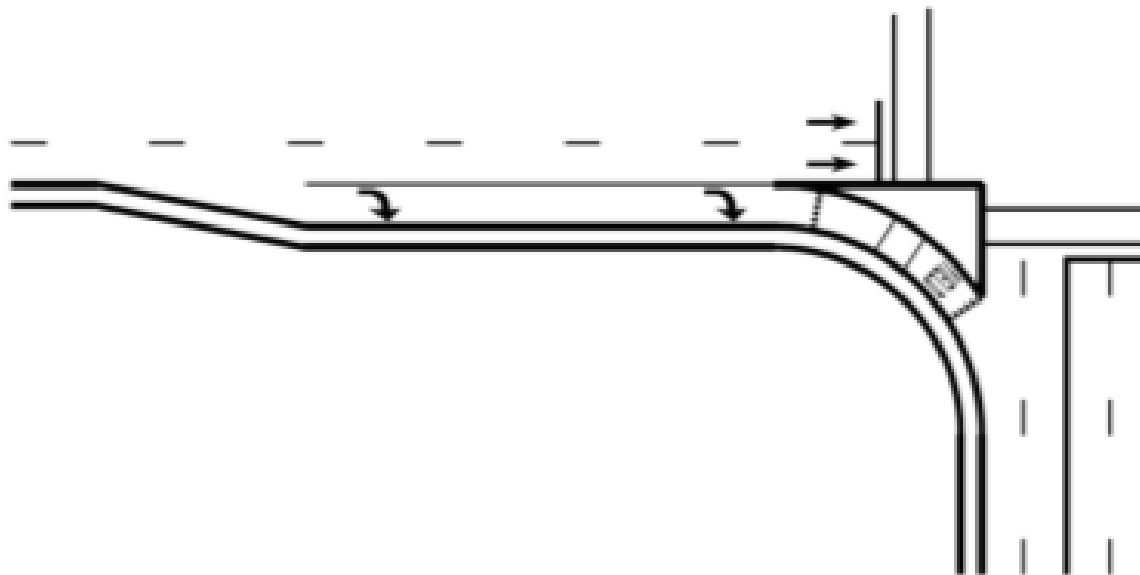
Chandler et al. 2013

Number of Approaches with Right-Turn Lanes

- Exclusive lanes for right-turn (RT) operations
 - not through lanes
- High speed RT lane may include
 - entering taper with sufficient storage length to accommodate queued vehicles
 - channelization
- Range between 0 and 4 for 4-leg intersections

