

# Interchange Selection Matrix

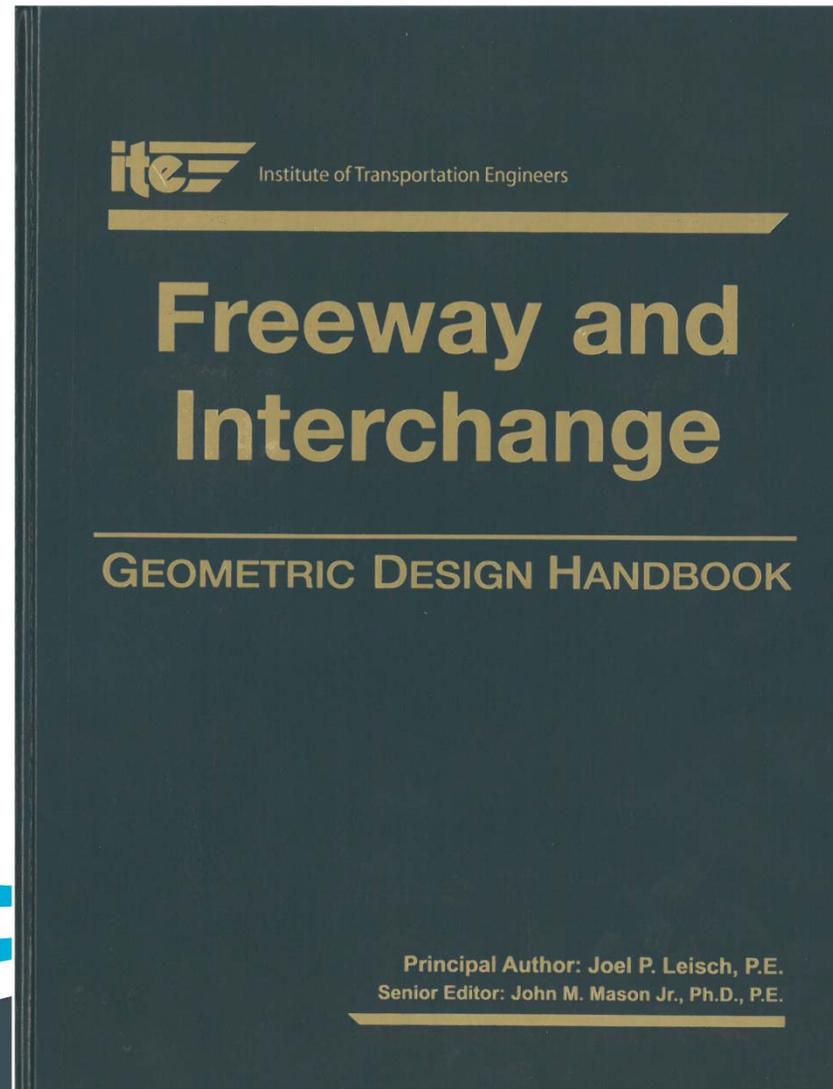
JUNE 25, 2015  
Ryan Hoyt, P.E.,PTOE







# REFERENCE





# EXISTING CONDITION AND DATA COLLECTION

- DEFINE STUDY AREA
  - Along the Interstate including the adjacent interchanges
  - Along the cross street (new or existing) of the proposed interchange
  - Existing road network connecting the cross streets of adjacent interchanges
- Data Collection
  - Tube counts (with classification)
  - Turning movement counts
  - Speed studies
  - Crashes



# EXISTING CONDITION AND DATA COLLECTION

- **AERIAL**
  - For sketches/designs and potential environmental impacts
- **EXISTING CONDITIONS**
  - Lane configurations
  - Existing signal timings
  - Field observations





## DESIGN YEAR CONDITION

- Usually 20 years after build year
- Growth Rate
  - MPO – TransCad future model
  - Proposed nearby developments (TIS)
  - History ADTs
- Future projects
  - Proposed intersection improvements
  - Corridor widening and improvements
  - New roadways



