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Interchange Design

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Presentation Overview

- Interchange Characteristics
- Process for Interchange Type Selection
- Service Interchange
- System Interchange
- New Type of Interchange
- Design Process and Details
- Interchange Attributes to Consider

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Interchange Characteristics

- Two main types of interchanges
  - Service Interchange – between a freeway or controlled access facility and a lower class roadway such as an arterial or collector (i.e. diamond)
  - System Interchange – between two or more freeways or controlled access facilities (i.e. cloverleaf)

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Interchange Characteristics

- Attributes of interchange type varies
  - Traffic operations
  - Safety
  - Physical impacts (R/W)
  - Construction cost
  - Constructability

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Process for Interchange Type Selection

- Process for interchange type selection
  - Data Collection
  - Planning Framework
  - Identify and Develop Concepts
  - Evaluate and Screen Alternatives
  - Select Preferred Alternative

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Process for Interchange Type Selection

- Additional items to consider
  - Identify and understand key project issues
  - Design creativity and context sensitivity
    - required to develop feasible solutions
  - Maintain fiscal feasibility
  - Maintain/enhance local access in reconstructing urban system ramp interchanges
  - Incorporating exclusive HOV lanes or ramps
    - Complicates the design and increases cost
  - Constructability
    - Reconstruction typically requires maintaining all movements

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Service Interchange

- Urban and suburban areas (tight R/W constraints)
  - Single point design creativity and context sensitivity
    - One intersection vs. two along local roadway
    - Expensive
  - Compressed or tight diamond
    - Intersections spaced 250’-400’ apart
    - Similar footprint to SPDI
  - Operational characteristics
  - Determine number of lanes
  - Traffic operations are key to success

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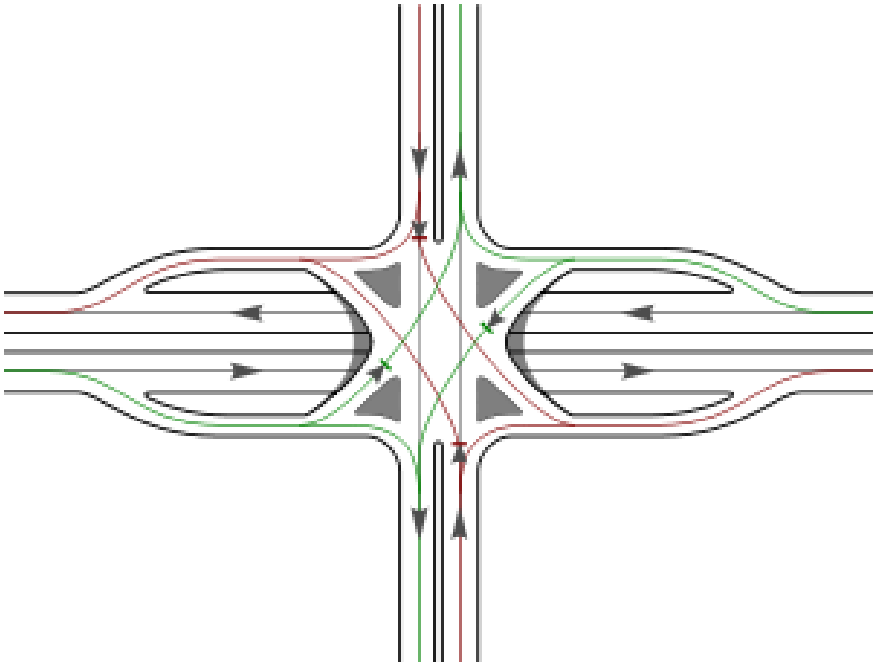
Service Interchange

- Single point diamond interchange (SPDI)



