Directory of 85 Four-Legged Grade-Separated Intersection Concepts

Joseph E. Hummer, PhD, PE, State Traffic Management Engineer
919-814-5040, jehummer@ncdot.gov
Mobility and Safety Division
North Carolina Department of Transportation
750 North Greenfield Parkway, Garner, NC 27529

Trevor Darnell, Senior Assistant District Engineer, Division 5, NCDOT
Aidan D. Burnside, MSTA Engineer 1, NCDOT

And
Jonathan Reid, Vice President, Transportation Practice Lead
Arcadis G&M of North Carolina, Inc.

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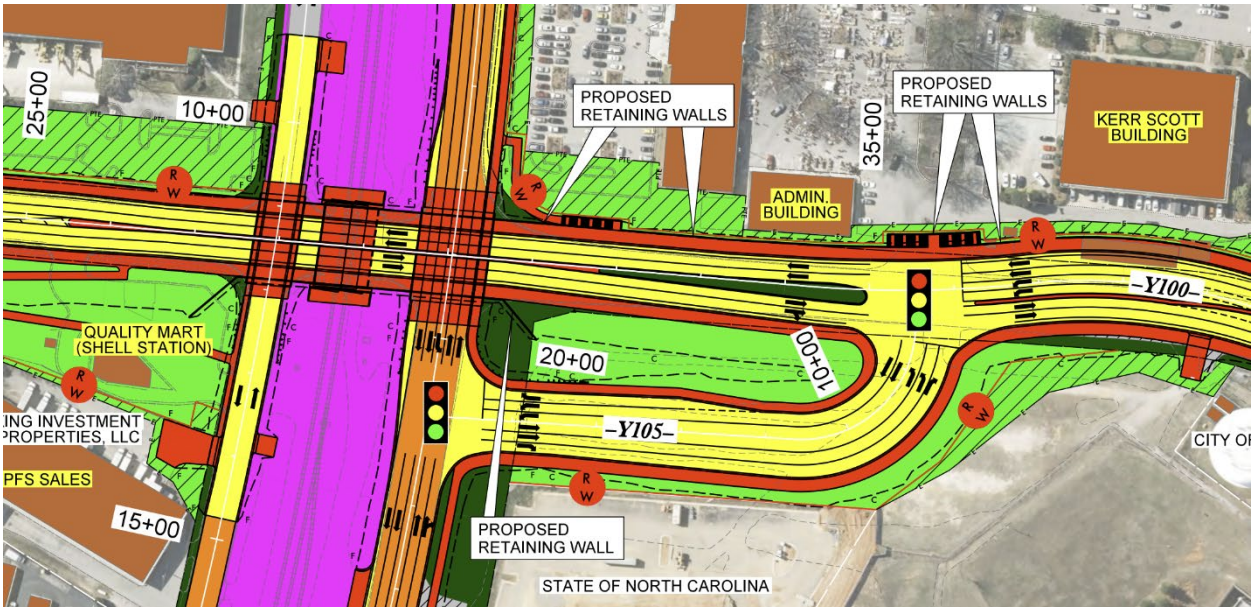

Contents

Contents, Continued.

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Introduction

This Directory shows and describes 85 different grade-separated intersection concepts. A grade-separated intersection is the meeting of two non-freeways that uses a bridge to aid in the performance of the junction. There are about 200 grade-separated intersections in North Carolina and more are under development.

Our objective for this Directory was to provide planners, designers, traffic engineers, and all members of project teams with a look at the wide range of possibilities in the event that they are installing or retrofitting a grade-separated intersection. Most grade-separated intersections in service now in North Carolina, and likely across most of the US, are standard diamonds or other common interchange forms. However, grade-separated intersections are not interchanges, and in the experience of the authors those interchanges often perform poorly in the intersection context. Project teams should think about a wider range of possibilities.

The scope of this Directory is limited in several important ways. The Directory only covers concepts with four approaches. In the field almost always the bridge is deployed to carry the through movements of one roadway over the through movements of the other roadway, and this Directory only covers those types of concepts. The Directory does not include any concepts with three levels. Consistent with the idea that neither road is a freeway, the authors also assumed that all turns onto an arterial would be signal-controlled rather than merges.

This Directory is certainly not comprehensive, in the sense that it cannot and does not include all possible grade-separated intersection concepts. Our hope was to include most reasonable and feasible concepts, but we are sure that there are many more that are not included. Project teams should take the time to explore, create, and sketch before landing on a concept that will cost a lot of money, cause a lot of impacts, and be expected to serve for many decades.

Explanation of the Numbers, Names, and Key Assumptions

Numbers

- Every concept has a unique number and name.
- The first digit of the number refers to the number of loop ramps that connect the two roads.
- The second digit of the number refers to the number of direct ramps that connect the two roads.
- The digits following the dash provide a sequential identifying number.

Name

- If the concept previously has a unique name, published or commonly known within the profession, we use that.
- If the concept did not already have a unique name, we created a name using one or more descriptors of the style of the ramps. The descriptors often start with a term for the overall look, then one or more descriptors for the type of entrances to the ramps, then one or more descriptors for the types of ramp terminals.
- For example, the concept number and name "11-04, One quadrant, roundabout, u-turn" describes a junction with one loop ramp and one direct ramp in the same quadrant in which one ramp terminal has a roundabout and the other ramp terminal has a u-turn crossover.

Key Assumptions

To fairly compute the score for each design we made a number of assumptions. The most important of these included:

- Keeping the dimensions equivalent. For example, it was always 300 feet from the center of the bridge to the begin or end of a loop ramp, 350 feet from the center of the bridge to the begin or end of a direct ramp, 600 feet from a ramp terminal to a u-turn crossover, etc.
- All ramp terminals, leftovers, CFI crossovers, and u-turn crossovers were signalized.
- Each through movement had two lanes and each turning movement had one lane (up to a maximum of two turning lanes in a direction at any signal). Each exclusive turn lane was 500 feet long.
- Note that mirror images of some of the concepts might be helpful in some contexts and would likely score just like the concept shown in this Directory.
- The sketches generally show the more major of the two roadways to be up and down the page and the more minor roadway to be across the page but there are many exceptions.

Grade-Separated Intersection Scoring Criteria

We judged grade-separated intersections using 12 categories, including three travel efficiency categories, five safety categories, and four cost categories. Within each category we used a scale of zero to five points, with zero representing the poorest quality of service and five representing the best. We judged generic sketches with standard dimensions. To establish rankings in the event of a tied total score, we developed a secondary numerical value based on the magnitude each design achieved in each of the 12 categories.

Efficiency

Capacity

5) Arterial annual average daily traffic (AADT) at capacity, vehicles per day (vpd) = 40000 or higher
4) Arterial AADT at capacity = 36000 to 39999 vpd
3) Arterial AADT at capacity = 32000 to 35999 vpd
2) Arterial AADT at capacity = 28000 to 31999 vpd
1) Arterial AADT at capacity = 24000 to 27999 vpd
0) Arterial AADT at capacity = 23999 vpd or lower

Quality of Progression

5) No full signals
4) One full signal with two phases on one road, none on the other road
3) One full signal with three or more phases on one road, none on the other road
2) Two or more full signals on one road, none on the other road
1) One full signal on each road
0) Two or more full signals on one road with one or more full signals on the other road

A roundabout on one road subtracts one point from the score; a roundabout on both roads subtracts two points from the score.

Extra Distance Travelled

5) Total = 2000 ft or lower
4) Total = 2001 to 3000 ft
3) Total = 3001 to 4000 ft
2) Total = 4001 to 5000 ft
1) Total = 5001 to 6000 ft
0) Total = 6001 ft or higher

Safety

Wrong Way Prevention

5) Five “no” values
4) Four “no” values
3) Three “no” values
2) Two “no” values
1) One “no” values
0) Zero “no” values

Score is based on yes or no answers to five questions. A “no” answer is good. The questions include whether there is a median opening in front of a ramp terminal, whether a ramp terminal forms an acute angle with the cross street, whether a left turn lane develops prior to a ramp terminal, whether the design is unfamiliar, and whether there are more than four ramps.

Unusual Maneuvers Required of Drivers

5) Total = 0
4) Total = 1 or 2
3) Total = 3 or 4
2) Total = 5 or 6
1) Total = 7 or 8
0) Total = 9 or more

An unusual maneuver occurs when a driver wishing to make a left turn has to turn right when faced with a choice, or vice versa.

Conflict Points

5) Weighted total = 14 or lower
4) Weighted total = 15 to 18
3) Weighted total = 19 to 22
2) Weighted total = 23 to 26
1) Weighted total = 27 to 30
0) Weighted total = 31 or higher

Pedestrian Quality

5) Weighted total number of crossings = 4 or lower
4) Weighted total = 5 to 6
3) Weighted total = 7 to 8
2) Weighted total = 9 to 10
1) Weighted total = 11 to 12
0) Weighted total = 13 or higher

Subtract one point for any design that causes pedestrians to have to walk more than 500 feet longer than the straight line distance. Yield control scores the same as signal control.

Speed Control
5) Two or more speed control elements (curves or half signals) on both roadways
4) Two or more elements on one roadway with one element on the other roadway
3) One element on both roadways
2) Two or more elements on one roadway with no elements on the other roadway
1) One element on one roadway with no elements on the other roadway
0) No speed control elements on either roadway

Cost

Bridge Size
5) Total = 6,000 sf or lower
4) Total = 6,001 to 7,000 sf
3) Total = 7,001 to 8,000 sf
2) Total = 8,001 to 9,000 sf
1) Total = 9,001 to 10,000 sf
0) Total = 10,001 sf or higher

If a concept had an “L” or “+” shaped bridge it scored a zero in this category due to the difficulty in building such a bridge while maintaining traffic.

Right of Way
5) Total = 280,000 sf or lower
4) Total = 280,001 to 360,000 sf
3) Total = 360,001 to 440,000 sf
2) Total = 440,001 to 520,000 sf
1) Total = 520,001 to 600,000 sf
0) Total = 600,001 sf or higher

Extent Along Roadways
5) Total = 1000 ft or lower
4) Total = 1001 to 1500 ft
3) Total = 1501 to 2000 ft
2) Total = 2001 to 2500 ft
1) Total = 2501 to 3000 ft
0) Total = 3001 ft or higher

Right of Way Flexibility
5) 3 vacant quadrants
4) 2 vacant quadrants and one quadrant with smaller (loop) ramp
3) 2 vacant quadrants
2) 1 vacant quadrant and one quadrant with smaller (loop) ramp
1) 1 vacant quadrant
0) 0 vacant quadrants

Top Performing Grade-Separated Intersections

Top total scores

Rank	Number	Name	Score	Page
1	11-13	One quadrant, roundabout, roundabout	45	63
2	11-15	One quadrant, roundabout, u-turn	43	65
3	02-01	Echelon	41	13
3	22-01	Diagonal, contraflow	41	82
3	22-02	Diagonal, leftover	41	83
6	12-01	Right turn ramp diagonal, roundabout	40	69
6	11-18	One quadrant, u-turn, u-turn	40	68
8	00-01	Center turn overpass	39	12
8	04-21	Two-level signalized	39	49
8	04-10	Single roundabout	39	38
8	11-14	One quadrant, roundabout, three-phase	39	64