# TIER ANALYSIS

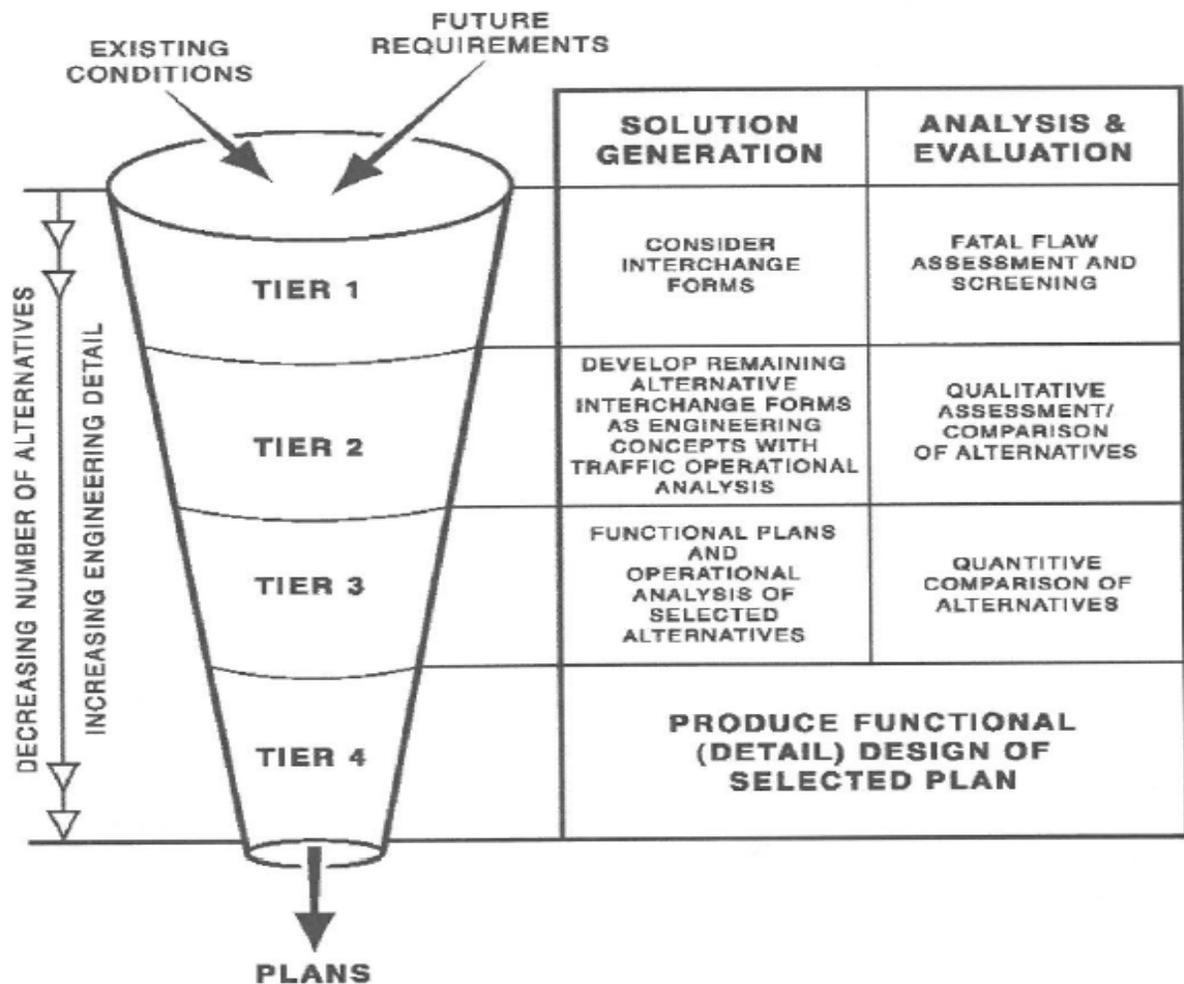


Figure 4-13. Project Solution Process.  
Source: Joel P. Leisch.



## Tier 1: System-Area Environment

- Base conditions in terms of broad controls
  - Freeway- local road, rural
  - Freeway- primary highway, rural
  - Freeway- freeway, rural
  - Freeway- minor street, urban
  - Freeway- major street, urban
  - Freeway- freeway, urban



