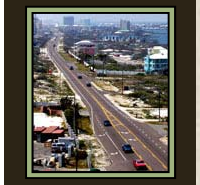
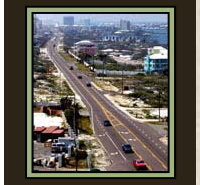
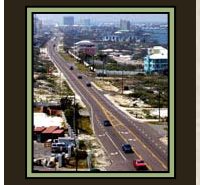


Engineering Guidelines for Roadway Interchanges

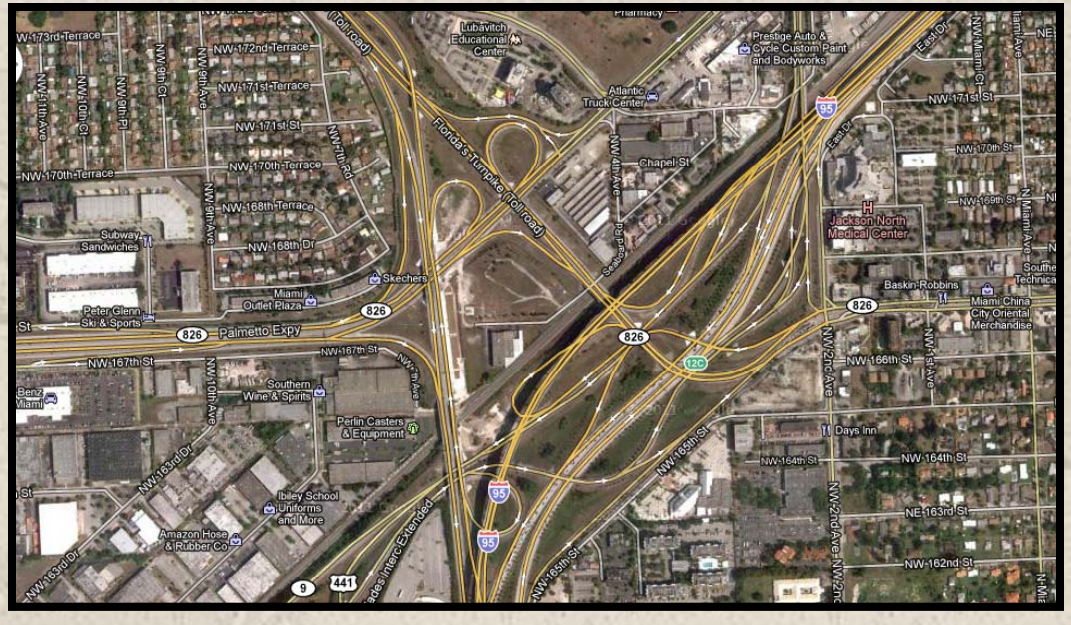


Agenda

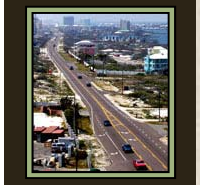
- Definition of Interchange
- Basic Types
- Factors to Consider
- Basic & Unconventional
- Federal Process
- What Not to Do



What is an Interchange?

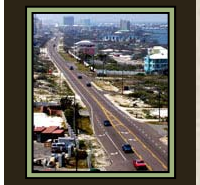


- **Grade Separated Junction Between Roadways**
  - Separate Conflicting Movements
- **Traffic Moves Freely Between Roadways on Ramps**
- **Traffic Too High for At-Grade Intersection**
- **High-Speed Arterials, Expressways, Interstates**



Interchange Considerations

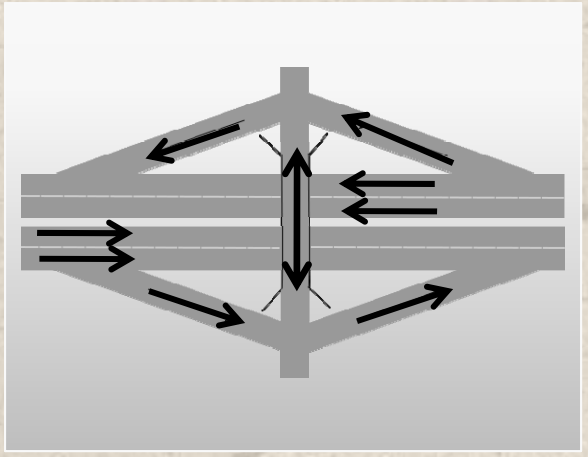
- Area Type
  - Rural - Low Development Density, Low R/W Cost
  - Urban – Within City / CBD, High R/W Cost
- Design Speeds
  - High Speed or Low Speed
  - Difference in Speed from Mainline to Ramp
- Traffic Mix – Truck Percentage
- Traffic Operations
- Sight Distance
- Bike & Pedestrian Accommodations
- Right-of-Way
- Drainage
- Right-Hand Exit/Entrance



Basic Types

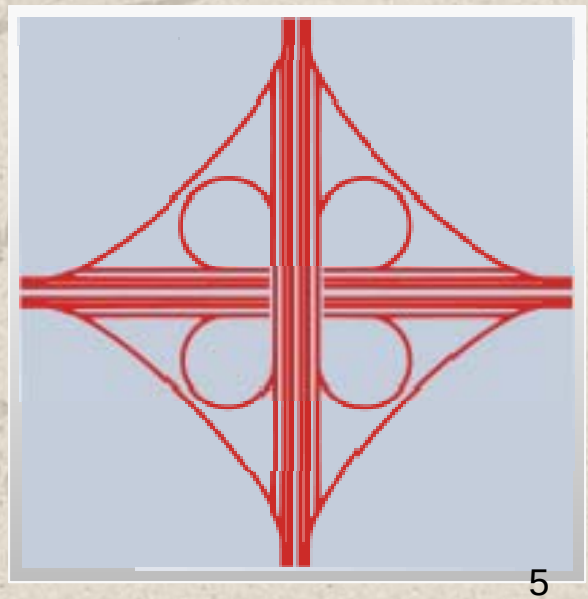
Service Interchange

- Between Freeway and Highway
- Diamond - 2 Intersections
- Stop or Signal control

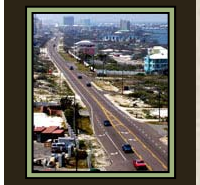


System Interchange

- Between Freeway and Freeway
- High Speed
- Free-Flow / Directional



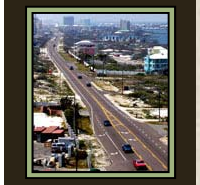




Design Speeds

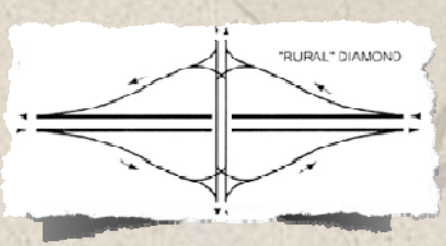
- Interstate 70 mph
- Urban Arterial 50 mph
- Rural Arterial 60 mph

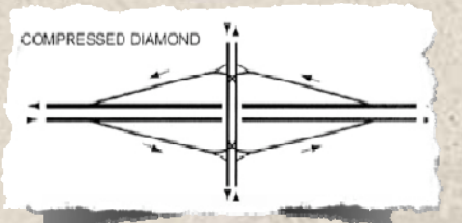
- Ramp Speed 50% - 85% of Highway Speed
- Loop Ramp 25 – 50 mph
- Diamond 50 mph
- Direct Connection Ramp 60 – 70 mph