Top efficiency scores

Rank	Number	Name	Score	Page
1	04-14	Top and bottom different, CFI, single point	15	42
1	04-16	Top and bottom different, contraflow, single point	15	44
1	04-21	Two-level signalized	15	49
4	04-03	Eyler design	14	31
4	04-13	Top and bottom different, CFI, contraflow	14	41
4	04-19	Top and bottom same, CFI	14	47
4	04-20	Top and bottom same, contraflow	14	48
8	02-01	Echelon	13	13
8	04-04	Four leftovers	13	32
8	04-15	Top and bottom different, contraflow, leftover	13	43
8	04-17	Top and bottom different, one CFI	13	45
8	04-18	Top and bottom different, two CFIs	13	46

Top safety scores

Rank	Number	Name	Score	Page
1	04-21	Two-level signalized	20	49
2	04-02	Double roundabout	19	30
2	04-03	Eyler design	19	31
2	04-04	Four leftovers	19	32
5	03-06	U-turn	18	28
5	04-10	Single roundabout	18	38
5	04-15	Top and bottom different, contraflow, leftover	18	43
5	04-16	Top and bottom different, contraflow, single point	18	44
5	04-17	Top and bottom different, one CFI	18	45
5	04-18	Top and bottom different, two CFIs	18	46
5	04-20	Top and bottom same, contraflow	18	48
5	11-13	One quadrant, roundabout, roundabout	18	63

Top cost scores

Rank	Number	Name	Score	Page
1	11-13	One quadrant, roundabout, roundabout	19	63
1	11-14	One quadrant, roundabout, three-phase	19	64
1	11-15	One quadrant, roundabout, u-turn	19	65
1	11-16	One quadrant, three-phase, three-phase	19	66
1	11-17	One quadrant, three-phase, u-turn	19	67
6	11-10	One quadrant, CFI, roundabout	18	60
6	11-11	One quadrant, CFI, three-phase	18	61
8	11-01	Diagonal, left, left	16	51
8	11-18	One quadrant, u-turn, u-turn	16	68

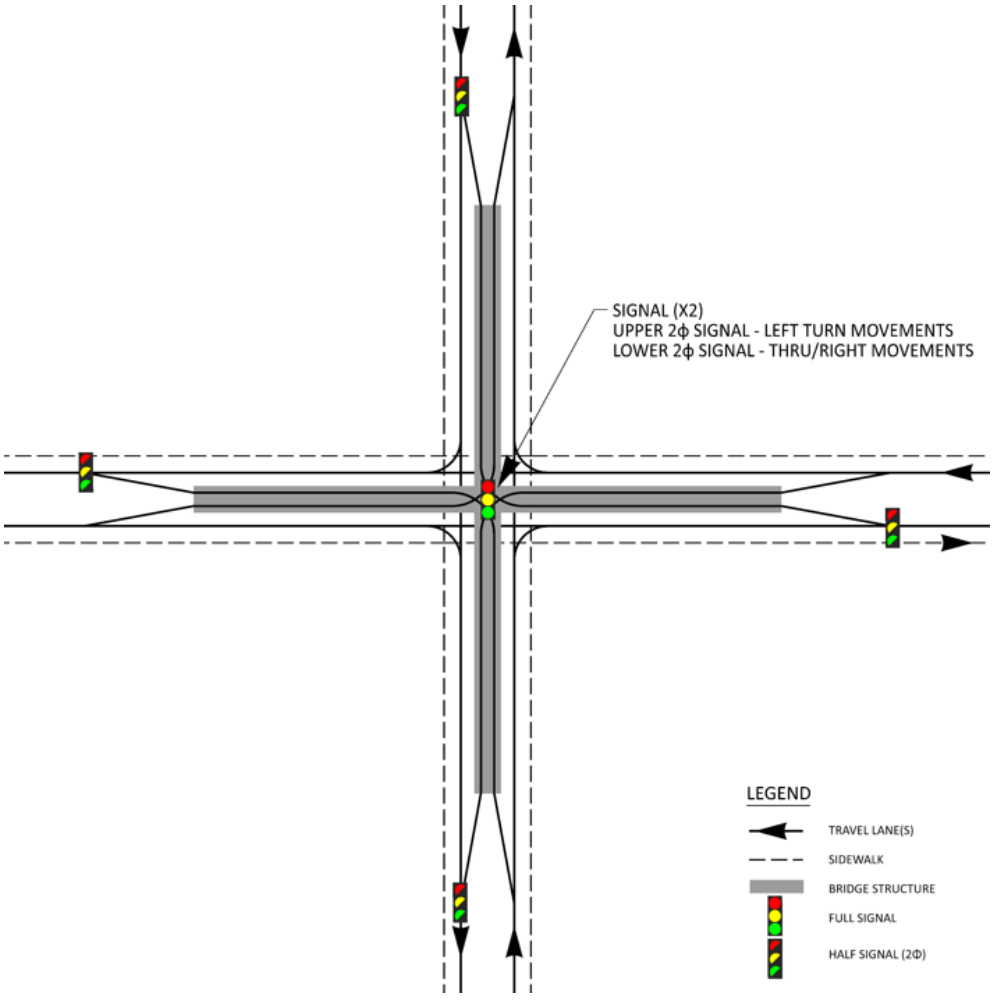
Common concepts

Overall Rank	Number	Name	Score	Page
10	04-10	Single roundabout	39	38
19	04-02	Double roundabout	36	30
41	11-16	One quadrant, three-phase, three-phase	34	66
46	24-04	Parclo B	33	93
58	44-01	Cloverleaf	31	96
74	22-03	Parclo AB	29	84
78	04-09	Single point	27	37
79	04-12	Tight diamond	27	40
82	24-03	Parclo A	26	92
83	04-11	Standard diamond	25	39

Concepts
00-01, Center turn overpass

Summary: Generally good efficiency, safety, and cost scores with three notable weaknesses, including poor progression potential, a relatively large number of conflict points, and a large bridge. It may be difficult to build while maintaining traffic.
History: Invented and patented over 20 years ago. Several agencies have studied it but it was never built to our knowledge. The design may still be patented.
Rank: 8 of 85.

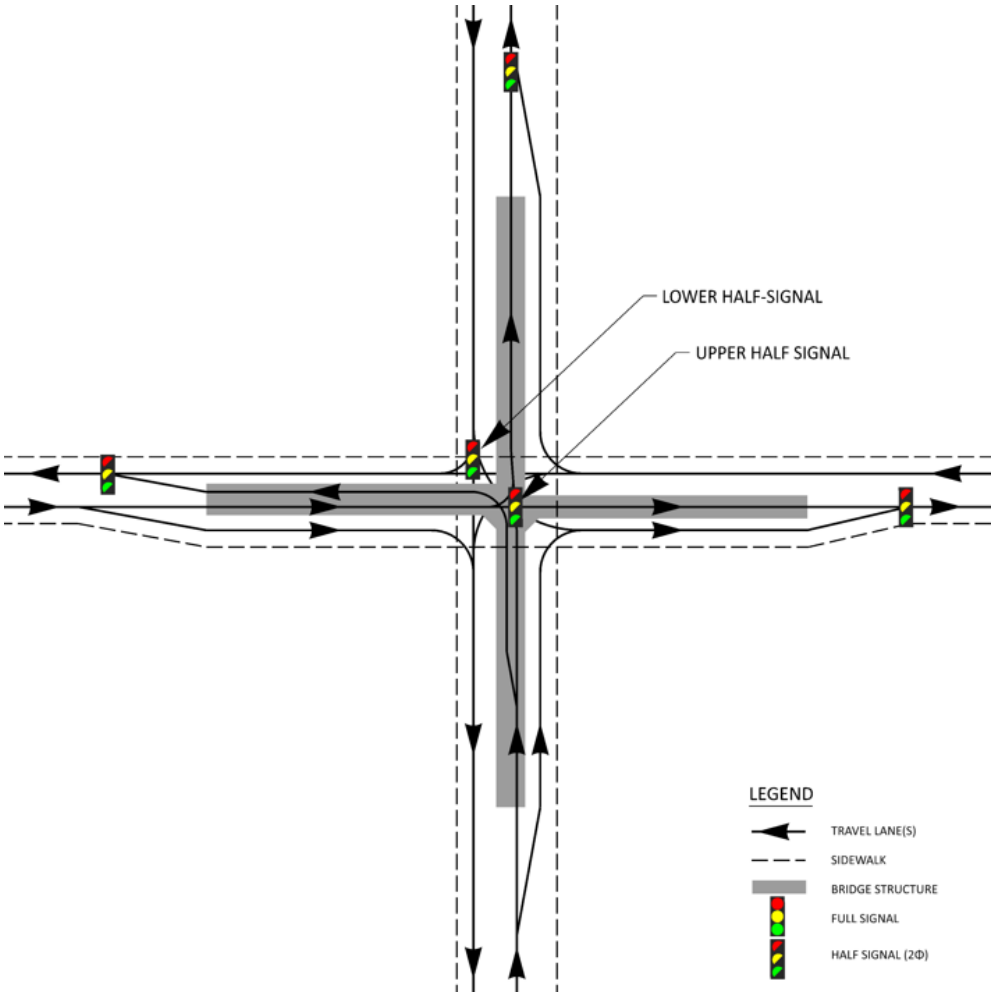
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	1	5	0	5	2	5	3	0	5	5	5	9	15	15	39



02-01, Echelon

Summary: Performed superbly for efficiency and generally good on the safety measures. The major apparent weakness is the bridge size and maintenance of traffic during bridge construction.
History: This design was published in 1999 by Miller and Vargas. We believe the only one to be built was a hybrid that opened in the late-1990s in Adventura, FL. Later, a patent was granted and may or may not be enforceable.
Rank: 3 of 85.

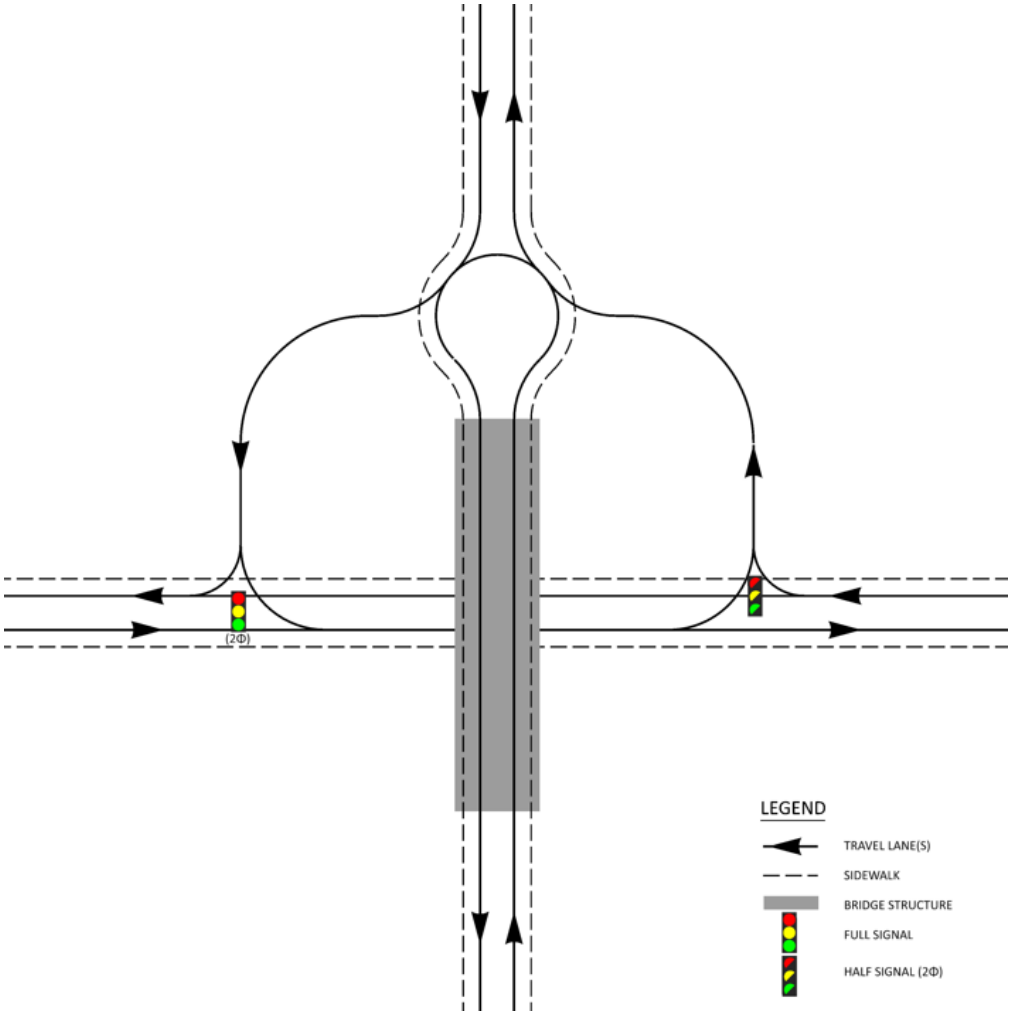
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	5	2	5	3	2	5	0	4	4	3	13	17	11	41



02-02, Left, roundabout

Summary: Performs relatively well on cost and impact measures but struggles for efficiency. May be competitive in locations with lower demands.
History: This is a new design.
Rank: 33 of 85.