# INTERCHANGE TYPES BY CLASSIFICATION

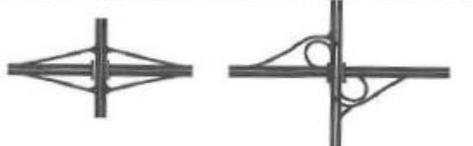
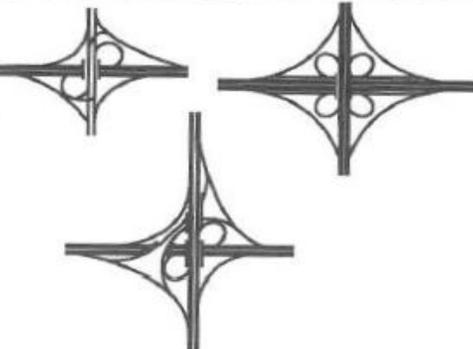
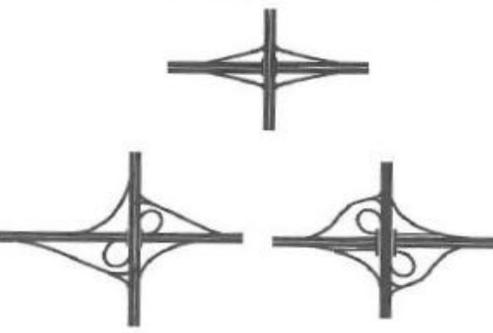
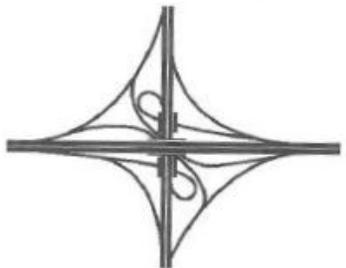
INTERSECTING FACILITY	RURAL	URBAN
LOCAL ROAD OR MINOR STREET		
MAJOR STREET OR HIGHWAY		
FREEWAY		

Figure 4-14. Adaptability of Interchanges.  
Source: Jack E. Leisch

# Basic Interchange Types

- T and Y interchanges (three-leg)
- Diamond interchanges
- Partial Cloverleaf (ParClo) interchanges
- Cloverleaf interchanges
- Directional interchanges (with or without loop ramps)

