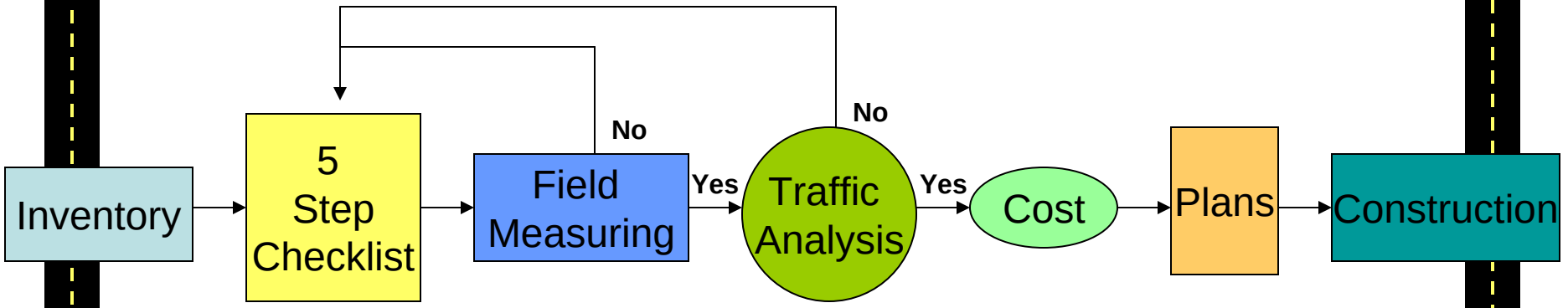
KIPDA Bicycle/Pedestrian Safety Study Toolbox

Evaluation Process



INVENTORY

EXISTING PEDESTRIAN FACILITIES				
1	Are there existing pedestrian facilities on either end of the interchange?		☐ YES	☐ NO
2	Are the facilities continued through the interchange?		☐ YES	☐ NO
3	What type of facilities exists?			
4	How wide are the facilities?			
5	What is the condition of the facilities?	☐ GOOD ☐ FAIR ☐ POOR		
6	Are there existing signs for pedestrians? (Please note location and type on field sketch)		☐ YES	☐ NO
7	Are there existing markings for pedestrians? (Please note location and type on field sketch)		☐ YES	☐ NO
8	Are there existing signals for pedestrians? (Please note location and type on field sketch)		☐ YES	☐ NO
EXISTING BICYCLE FACILITIES				
1	Are there existing bicycle facilities on either end of the interchange?		☐ YES	☐ NO
2	Are the facilities continued through the interchange?		☐ YES	☐ NO
3	What type of facilities exists?			
4	How wide are the facilities?			
5	What is the condition of the facilities?	☐ GOOD ☐ FAIR ☐ POOR		
6	Are there existing signs for bicyclists? (Please note location and type on field sketch)		☐ YES	☐ NO
7	Are there existing markings for bicyclists? (Please note location and type on field sketch)		☐ YES	☐ NO
EXISTING ROADWAY FACILITIES				
1	How many lanes are through the interchange?			
2	Do shoulders exist?		☐ YES	☐ NO
3	What are the shoulder widths?			
4	How wide are the facilities (lanes / shoulders)?			
5	What is the posted speed through the interchange?			
6	What is the functional classification of the roadway through the interchange?			
7	If signals exist, obtain signal timing and phasing and attach to inventory.			
USAGE				
1	What is the ADT on the non-interstate/limited access route?			
2	What is the ADT on the interstate/limited access route?			
3	What is the current daily/hourly volume of bicyclists?			
4	What is the current daily/hourly volume of pedestrians?			

CRASH HISTORY				
1	Within the vicinity of the interchange, has the non-interstate/limited access route been found to have a critical crash rate factor greater than one?		☐ YES	☐ NO
2	Within the vicinity of the interchange, has the interstate/limited access route been found to have a critical crash rate factor greater than one?		☐ YES	☐ NO
3	During the past three years of available data, have any of the reported crashes involved pedestrians?		☐ YES	☐ NO
4	If the answer to #3 was yes, how many and what percentage.		_____	____%
5	During the past three years of available data, have any of the reported crashes involved bicyclists?		☐ YES	☐ NO
6	If the answer to #5 was yes, how many and what percentage.		_____	____%
ADJACENT LAND USE				
1	Are there nearby apartments or dense housing?		☐ YES	☐ NO
2	Are there nearby retail or shopping destinations?		☐ YES	☐ NO
3	Are there nearby schools?		☐ YES	☐ NO
4	Are there nearby recreation centers?		☐ YES	☐ NO
5	Are there nearby libraries?		☐ YES	☐ NO
6	Are there nearby parks?		☐ YES	☐ NO
7	What is the likelihood that one of the above land uses will relocate nearby?	☐ GOOD	☐ FAIR	☐ POOR
FUTURE DEVELOPMENT				
1	Is this a priority pedestrian / bicycle corridor now?		☐ YES	☐ NO
2	Will it be a priority pedestrian/bicycle corridor in the future?		☐ YES	☐ NO
3	Is there a need for grade separation?		☐ YES	☐ NO
4	Are there any plans for improvements to the interchange? (If yes, please provide additional detail on an attached sheet)		☐ YES	☐ NO

Are there any other current/planned characteristics that would affect pedestrians/bicyclists through this interchange?

_____

_____

_____

_____

_____

_____

_____

_____

5 Step Checklist

If an existing pedestrian or bicycle facility is present, continue that same type through the intersection. Otherwise consider the following:

1. Maintenance and Signage

- Warning signs should be in fluorescent yellow-green (FYG)
- Crosswalks should have zebra stripes
- All markings should be retro-reflective
- Adequate lighting, especially under the roadways
- Consider supplemental signs on ramps (“Stop Here on Red” and “Right Turn Yield to Bikes”)
- Consider pedestrian actuated signals and advance warning beacons

2. Sidewalks and Pedestrian Facilities

- Consider narrowing adjacent travel lanes to accommodate sidewalks

3. Bicycle Facilities

- Consider narrowing adjacent travel lanes to accommodate a wide curb lane or bicycle lane

4. Reduction of Conflict Points

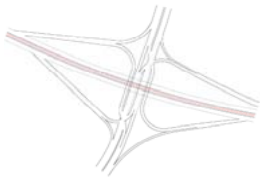
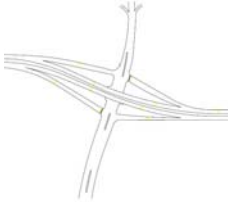
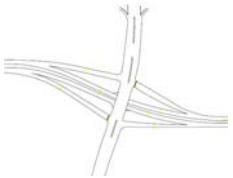
- Concentrate conflict points
- Consider eliminating or consolidating free flow ramp movements

5. Grade Separation

*Note that there are various treatments for each step on the checklist. These are options that could work, however engineering judgment should be applied to determine if a treatment is appropriate for a specific interchange.

BACK

Interchange Types

Skewed Partial Cloverleaf		Displaced Left Turns	
Partial Cloverleaf		Diverging Diamond	
Single Point Urban Interchange		Full Cloverleaf	
Diamond Interchange with Arterial Under Interstate		Trumpet Interchange	
Diamond Interchange with Arterial Over Interstate		Tight Diamond Interchange	

BACK

Skewed Partial Cloverleaf

Interchange Specific Pedestrian / Bicyclist Challenges:

- High speed free flow movements with long merge areas
- Confusion for bicyclists regarding whether to stay to the right or move to the left of free flow movements
- Multiple conflict points
- Low visibility to drivers

BACK

Skewed Partial Cloverleaf

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place “Begin Right Turn Lane Yield to Bikes” signs prior to free flow entrance ramps (MUTCD R4-4).
   - Place **electrical pedestrian warning system** at particularly dangerous free flow movements, or where sight distance is poor.
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Make **freeway ramp crossings** at 90 degree angles.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Add pedestrian actuated countdown signals where traffic signals exist.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side, make accommodations for cross over at signalized intersections.
   - If an arterial overpass exists, see **Bridge Treatments.**

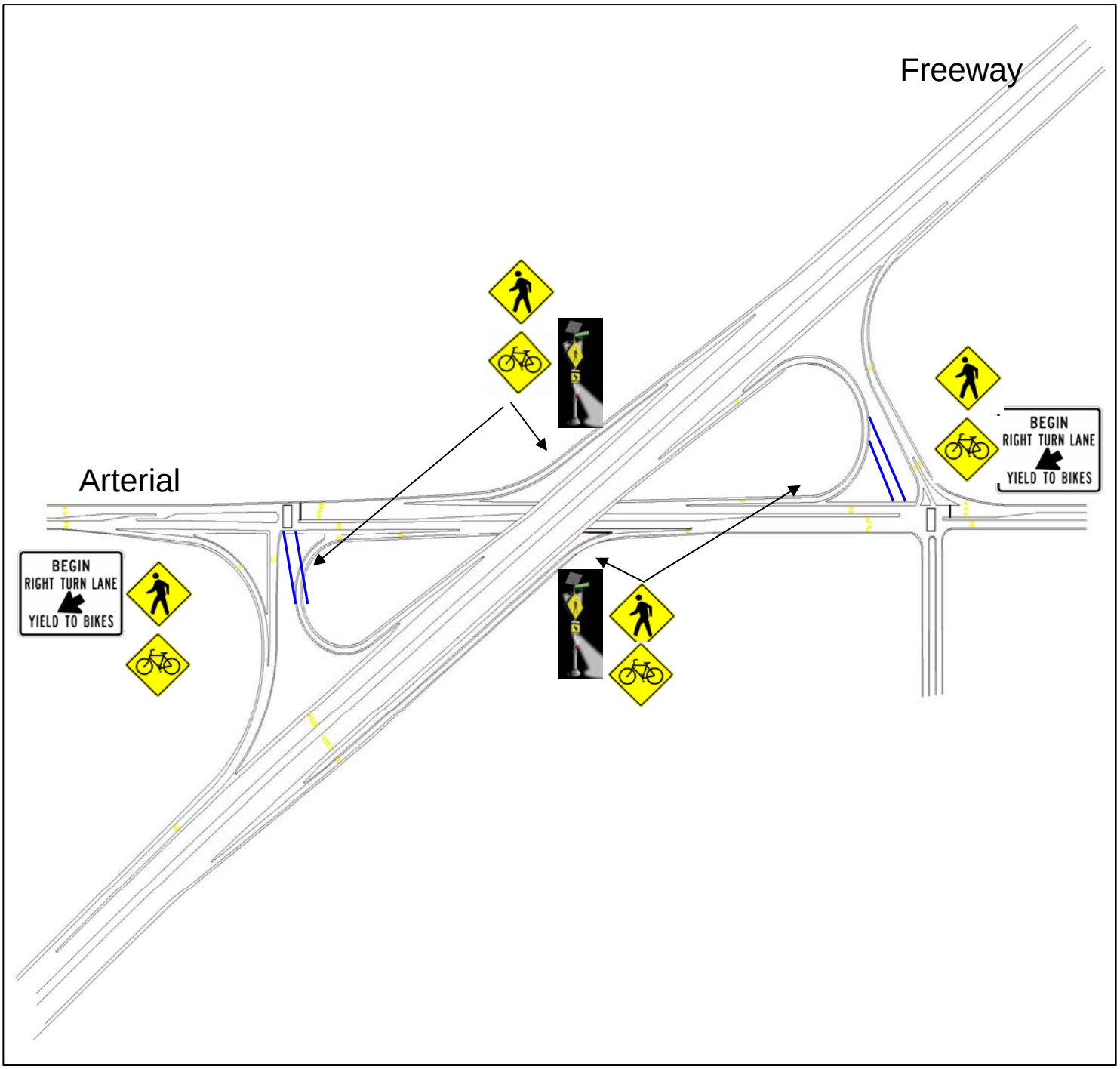
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, determine if a wide curb lane, bicycle lane or shared use path is appropriate.
   - A bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping, if space allows.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).
   - If an arterial overpass exists, see **Bridge Treatments.**

4) Reduction of Conflict Points
   - Where **cloverleafs** exist, the free flow movement can be removed and the ramp will intersect with the arterial at a 90 degree angle.
   - Where free flow entrance or exit ramps exist, the free flow movements can be pulled in to intersect the arterial at a 90 degree angle, reducing the number of conflict points.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