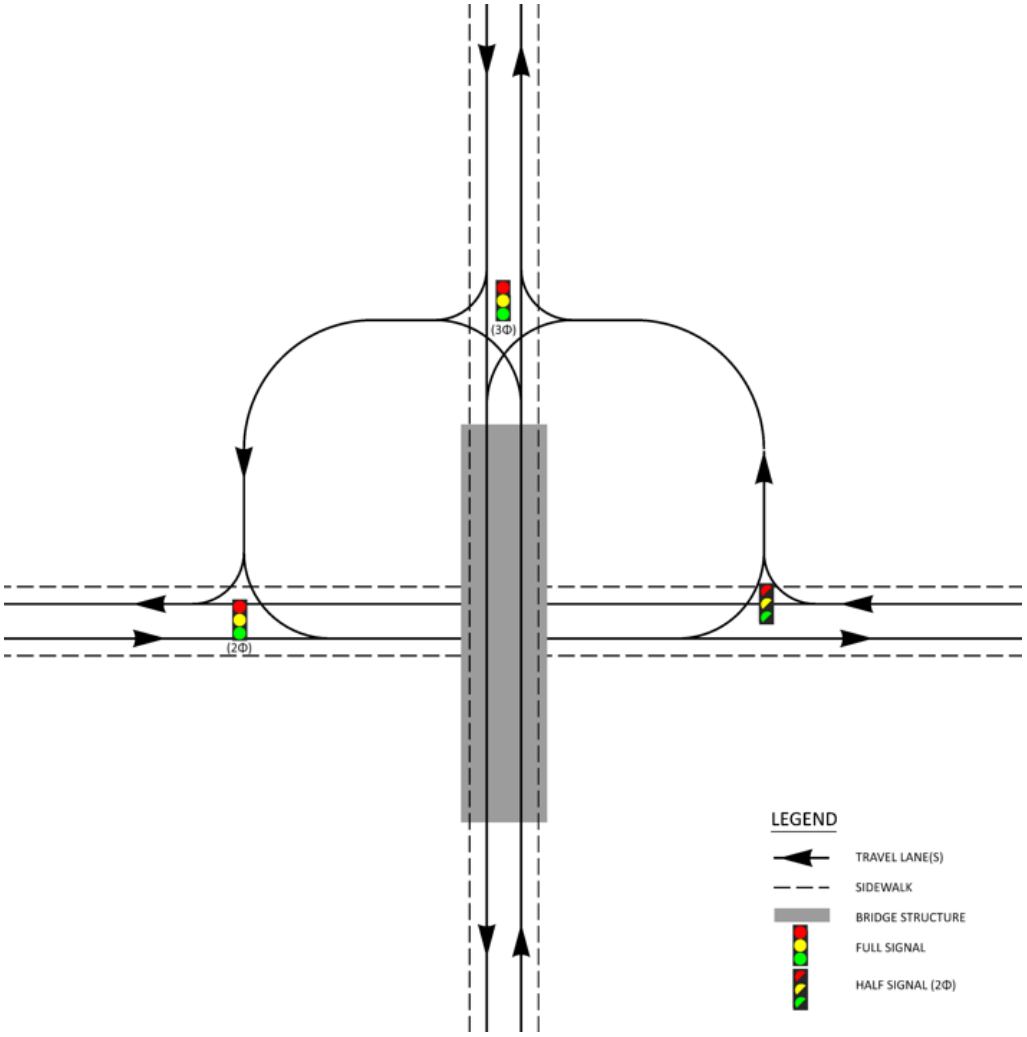
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	3	2	5	1	3	4	1	4	5	3	3	6	14	15	35



02-03, Left, three-phase

Summary: Has a couple of strong features, including pedestrian quality and right of way size, but struggles for efficiency and has some other weaknesses.
History: This is a new design.
Rank: 76 of 85.

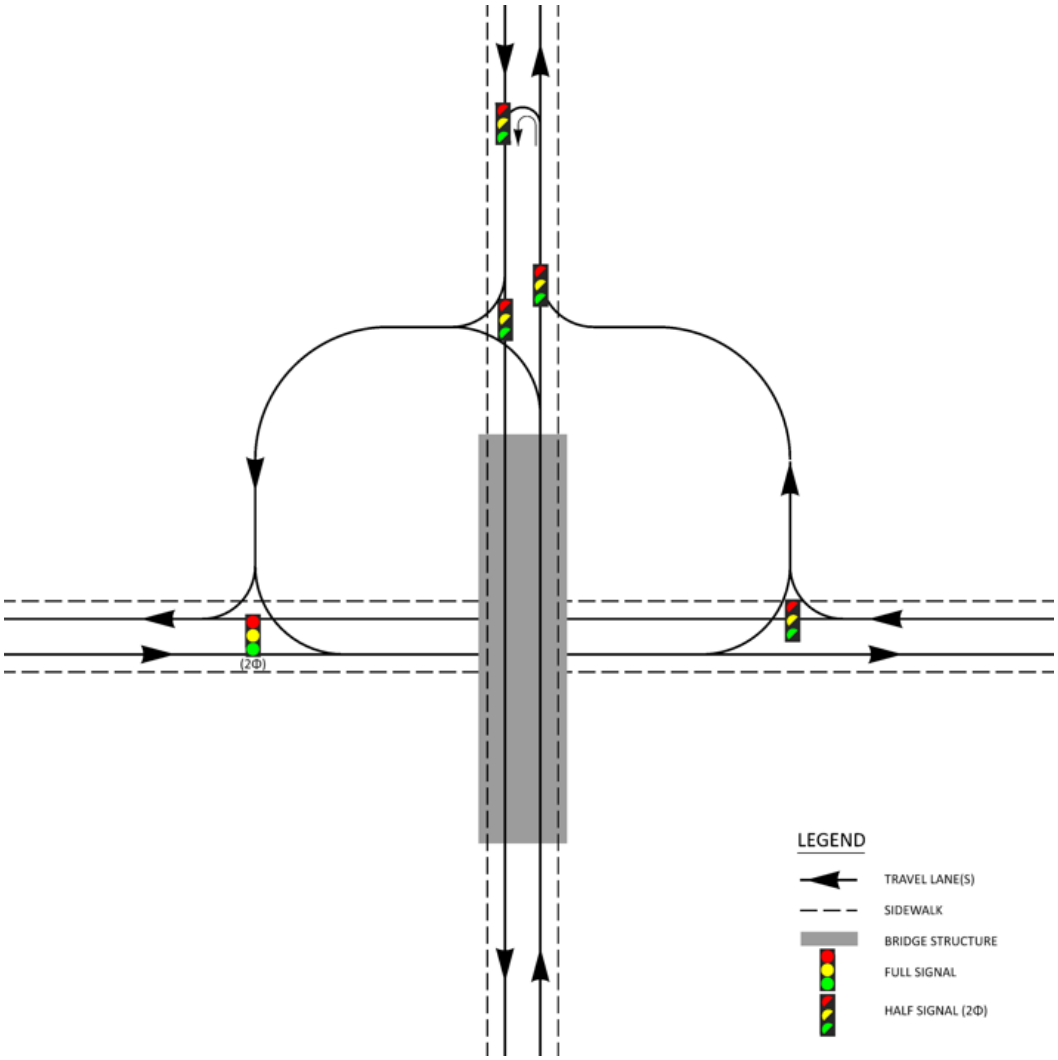
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	1	2	3	1	2	5	0	1	5	4	3	5	11	13	29



02-04, Left, u-turn

Summary: Has a couple of strong features, including pedestrian quality and right of way size, but struggles for efficiency and has some other weaknesses. Just a bit stronger in efficiency and safety than the same concept with a three-phase signal.
History: This is a new design.
Rank: 51 of 85.

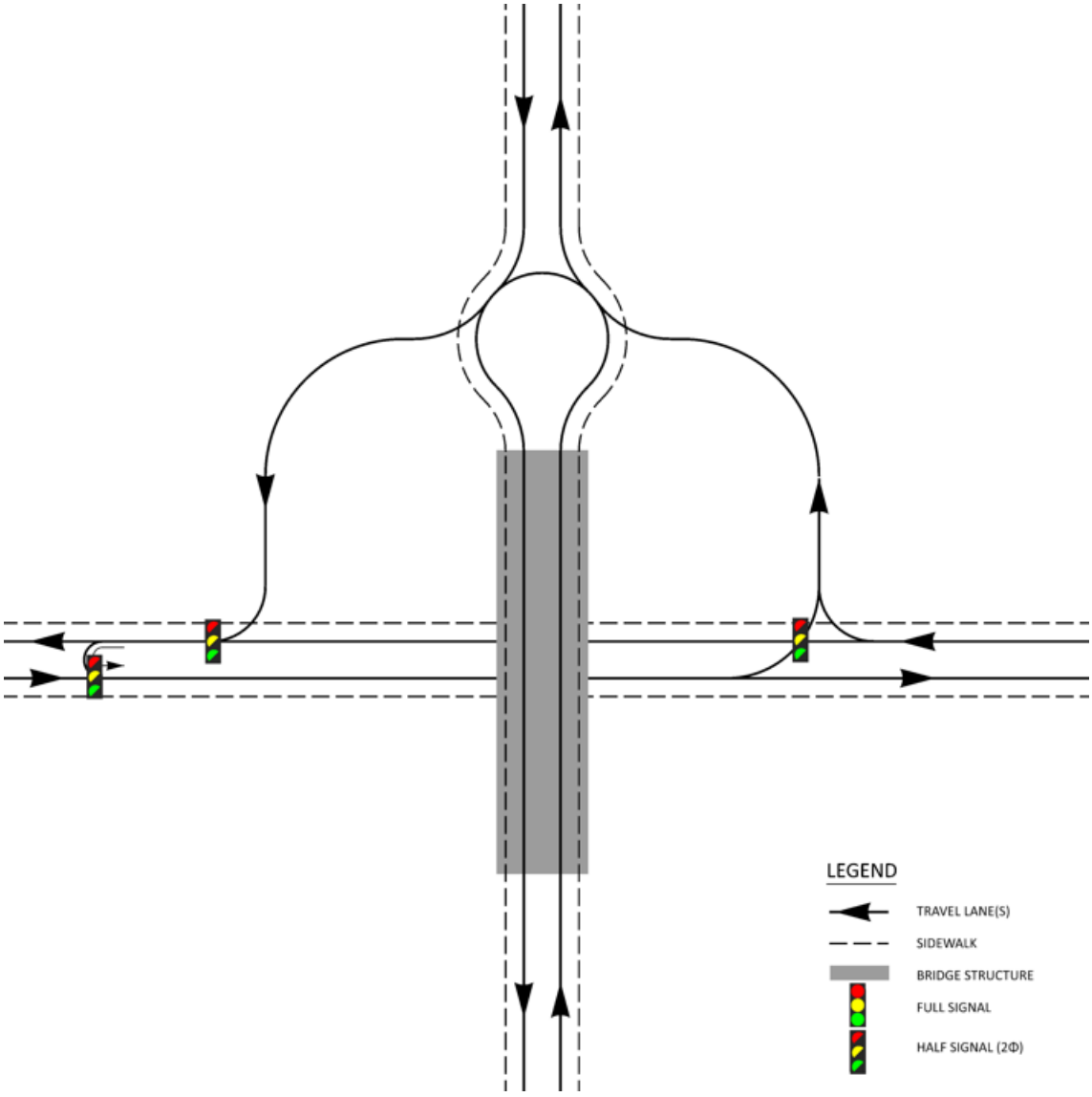
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	4	0	4	1	2	5	1	1	5	3	3	7	13	12	32