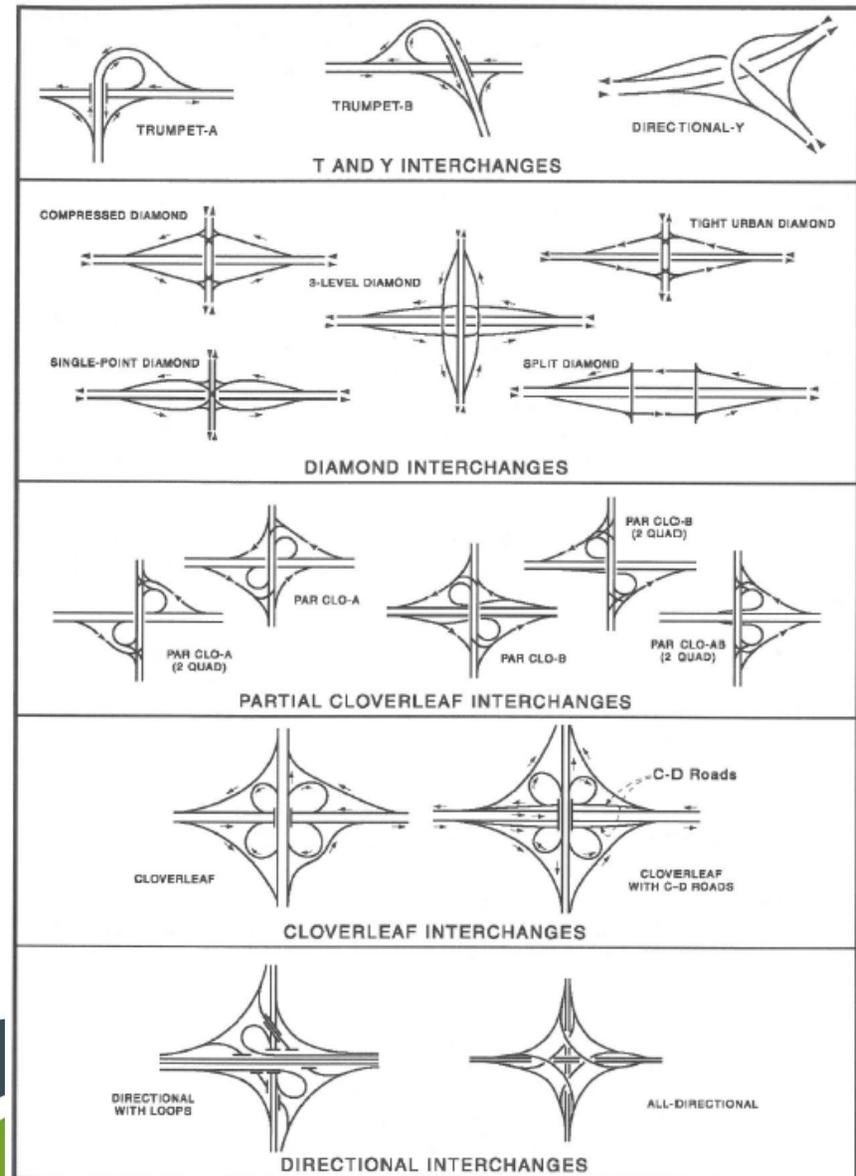


Figure 3-10. Interchanges—General Forms and Types.  
Source: Jack E. Leisch.