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Service Interchange

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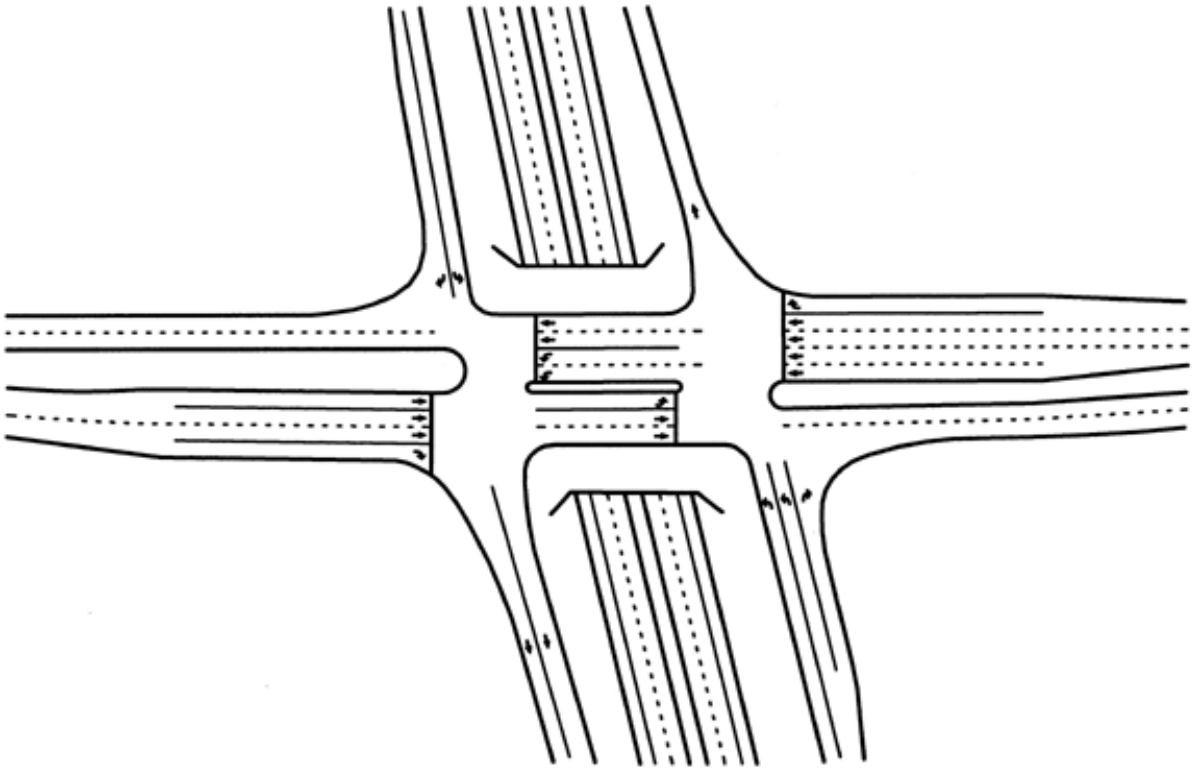
Service Interchange

- Compressed or tight diamond interchange



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Service Interchange

- Urban and suburban areas (tight R/W constraints)
  - Implement selection process
  - 12 points for the design of system interchanges
    - Maintain route continuity
    - Maintain basic number of lanes
    - Provide lane balance and continuity
    - Maintain appropriate ramp spacing
    - Design ramps for freeway speeds
    - Select appropriate interchange types
    - Employ only right-hand entrances and exits
    - Provide single exit at interchanges
    - Provide exits in advance of crossroad
    - Provide decision sight distance in advance of exits
    - Eliminate weaving within interchanges along the mainline
    - Provide designs that can be simply signed

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New Type of Interchange

- Diverging diamond

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Design Process and Details

- Stakeholders
  - Maintaining authority
  - Traveling public
  - Impacted public
  - Landowners
  - Environment
  - Politics
  - Federal funding
  - Be honest!

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Design Process and Details

- Geometrics
  - Iterative process
  - Provide desirables
    - DSD, SSD, etc…
  - Avoid flat spots and crown transitions
  - Rollovers
  - Nearby interchanges
  - Lane balance
  - Barrier concept
  - Adequate signing
  - Structures - construction restrictions to traffic