02-05, Roundabout in center, u-turn

Summary: Poor efficiency scores, but solid safety and cost scores. Could compete at a lower-demand site.
History: This is a new design.
Rank: 16 of 85.

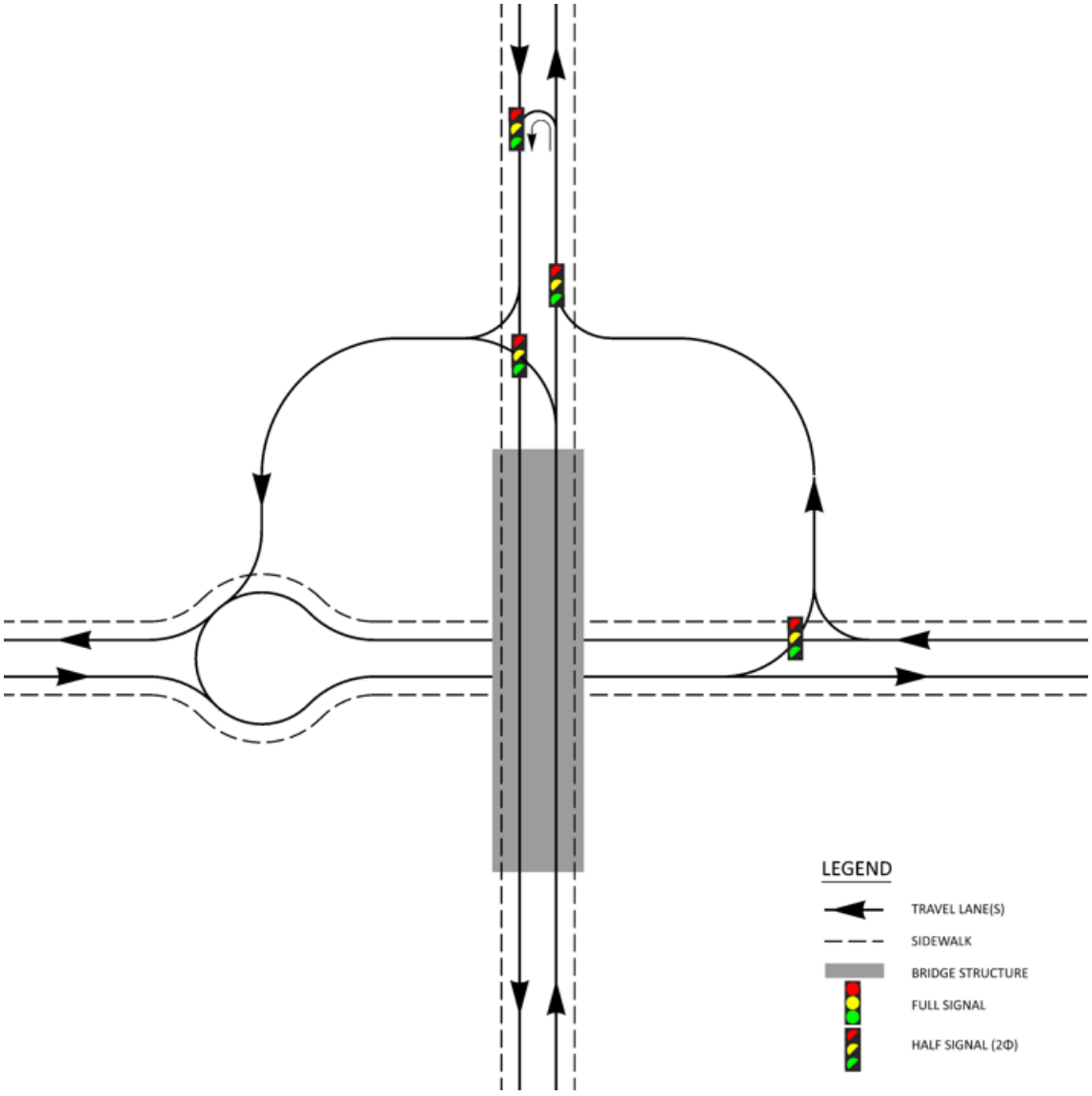
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	4	0	5	1	4	4	3	4	5	3	3	5	17	15	37



02-06, Roundabout to left, u-turn

Summary: Comparable to the design with the roundabout in the center; this design provides an increased capacity but has a higher bridge cost.
History: This is a new design.
Rank: 24 of 85.

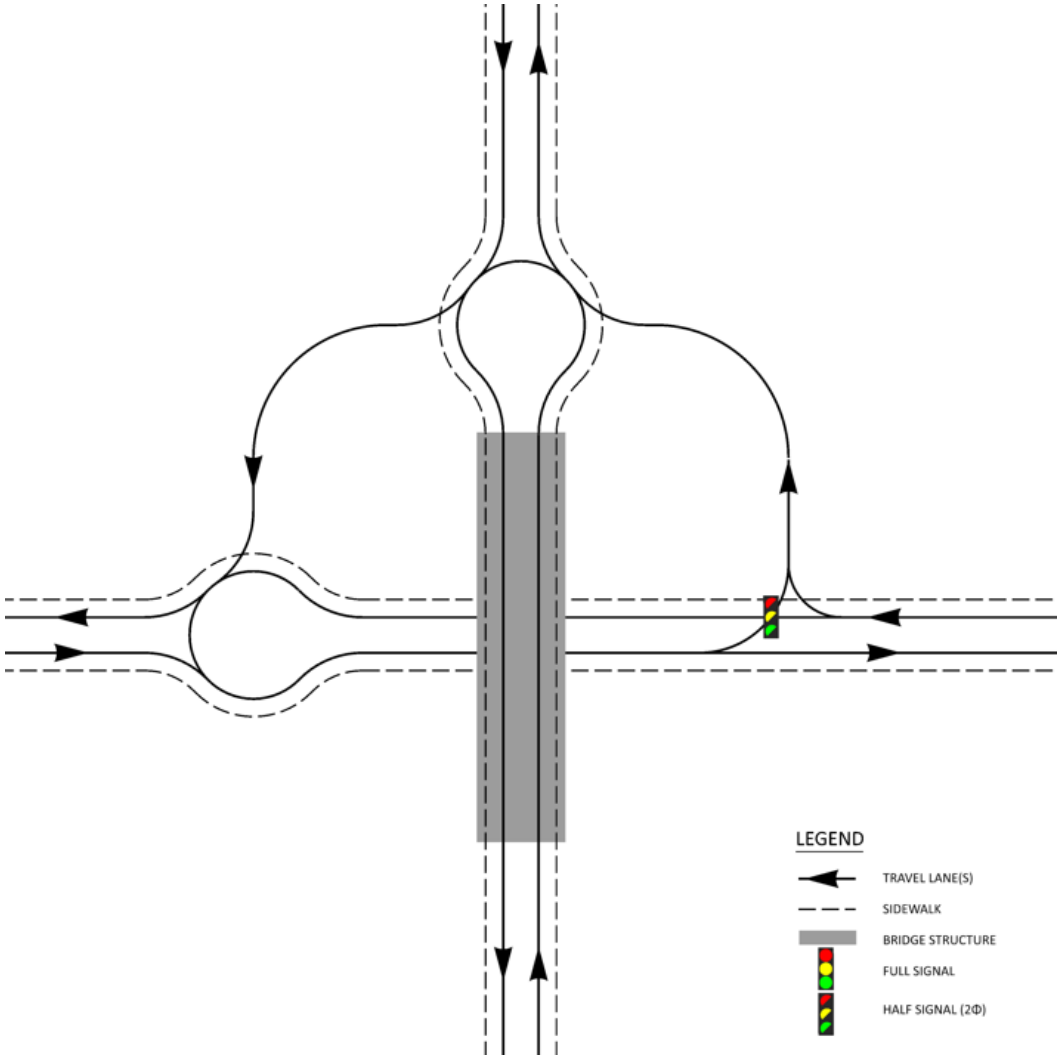
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	4	0	4	1	4	5	3	1	5	3	3	7	17	12	36



02-07, Roundabout, roundabout

Summary: Weak for efficiency, but delivered good safety and cost scores. Could be competitive at lower-demand sites.
History: This is a new design.
Rank: 15 of 85.