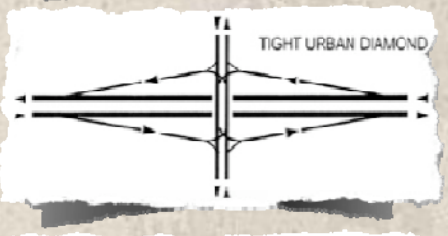


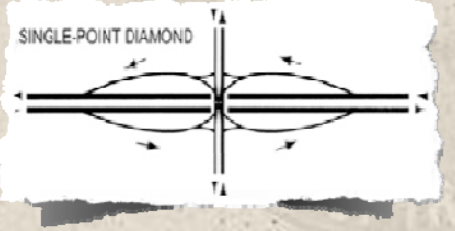
Basic Interchanges

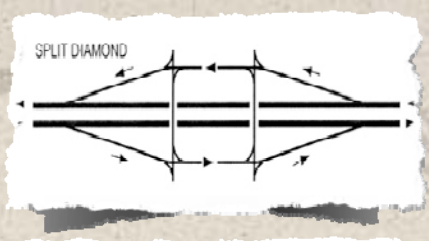
Diamonds

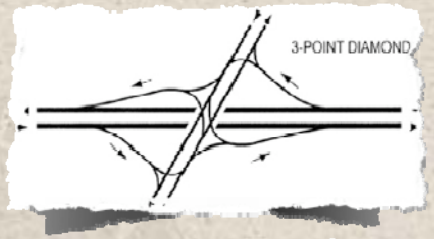


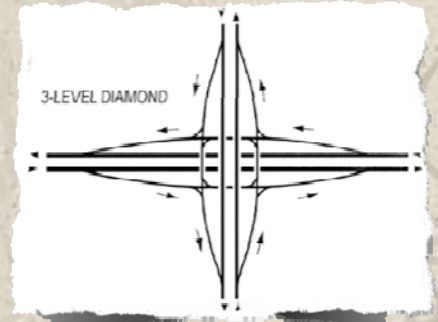




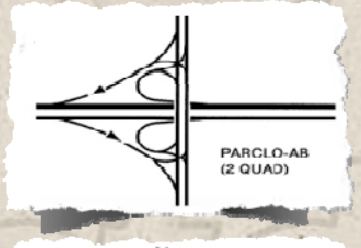


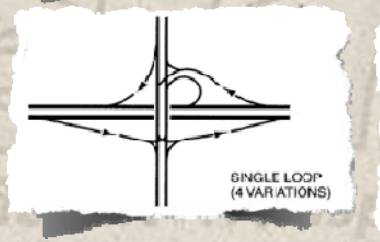


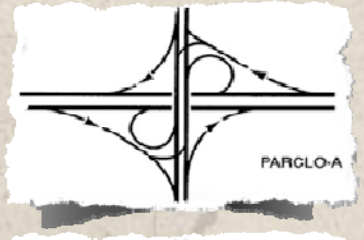


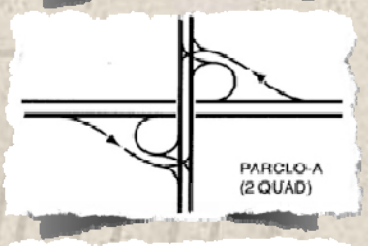


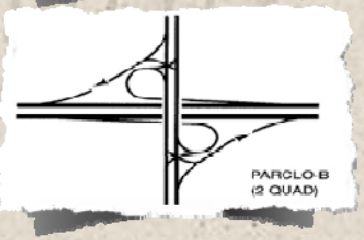
Partial Cloverleafs

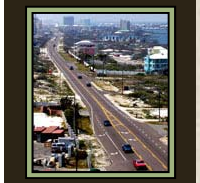




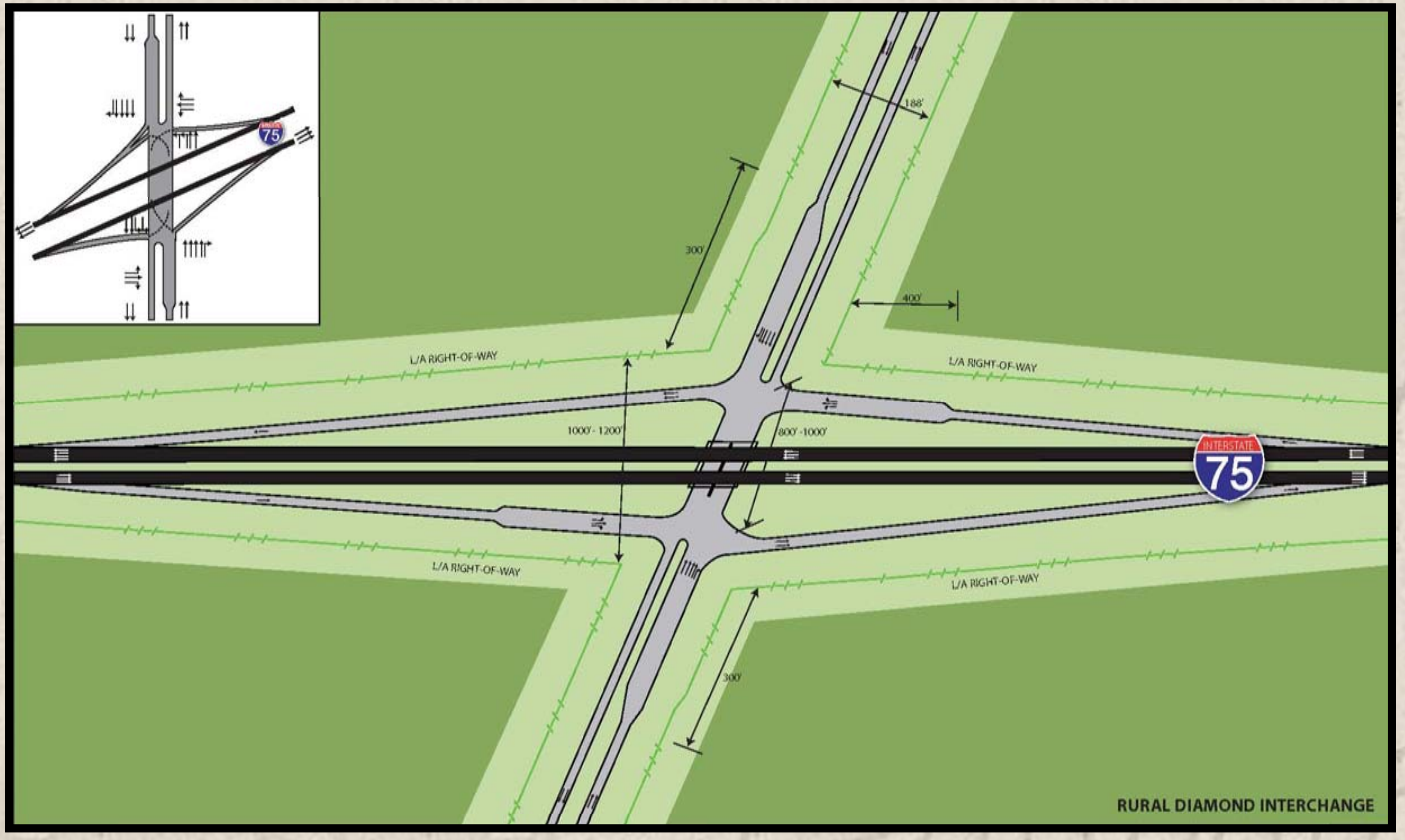




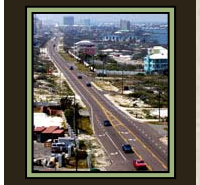




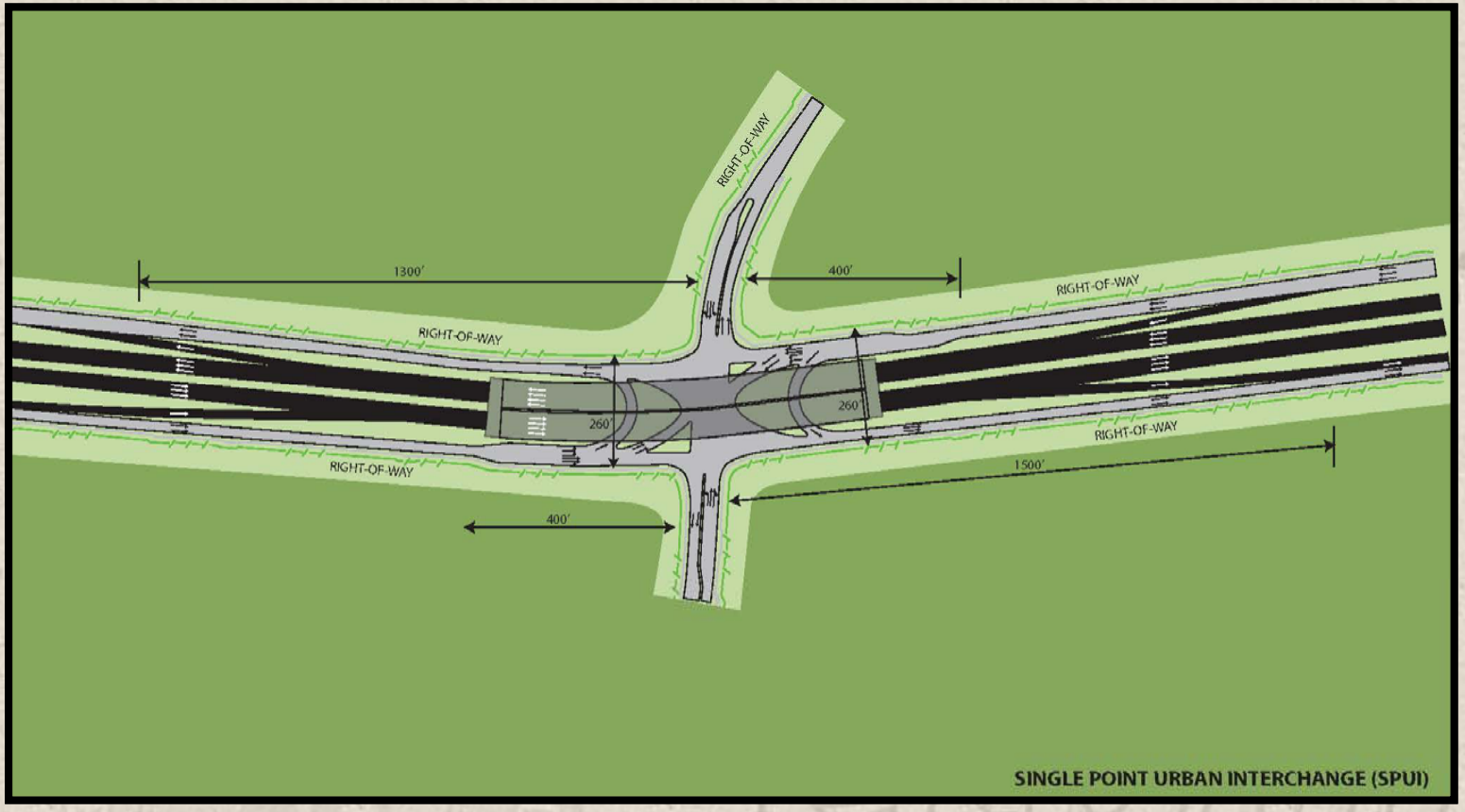
Rural Diamond



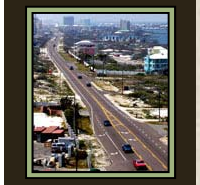
- Two Levels
- Two Intersections – Stop or Signal Control
- Expansive Right-of-Way
- Low Capacity
- Queues Between Ramps (Don't Have to Clear)