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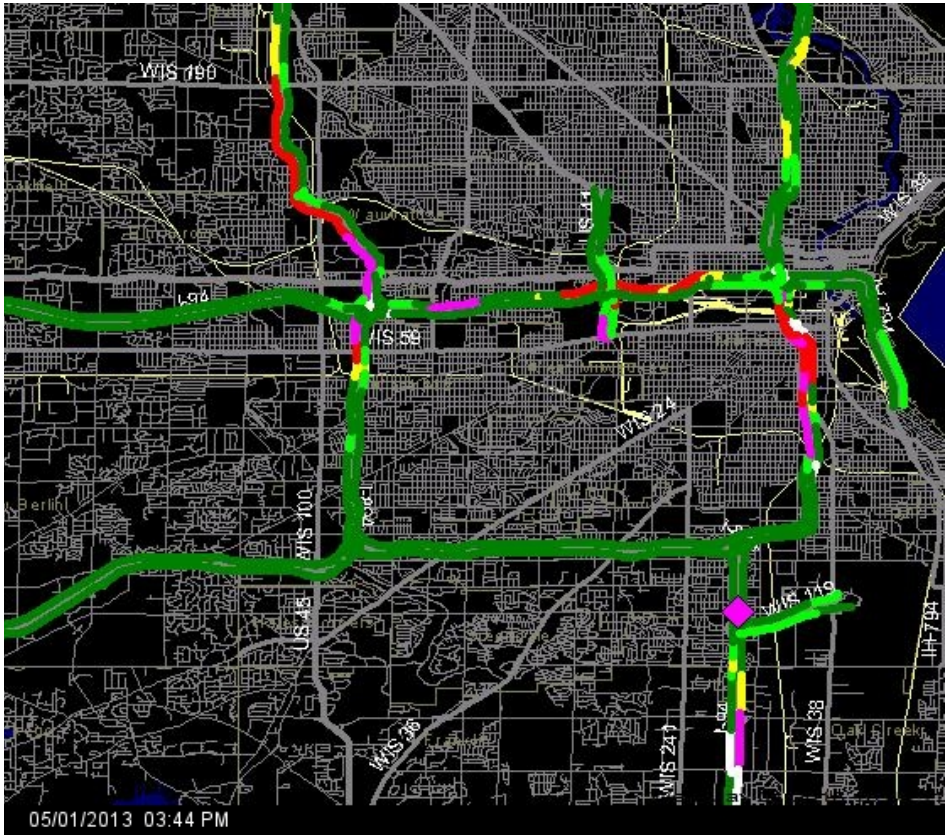
Design Process and Details



Milwaukee area – Congestion map

- Traffic
  - Large trucks
  - Avoid off-ramp queueing onto freeway
  - Analysis for staging and permanent conditions

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Design Process and Details

- Staging
  - Finding the optimal balance
  - Impacts of staging
    - Tie-ins and project length, ROW, utilities
    - Justify expenditure to provide desirable features
  - Over the top first
  - Traffic considerations
    - Seasonal peaks
    - Concurrent projects along corridor

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Design Process and Details

- Staging continued…
  - Structures
    - Lateral and vertical clearance
    - Construction joints
    - Future fill/cut at footings
  - Settlement of embankments
  - Design drainage for winter maintenance
  - Early project to eliminate complications
  - Lessons learned

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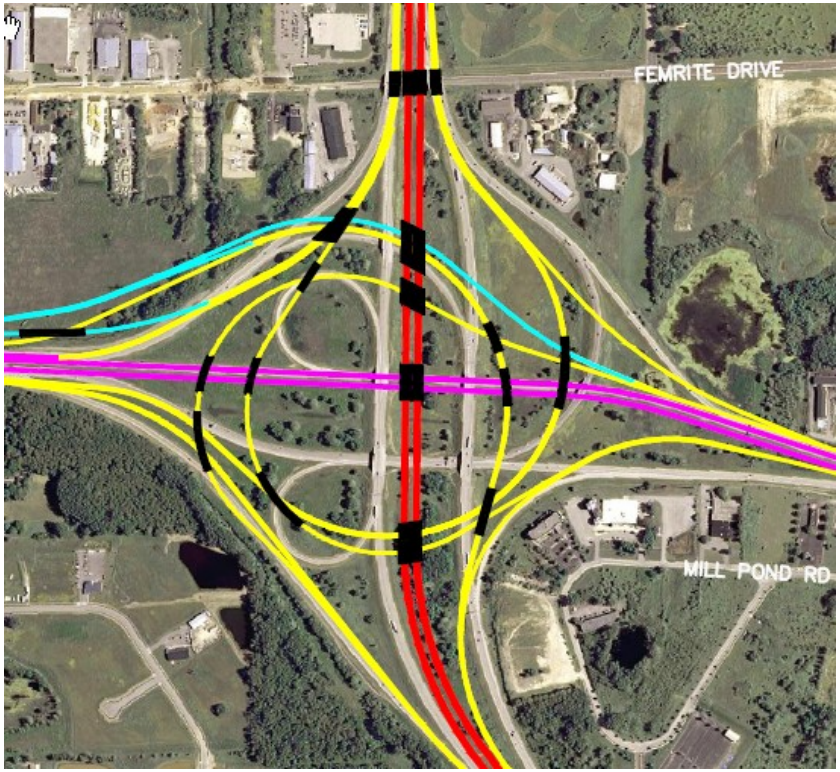
Interchange Attributes to Consider