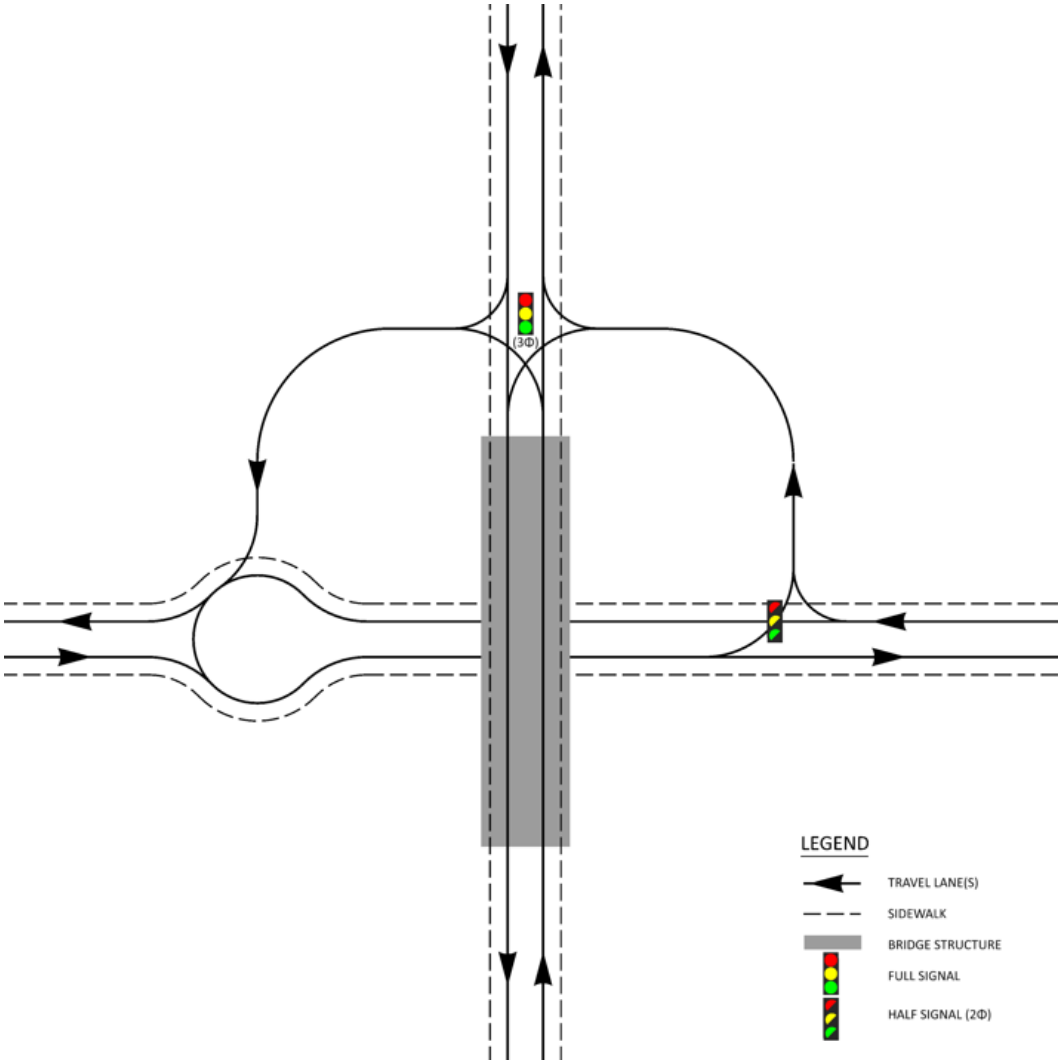
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	3	2	5	1	4	4	3	4	4	3	3	6	17	14	37



02-08, Roundabout, three-phase

Summary: Like similar designs, has a couple strong features but generally weak in efficiency and not good in safety.
History: This is a new design.
Rank: 68 of 85.

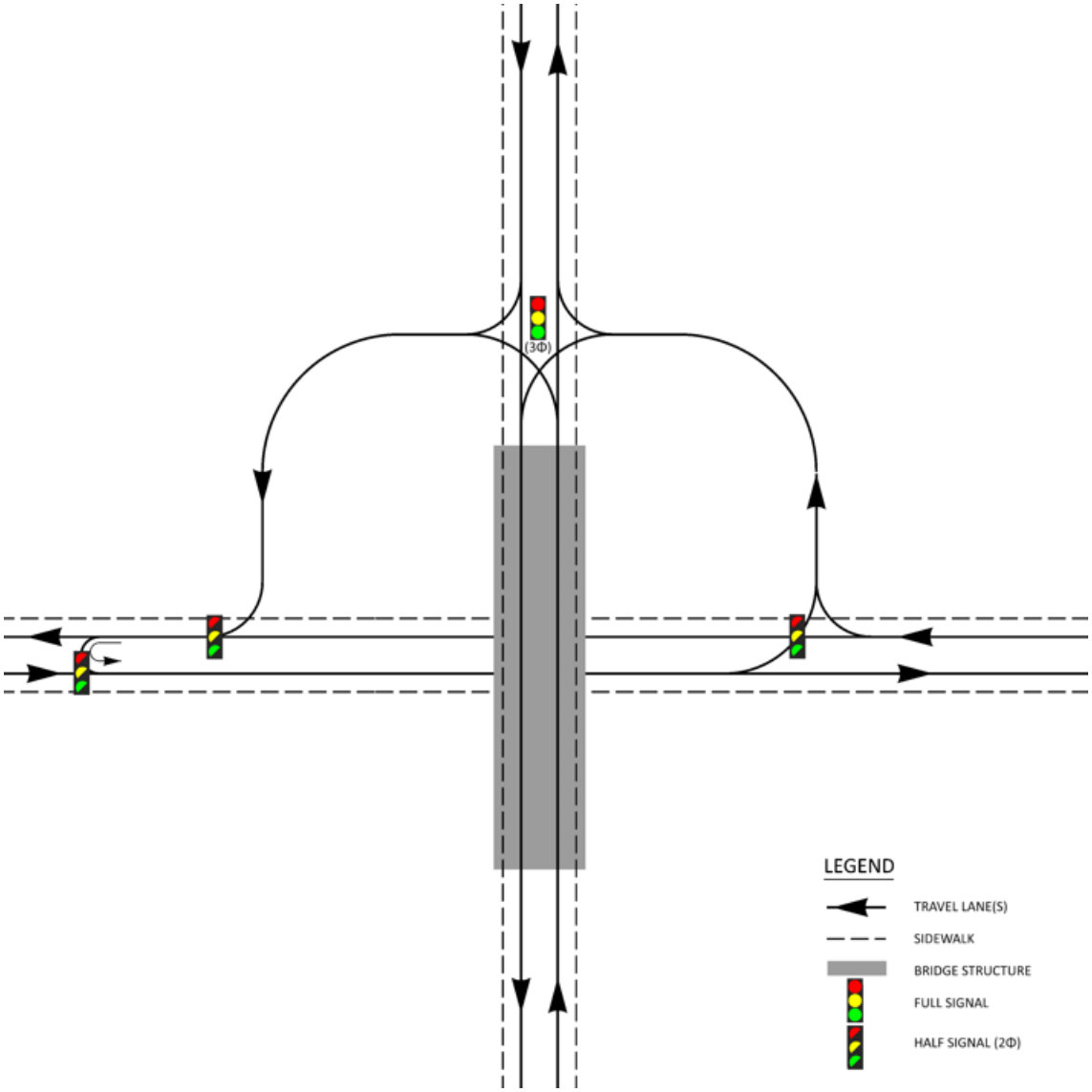
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	2	2	3	1	2	5	1	1	5	3	3	6	12	12	30



02-09, Three-phase, u-turn

Summary: Like similar designs, has a couple strong features but generally weak in efficiency and not good in safety.
History: This is a new design.
Rank: 75 of 85.

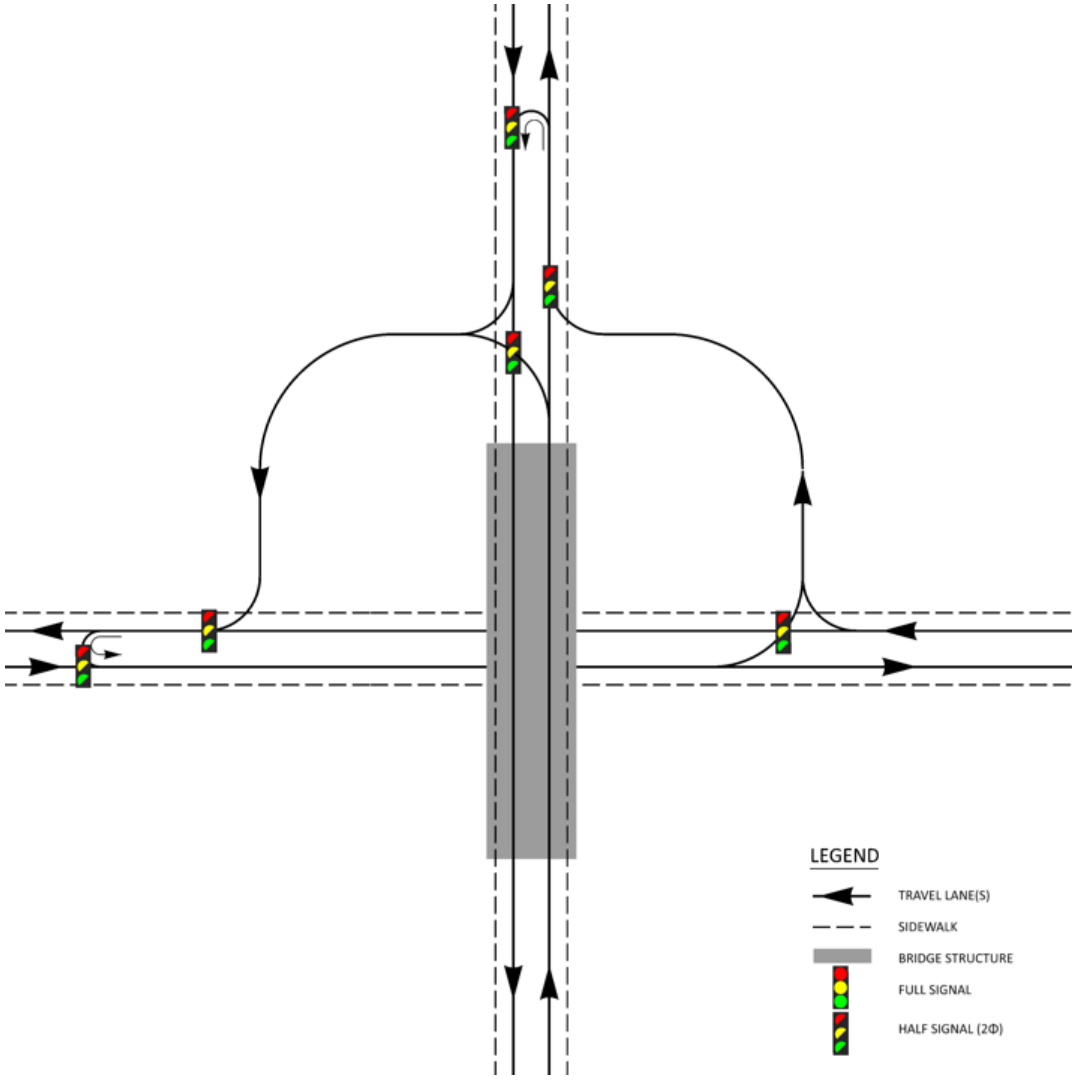
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	3	0	3	1	2	5	1	1	5	3	3	5	12	12	29



02-10, U-turn, u-turn

Summary: Features a good safety score and some other strengths. A long distance to travel is the big drawback.
History: This is a new design.
Rank: 17 of 85.