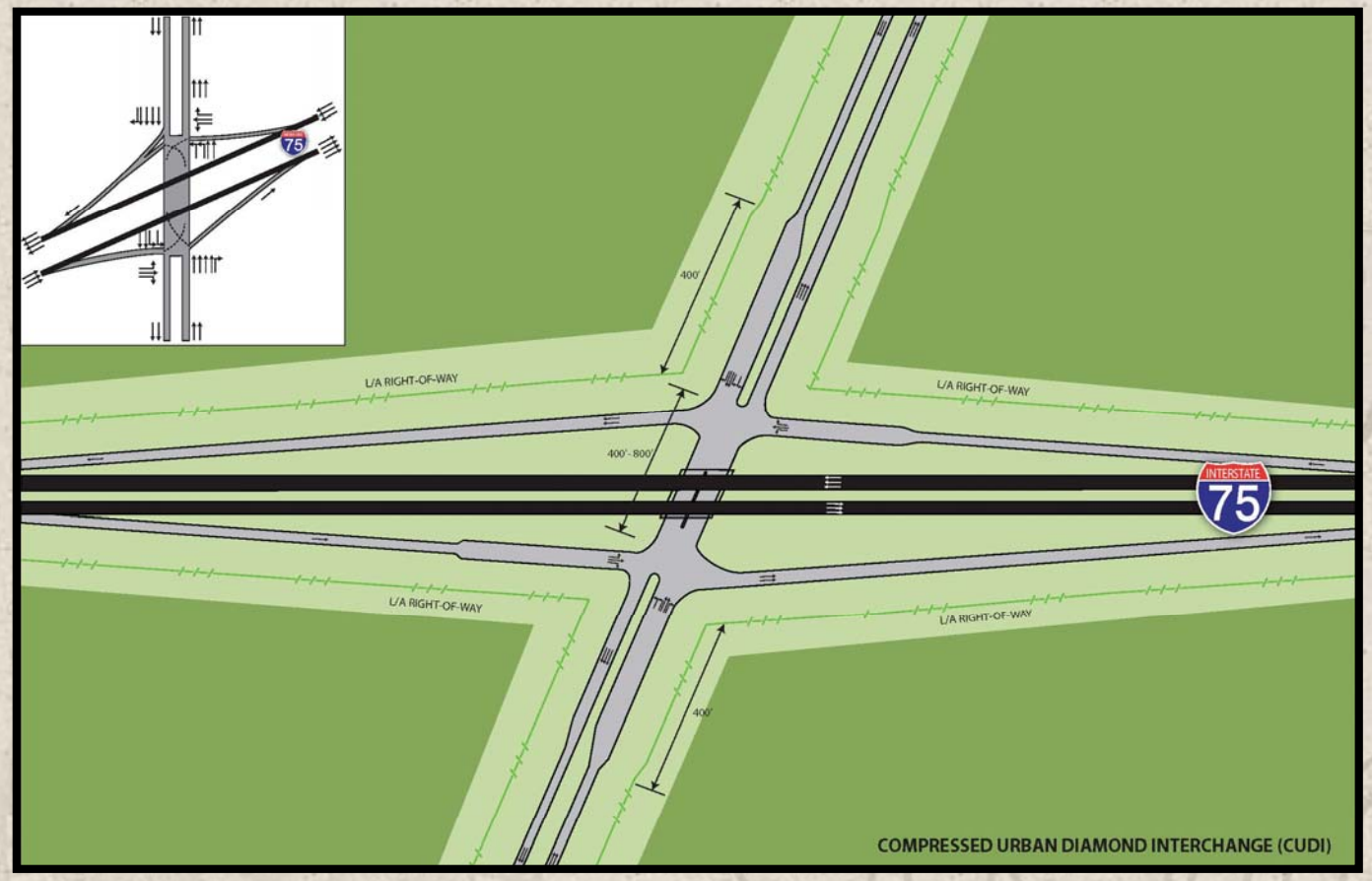
Single Point Urban Interchange



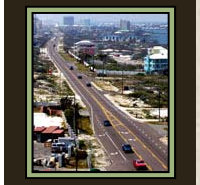
- Two Levels
- One Signalized Intersection
- Medium/High Capacity
- Left Turns Balanced
- No Queues Between Ramps
- Minimal Right-of-Way
- U-Turn
- Potential Problem Viewing Signal



Tight Urban Diamond Interchange (TUDI)

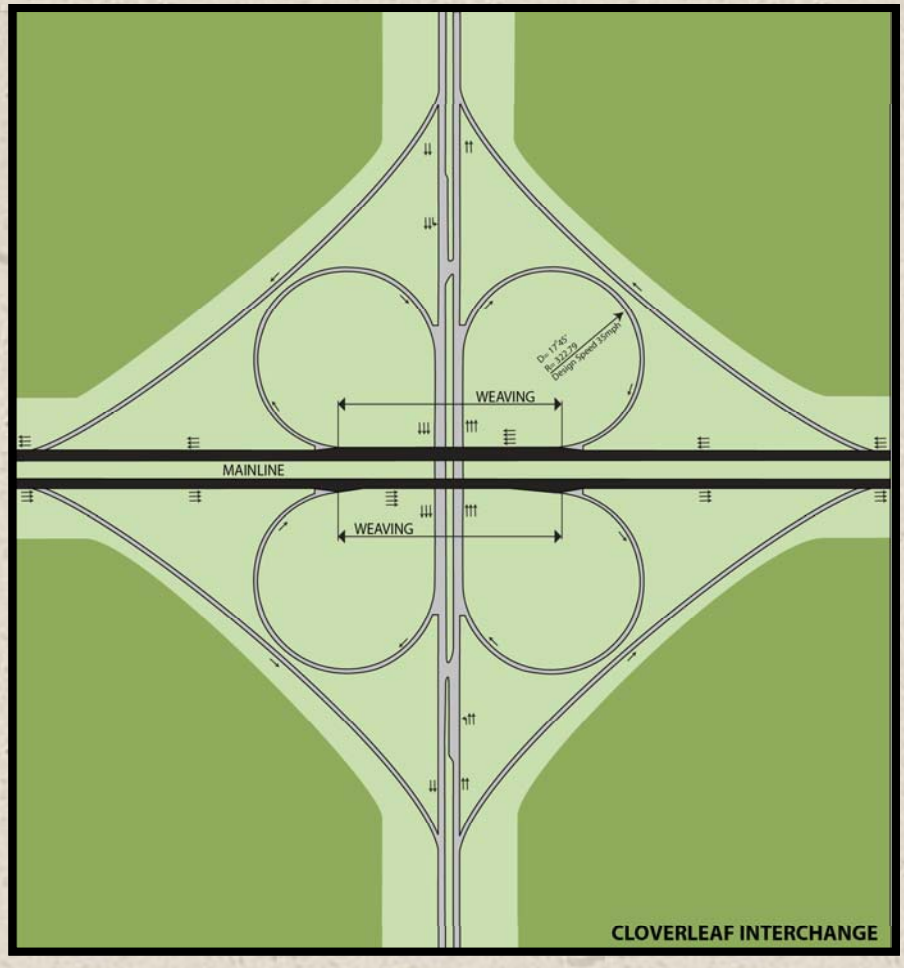


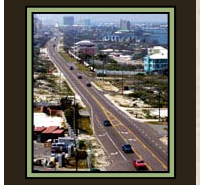
- **Left Turns Unbalanced**
- **Two Signals (Interconnected)**
- **Left Turns Developed in Advance**
- **Less ROW than Rural Diamond**
- **Queues Between Ramps must Clear**