- Design
  - Type, size:
    - Single point, trumpet, three leg, one quadrant, diamond, cloverleaf, etc…
    - Based on typically 6 warrants
    - Determine # lanes, heavy movements, crash locations



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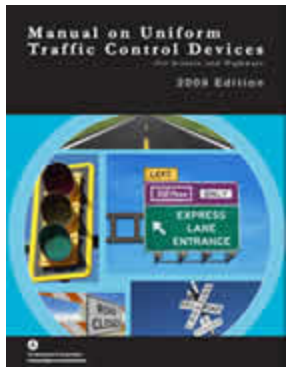
Interchange Attributes to Consider

- Design continued…
  - Utilities
    - Existing? Proposed?
  - Space or R/W constraints
  - Real estate
  - Safety, safety, safety
    - AASHTO Green Book, FDM, AASHTO RDG, MUTCD. How do these affect the design?



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U.S. Department of Transportation
Federal Highway Administration

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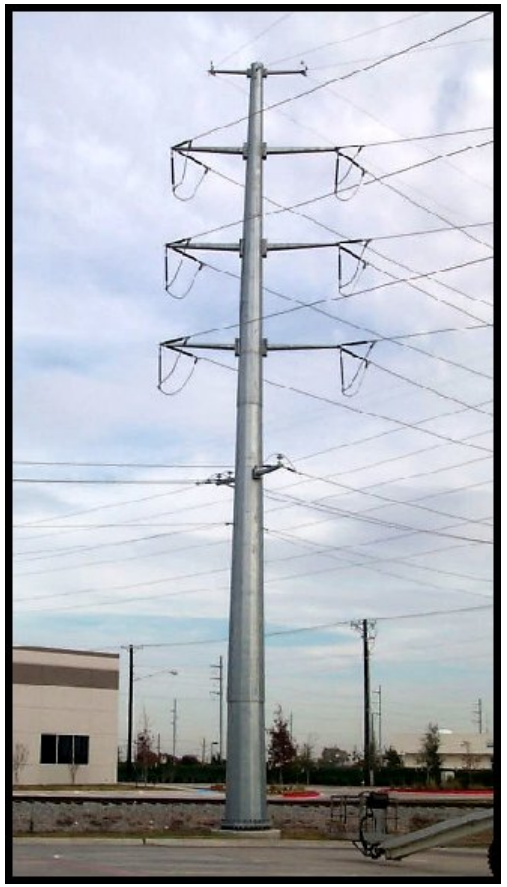
Interchange Attributes to Consider

- Users
  - Local facilities
  - Economics
  - Travel times
  - Utilities - NIMBY
  - Multimodal
  - Environmental/recreation



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Future Considerations

- Future considerations
  - Additional lanes / interchange capacity
    - Future development in the immediate area
  - Overhead utilities and constructability of structures
    - OSHA requirement for cranes
    - Address in utility coordination
  - Temporary traffic shifts for maintenance and rehab
    - Leave in crossovers used for construction
    - Wider, “beefed up” shoulders necessary?

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Future Considerations

- Future considerations continued…
  - Profile gradient should be steep enough to accommodate future barrier wall when highway expanded.
  - Ramp metering
  - Ramp spacing between terminals
    - Congestion
    - Queue spillback
    - Stop and go travels
    - Heavy weaving
    - Poor traffic signal progression

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Questions????

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