BACK

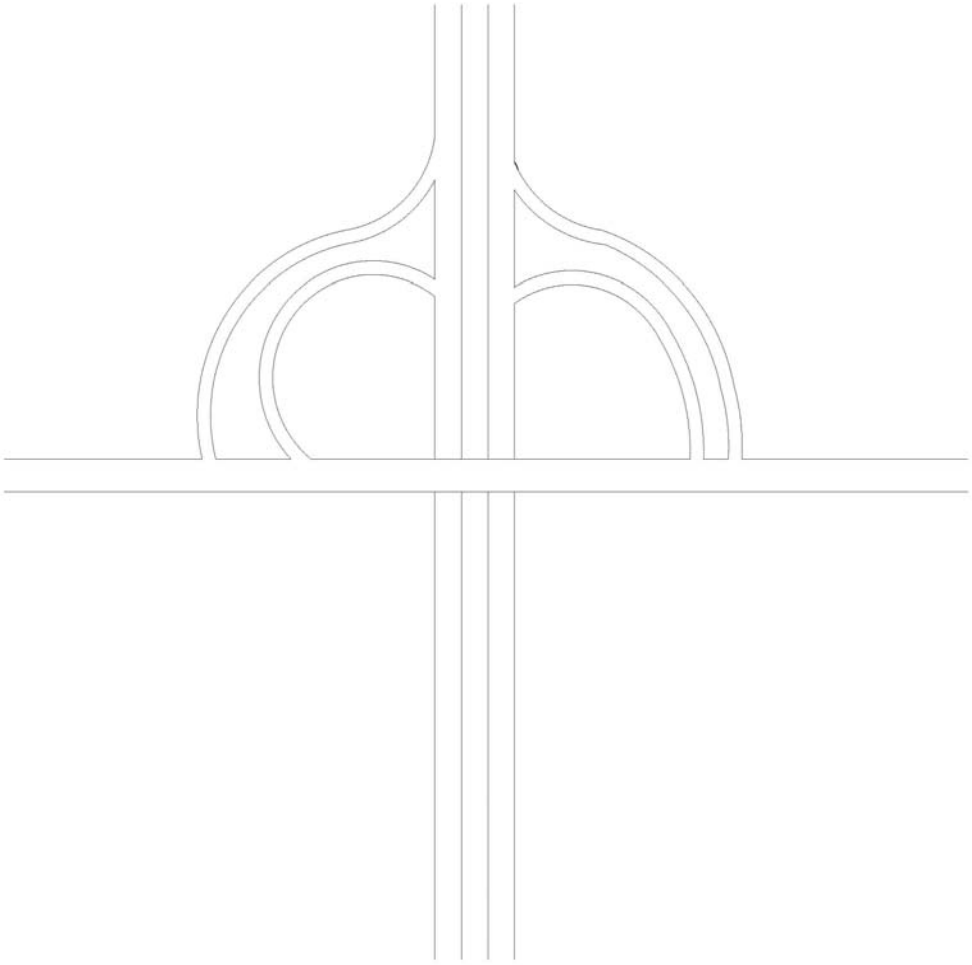
Appropriate Signage for Skewed Partial Cloverleaf



*The blue lines indicate how the cloverleafs can be brought in to intersect the arterial at 90 degree angles, and reduce conflict points and merging areas.

BACK

Partial Cloverleaf



Interchange Specific Pedestrian / Bicyclist Challenges:

- Multiple conflict points
- Possibility of high speed free flowing movements
- Confusion for bicyclists regarding whether to stay to the right or move to the left of free flow movements
- Low visibility to drivers

BACK

Partial Cloverleaf

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place “Begin Right Turn Lane Yield to Bikes” signs prior to free flow entrance ramps (MUTCD R4-4).
   - Place **electrical pedestrian warning system** at particularly dangerous free flow movements, or where sight distance is poor.
   - If signals exist, consider placing “Stop Here on Red” sign to keep vehicles out of crosswalk (MUTCD R10-6).
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Make **freeway ramp crossings** at 90 degree angles.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Add pedestrian actuated countdown signals where traffic signals exist.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side, make accommodations for cross over at signalized intersections.
   - If an arterial overpass exists, see **Bridge Treatments.**

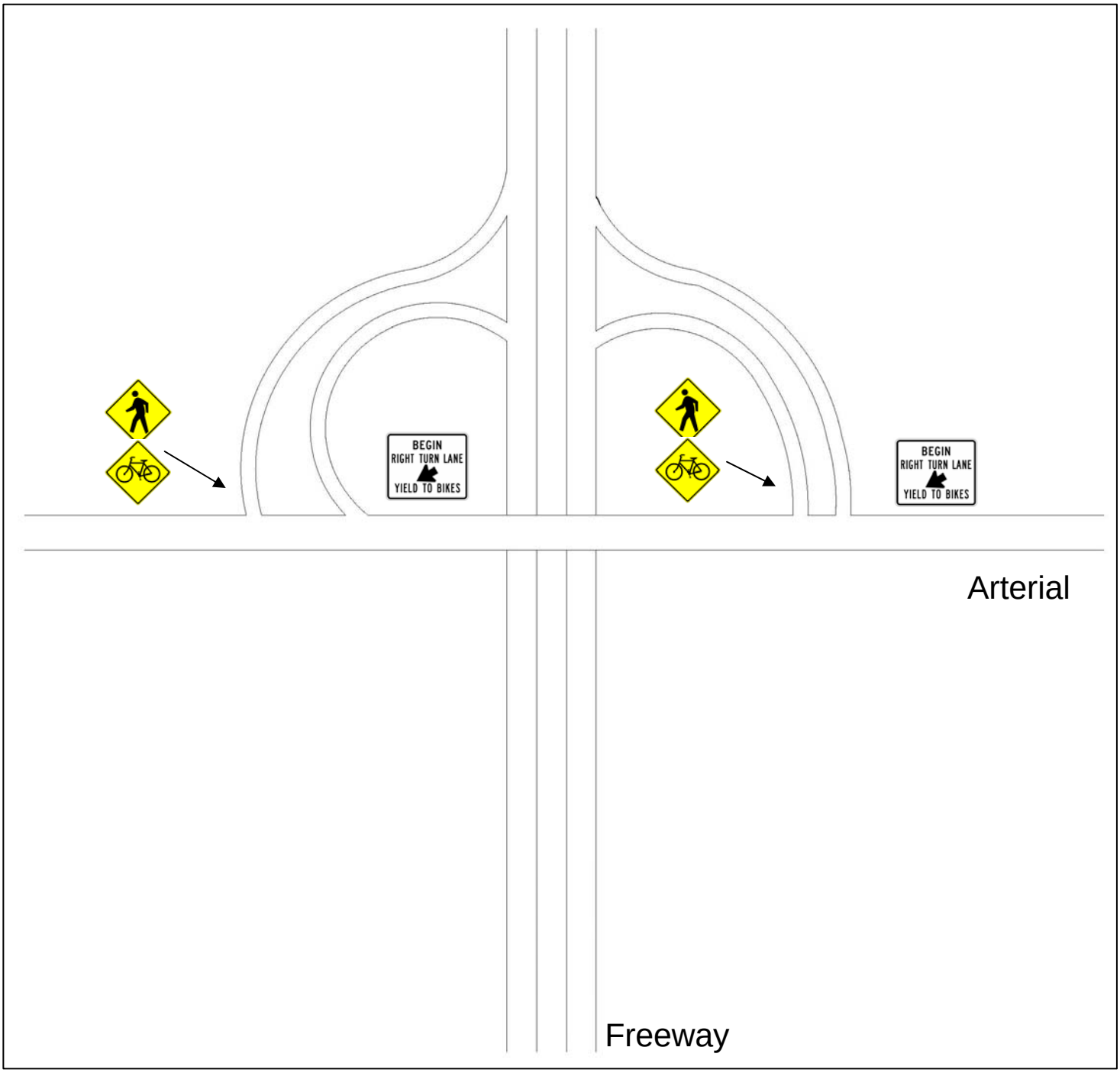
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, determine if a wide curb lane, bicycle lane or shared use path is appropriate.
   - A bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping, if space allows.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).
   - If an arterial overpass exists, see **Bridge Treatments.**

4) Reduction of Conflict Points
   - If **cloverleafs** are free flowing, the free flow movement can be removed and the ramp will intersect with the arterial at a 90 degree angle.
   - Where free flow entrance or exit ramps exist, the free flow movements can be pulled in to intersect the arterial at a 90 degree angle, reducing the number of conflict points.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

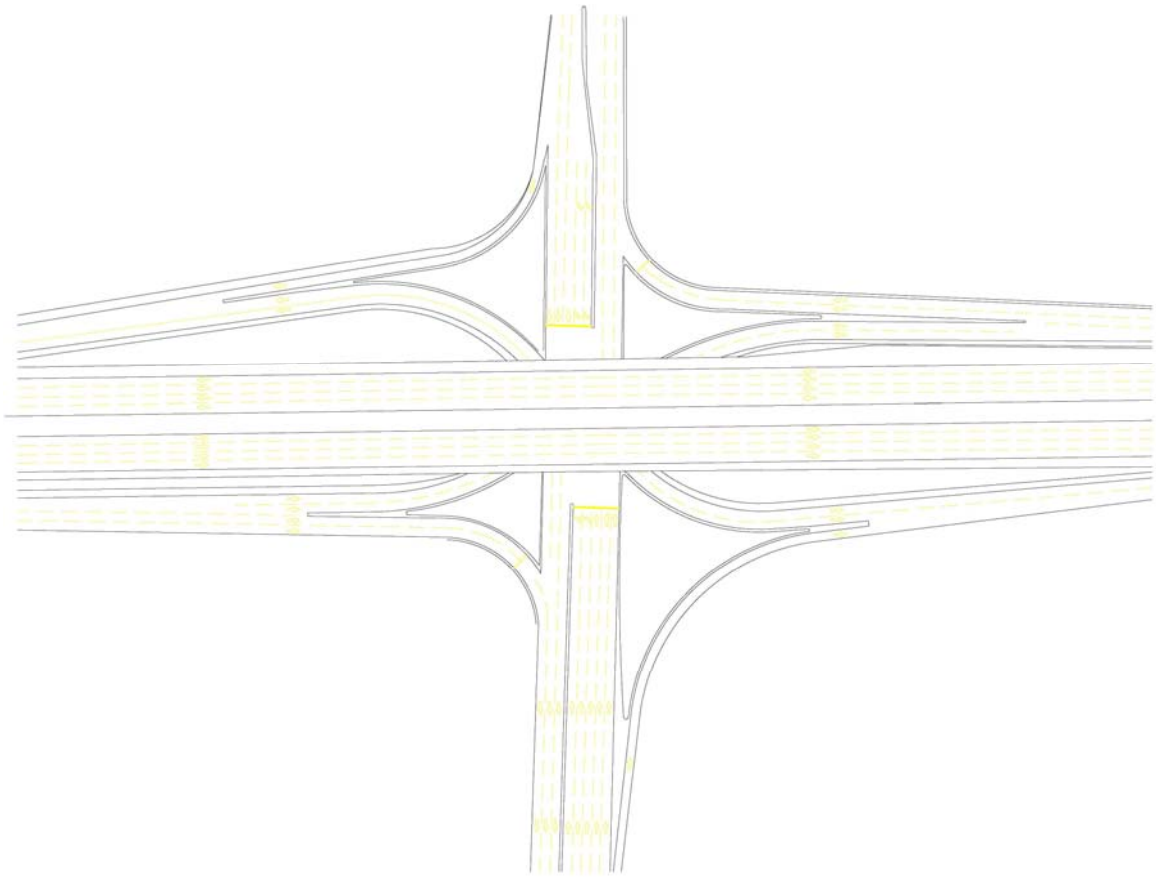
BACK

Appropriate Signage for Partial Cloverleaf



BACK

Single Point Urban Interchange



Interchange Specific Pedestrian / Bicyclist Challenges:

- Only one signal controlling all movements
- Long crossing distance where ramps meet at the signal
- Free flow right-turn movements

BACK

Single Point Urban Interchange

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place “Begin Right Turn Lane Yield to Bikes” signs prior to free flow entrance ramps (MUTCD R4-4).
   - Place **electrical pedestrian warning system** at particularly dangerous free flow movements, or where sight distance is poor.
   - Place “Stop Here On Red” signs at signals to keep vehicles out of crosswalks (MUTCD R10-6)
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Make **freeway ramp crossings** at 90 degree angles.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Add pedestrian actuated countdown signals.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine the appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side, make accommodations for cross over at signalized intersections.
   - If an arterial overpass exists, see **Bridge Treatments.**