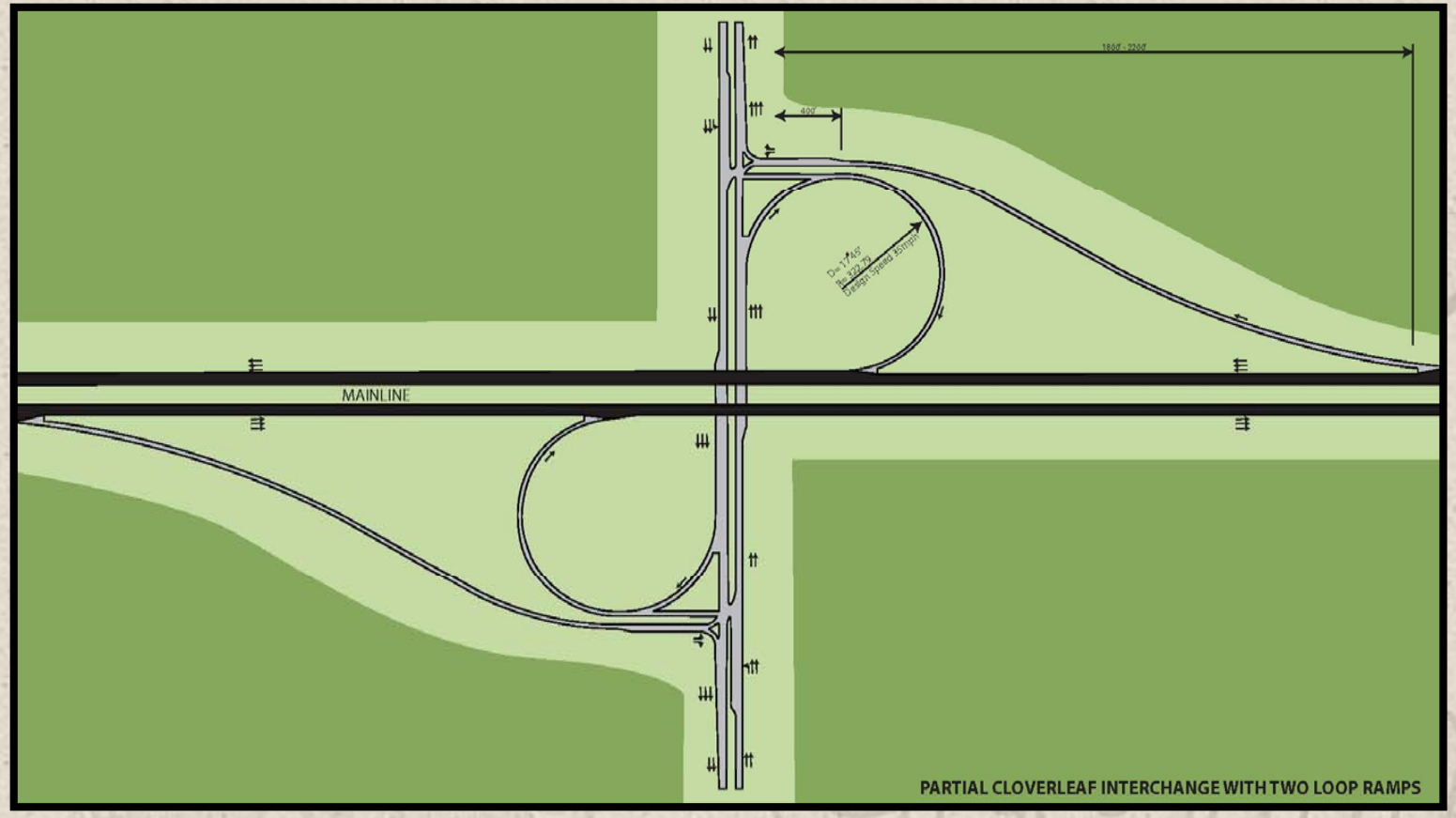
Cloverleaf

- Two Levels
- Free Flow
- Low Capacity
- Weaving Issues
- Expansive Right-of-Way
- Rural Areas
- No Left Turns
- Second Chance

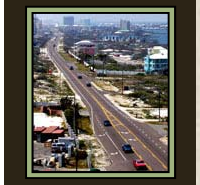




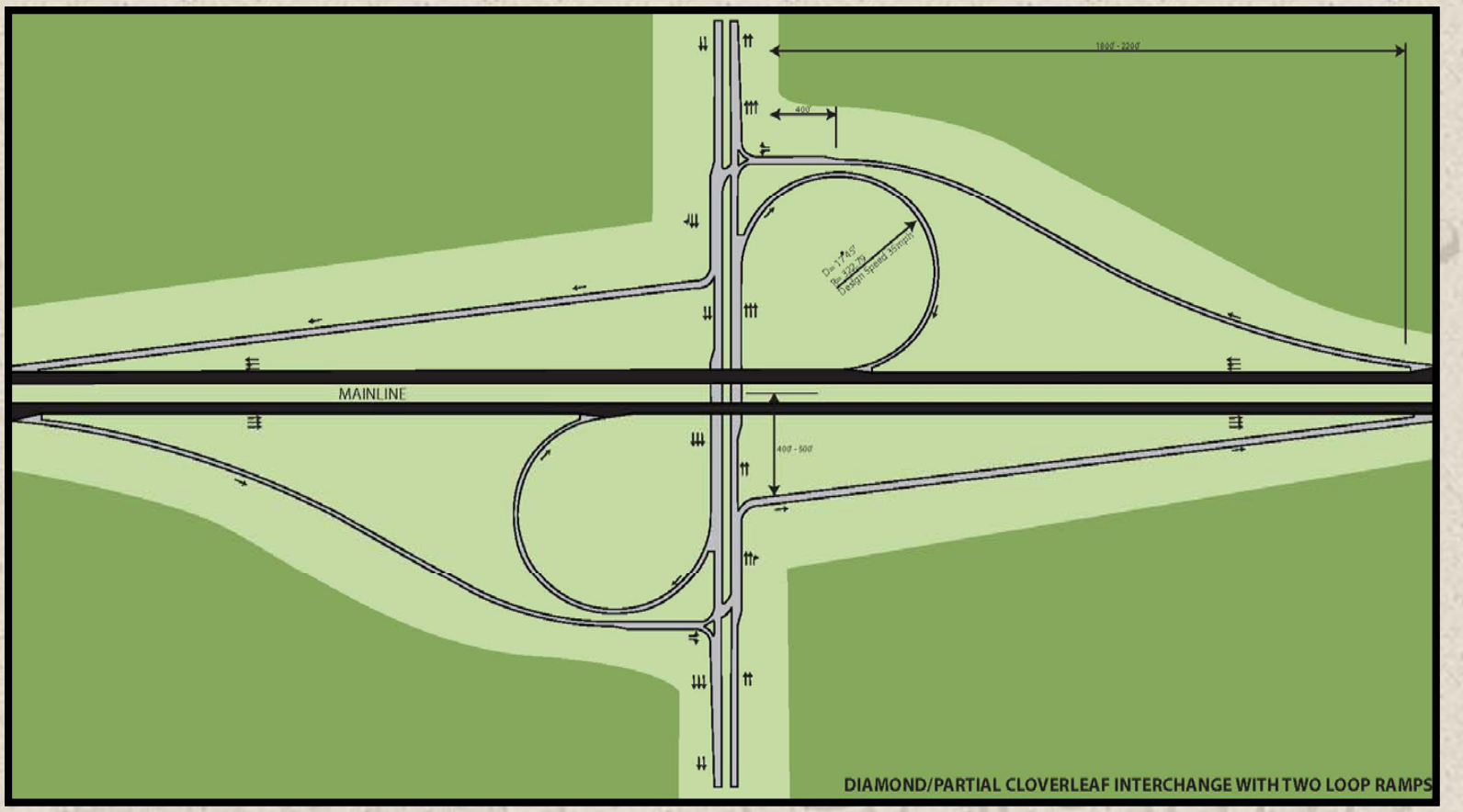
Partial Cloverleaf (Par-Clo)



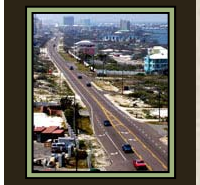
- Two Levels
- Two Signals
- No Weaving - High Capacity
- ROW Varies by Quadrant
- Left Turn On-Ramps to go Right