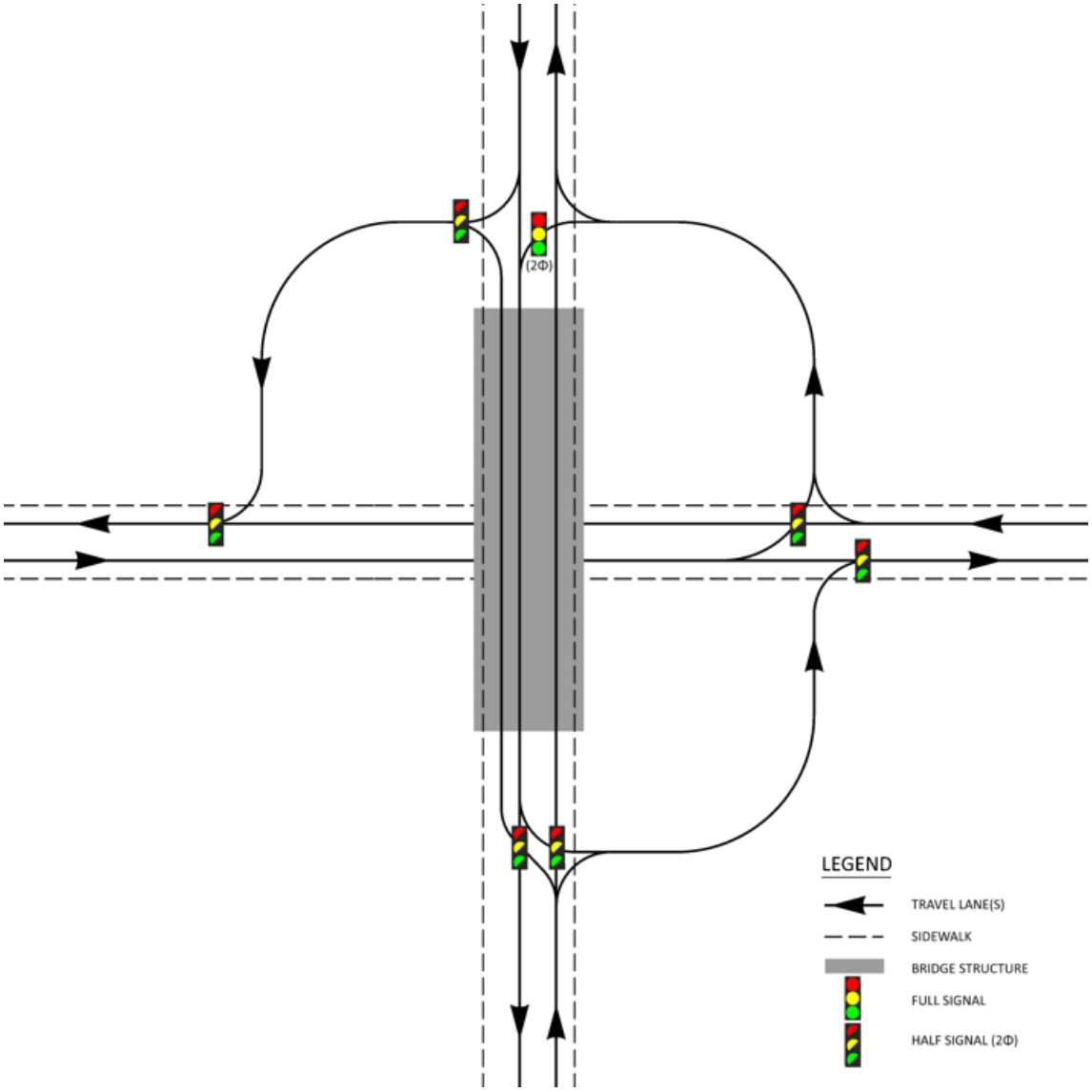
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	4	1	4	5	3	1	5	3	3	8	17	12	37



03-01, CFI, left

Summary: This design earned decent efficiency and safety scores but relatively low cost scores.
History: This is a new design.
Rank: 66 of 85.

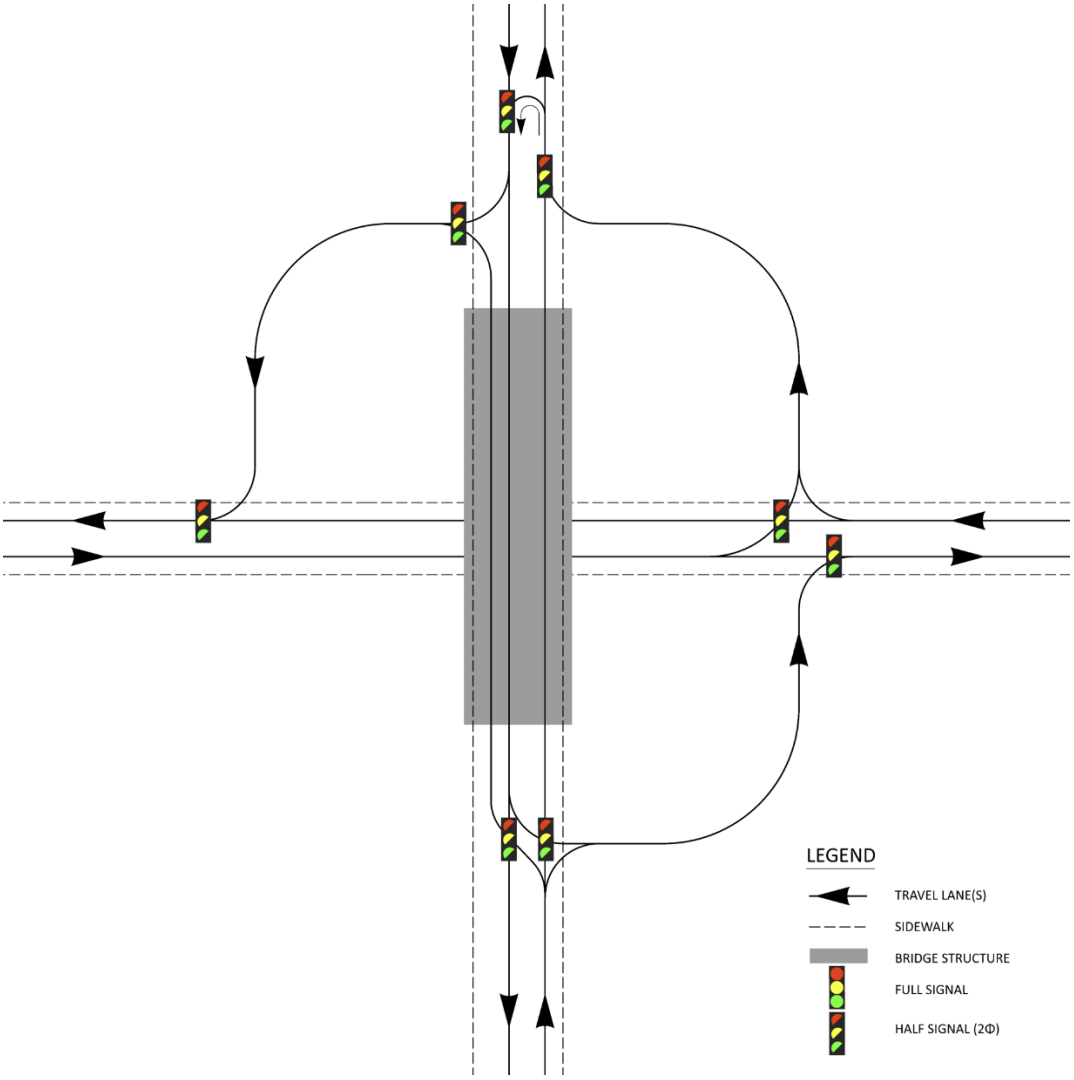
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	4	3	3	3	1	4	3	1	3	1	1	10	14	6	30



03-02, CFI, u-turn

Summary: Like the 03 Contraflow design, great progression potential and solid safety scores are offset by poor cost scores.
History: This is a new design.
Rank: 56 of 85.

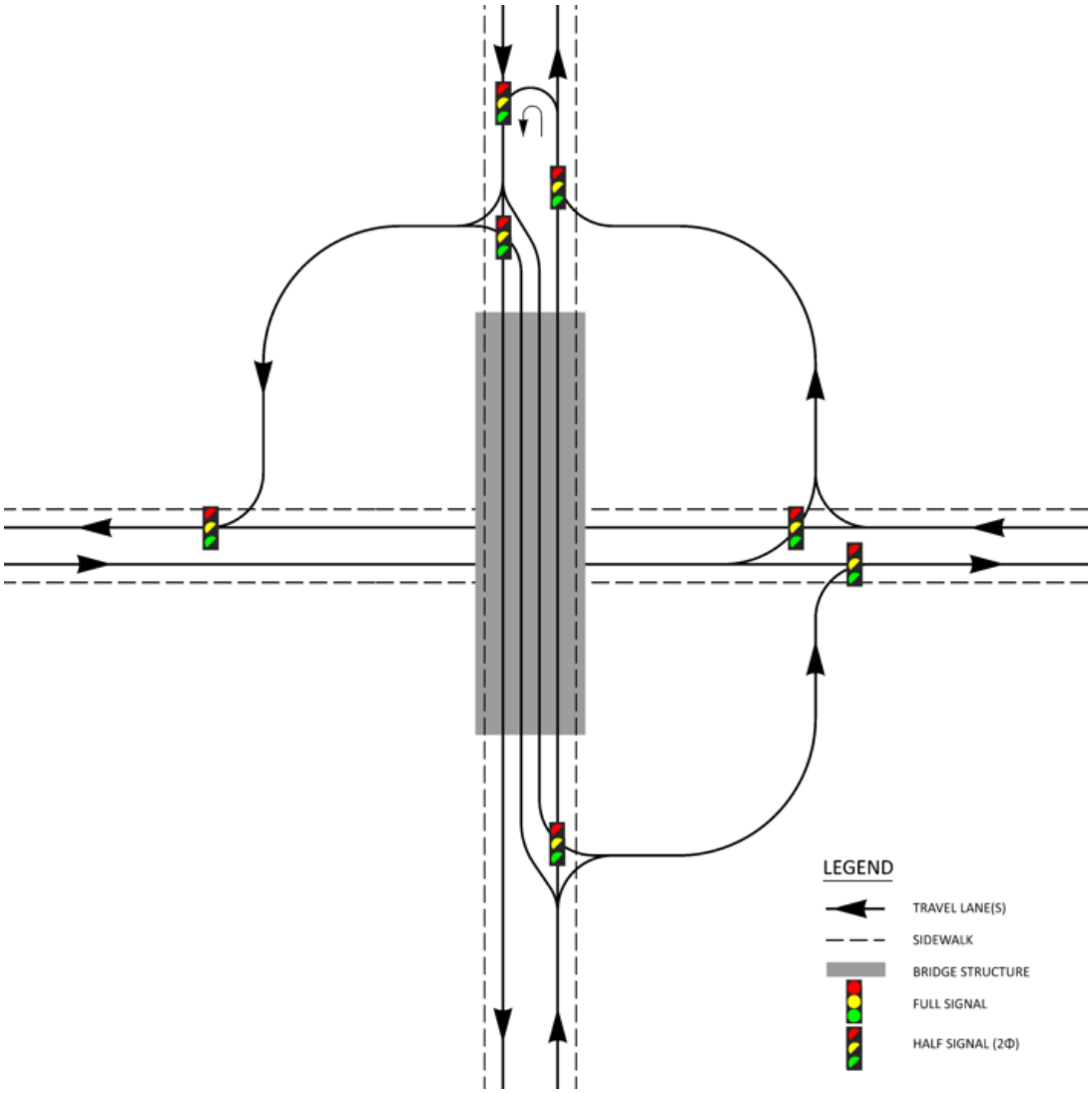
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	3	3	3	4	4	1	3	1	1	8	17	6	31



03-03, Contraflow

Summary: Like the 03 CFI, u-turn design, great progression potential and solid safety scores are offset by poor cost scores.
History: This is a new design.
Rank: 54 of 85.