# T & Y INTERCHANGE EXAMPLES

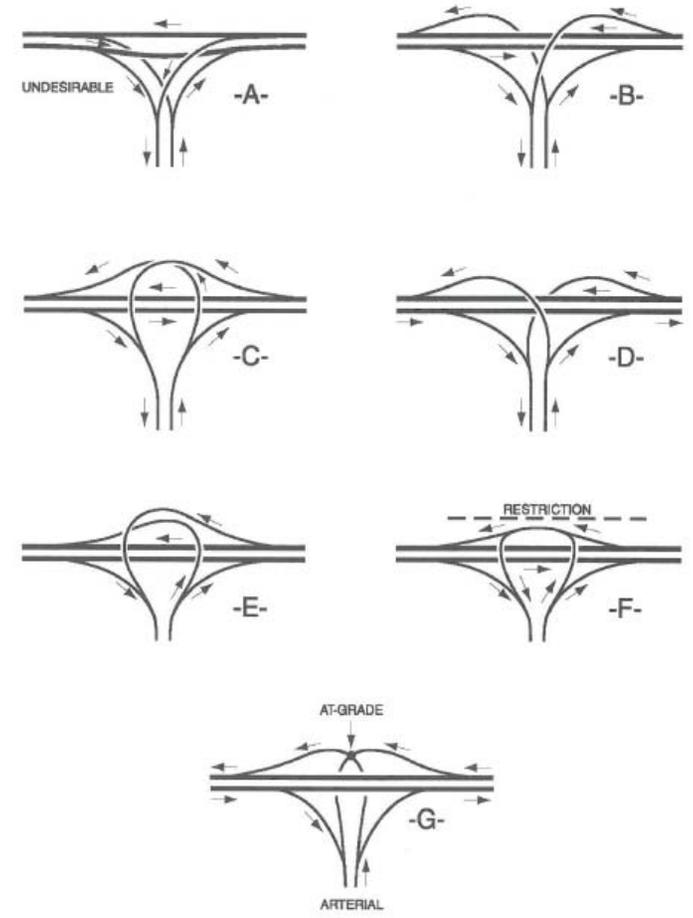
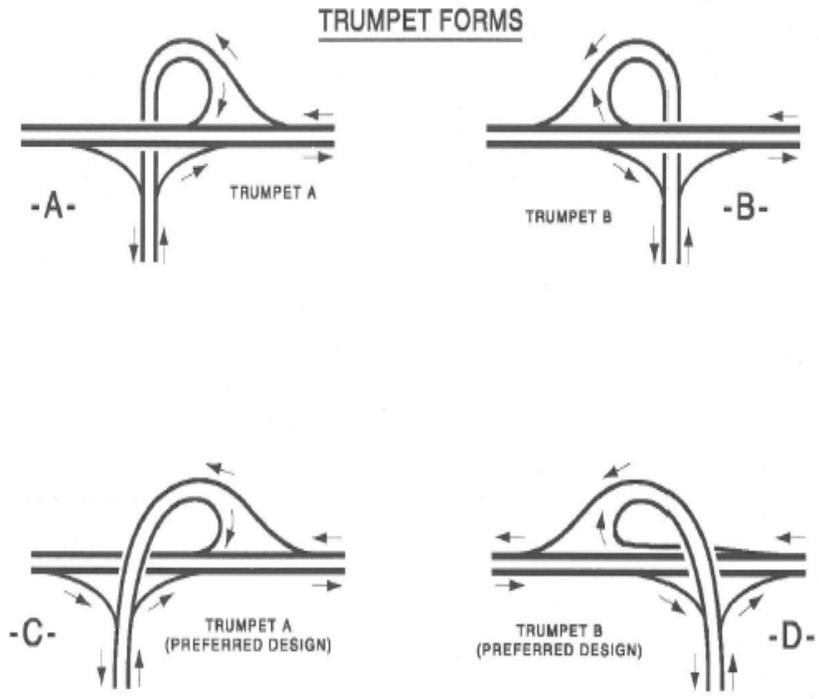
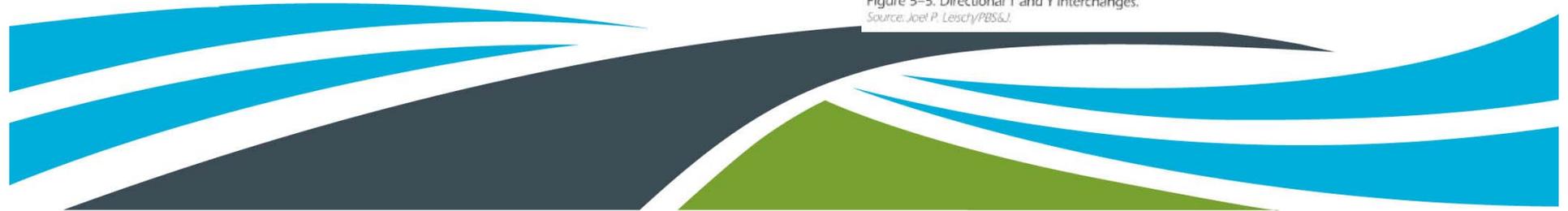