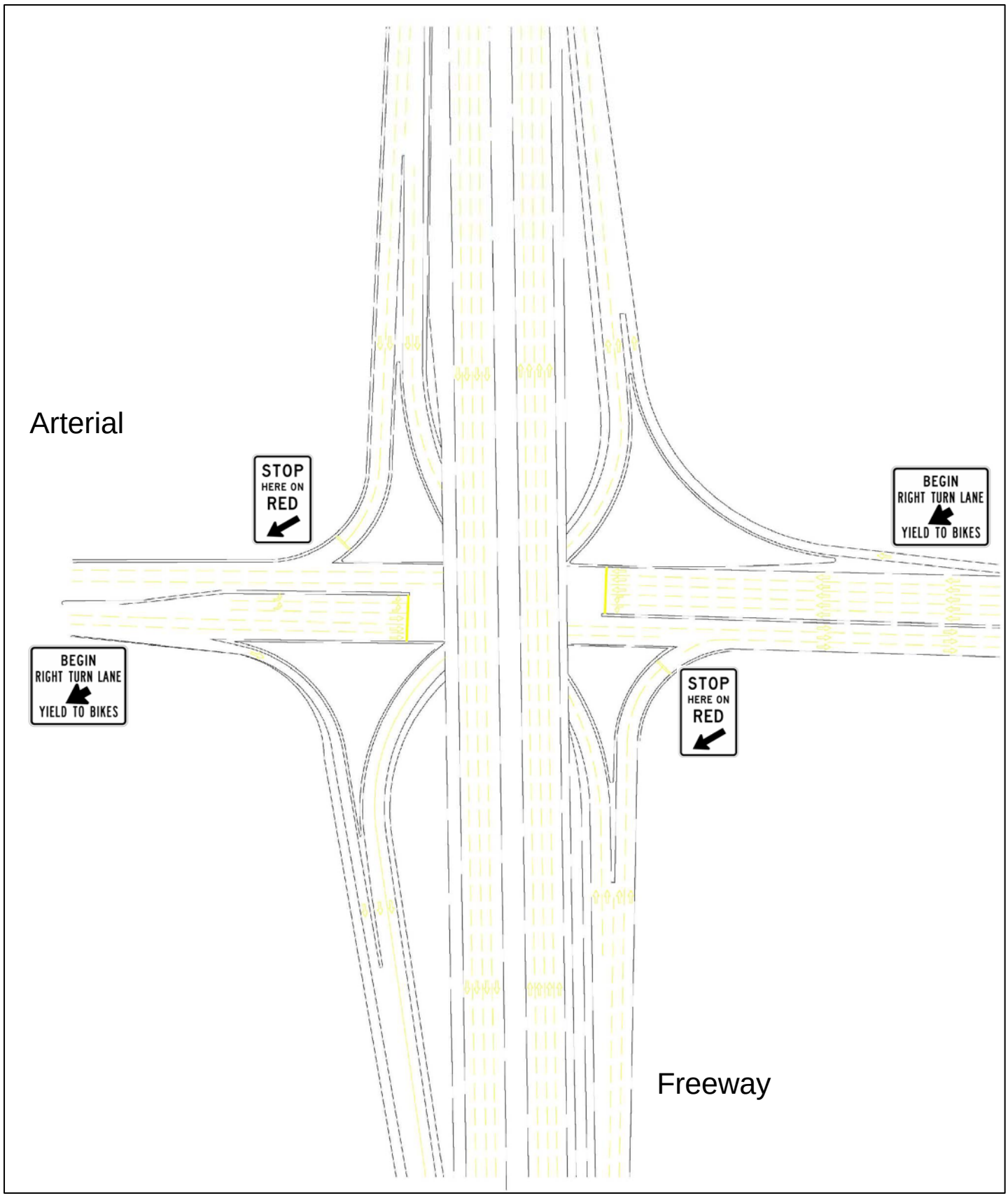
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, determine if a wide curb lane, bicycle lane or shared use path is appropriate.
   - A bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping, if space allows.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).
   - If an arterial overpass exists, see **Bridge Treatments.**

4) Reduction of Conflict Points
   - Consider tighter SPUI so free flow right turn entrance and exit ramps are closer to 90 degree angles causing vehicles to reduce speed.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

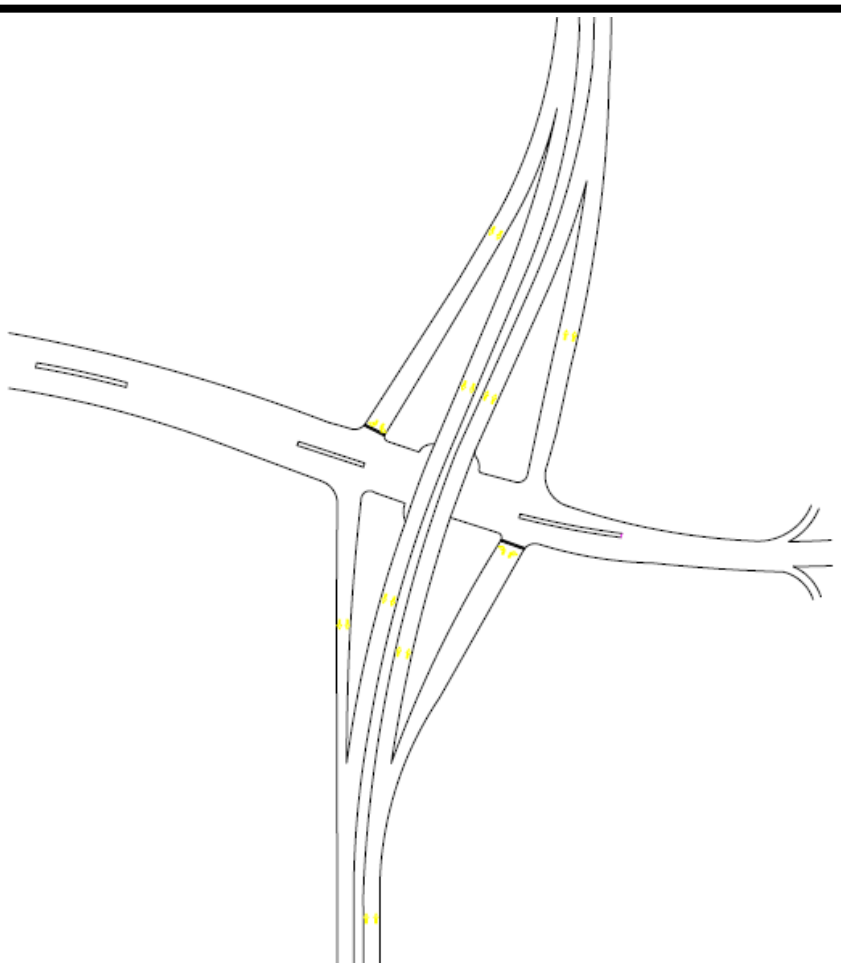
BACK

Appropriate Signage for SPUI



BACK

Diamond Interchange with Arterial Under Interstate



Interchange Specific Pedestrian / Bicyclist Challenges:

- Multiple conflict points
- Free flow right-turn movements
- Confusion for bicyclists regarding whether to stay to the right or move to the left of free flow movements

BACK

Diamond Interchange with Arterial Under Interstate

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place “Begin Right Turn Lane Yield to Bikes” signs prior to free flow entrance ramps (MUTCD R4-4).
   - Place **electrical pedestrian warning system** at particularly dangerous free flow movements, or where sight distance is poor.
   - If signals exist, consider placing “Stop Here on Red” sign to keep vehicles out of crosswalk (MUTCD R10-6).
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Make **freeway ramp crossings** at 90 degree angles.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Add pedestrian actuated countdown signals where traffic signals exist.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side, make accommodations for cross over at signalized intersections.

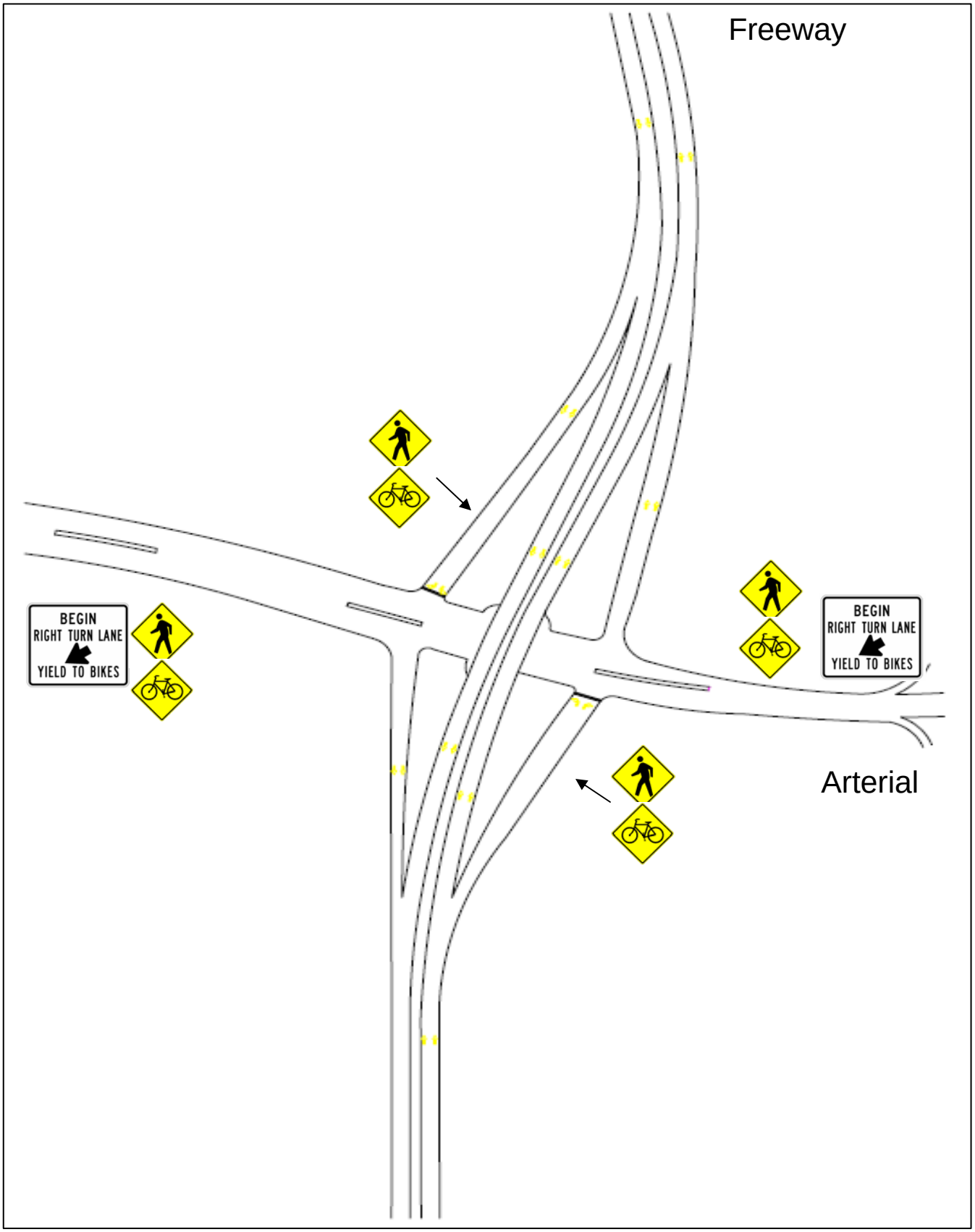
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, determine if a wide curb lane, bicycle lane or shared use path is appropriate.
   - A bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping, if space allows.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).

4) Reduction of Conflict Points
   - Where free flow entrance or exit ramps exist, the free flow movements can be pulled in to intersect the arterial at a 90 degree angle, reducing the number of conflict points.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

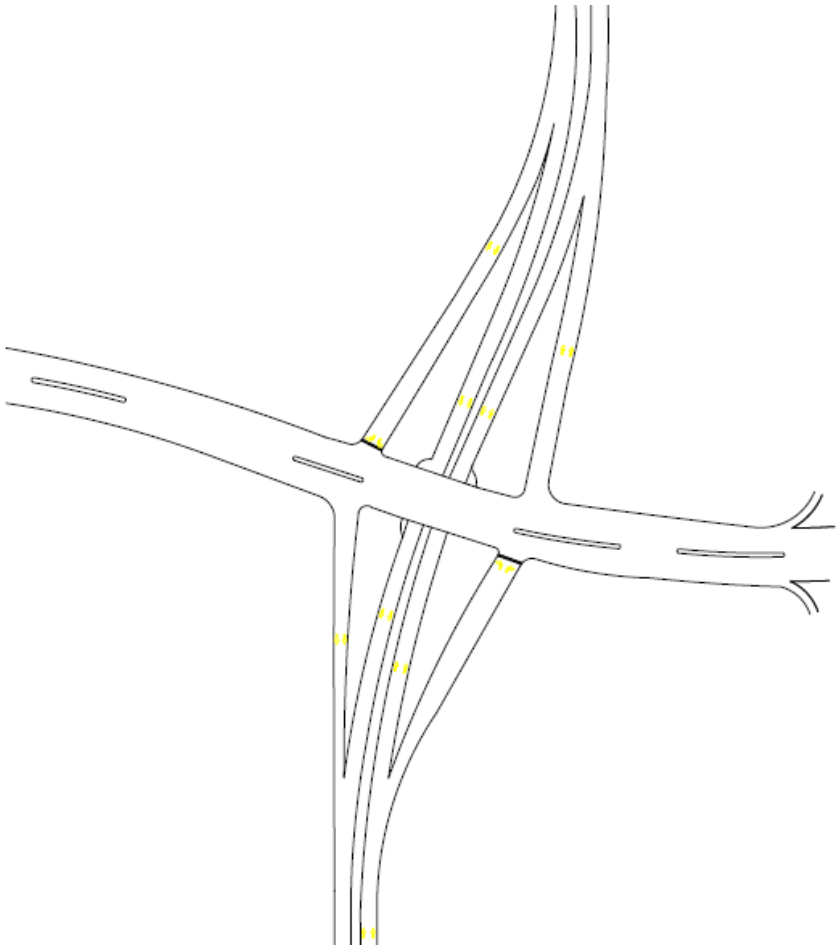
BACK

Appropriate Signage for Diamond Interchange With Arterial Under Interstate



BACK

Diamond Interchange with Arterial Over Interstate



Interchange Specific Pedestrian / Bicyclist Challenges:

- Multiple conflict points
- Free flow right-turn movements
- Confusion for bicyclists regarding whether to stay to the right or move to the left of free flow movements

BACK

Diamond Interchange with Arterial Over Interstate

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place "Begin Right Turn Lane Yield to Bikes" signs prior to free flow entrance ramps (MUTCD R4-4).
   - Place **electrical pedestrian warning system** at particularly dangerous free flow movements, or where sight distance is poor.
   - If signals exist, consider placing "Stop Here on Red" sign to keep vehicles out of crosswalk (MUTCD R10-6).
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Make **freeway ramp crossings** at 90 degree angles.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Add pedestrian actuated countdown signals where traffic signals exist.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side make accommodations for cross over at signalized intersections.
   - See **Bridge Treatments** for arterial overpass considerations.