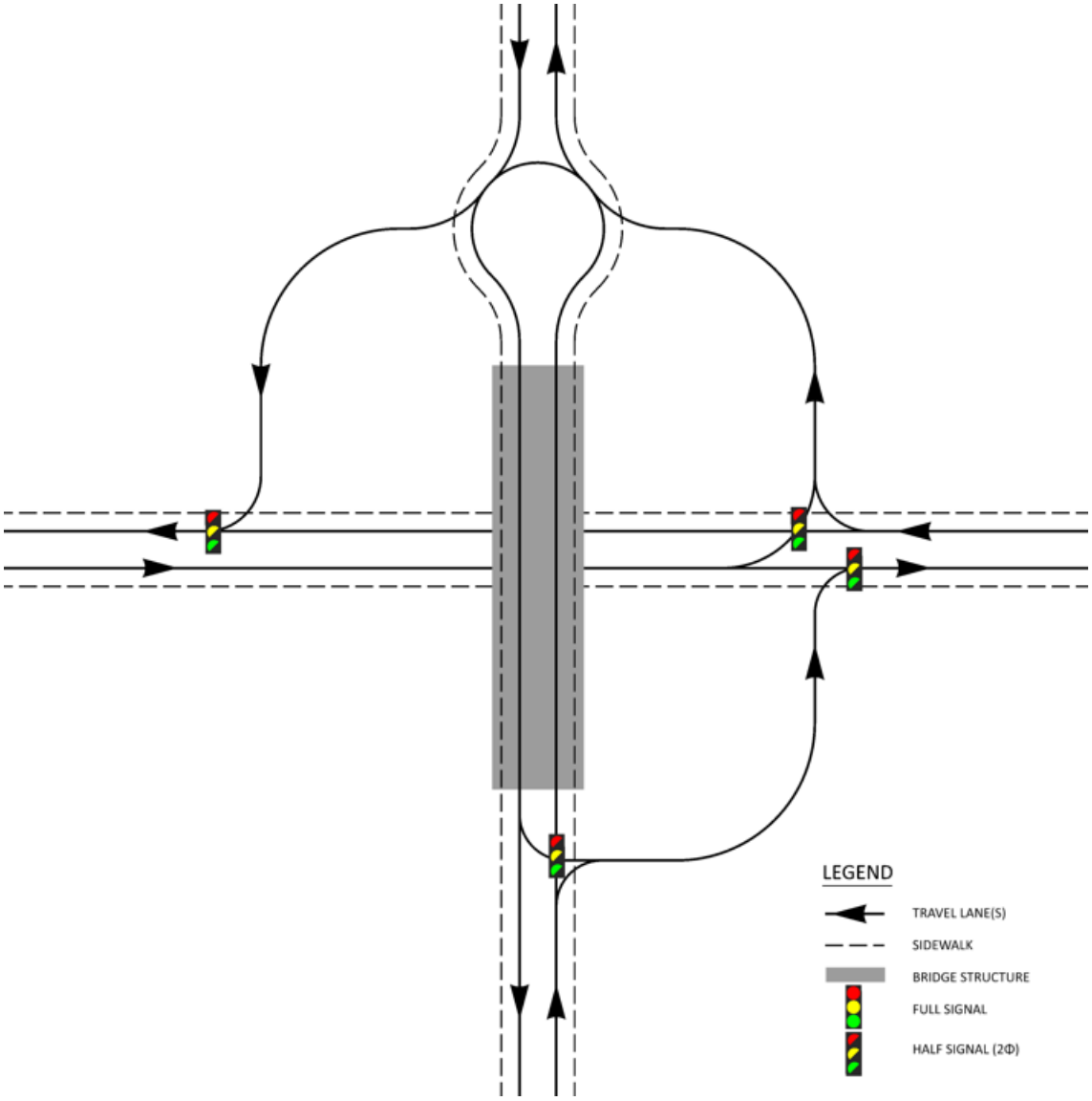
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	3	3	3	4	4	0	3	2	1	8	17	6	31



03-04, Roundabout

Summary: Another 03 design with good safety scores, and the cost scores are not quite as poor.
History: This is a new design.
Rank: 38 of 85.

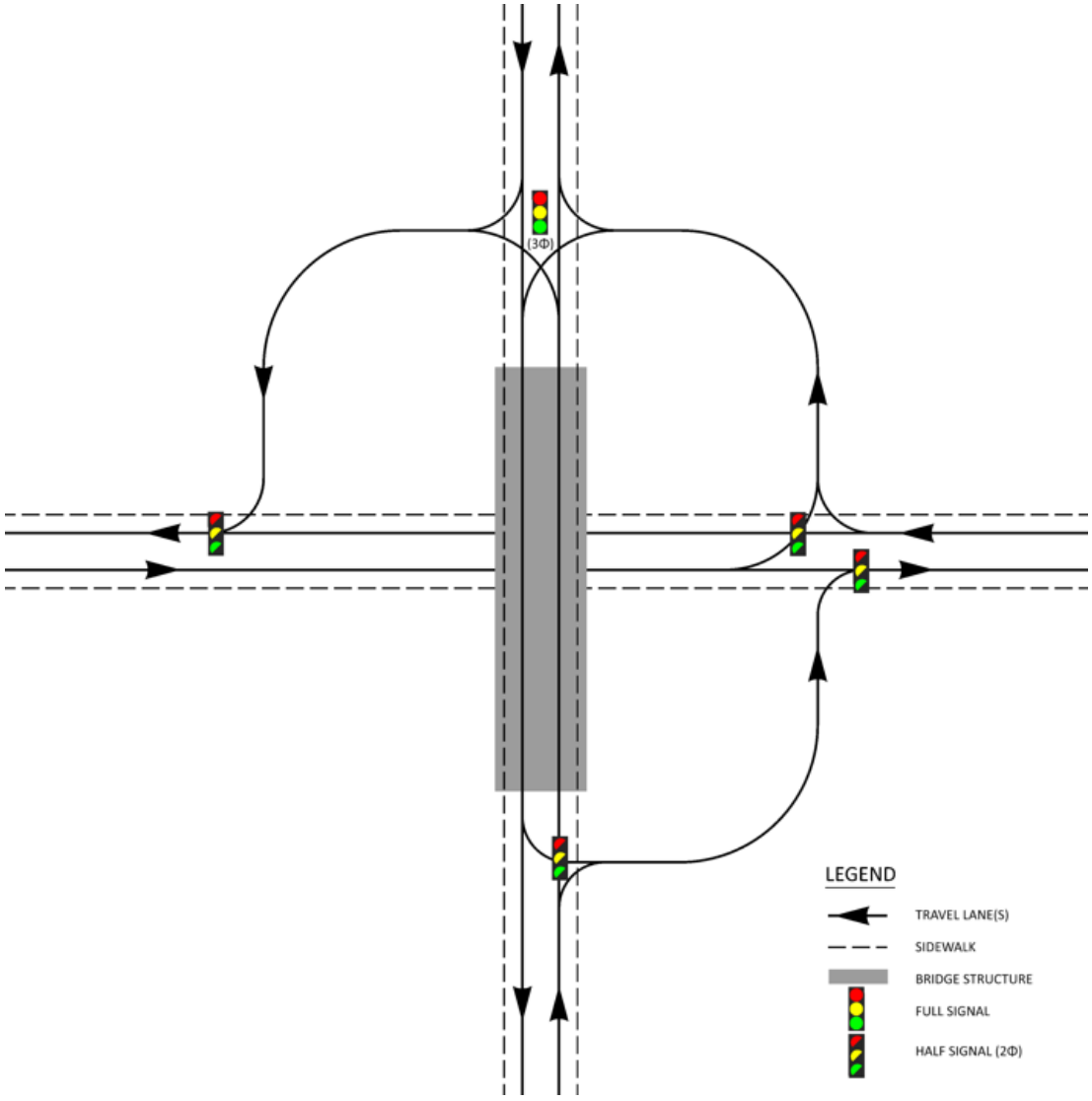
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	4	3	4	3	4	3	3	2	3	2	1	9	17	8	34



03-05, Three-phase

Summary: Relatively dismal performance across the categories, with pedestrian crossing quality as the only bright spot.
History: This is a new design.
Rank: 81 of 85.

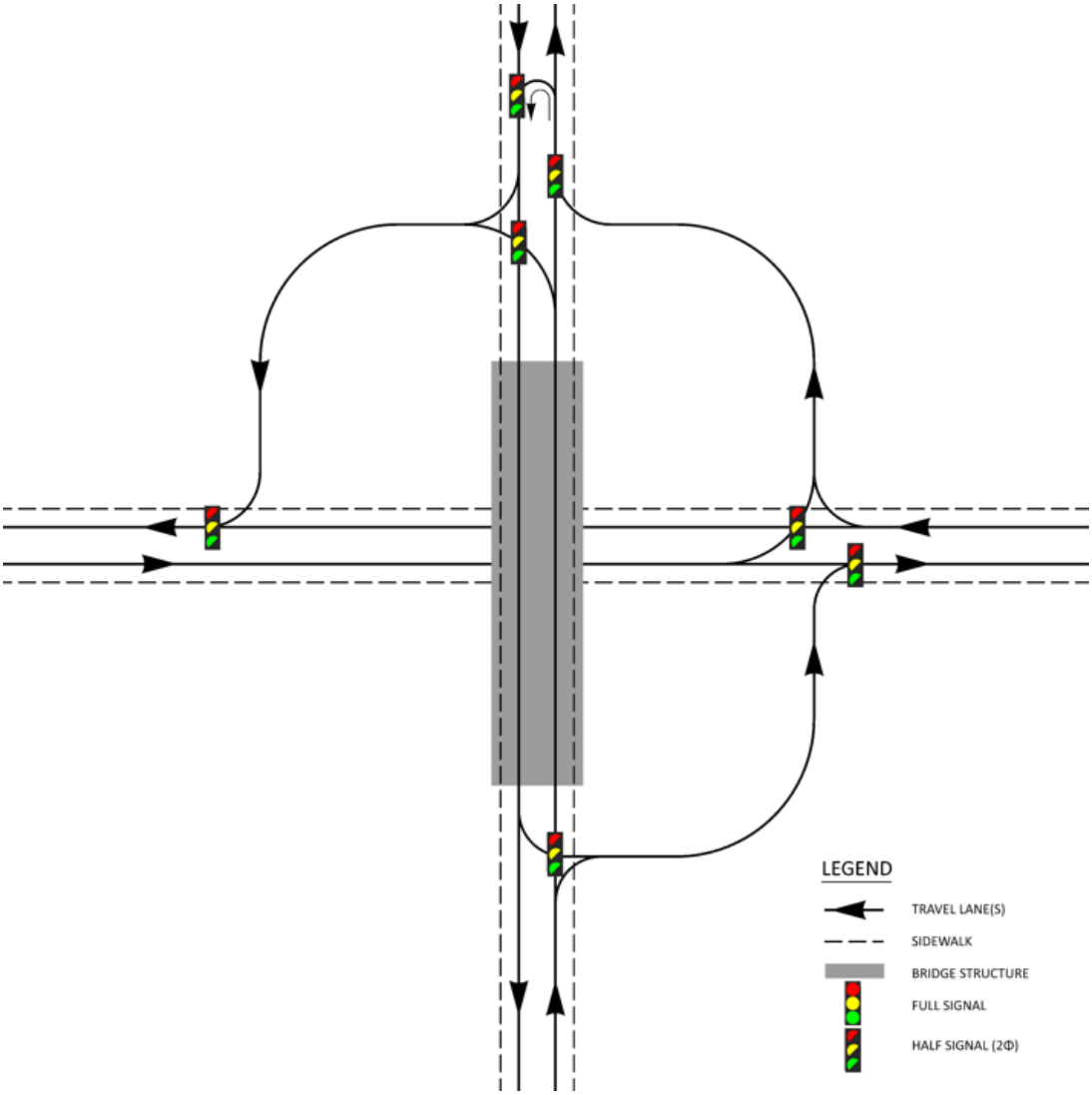
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	3	3	2	3	2	4	1	1	3	2	1	7	12	7	26



03-06, U-turn

Summary: Near the top of the rankings in safety but middling in efficiency and relatively poor for cost.
History: This is a new design.
Rank: 43 of 85.