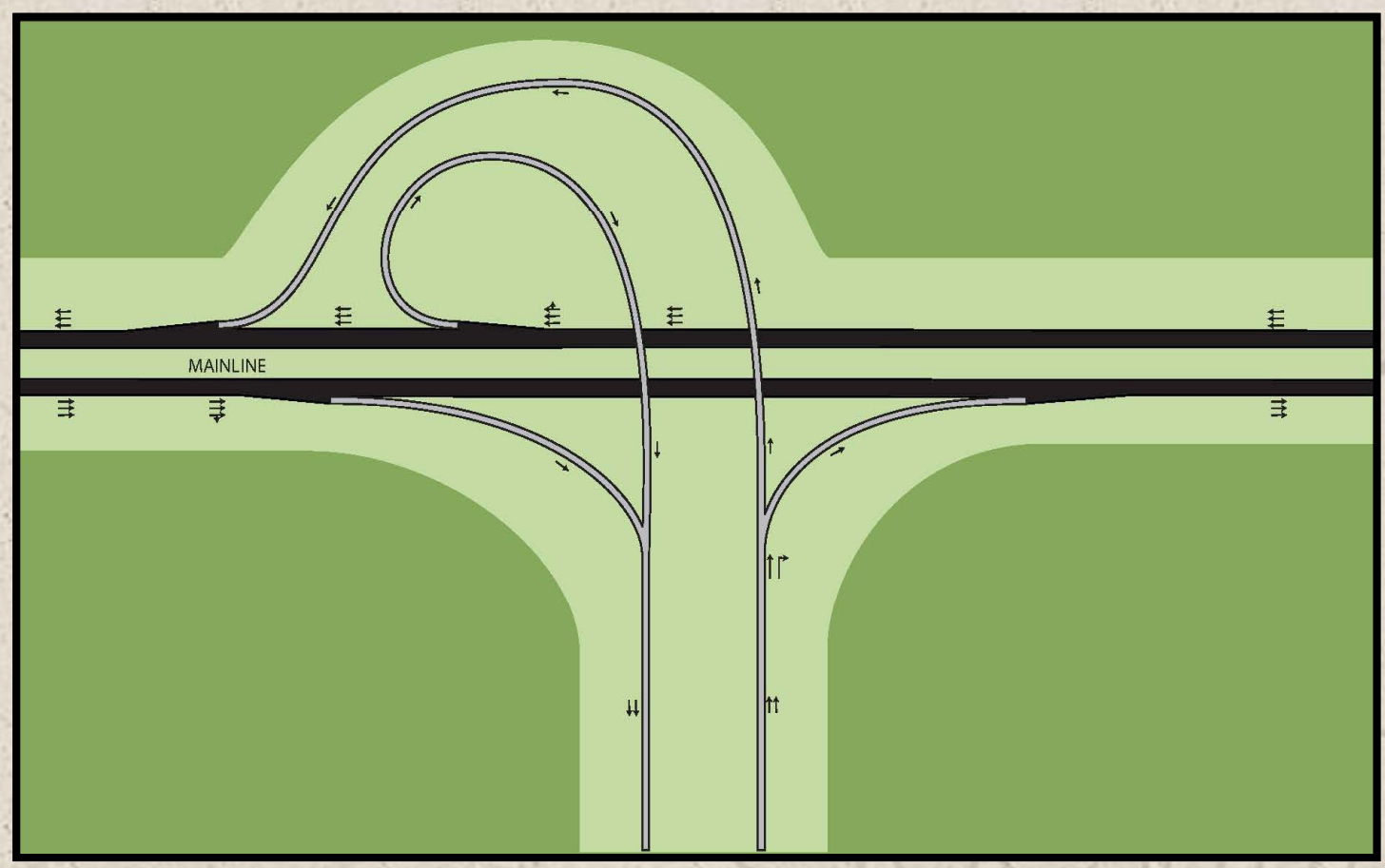
Par-Clo / Diamond



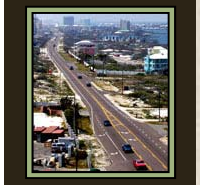
- **Two Levels**
- **Two Signals (Interconnected)**
- **No Left-Turn On-Ramps**



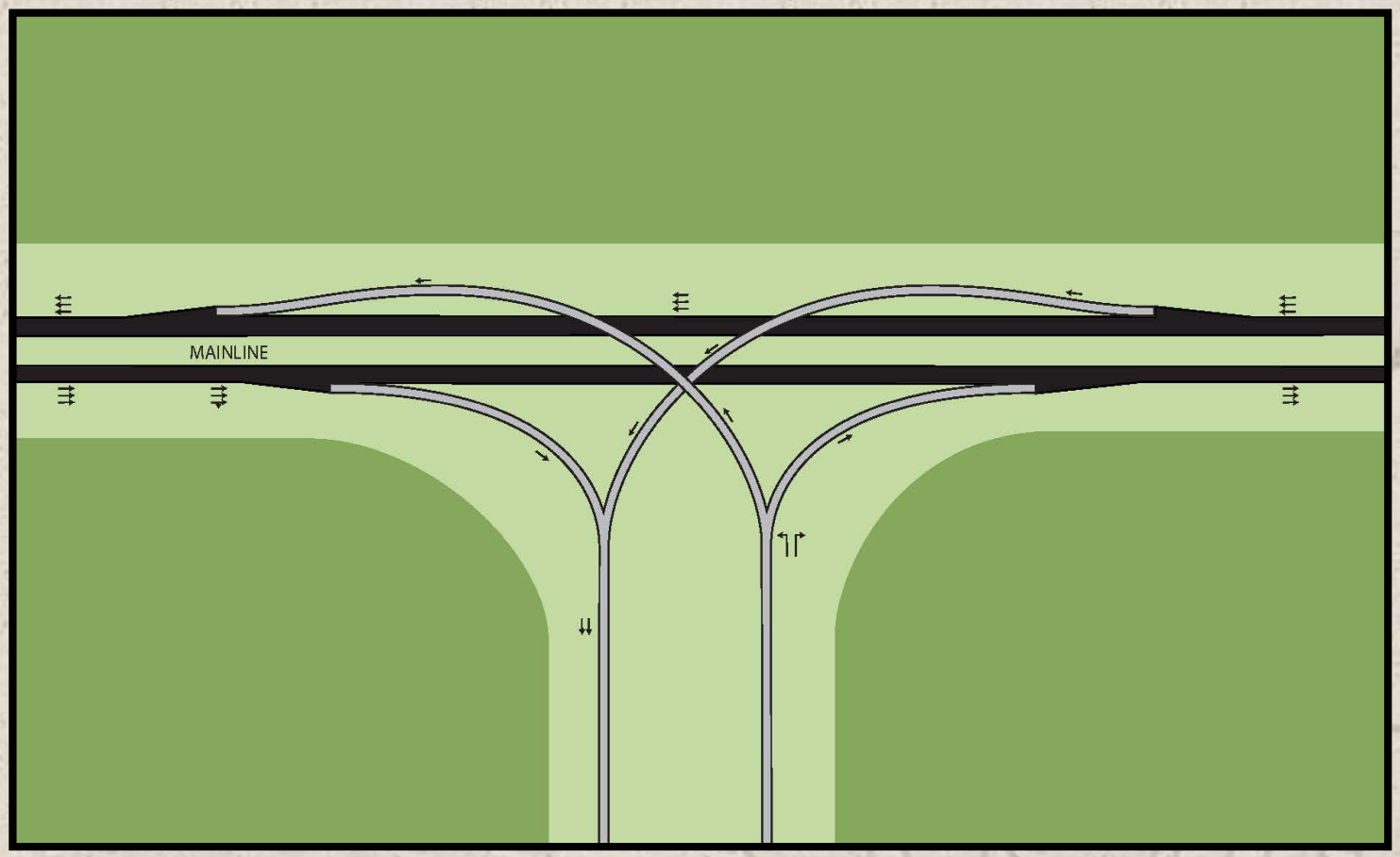
Trumpet



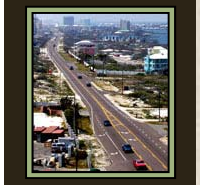
- **Three-Leg Interchange**
- **Two Levels**
- **Free-Flow**



Tee Interchange

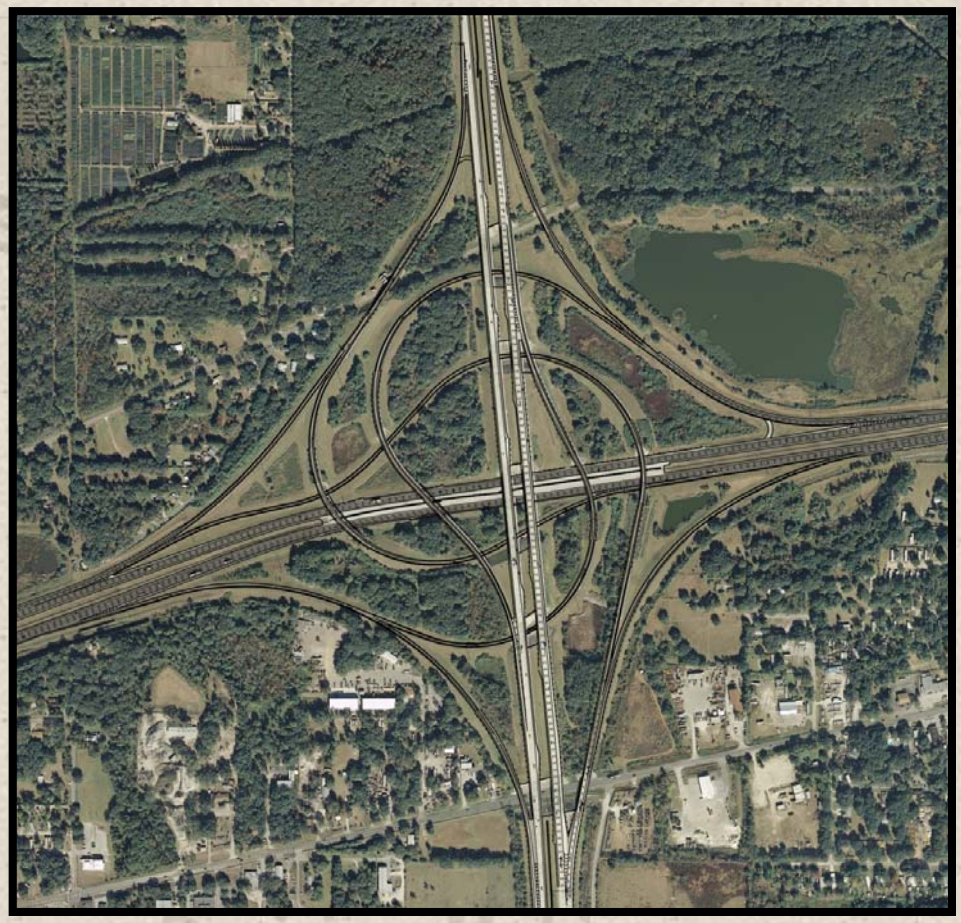


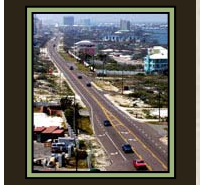
- **Three-Leg Interchange**
- **Three Levels**
- **Free Flow/High Speed**