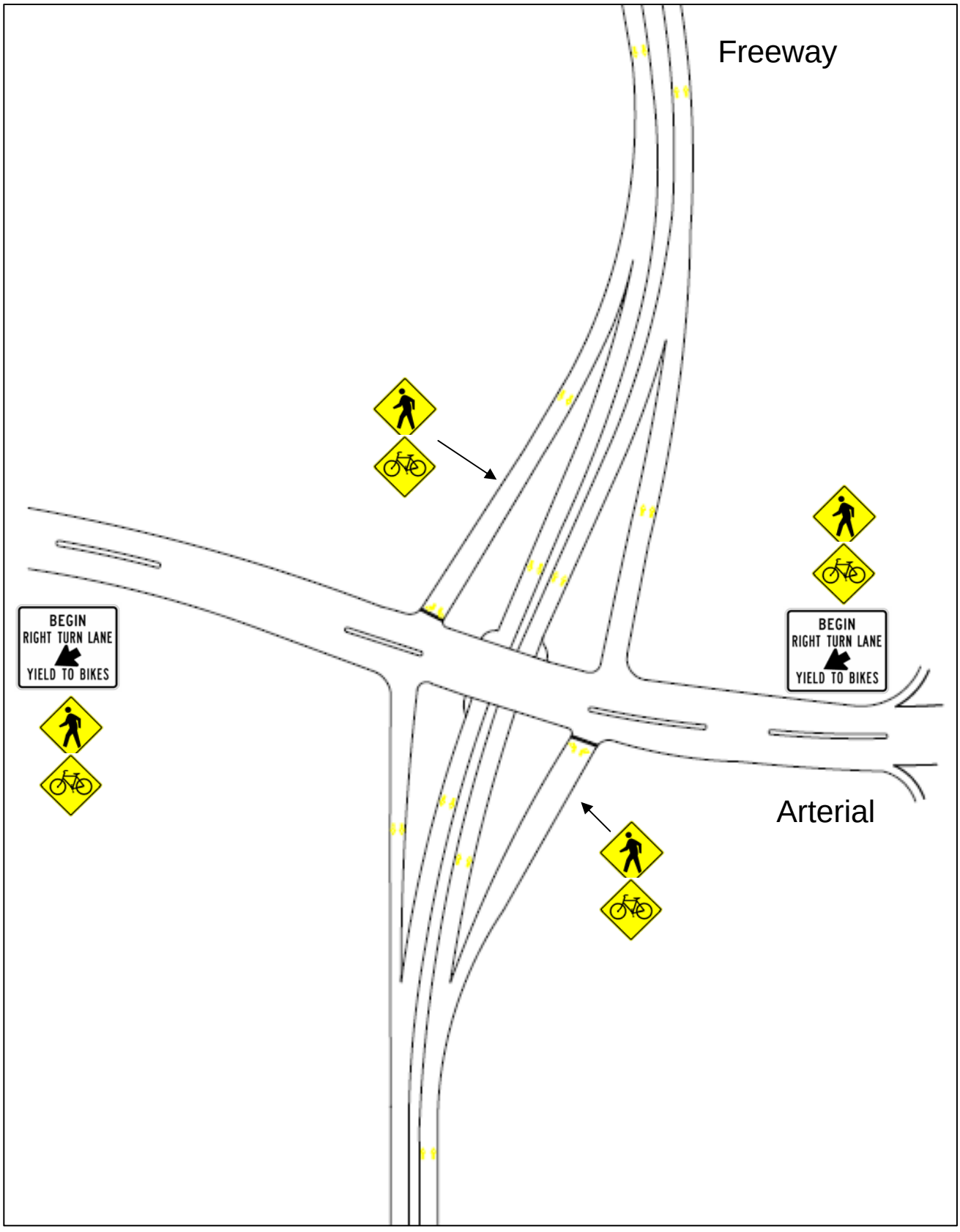
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, determine if a wide curb lane, bicycle lane or shared use path is appropriate.
   - A bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping, if space allows.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).
   - See **Bridge Treatments** for arterial overpass considerations.

4) Reduction of Conflict Points
   - Where free flow entrance or exit ramps exist, the free flow movements can be pulled in to intersect the arterial at a 90 degree angle, reducing the number of conflict points.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

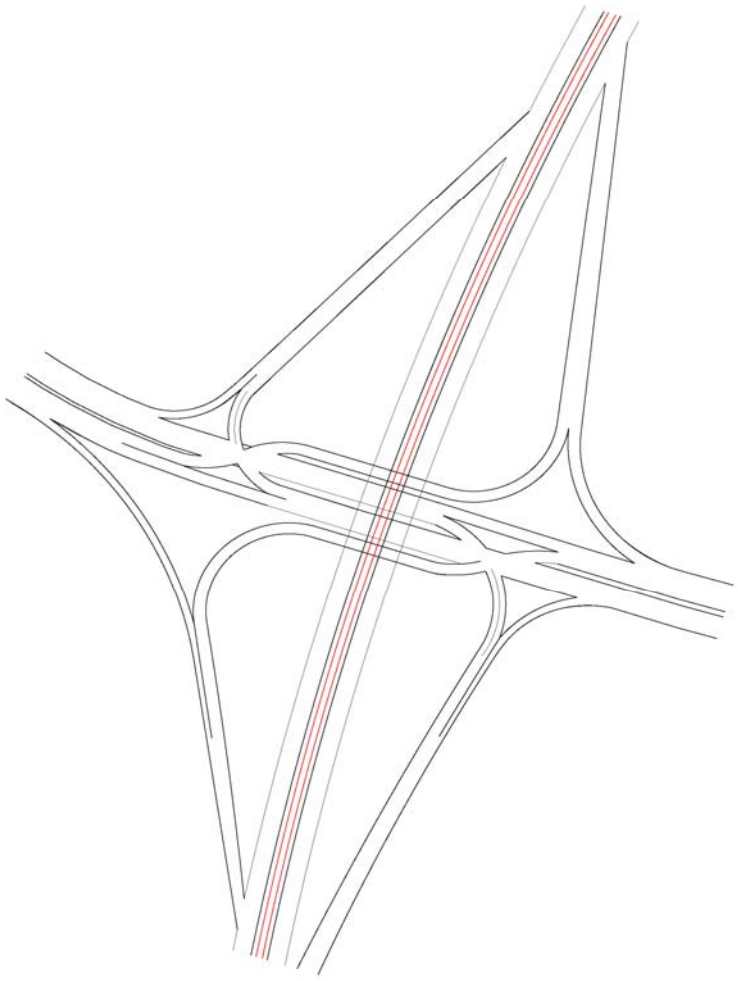
BACK

Appropriate Signage for Diamond Interchange With Arterial Over Interstate



BACK

Displaced Left Turns Interchange



Interchange Specific Pedestrian / Bicyclist Challenges:

- Confusion when traffic crosses to other side of road
- Driver unfamiliarity with interchange type
- Free flow right and left turn movements

BACK

Displaced Left Turns Interchange

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place “Begin Right Turn Lane Yield to Bikes” sign prior to free flow entrance ramps (MUTCD R4-4).
   - Place **electrical pedestrian warning system** at particularly dangerous free flow movements.
   - Place “Stop Here On Red” signs at signals to keep vehicles out of crosswalks, if signals exist. (MUTCD R10-6).
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Make **freeway ramp crossings** at 90 degree angles.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Add pedestrian actuated countdown signals.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine the appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side, make accommodations for cross over at signalized intersections.
   - If an arterial overpass exists, see **Bridge Treatments**

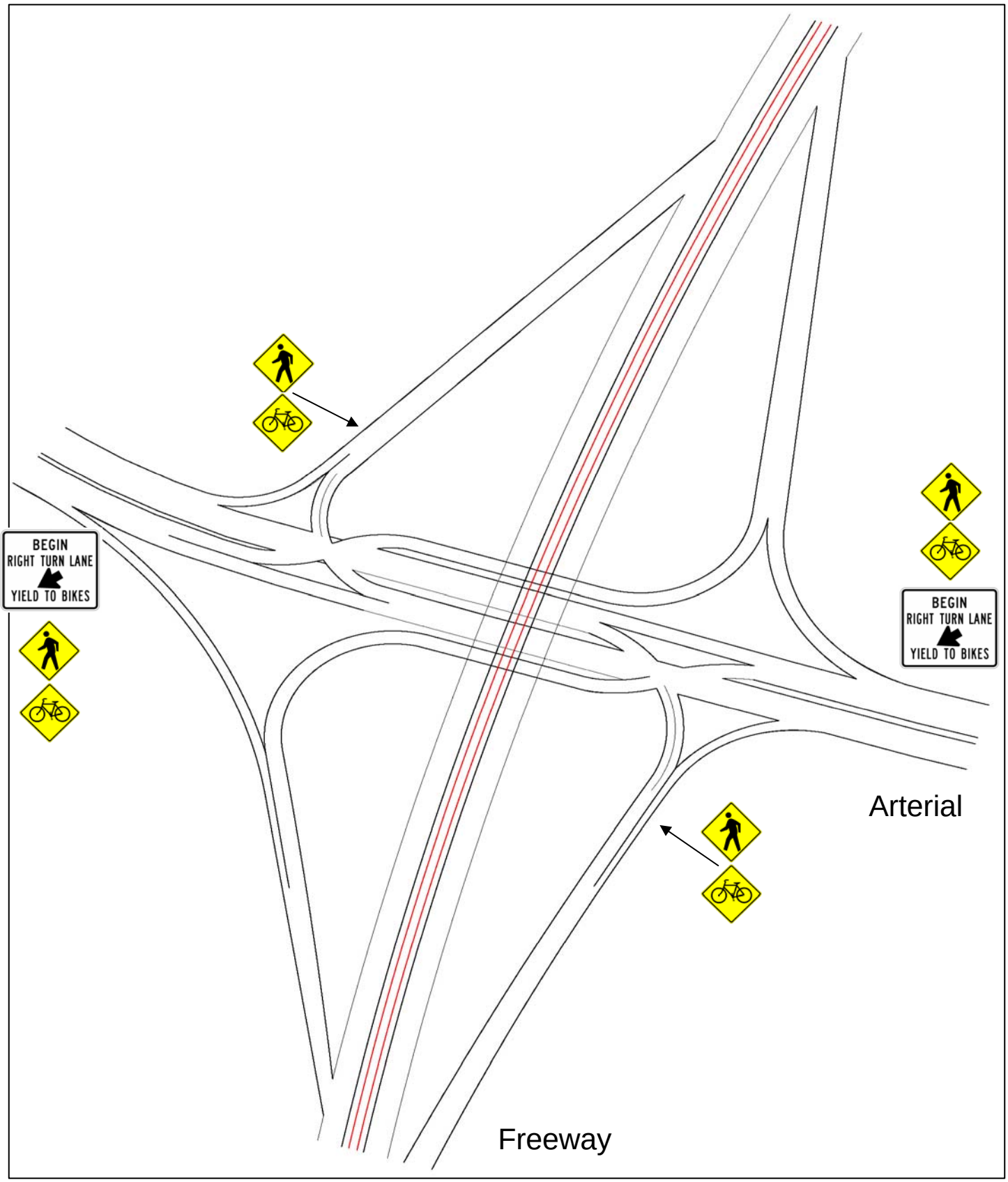
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, determine if a wide curb lane, bicycle lane or shared use path is necessary.
   - A bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping, if space allows.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).
   - If an arterial overpass exists, see **Bridge Treatments**