Right-Turn Lane Design

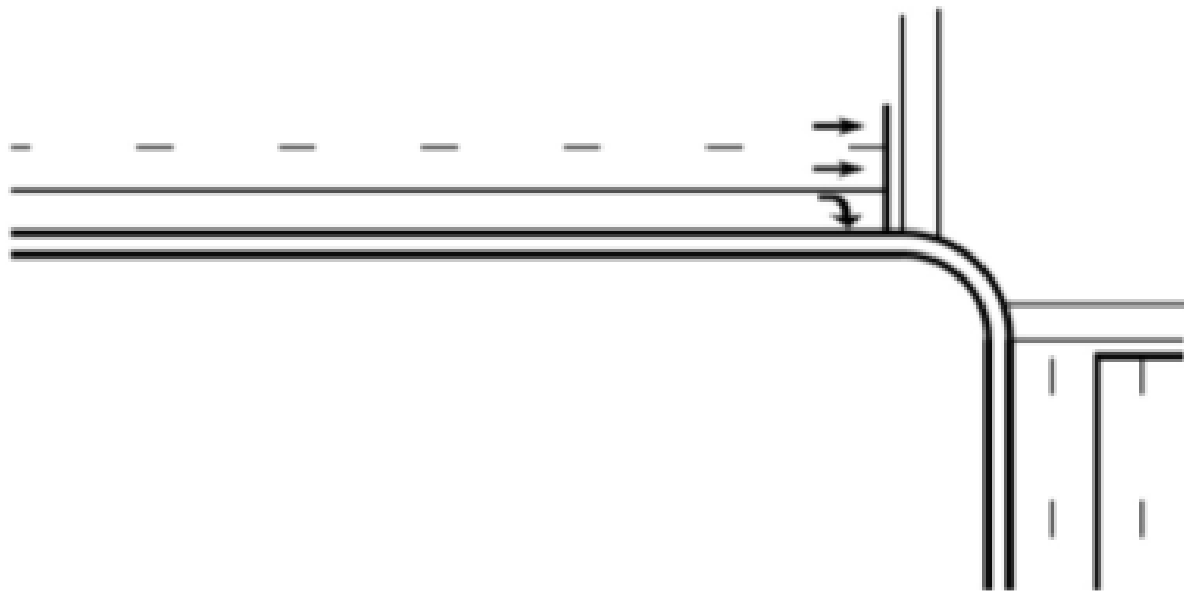
- Example of higher speed design



ODOT 2012

Right-Turn Lane Design

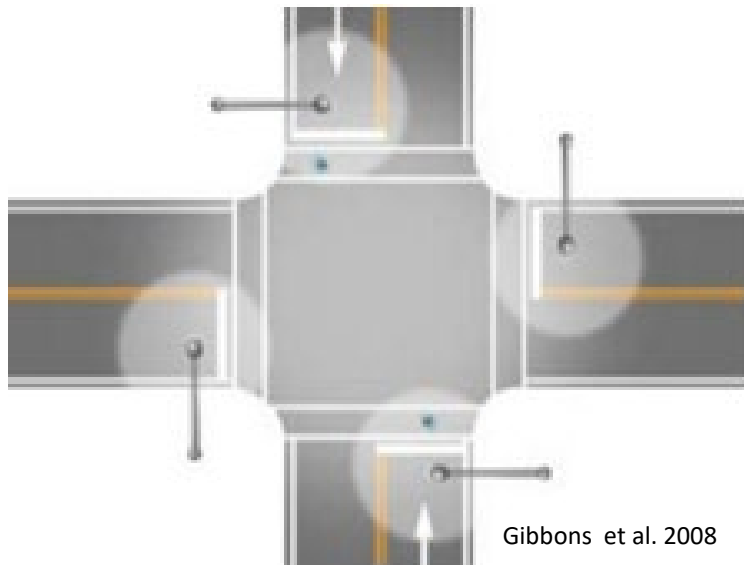
- Example of lower speed design



ODOT 2012

Presence of Lighting at Intersection

- Yes or no
- Examples



Gibbons et al. 2008



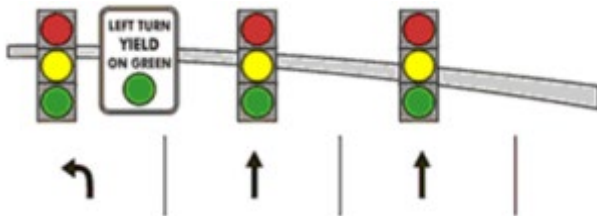
Google 2016

Number of Approaches with Permissive Left Turns

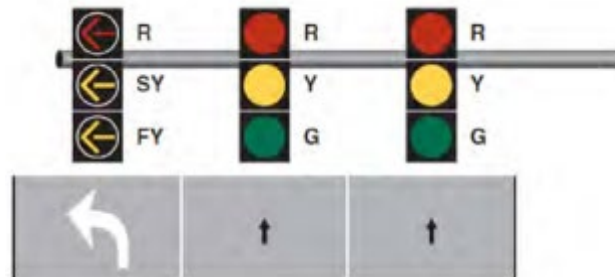
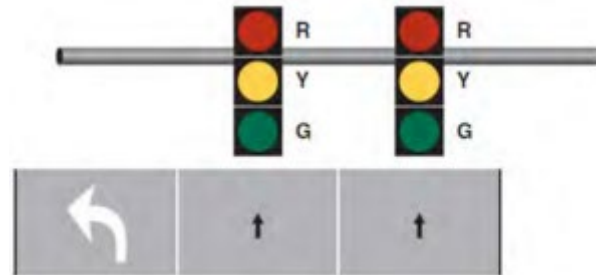
- Two opposing approaches
 - operating simultaneously with left turns allowed
 - yielding to opposing traffic and pedestrians
- Range between 0 and 4 for 4-leg intersections

Permissive Left-Turn Examples

- e.g. signage over LT lane
- e.g. flashing yellow arrow (FYA)