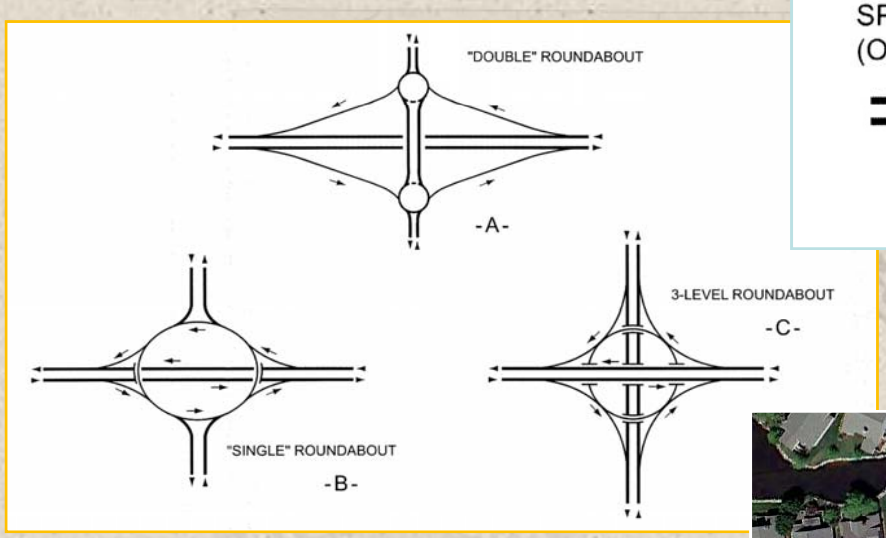
Fully Directional Turbine I-75 at I-4

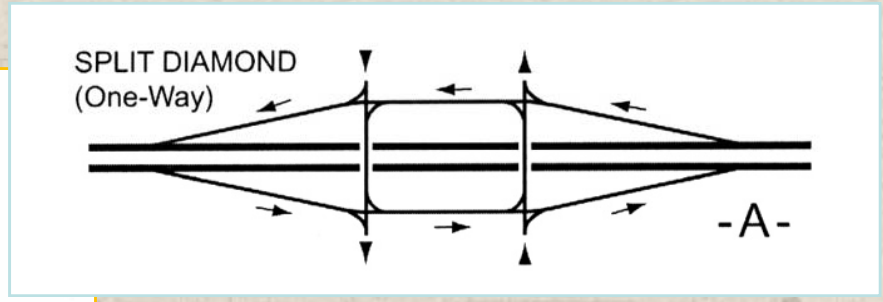
- High Speed
- Enormous Interchange
- Merge & Diverge Issues
- 15 bridges = $$$$$

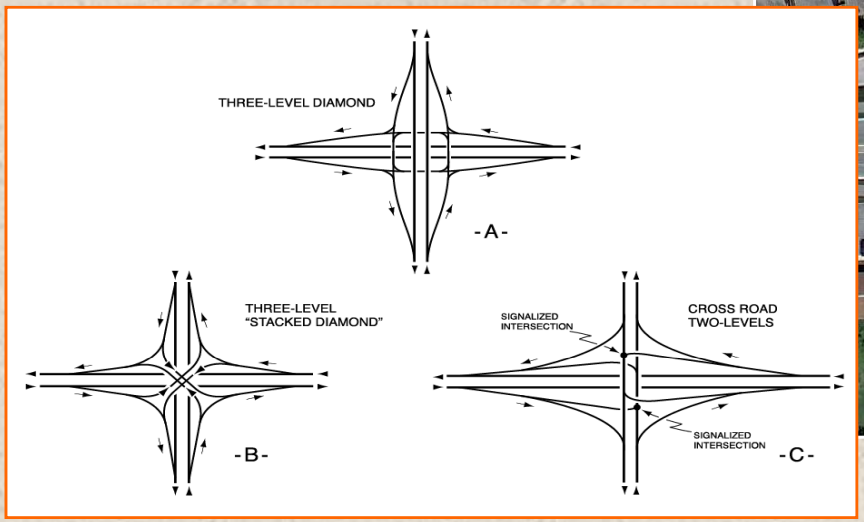


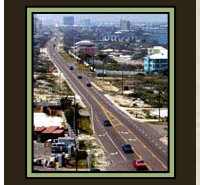


Unconventional Interchanges



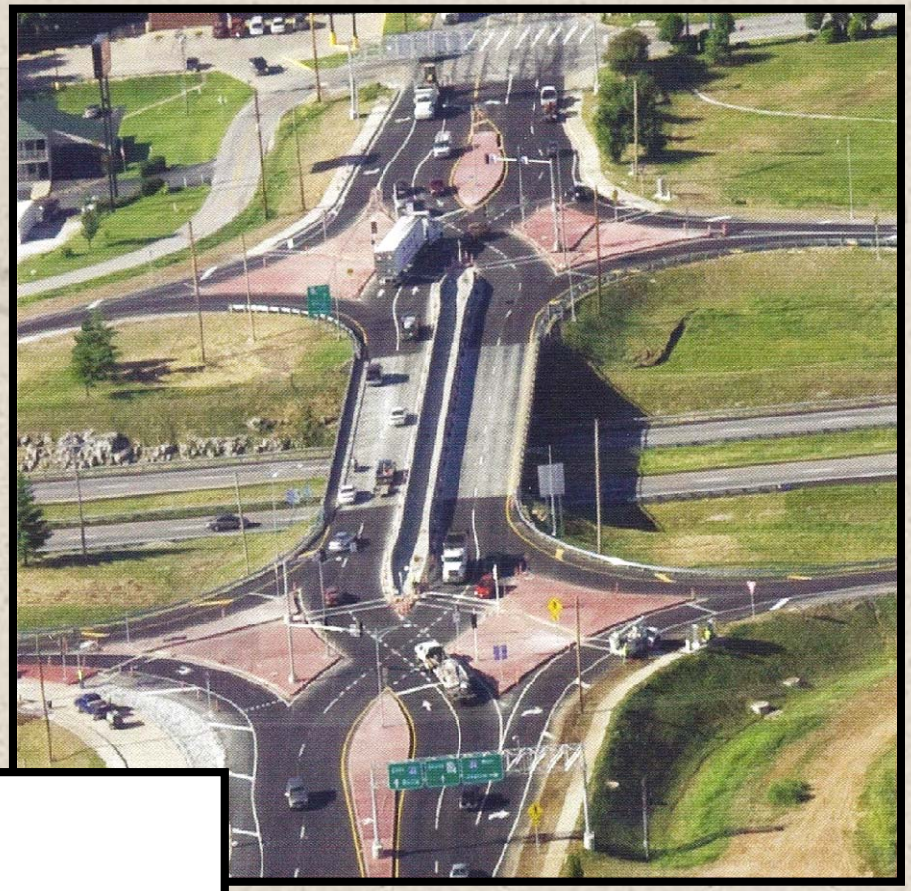


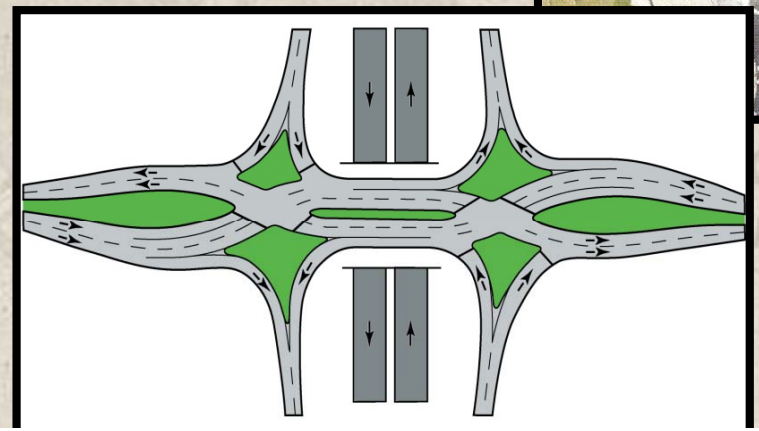


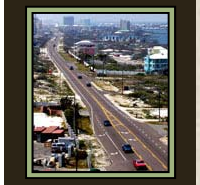


Diverging Diamond Interchange (DDI)

- Two Levels
- Cross Road Lanes Braided
- Two 2-phase Signals (Interconnected)
- High Volume Turns
- Requires Fewer Lanes
- Lower Speed
- Against Driver Expectancy: Signing
- Bike & Pedestrian
- Fewer Conflicts than other Diamonds