Figure 5-5. Directional T and Y Interchanges.  
Source: Joel P. Leisch/PBS&J.





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# DIAMOND INTERCHANGE EXAMPLES

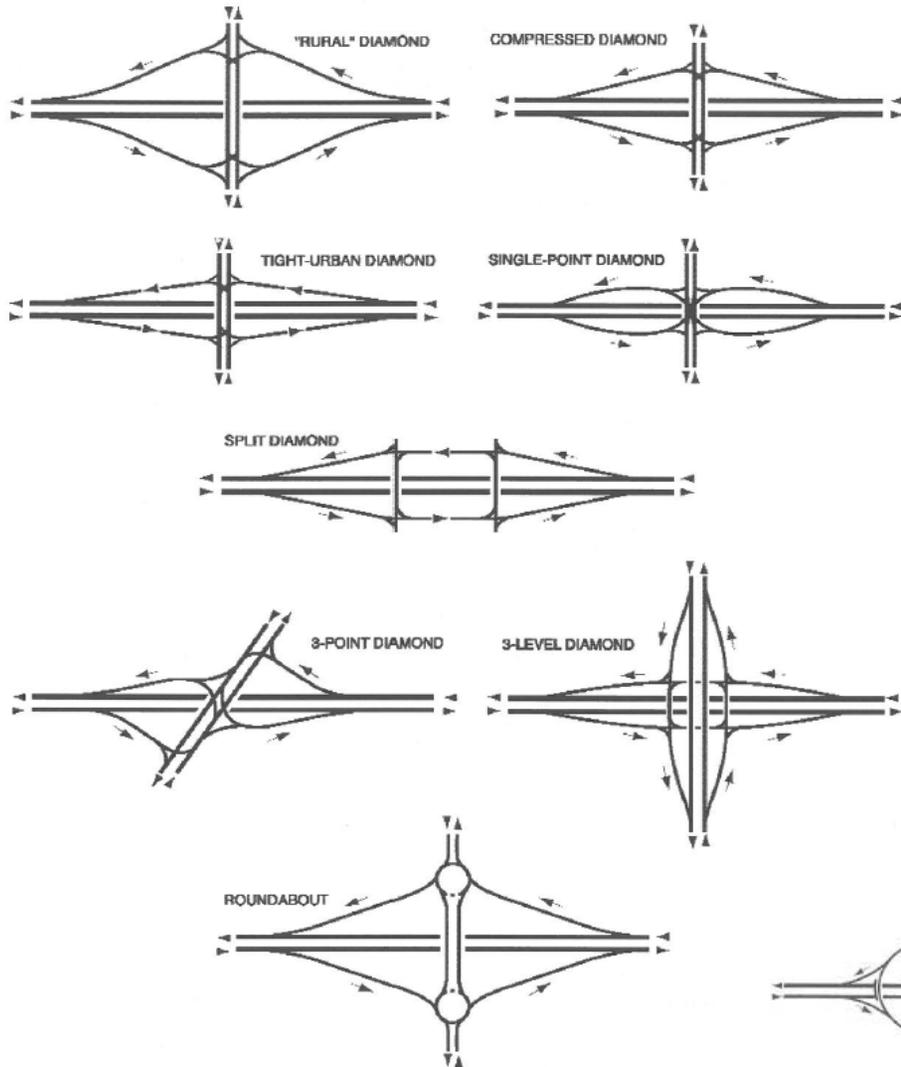


Figure 5-8. Basic Diamond Interchange Forms.

Source: Joel P. Leisch/PBS&J.

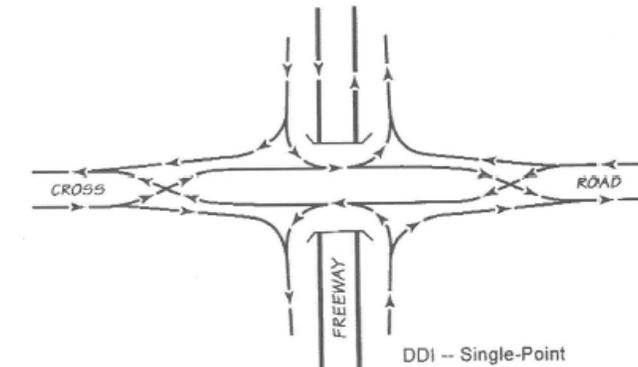
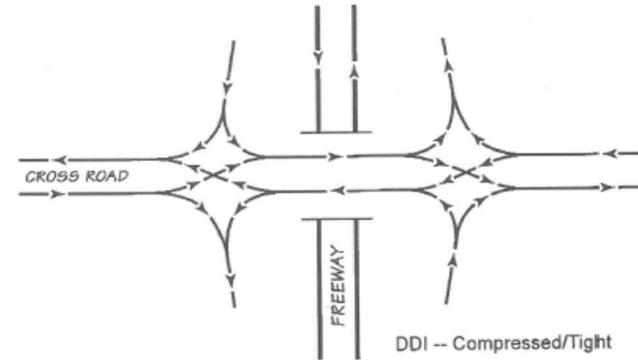
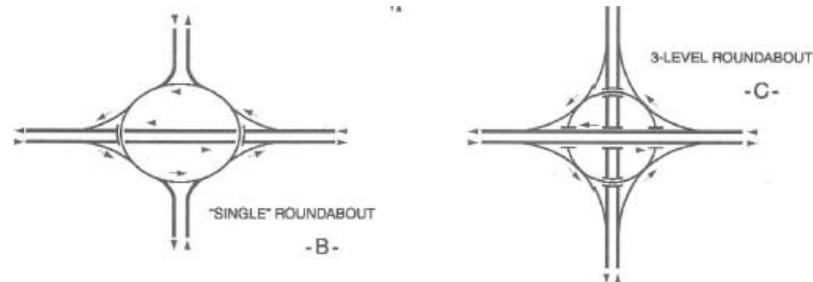


Figure 5-30. Diverging Diamond.

Source: Joel P. Leisch/PBS&J.