4) Reduction of Conflict Points
   - Where free flow entrance or exit ramps exist, the free flow movements can be pulled in to intersect the arterial at a 90 degree angle.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

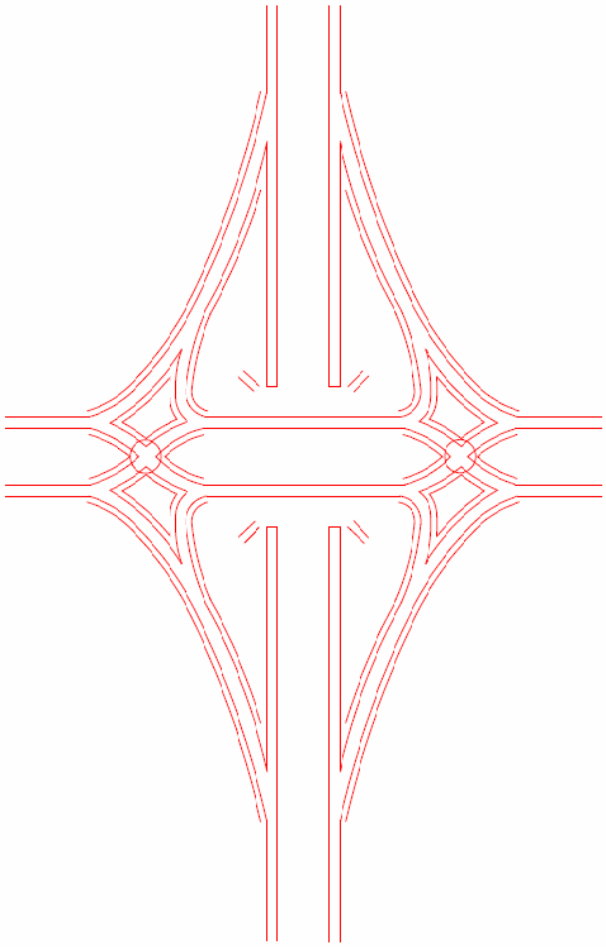
BACK

Appropriate Signage for Displaced Left Turns



BACK

Diverging Diamond Interchange



Interchange Specific Pedestrian / Bicyclist Challenges:

- Confusion when traffic crosses to other side of road
- Driver unfamiliarity with interchange type
- Free flow right and left turn movements

BACK

Diverging Diamond Interchange

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place “Begin Right Turn Lane Yield to Bikes” signs prior to free flow entrance ramps (MUTCD R4-4).
   - Place **electrical pedestrian warning** system at particularly dangerous free flow movements, or where sight distance is poor.
   - Place “Stop Here On Red” signs at signals to keep vehicles out of crosswalks, if signals exist. (MUTCD R10-6).
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Make **freeway ramp crossings** at 90 degree angles.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Add pedestrian actuated countdown signals.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine the appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side, make accommodations for cross over at signalized intersections.
   - If an arterial overpass exists, see **Bridge Treatments.**

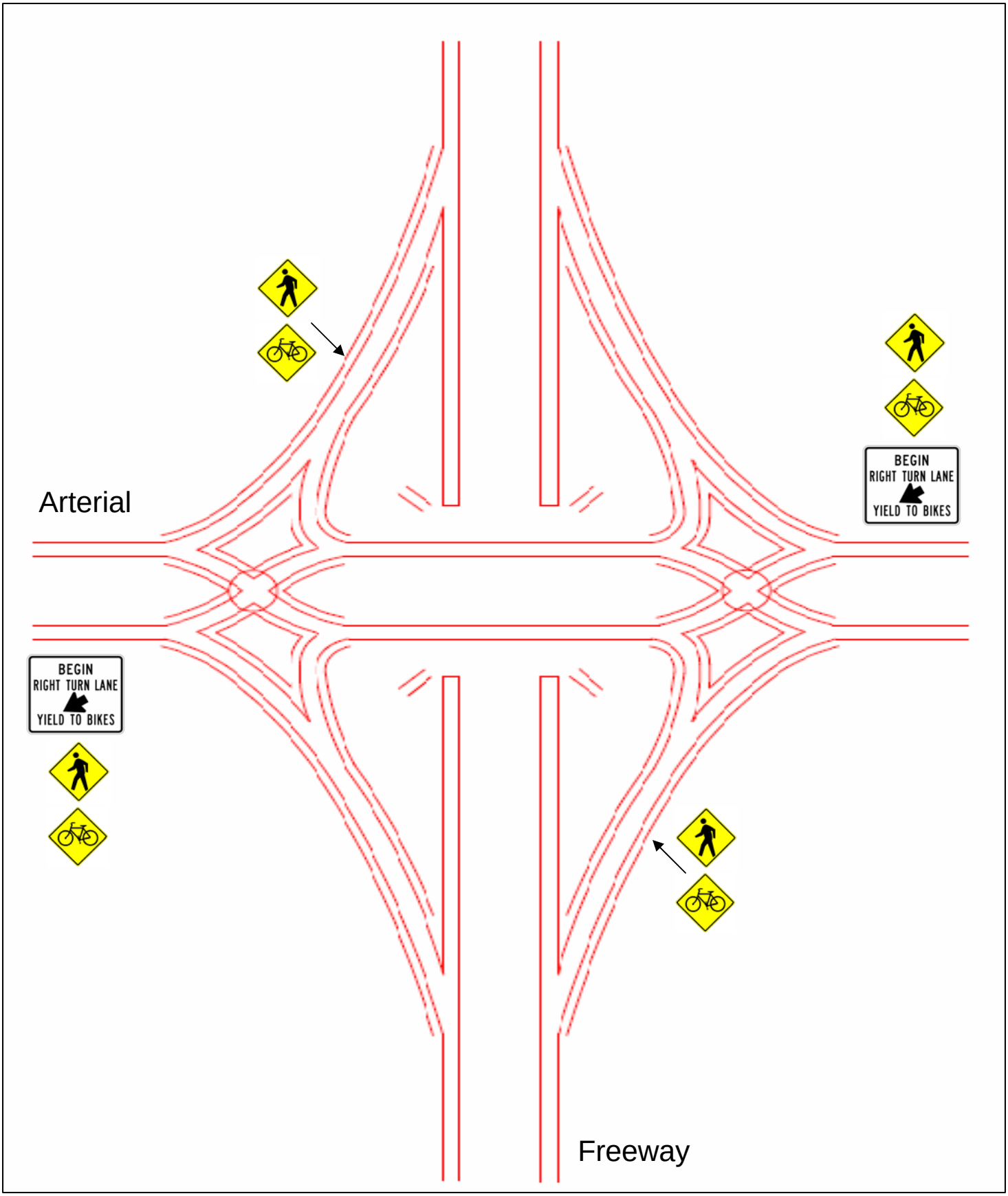
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, a separate path is an appropriate solution.
   - If space does not permit a separate facility determine if a wide curb lane or bicycle lane is appropriate. If necessary, a bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).
   - If an arterial overpass exists, see **Bridge Treatments.**

4) Reduction of Conflict Points
   - Tighten ramps to intersect at 90 degree angle, and bring right and left turns together to reduce the number of conflict points.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

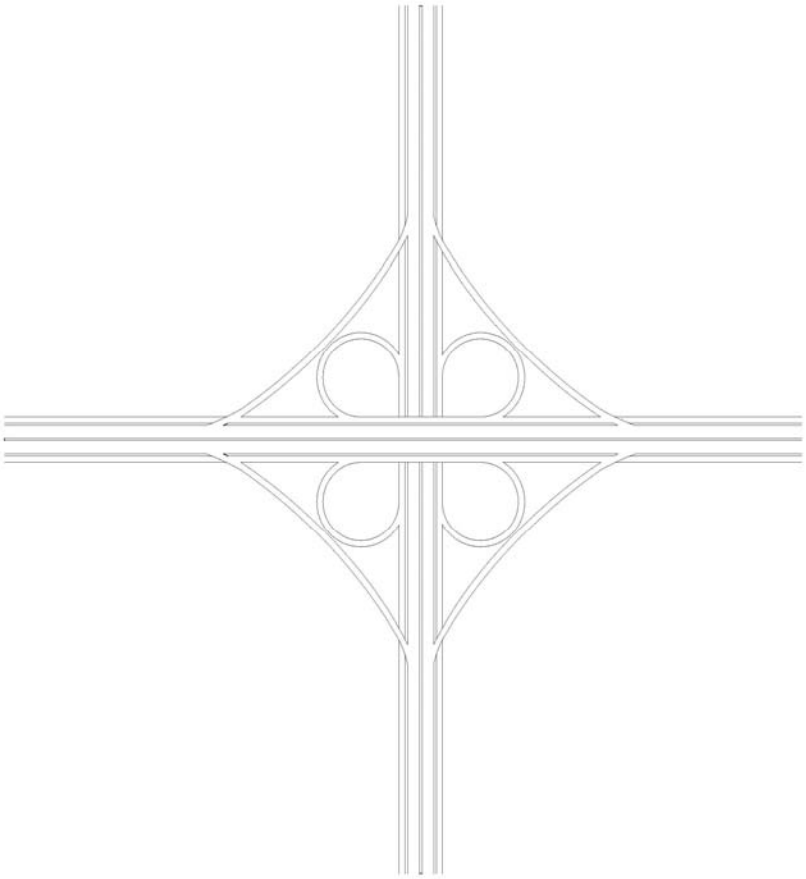
BACK

Appropriate Signage for Diverging Diamond



BACK

Full Cloverleaf Interchange



Interchange Specific Pedestrian / Bicyclist Challenges:

- High speed free flow movements with long merge areas
- Confusion regarding whether to stay to the right or move to the left of free flow movements
- Multiple conflict points
- Low visibility to drivers

BACK

Full Cloverleaf Interchange

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place “Begin Right Turn Lane Yield to Bikes” signs prior to free flow entrance ramps (MUTCD R4-4).
   - Place **electrical pedestrian warning system** at particularly dangerous free flow movements, or where sight distance is poor.
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Make **freeway ramp crossings** at 90 degree angles.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine the appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side, make accommodations for cross over at signalized intersections.
   - If an arterial overpass exists, see **Bridge Treatments**

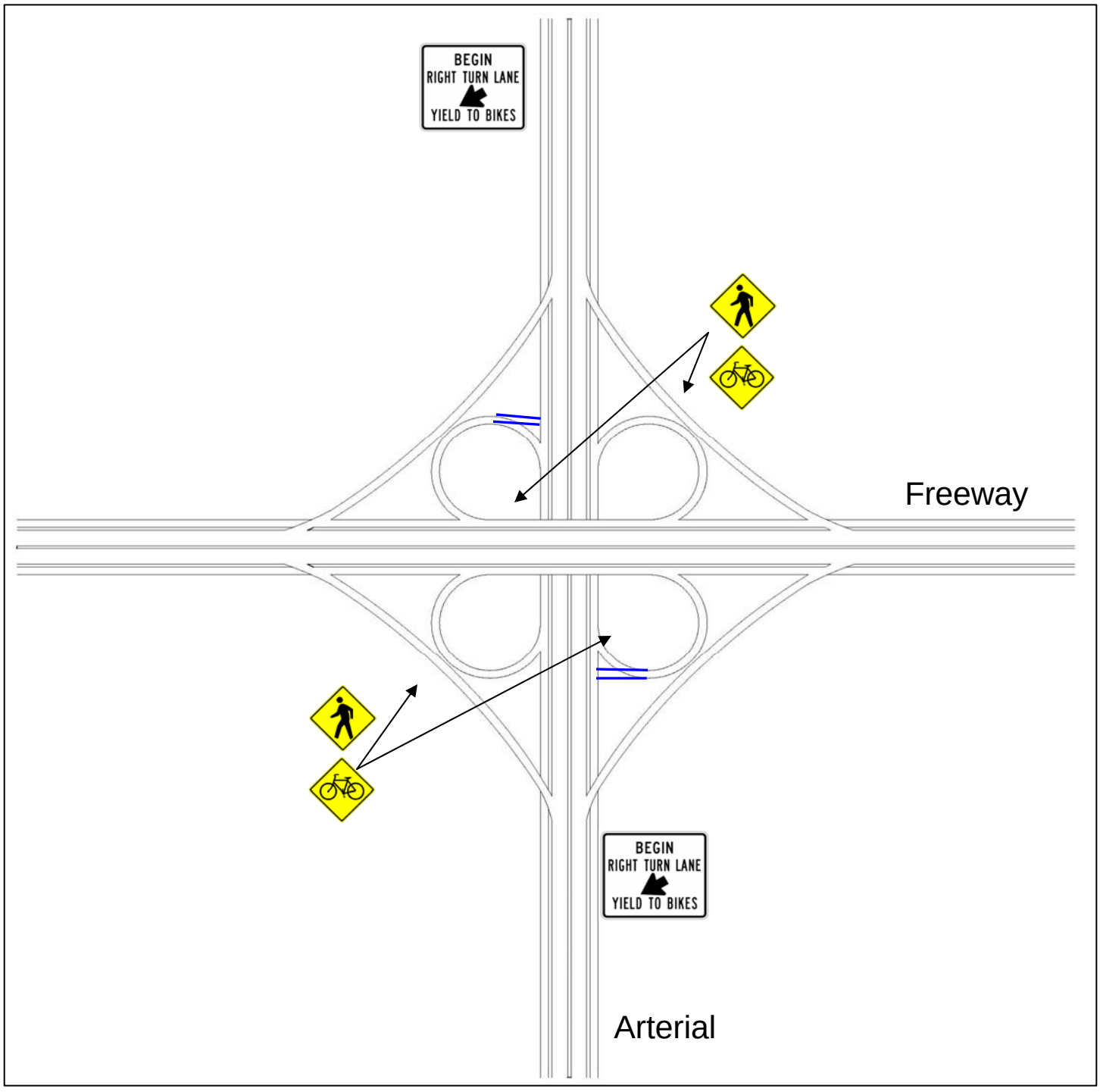
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, determine if a wide curb lane, bicycle lane or shared use path is appropriate.
   - A bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping, if space allows.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).
   - If an arterial overpass exists, see **Bridge Treatments**