Chandler et al. 2013



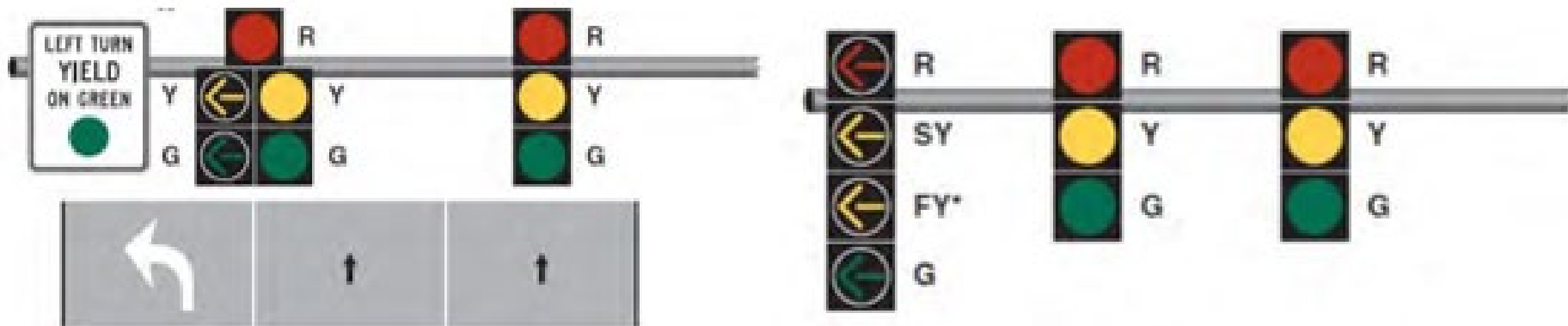
MUTCD 2009

Number of Approaches with Permissive/Protected Left Turns

- Permissive/Protected – protected LT + permissive LT phasing
- Signal head options
 - LT lane & adjacent through lane share signal head
 - separate signal head(s), exclusively for left turn(s)
- Range between 0 and 4 for 4-leg intersections

Permissive/Protected Left-Turn Examples

- five-head “dog house” vs. four-head vertical



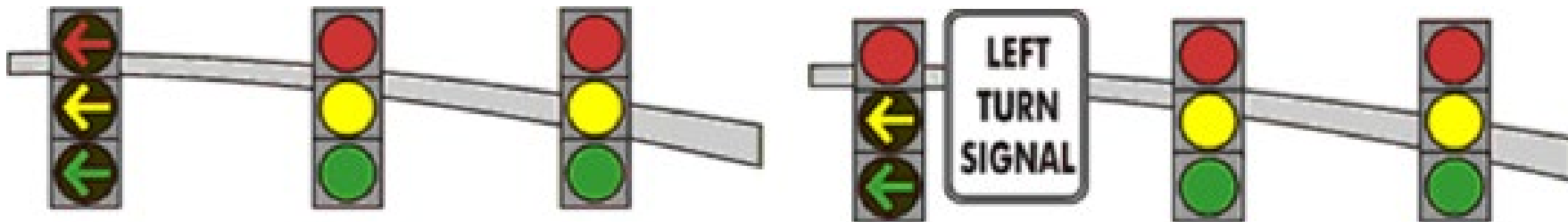
Chandler et al. 2013

Number of Approaches with Protected Left Turns

- Protected LT – separate phase for left-turning movements with LT arrow signalization
 - No pedestrian or vehicular conflicting movements allowed
- Range between 0 and 4 for 4-leg intersections