# Tier 1-Alternatives Screening Matrix

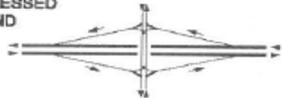
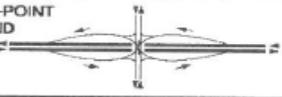
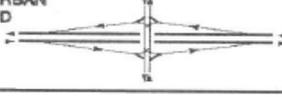
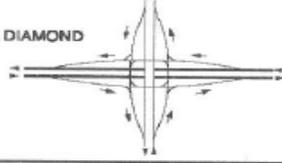
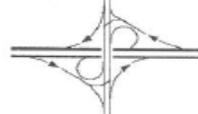
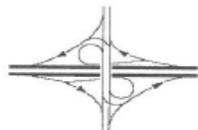
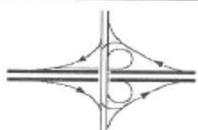
INTERCHANGE FORM	TRAFFIC OPERATIONS	RIGHT-OF-WAY	ENVIRONMENTAL/ SOCIAL IMPACTS	COSTS	CONSIDERATION TIER 2
<b>COMPRESSED DIAMOND</b> 	<ul style="list-style-type: none"> <li>• Adequate Capacity</li> <li>• Not as efficient as other Diamonds</li> </ul>	<ul style="list-style-type: none"> <li>• Small Amount of ROW— More than other Diamonds</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental – None</li> <li>• Some Access Modification</li> </ul>	<ul style="list-style-type: none"> <li>• Low Cost</li> </ul>	NO
<b>SINGLE-POINT DIAMOND</b> 	<ul style="list-style-type: none"> <li>• Adequate Capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Minimal ROW</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate Cost</li> </ul>	YES
<b>TIGHT URBAN DIAMOND</b> 	<ul style="list-style-type: none"> <li>• Adequate Capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Minimal (+) ROW</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• Low Cost</li> </ul>	YES
<b>3-LEVEL DIAMOND</b> 	<ul style="list-style-type: none"> <li>• High Capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate ROW</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental – None</li> <li>• Significant Access Impacts along Arterial</li> </ul>	<ul style="list-style-type: none"> <li>• High Cost</li> </ul>	NO
<b>PAR CLO A</b> 	<ul style="list-style-type: none"> <li>• High Capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Significant ROW</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental – None</li> <li>• Some Access Modification</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate Cost</li> </ul>	YES
<b>PAR CLO B</b> 	<ul style="list-style-type: none"> <li>• High Capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Significant ROW</li> </ul>	<ul style="list-style-type: none"> <li>• Loop in NE Quadrant – Historic Site</li> <li>• Some Access Modification</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate Cost</li> </ul>	NO
<b>PAR CLO AB</b> 	<ul style="list-style-type: none"> <li>• Adequate Capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Significant ROW</li> </ul>	<ul style="list-style-type: none"> <li>• Loop in NE Quadrant – Historic Site</li> <li>• Some Access Modification</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate-High Cost</li> </ul>	NO

Figure 4–15. Tier 1–Alternatives Screening.

Source: Joel P. Leisch.



## Tier 1- Screening

- Document all alternatives that are not selected to carry forward to Tier 2
- A previously excluded alternative can be included in a subsequent tier, if needed