4) Reduction of Conflict Points
   - Where **cloverleafs** exist, the free flow movement can be removed and the ramp will intersect with the arterial at a 90 degree angle.
   - Where free flow entrance or exit ramps exist, the free flow movements can be pulled in to intersect the arterial at a 90 degree angle.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

BACK

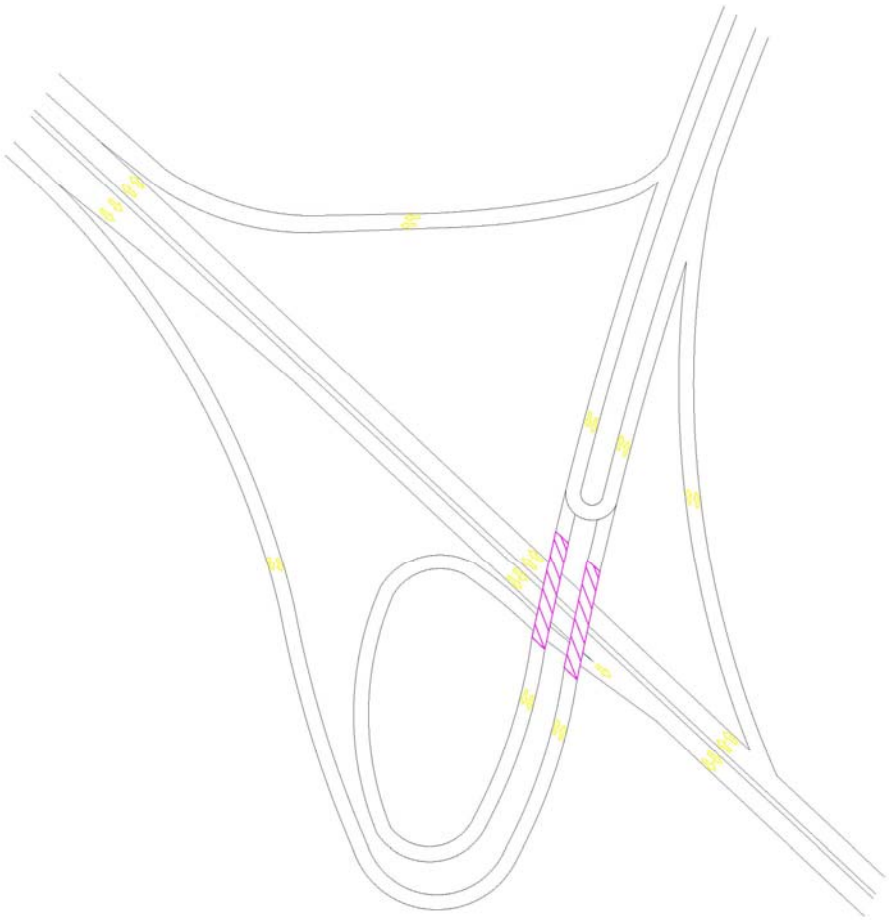
Appropriate Signage for Full Cloverleaf



*The blue lines indicate how the cloverleafs can be brought in to intersect the arterial at 90 degree angles, and reduce conflict points and merging areas.

BACK

Trumpet Interchange



Interchange Specific Pedestrian / Bicyclist Challenges:

- High speed free flow movements with long merge areas
- Confusion regarding whether to stay to the right or move to the left of free flow movements
- Multiple conflict points

BACK

Trumpet Interchange

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place “Begin Right Turn Lane Yield to Bikes” sign prior to free flow entrance ramps (MUTCD R4-4).
   - Place **electrical pedestrian warning system** at particularly dangerous free flow movements.
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Make **freeway ramp crossings** at 90 degree angles.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine the appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side, make accommodations for cross over at signalized intersections.

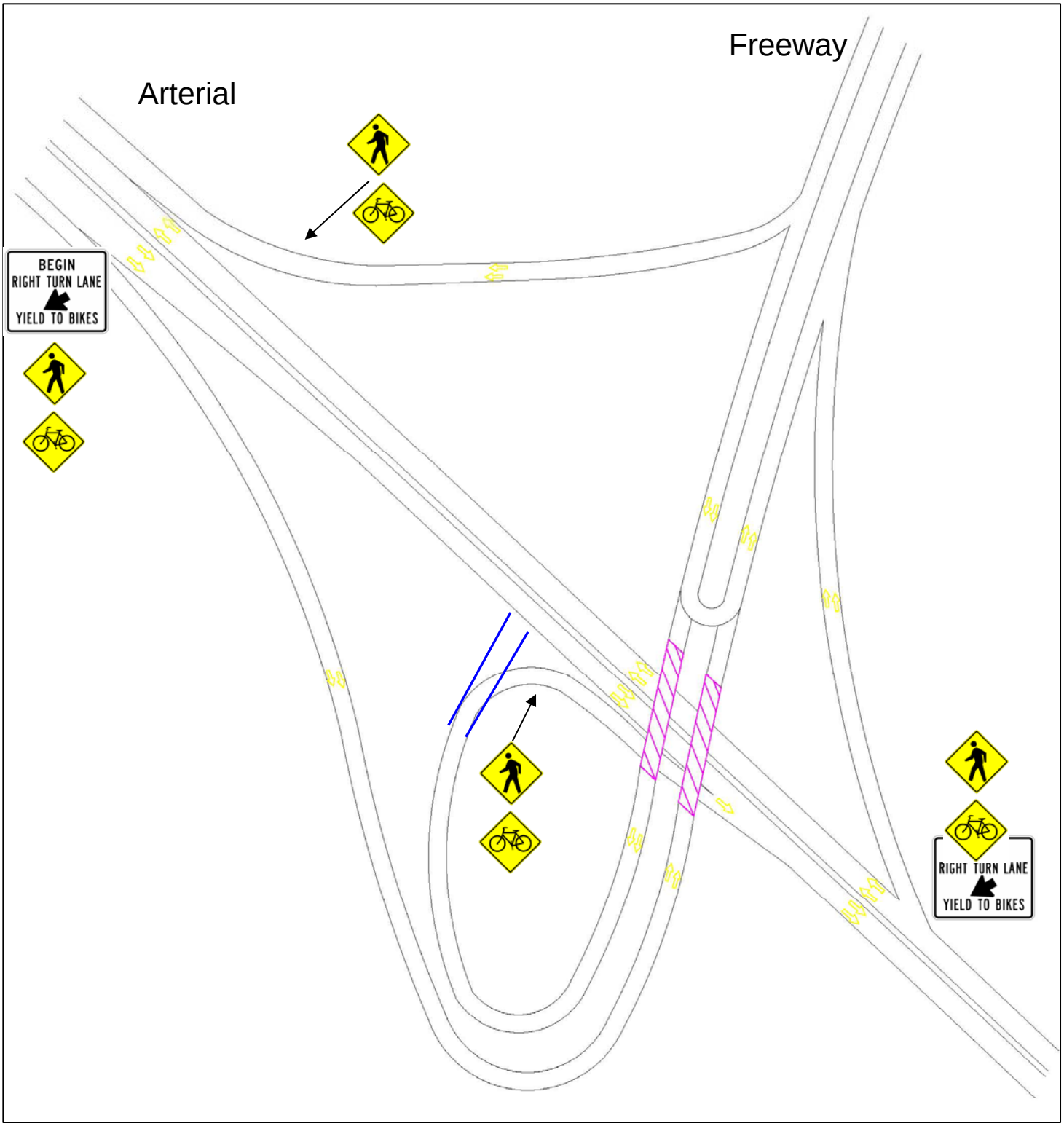
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, determine if a wide curb lane, bicycle lane or shared use path is necessary.
   - A bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping, if space allows.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).

4) Reduction of Conflict Points
   - Where **cloverleafs** exist, the free flow movement can be removed and the ramp will intersect with the arterial at a 90 degree angle.
   - Where free flow entrance or exit ramps exist, the free flow movements can be pulled in to intersect the arterial at a 90 degree angle.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

BACK

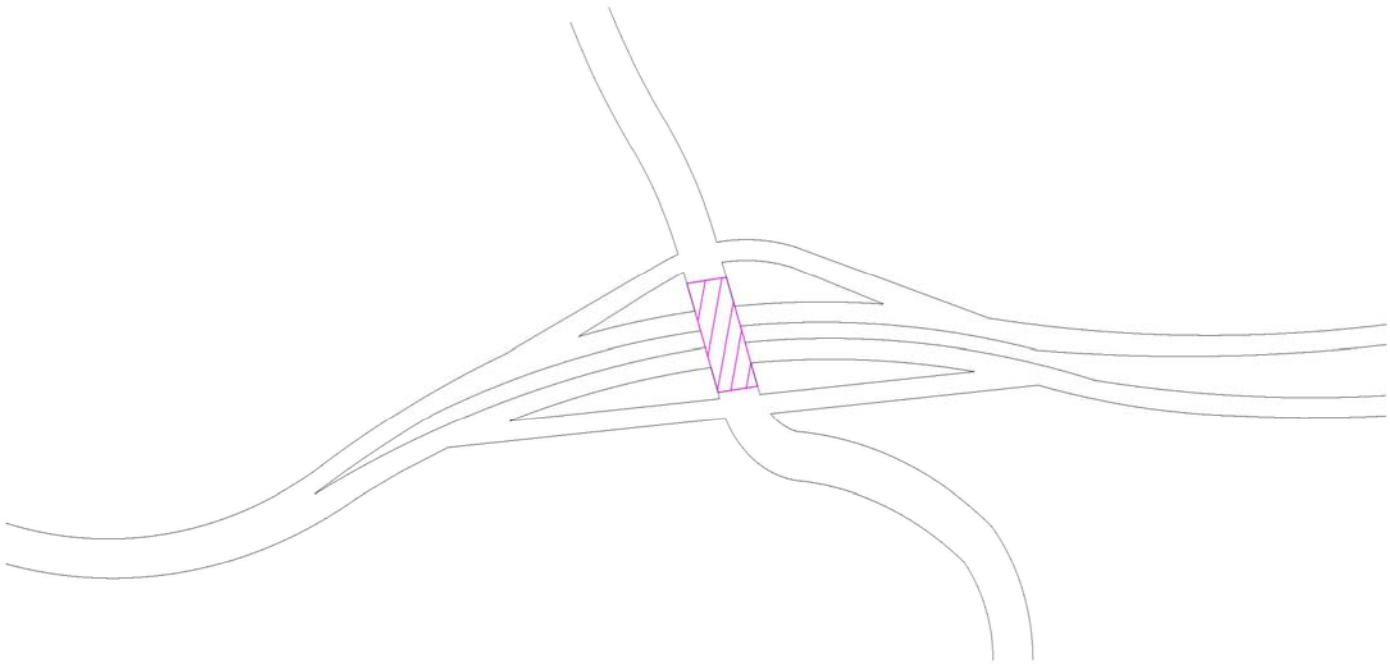
Appropriate Signage for Trumpet Interchange



*The blue lines indicate how the cloverleafs can be brought in to intersect the arterial at 90 degree angles, and reduce conflict points and merging areas.

BACK

Tight Diamond Interchange



Interchange Specific Pedestrian / Bicyclist Challenges:

- Multiple conflict points
- Right-turn and right-turn on red movements

BACK

Tight Diamond Interchange

Proposed Improvement Alternatives:

1) Maintenance and Signage
   - Keep interchange maintained by sweeping curb lanes and shoulders.
   - Trim any trees or bushes that impede sight distance.
   - Place pedestrian and bicycle warning signs at free flow exit ramps (MUTCD W11-1 and W11-2).
   - Place “Begin Right Turn Lane Yield to Bikes” signs prior to entrance ramps (MUTCD R4-4).
   - Place “Stop Here On Red” signs at signals to keep vehicles out of crosswalks, if signals exist. (MUTCD R10-6)
   - Improve lighting if necessary.