Protected Left-Turn Examples

- LT signal head with and without signage



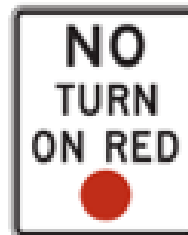
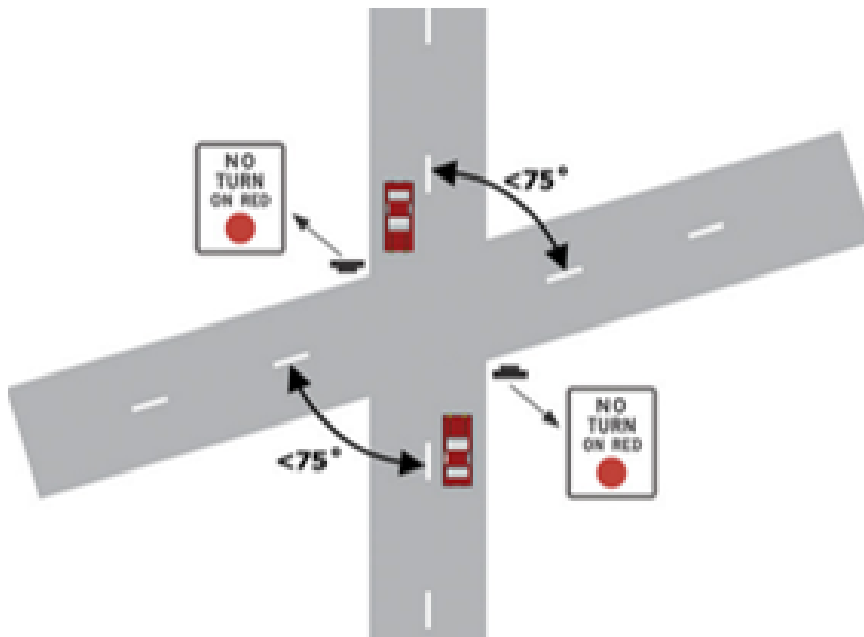
MUTCD 2009

Number of Approaches with Prohibited Right Turn on Red

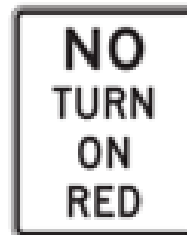
- Prohibition due to
 - inadequate sight distance to vehicles approaching from the left
 - geometry
 - pedestrian exclusive phase
 - skew angle less than 75 degrees

Prohibited Right Turn on Red Examples

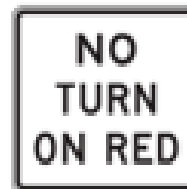
- Skewed intersection and MUTCD signage examples



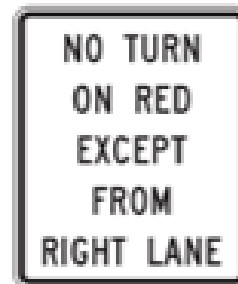
R10-11



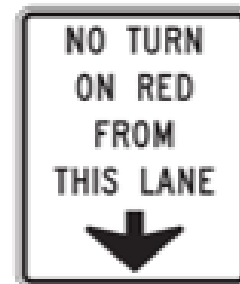
R10-11a



R10-11b



R10-11c



R10-11d

MUTCD 2009

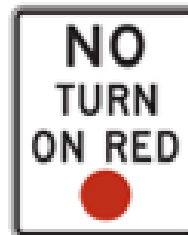
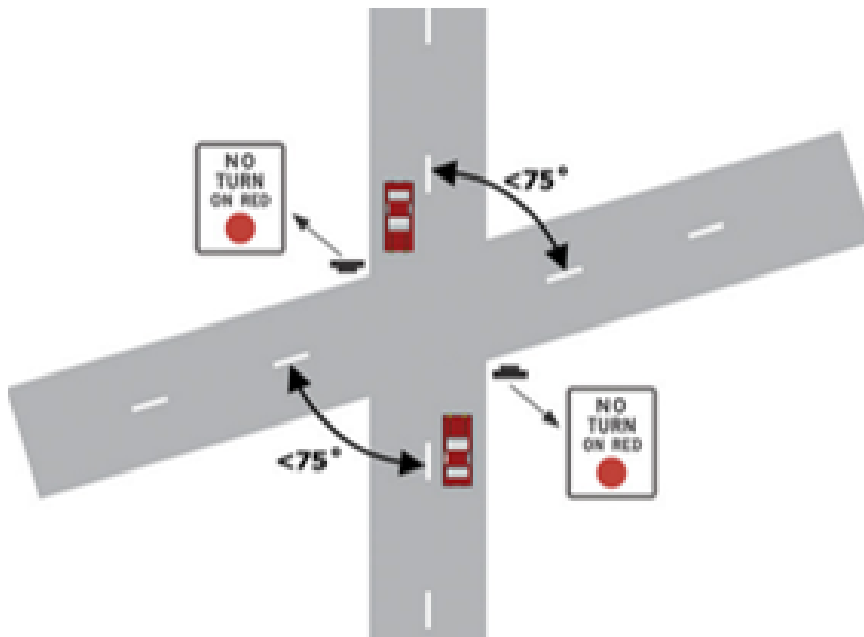
Presence of Red Light Cameras