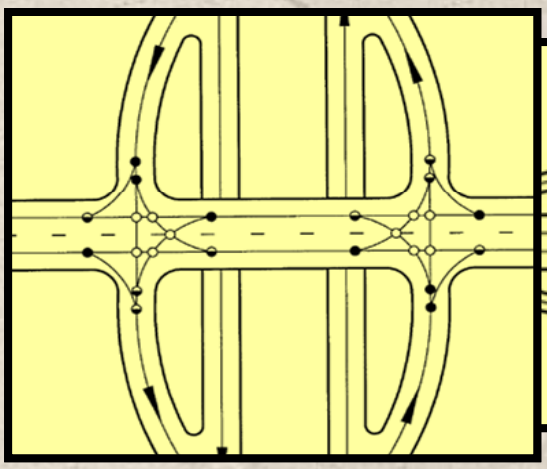




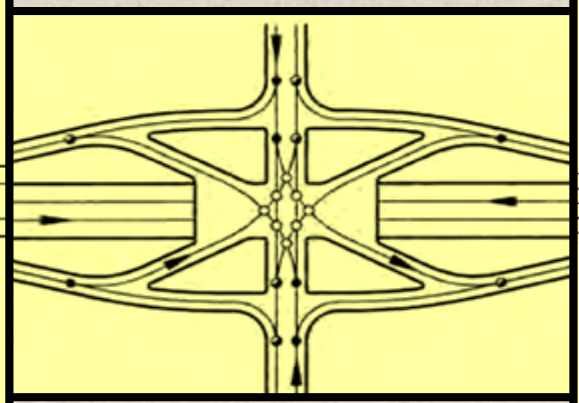


Intersection Conflicts

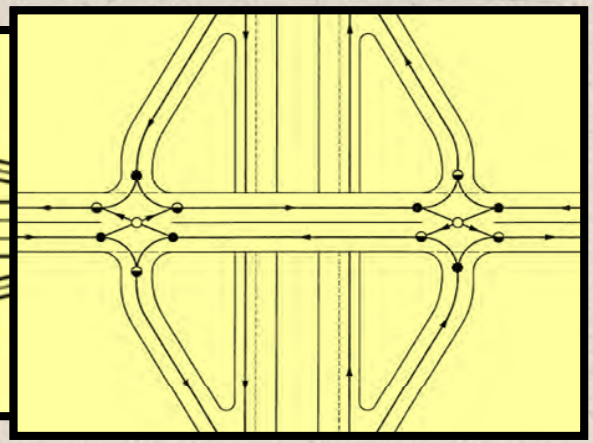
Diamond



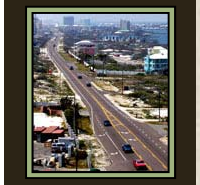
SPUI



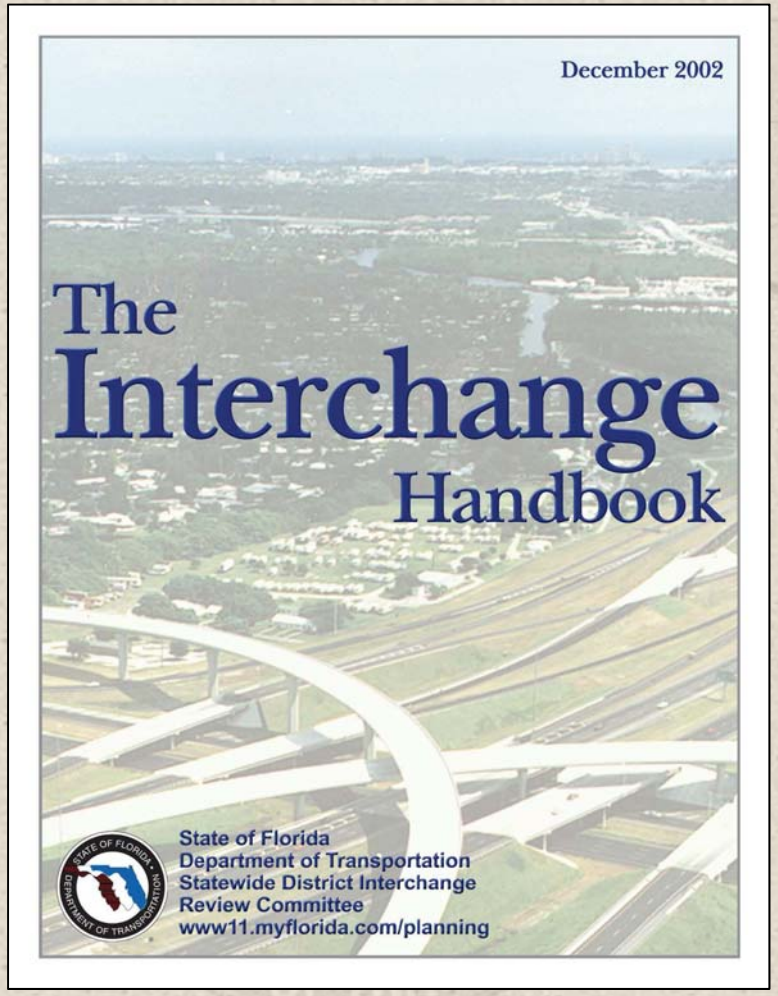
DDI



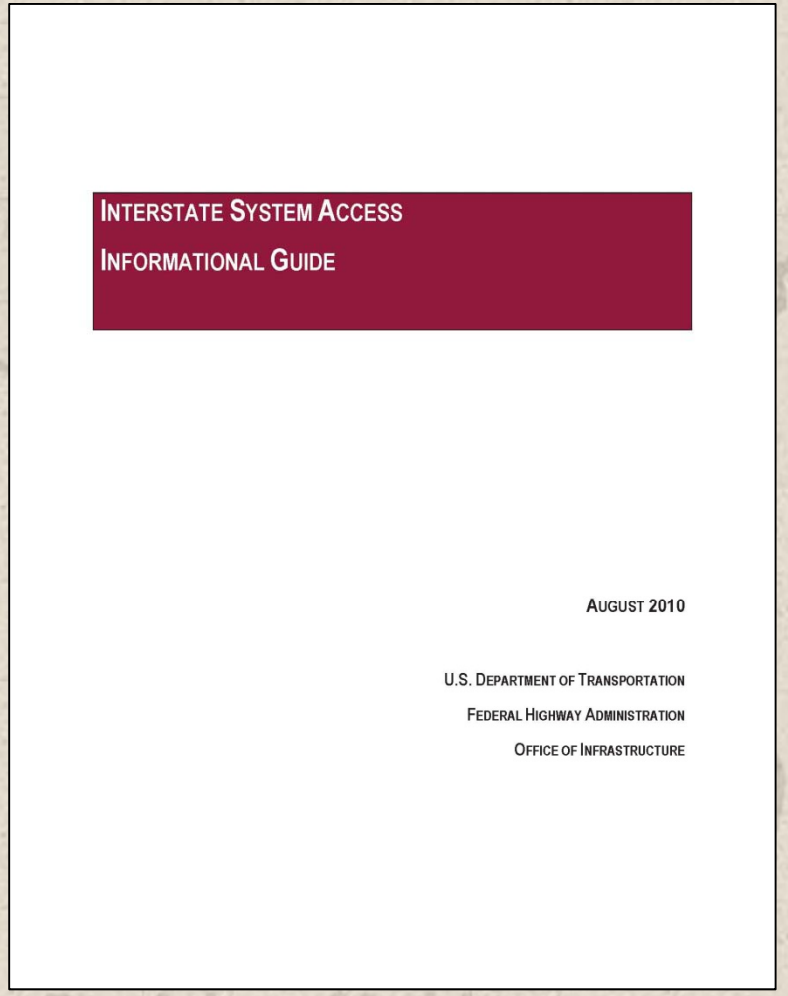
Conflict Type	Diamond	SPUI	DDI
Diverging	8	6	6
Merging	8	6	6
Crossing	10	8	2
Total	**26**	**20**	**14**



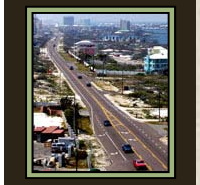
Interchange Resources



http://www.dot.state.fl.us/planning/systems/sm/intjus/interchangehb/PDFs/Preface.pdf



http://www.fhwa.dot.gov/design/interstate/pubs/access/access.pdf



New or Improved Interchanges on Limited Access Facilities

Interchange Operational Analysis Report (IOAR)

Interchange Modification Report (IMR)

Interchange Justification Report (IJR)

System IMR (SIMR)

Must Operate at Acceptable LOS and Not Degrade Mainline or Adjacent Interchanges

⬇

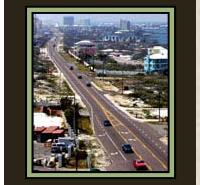
District Interchange Review Committee (DIRC)