2) Sidewalks and Pedestrian Facilities
   - Connect sidewalk through interchange if not present.
   - Add zebra striping to freeway pedestrian ramp crossings.
   - Add pedestrian actuated countdown signals where traffic signals exist.
   - Make necessary changes for ADA compliance.
   - If no sidewalk exists, determine the appropriate treatment (shoulder, sidewalk, or shared use path) based on pedestrian volumes, adjacent land use, and available right of way. Also need to determine if the facility is needed on both sides of the roadway. If 1 side make accommodations for cross over at signalized intersections.
   - If an arterial overpass exists, see **Bridge Treatments**

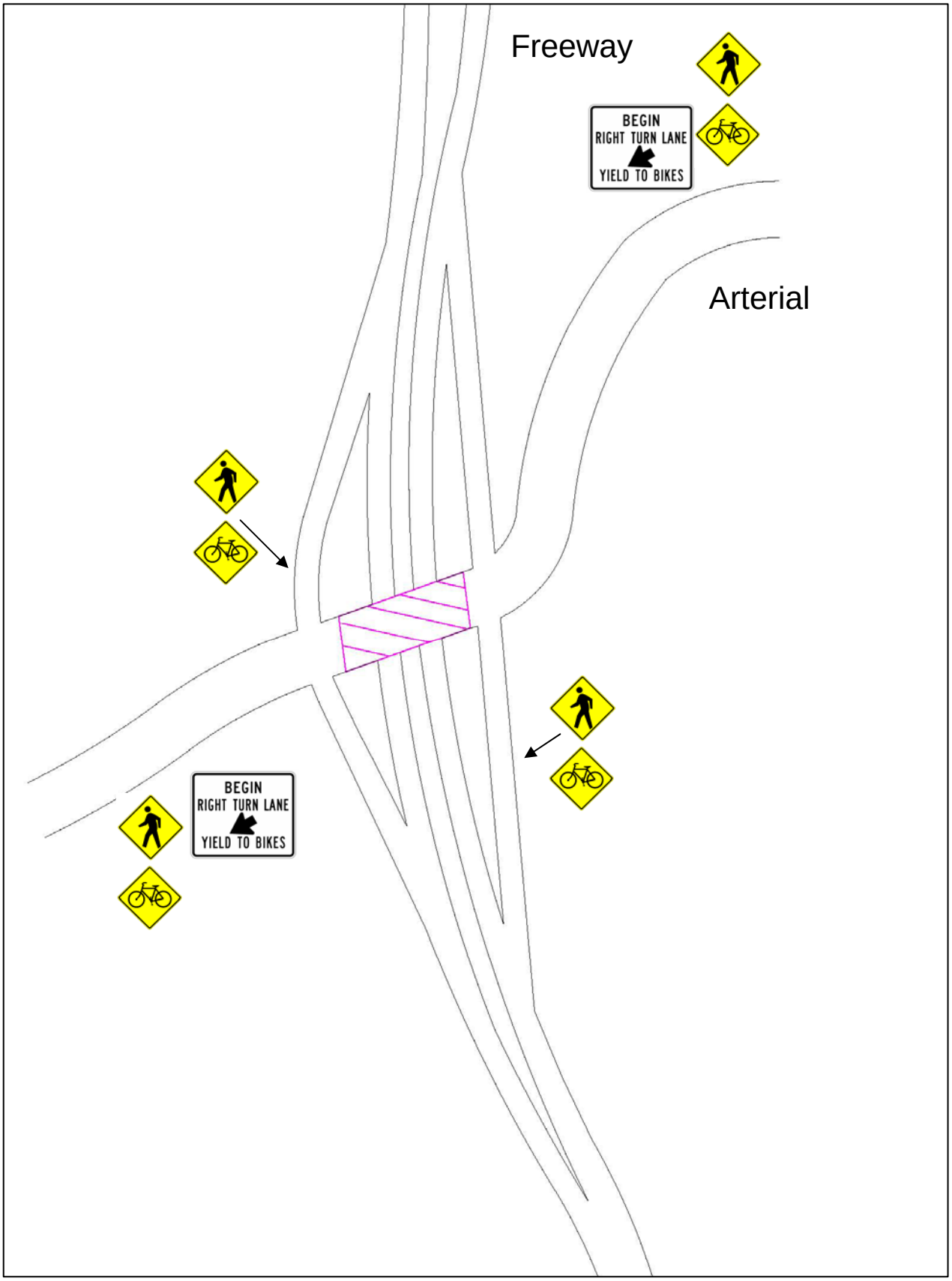
3) Bicycle Facilities
   - If bicycle lanes or a wide curb lane exists on either end of the interchange, continue them through the interchange.
   - If no facilities exist, determine if a wide curb lane, bicycle lane or shared use path is necessary.
   - A bicycle lane or wide curb lane could be added by re-striping, narrowing travel lanes and re-striping, or adding pavement to both sides of the roadway and re-striping, if space allows.
   - Consider using **colored pavements** at conflict points between bicycles and vehicles (merge/diverge areas and ramp crossings).
   - If an arterial overpass exists, see **Bridge Treatments**

4) Reduction of Conflict Points
   - Not applicable because by definition a tight diamond interchange minimizes conflict points.

5) Grade Separation
   - Refer to the ***Florida Pedestrian Facilities Planning and Design Handbook*** for warrants.

BACK

Appropriate Signage for Tight Diamond Interchange



BACK

Electrical Pedestrian Warning Systems

http://www.stopexperts.com/

- Above is an example of a pedestrian warning system. Although it is not MUTCD approved it could be used experimentally, to draw extra attention to pedestrian crossings.

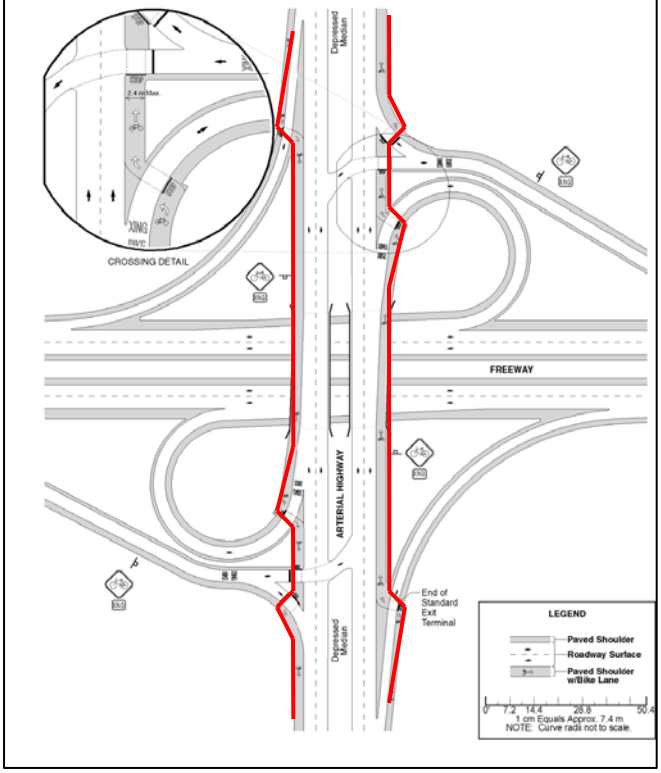
http://www.roadlights.com/content/products/R820C/default.aspx

- The flashing pedestrian beacon shown above is similar to what is approved in the MUTCD and can also be used to draw extra attention to pedestrian crossings.

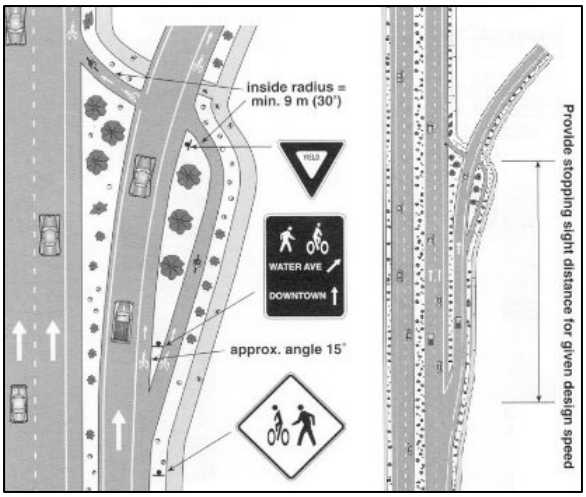
BACK

Crossing of Sidewalks, Bike Lanes, and Shared-Use Paths through Interchanges

Sidewalk Crossing Freeway Ramp

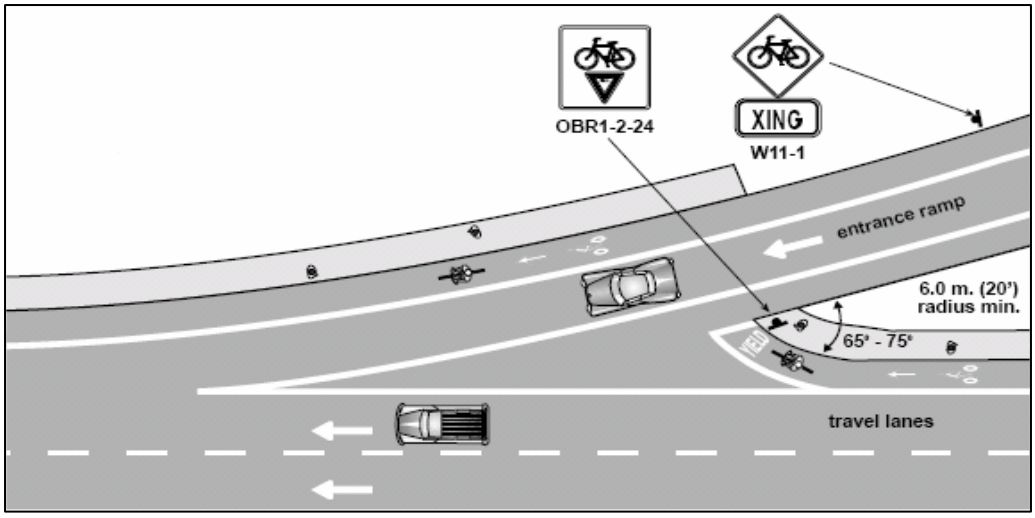


Shared Use Path Crossing Freeway Ramp



- These graphics show 90-degree crossings of freeway ramps which enhance visibility and decrease crossing distance.

Bike Lane Crossing Freeway Ramp



BACK

Bridge Treatments

If possible, continue existing facilities across bridge. If not, consider the following:

For Pedestrians:

- Narrow travel lanes and/or restripe to provide sidewalks or wide curb lanes on both sides of roadway.
- If bridge width does not permit sidewalks or wide curb lanes along both sides, narrow travel lanes, and/or restripe to provide facilities on one side of roadway
- If possible provide a barrier between pedestrians and vehicles

For Bicyclists:

- Narrow travel lanes and/or restripe to allow for bicycle lanes to be carried through on one or both sides of the roadway
- If bicycle lanes are not present on either end of the bridge, bicyclists may share a wide curb lane or sidewalk with pedestrians. If sidewalk is shared bicyclists should dismount and walk across bridge. The sign below should be present.

- If possible provide a barrier between bicyclists and vehicles
- For additional guidance see the following website: http://www.dot.il.gov/desenv/BDE%20Manual/BDE/pdf/chap17.pdf, page 17-2(10). (Or the next page of toolbox.)

  ** Please note that this is not Kentucky State policy but is one example of another state's approach to bicycle design through an interchange.

If the above treatments are not possible, consider a separate bike and pedestrian bridge over interstate

- If the bridge is too narrow to safely accommodate bicyclists and pedestrians over the bridge, and if volumes warrant it, a separate structure should be built to accommodate them.

BACK

Bridge Treatments from Illinois BDE Manual

17-2.01(e) Bikeway on Highway Structures

Bicycle accommodations on approach roadways should be carried across structures. The width of new highway structures should, at a minimum, equal the width of the traveled way plus the width of approaching bicycle lanes and/or sidewalks. Minimum cross sections for roadways and structures will vary significantly depending on the type of bicycle facility being accommodated. Several examples of minimum cross sections for shared roadways, bicycle lanes and bicycle paths are shown in Figures 17-2J through 17-2L. In addition, the criteria for accommodating bikeways at or near bridges along freeways and expressways are illustrated in Figure 17-2M. Figure 17-2N presents a typical modification of existing facilities for bikeways under a bridge.

Where it is necessary to retrofit a separated bicycle path (see Section 17-2.02) onto an existing highway bridge, several alternatives should be considered in light of what the geometrics of the bridge will allow. One option is to carry the bicycle path across one side of the structure. This should be considered where:

- the bridge facility will connect to a bicycle path at both ends,
- sufficient width exists on that side of the bridge or can be obtained by widening or restriping lanes, and
- provisions are made to physically separate bicycle traffic from motor vehicle traffic.