- Yes or no
- Automated enforcement
 - takes a picture of vehicle running red light
 - ticket is issued after police officer review

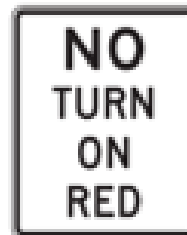


Prohibited Right Turn on Red Examples

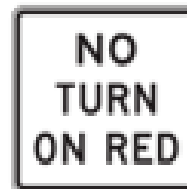
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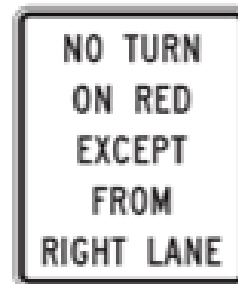
R10-11



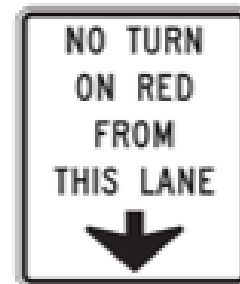
R10-11a



R10-11b



R10-11c

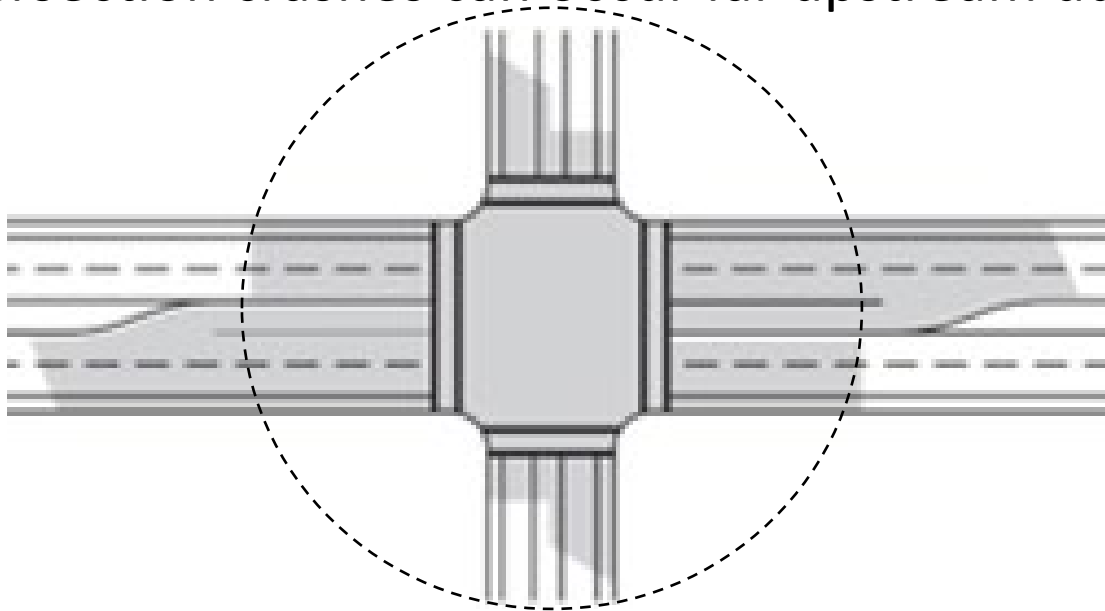


R10-11d

MUTCD 2009

Observed Number of Crashes

- Physical vs. functional classification
 - intersection crashes can occur far upstream due to queuing



AASHTO 2010

Observed Number of Crashes

- Physical – distance threshold
 - HSM 250 ft
 - MoDOT 132 ft
 - MUCR – based on location of first harmful event
 - before, at, or after intersection
- Functional – if intersection-related
 - e.g. queuing, turning, intersection channelization
 - based on review of entire crash report: collision diagram, narratives, all fields

Traffic Volumes

- Major Road AADT
 - major – higher AADT and/or higher road classification
- Minor Road AADT