# Tier 2 – Concept Design (Single Line)

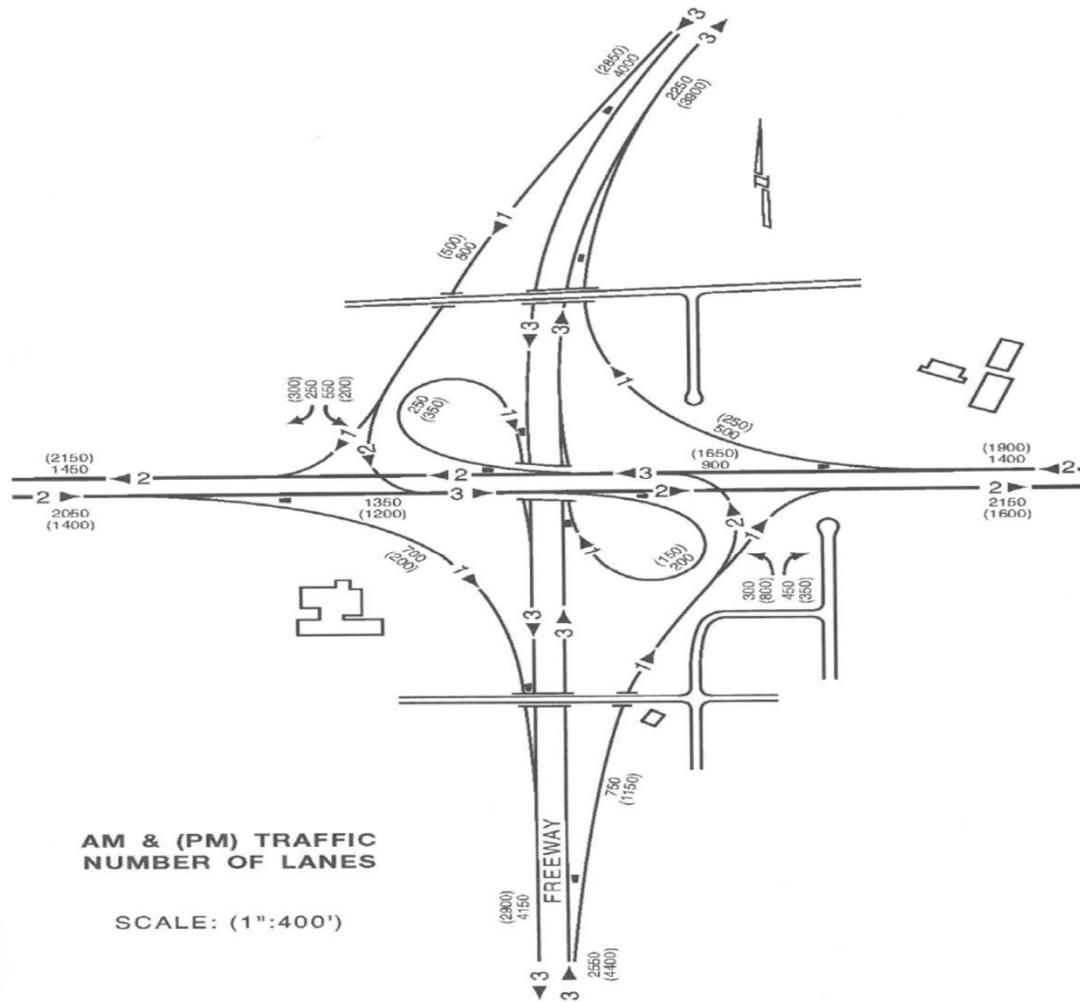


Figure 4-16. CADD Generated Single-Line.  
Source: Joel P. Leischy/PBS&J.



# High Level Capacity Analysis

Quick capacity analysis at critical points





## Additional Considerations

- Causes for interchange alternative failures
  - Close-by critical intersections
  - Ramp to mainline access failures
- Try to identify failures early in the selection process





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# Tier 2 - Ranking

RATING SCALE: 5-10

PLAN ALTERNATIVE		I		II		III	
ITEM	SCALE VALUE	RATING	WEIGHTED VALUE	RATING	WEIGHTED VALUE	RATING	WEIGHTED VALUE
<b>OPERATIONAL (25)</b>							
CAPACITY/LOS	(10)	8	80	8	80	10	100
FLEXIBILITY	(10)	6	60	10	100	10	100
GEOMETRIC ALIGNMENT	(5)	8	40	8	40	10	50
<b>SAFETY (20)</b>							
OPERATIONAL	(15)	7	105	8	120	10	150
ROADSIDE	(5)	9	45	9	45	10	50
<b>COSTS (25)</b>							
CONSTRUCTION	(15)	8	120	10	150	8	120
R-O-W	(10)	10	100	9	90	7	70
<b>IMPLEMENTATION (15)</b>							
STAGING - CONSTRUCTION	(10)	6	60	10	100	9	90
MAINTENANCE OF TRAFFIC	(5)	7	35	9	35	10	50
<b>ENVIRONMENTAL (15)</b>							
TRAFFIC ACCESSIBILITY	(5)	10	50	10	50	8	40
IMPACT ON DEVELOPMENT	(10)	10	100	10	100	7	70
	(100)						
<b>(POSSIBLE: 1000)</b>	<b>TOTAL</b>		<b>795</b>		<b>810</b>		<b>890</b>

Figure 4-19. Alternatives Ranking (Example).

Source: Jack F. Leisch



## Tier 3 – Functional Design

- Convert single-line drawings from Tier 2 to cross sections and profiles
- Investigate drainage
- Study existing bridges and retaining walls
- Draft a signing plan
- Develop a phased implementation plan
- Develop a sequence of construction and traffic control plan
- With this additional information, reevaluate the following:
  - Environmental impact
  - Right-of-way and construction cost





## Tier 3 – Functional Design

- Operational Analysis
  - HCM (Synchro, Vistro, HCS)
    - For simple intersections that operate at capacity
    - To determine intersection control, signal timings and lane configuration
    - For simple weave sections (HCS)
  - Microsimulation (VISSIM)
    - For complex designs
    - For corridors over capacity
    - For closely spaced intersections





## Tier 3 – Functional Design

- Safety analysis
- Bring alternatives from Tier 3 to public meeting for comment
- Reevaluate and compare alternatives





## Tier 4 – Final Alternative

- Show at public hearing as final alternative
- Develop final plans taking public and stakeholder input into consideration





**?? Questions ??**