⬇

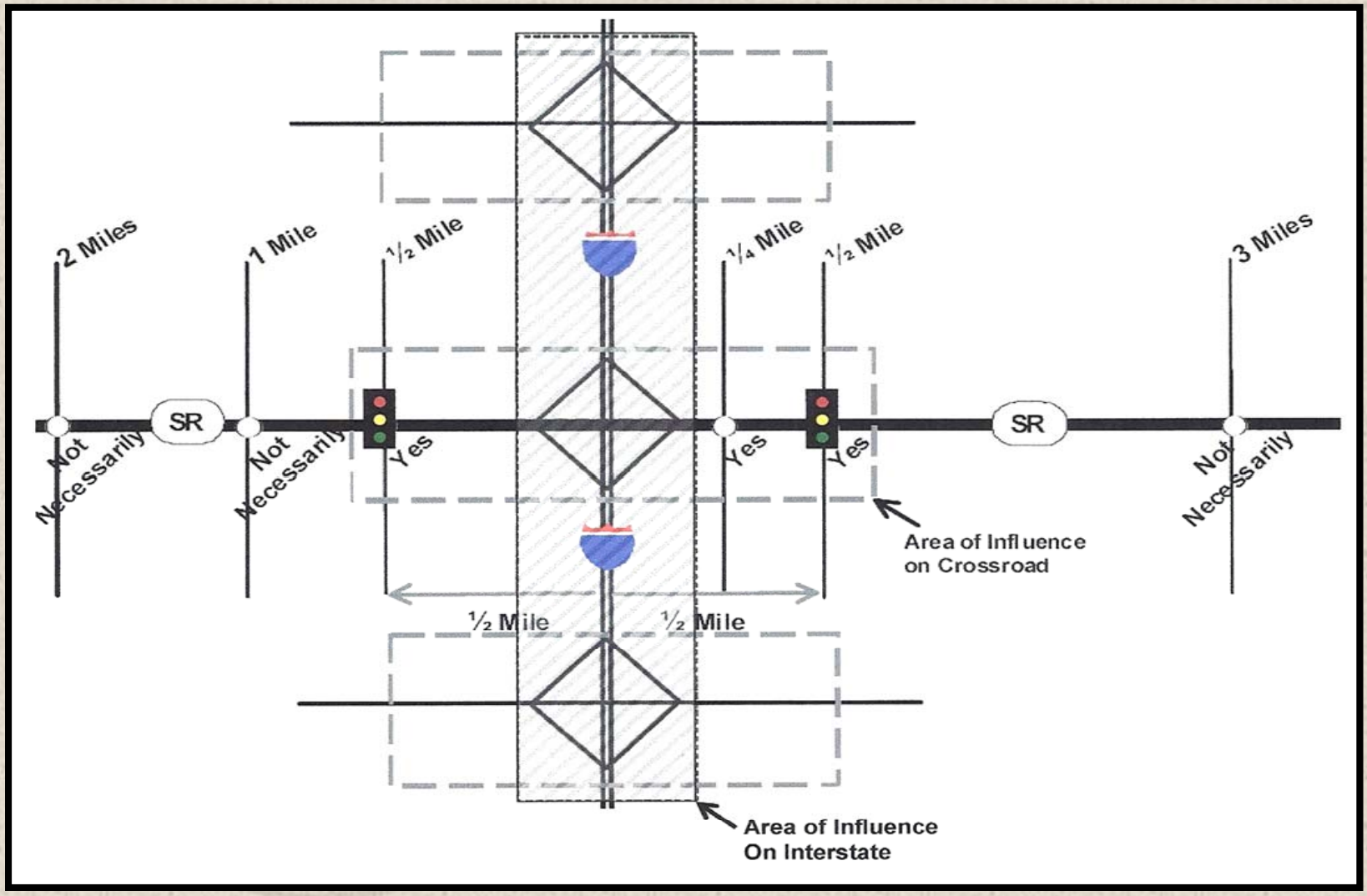
FHWA

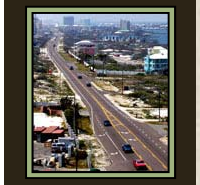
⬇

PD&E Study

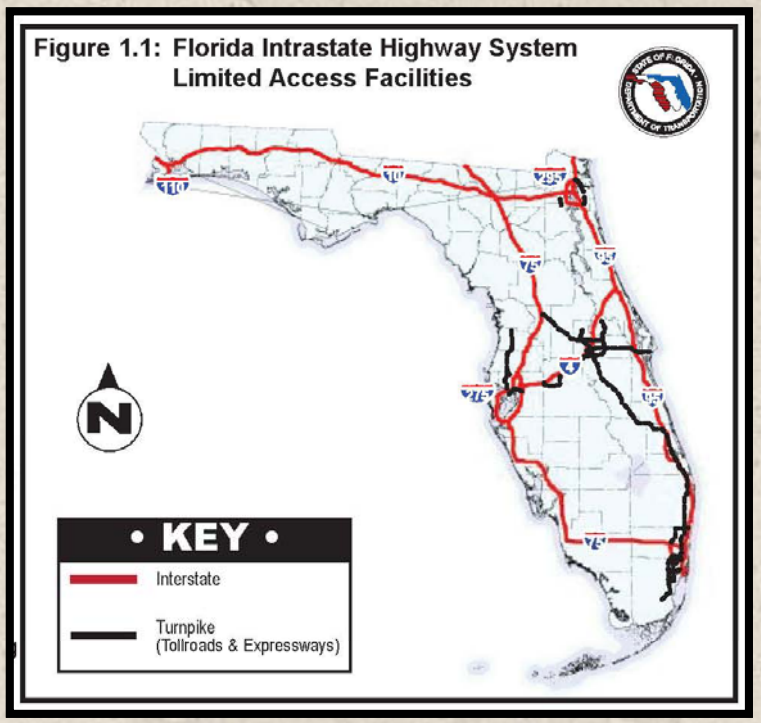


Required Area of Study

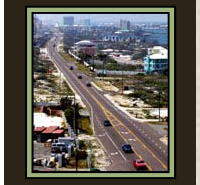




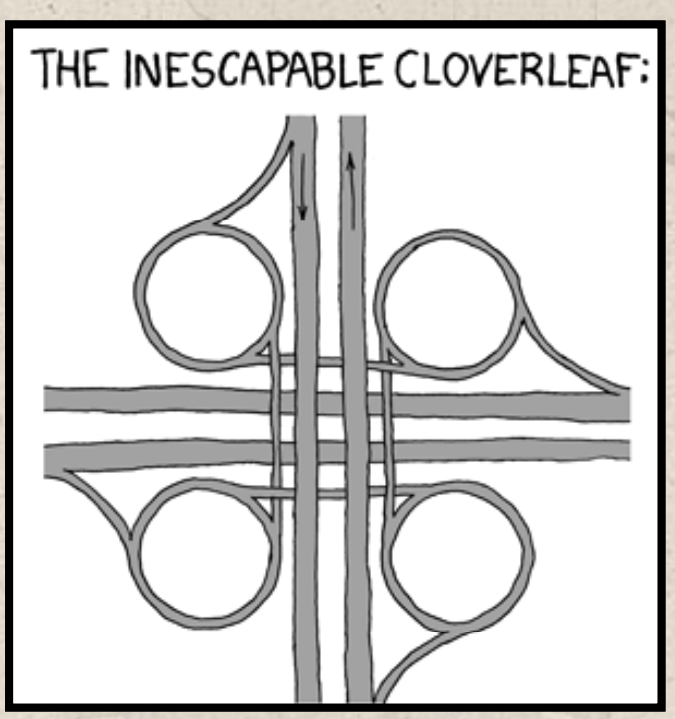
Approval Authority

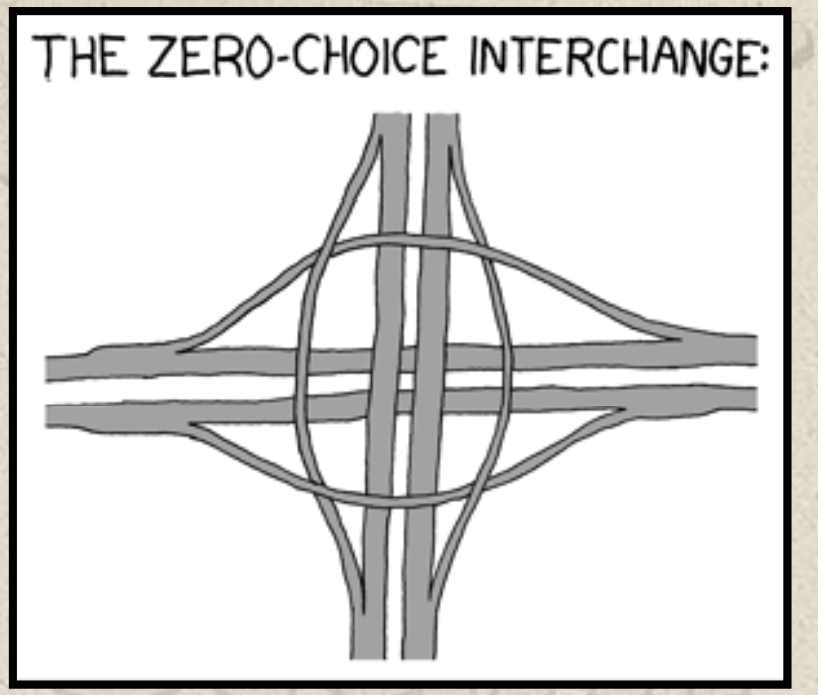


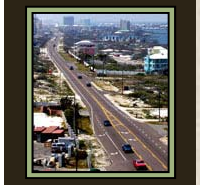
- FHWA – All Interstate
- State Transportation Secretary
  - All non-interstate limited-access IJRs not in FIHS Plan
- District Secretary
  - All non-interstate limited-access in FIHS 10 Year Plan



Failed Concepts







Questions?