Another option is to use existing sidewalks as one-way or two-way facilities. This may be advisable where:

- conflicts between bicyclists and pedestrians will not exceed tolerable limits, and
- the existing sidewalks are adequately wide.

If the facility cannot provide adequate accommodation (per widths indicated in this section), appropriately sign the facility to warn users of the deficiencies or require bicyclist to dismount and cross the structure as a pedestrian. Section 17-2.02(i) provides additional design guidance for structures on bicycle paths. The AASHTO *Bridge Manual* specifies a 4’-6” (1.4 m) outside railing height. Design on-road bicycle accommodations accordingly. Bridge railing on off-road-shared-use paths must meet a 3’-6” (1.1 m) minimum rail height requirement.

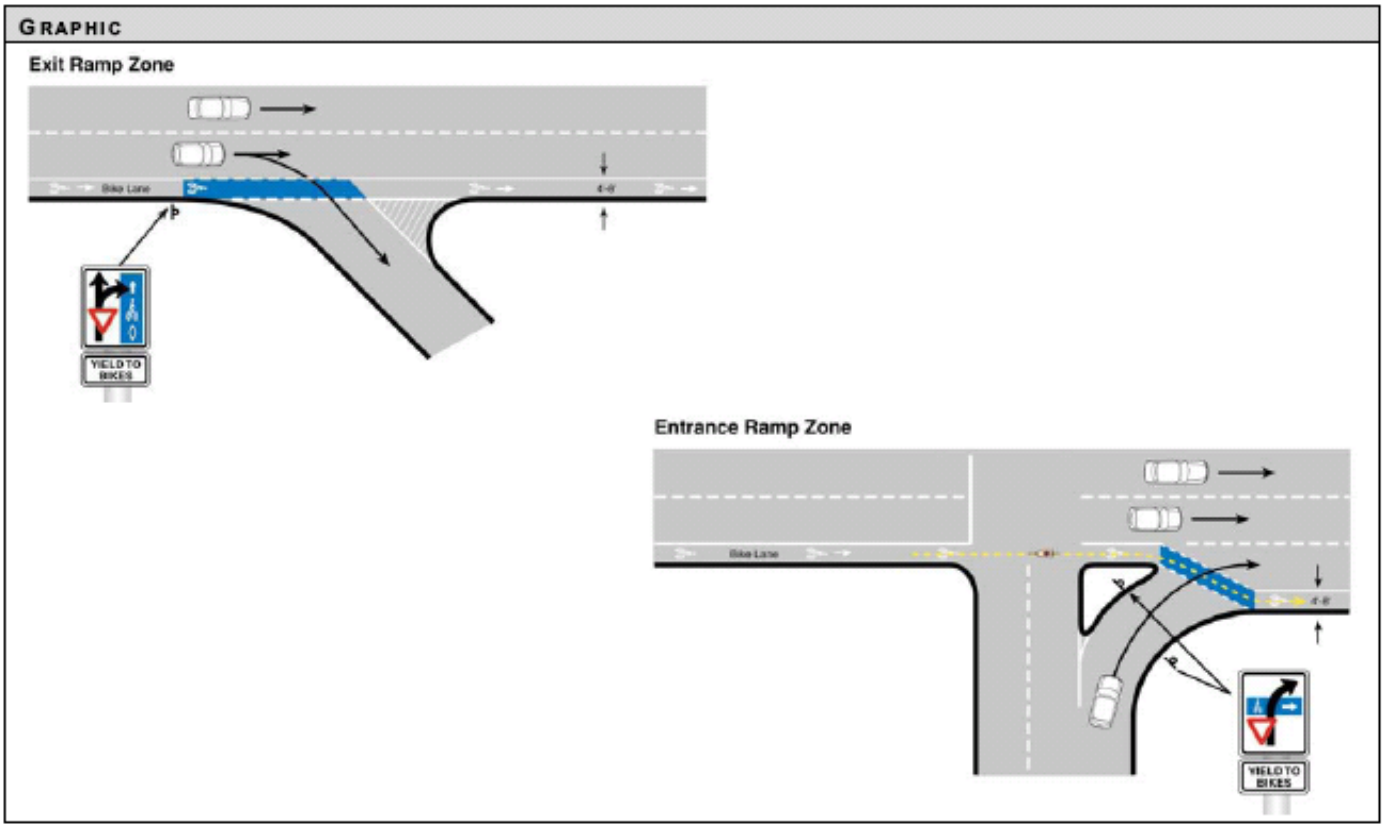
Where bridge projects include bikeway or sidewalk accommodations, the approaches to the structure should ensure a usable facility by continuing the accommodation to logical termini.

17-2(10) Bureau of Design and Environment Manual. Illinois Department of Transportation. 2002. 22 Aug. 2007 <http://www.dot.il.gov/desenv/bdemanual.html>.

BACK

Colored Pavement Treatments

- The figure below shows an example of using experimental colored pavement treatments to alert bicyclists and drivers to a potential conflict area. (This treatment is experimental because it is not in the current MUTCD.



Innovative Bicycle Treatments. Institute of Transportation Engineers. 2003. 22 Aug. 2007 <http://www.ite.org/education/IBT/StudentSuppIBT.pdf>.

BACK

Florida Pedestrian Facilities Planning and Design Handbook – Warrants for Grade Separation

1. The hourly pedestrian volume should be more than 300 in the four highest continuous hour periods if the vehicle speed is more than 65 km/h (40 mph) and the proposed sites are in urban areas and not over or under a freeway. Otherwise, the pedestrian volume should be more than 100 pedestrians in the four highest continuous hour periods.

2. Vehicle volume should be more than 10,000 in the same four-hour period used for the pedestrian volume warrant or have an ADT greater than 35,000 if vehicle speed is over 65 km/h (40 mph) and the proposed site(s) are in urban areas. If these two conditions are not met, the vehicle volume should be more than 7,500 in the four hours or have an ADT greater than 25,000.

3. The proposed site should be at least 183 m (600 ft) from the nearest alternative safe crossing. A safe crossing is defined as a location where a traffic control device stops vehicles to create adequate gaps for pedestrians to cross. Another safe crossing is an existing overpass or underpass near the proposed facility.

4. A physical barrier is desirable to prohibit at-grade crossing of the roadway as part of the overpass or underpass design plan.

5. Artificial lighting should be provided to reduce potential crime against users of the underpasses or overpasses. It may be appropriate to light underpasses 24 hours a day and overpasses at nighttime.

6. Topography of the proposed site should be such as to minimize changes in elevation for users of overpasses and underpasses and to help ensure that construction costs are not excessive. Elevation change is a factor that affects the convenience of users.

7. A specific need may exist for a grade-separated crossing based on the existing or proposed land use(s) adjoining the proposed development site that generates pedestrian trips. This land use should have a direct access to the grade separated facility.

8. Funding for construction of the pedestrian overpass or underpass must be available prior to a commitment to construct it.

Florida Pedestrian Facilities Planning and Design Handbook. Florida Department of Transportation. 1999. 22 Aug. 2007 <http://www.dot.state.fl.us/safety/ped_bike/ped_bike_standards.htm#Florida%20Bike%20Handbook>.

BACK

FIELD MEASURING

1) Obtain aerial photographs (if not already obtained).

2) Review the Kentucky Transportation Cabinet's Highway Design Manual, Section HD-1502 *Guidelines for Pedestrian and Bicycle Accommodations* (http://transportation.ky.gov/design/designmanual/chapters/18Chapter%201500%20AS%20PRINTED%202006.pdf)

3) Take conceptual plans and visit interchange site.

4) Compare to KYTC Highway Design Manual guidelines.

5) Complete evaluation survey (below) to determine if the proposed treatments are feasible at this interchange.

FIELD EVALUATION SURVEY			
1	Is the area on either side of the interchange developed or developing?	☐ YES	☐ NO
2	Is the interchange along the path of an existing or proposed bicycle or pedestrian route?	☐ YES	☐ NO
3	Does right-of-way exist to make changes?	☐ YES	☐ NO

Recommendation:

_____

_____

_____

If the proposed treatments are not recommended, re-visit "5 Step Checklist" and select different treatment.

BACK

TRAFFIC ANALYSIS

1) Collect additional traffic data including any turning movement volumes (if not available from the INVENTORY step).

2) Perform existing highway level of service, delay, and queue length analysis using data compiled from the INVENTORY step (if not already completed).

3) Calculate the existing pedestrian level of service (as outlined in the Highway Capacity Manual 2000) if pedestrian facilities are recommended.

4) Calculate the existing bicycle level of service (as outlined in the Highway Capacity Manual 2000) if bicycle facilities are recommended.

5) Calculate new highway, pedestrian, and bicycle levels of service based on the proposed improvements.

6) Compare the impact (changes in level of service) for each mode and determine if the change in highway level of service is acceptable given the changes in either (or both) pedestrian and bicycle level of service.

Recommendation:

_____

_____

_____

If the proposed treatments are not recommended, re-visit "5 Step Checklist" and select different treatment.

BACK

KIPDA INTERCHANGES
CONSTRUCTION QUANTITIES AND ESTIMATED COSTS

ITEM	ITEM NUMBER	UNIT	UNIT PRICE
DGA BASE	00001	TON	$30.00
CRUSHED STONE BASE	00003	TON	$32.00
LIME STABILIZED ROADBED	00013	SQYD	$7.00
LIME STABILIZED ROADBED	00013	SQYD	$7.00
CL2 ASPH BASE 1.00 PG64-22	00212	TON	$85.00
CL2 ASPH SURF 0.38D PG64-22	00301	TON	$85.00
STANDARD HEADER CURB	01875	LF	$23.16
ROADWAY EXCAVATION	02200	CUYD	$5.00
SIGNS (R10-6)	02562	SQFT	$9.08
SIGNS (R4-4)	02562	SQFT	$9.08
SIGNS (W11-1)	02562	SQFT	$9.08
SIGNS (W11-2)	02562	SQFT	$9.08
FABRIC-GEOTEXTILE TYPE IV	02599	SQYD	$2.97
ASPH PAVE MILLING & TEXTURING	02677	TON	$85.18
SIDEWALK-4 INCH CONCRETE	02720	SQYD	$50.00
SIDEWALK RAMP TYPE 1	03287	EACH	$1,740.93
POLE 30 FT MTG HT	04700	EACH	$957.15
BRACKET 12 FT	04724	EACH	$304.80
BRACKET 15 FT	04725	EACH	$512.90
POLE BASE	04740	EACH	$723.53
TRANSFORMER BASE	04750	EACH	$297.48
HPS LUMINAIRE	04770	EACH	$318.72
FUSED CONNECTOR KIT	04780	EACH	$7.44
CONDUIT-1 1/4 INCH	04793	LF	$7.40
JUNCTION BOX TYPE B	04811	EACH	$382.25
TRENCHING AND BACKFILLING	04820	LF	$9.15
WIRE-NO. 8	04833	LF	$1.76
SIGNAL-PEDESTRIAN	04916	EACH	$757.00
STEEL POST TYPE 2	06411	LF	$6.60
PAVE STRIPING-PERM PAINT-4 IN	06514	LF	$0.58
PAVE STRIPING-DUR TY 1-12 IN W	06560	LF	$5.92
PAVE MARKING-THERMO STOP BAR-24IN	06568	LF	$7.80
15' WIDE PEDESTRIAN BRIDGE	---	SF	$85.00
8' WIDE PEDESTRIAN BRIDGE RAMPS	---	SF	$85.00
BRIDGE WIDENING	---	SF	$100.00
GREENWAY FACILITY BRIDGE	---	SF	$100.00
PEDESTRIAN WARNING SYSTEM	---	EACH	$30,000.00

Note: Prices are in 2007 dollars.

BACK

KIPDA INTERCHANGES
CONSTRUCTION QUANTITIES AND ESTIMATED COSTS

ITEM	UNIT	UNIT PRICE	UNIT PRICE (+25%)
LIGHT	EACH	$7,569	$9,470
MULTIUSE PATH	LF	$28	$40
PEDESTRIAN SIGNAL	EACH	$757	$950
PEDESTRIAN WARNING SYSTEM	EACH	$30,000	$37,500
RAMP (28' WIDE)	LF	$305	$390
ROADWAY WIDENING WITH CURB	SQYD	$145	$190
SIGNS			
BEGIN RIGHT TURN LANE YIELD TO BIKES (R4-4)	EACH	$151	$190
STOP HERE ON RED (R10-6)	EACH	$137	$180
BICYCLE WARNING (W11-1)	EACH	$119	$150
PEDESTRIAN CROSSING (W11-2)	EACH	$119	$150
SIDEWALK			
SIDEWALK	LF	$28	$40
SIDEWALK RAMP	EACH	$1,740	$2,180

Note: Prices are in 2007 dollars.

BACK