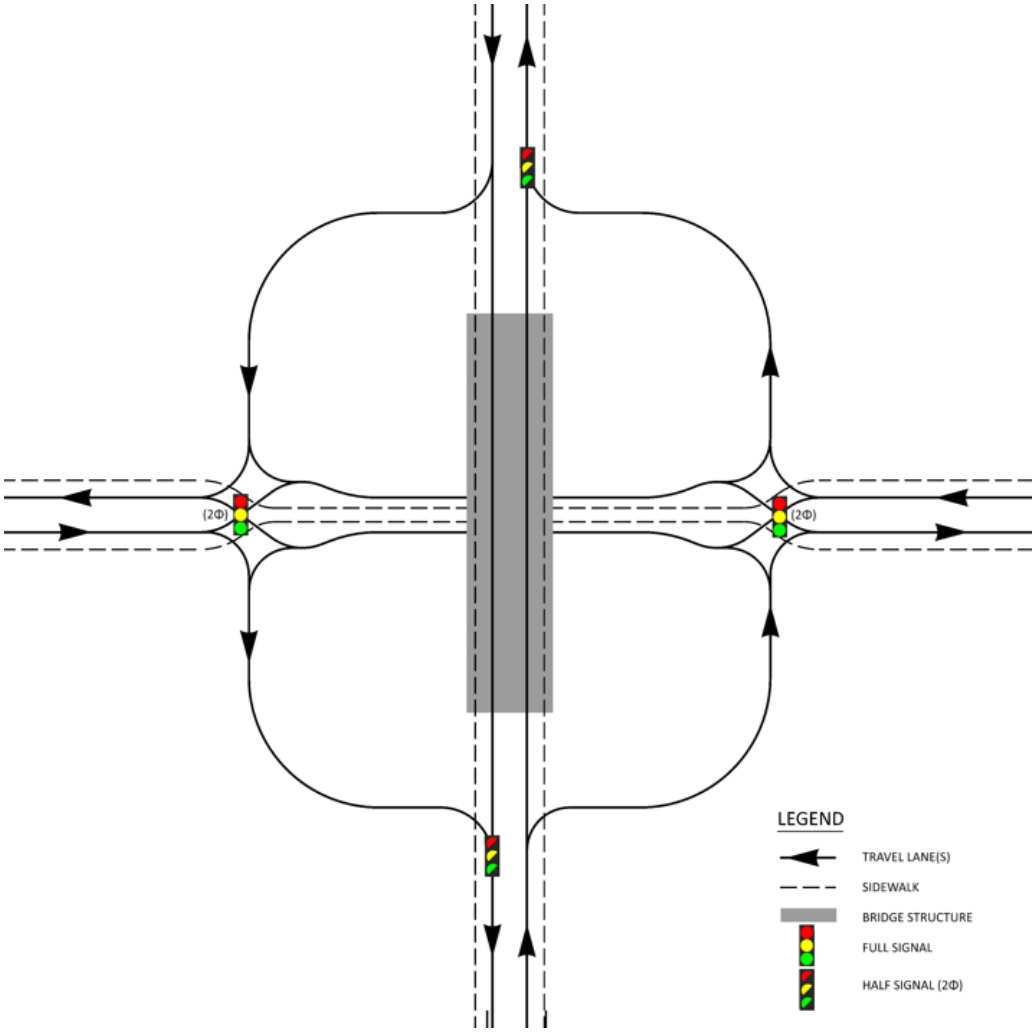
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	5	1	3	3	4	4	4	1	3	2	1	8	18	7	33



04-01, DDI

Summary: As with the interchange version, safety seems to be the strength of this design.
History: First constructed in France in the 1960s and 1970s. Published by Chlewicki in 2003. The first DDI in the US opened in 2009. Since then, they have become a common interchange design in the US.
Rank: 73 of 85.

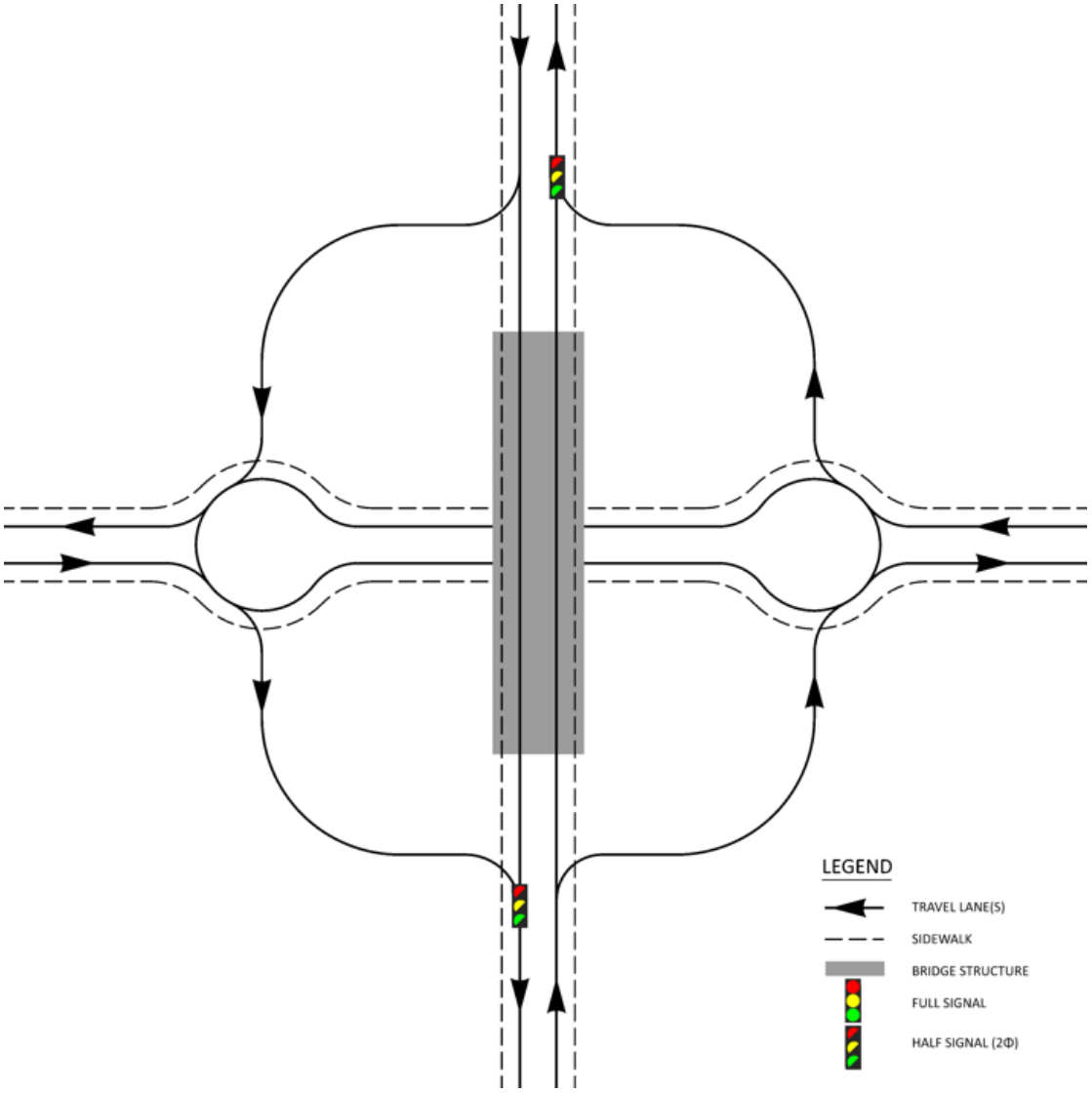
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	2	4	3	4	4	2	1	5	2	1	0	7	14	8	29



04-02, Double roundabout

Summary: Good efficiency scores and excellent safety scores are offset by poor cost scores.
History: This has become a common interchange design in the US over the past twenty years or so and has likely been used as a grade-separated intersection as well.
Rank: 19 of 85.

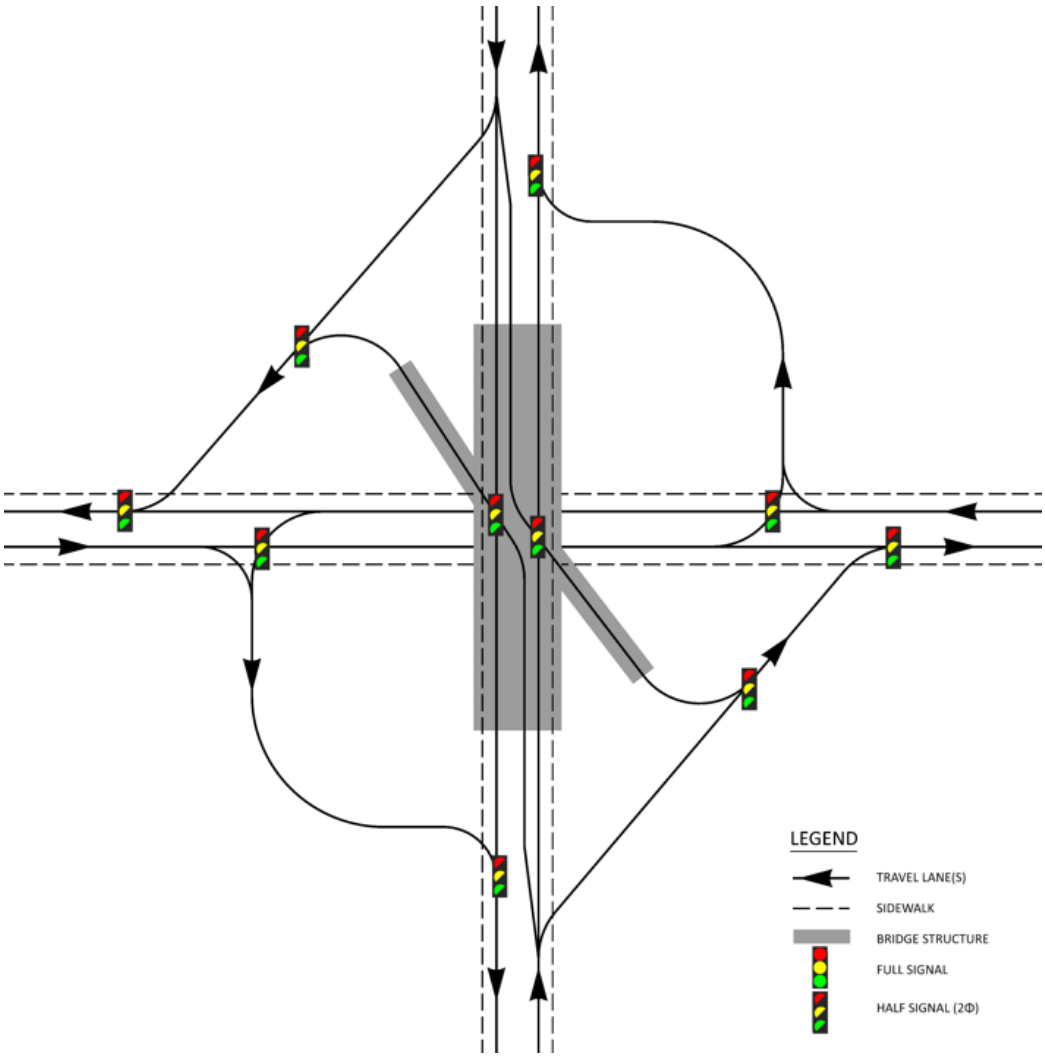
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	4	4	5	4	5	1	4	5	1	0	0	11	19	6	36



04-03, Eyler design

Summary: Like several 04 designs, features superb efficiency and safety scores but very poor cost scores. Could be competitive in a high-demand spot.
History: Published by Eyler in 2005. We do not believe that it has ever been built.
Rank: 21 of 85.

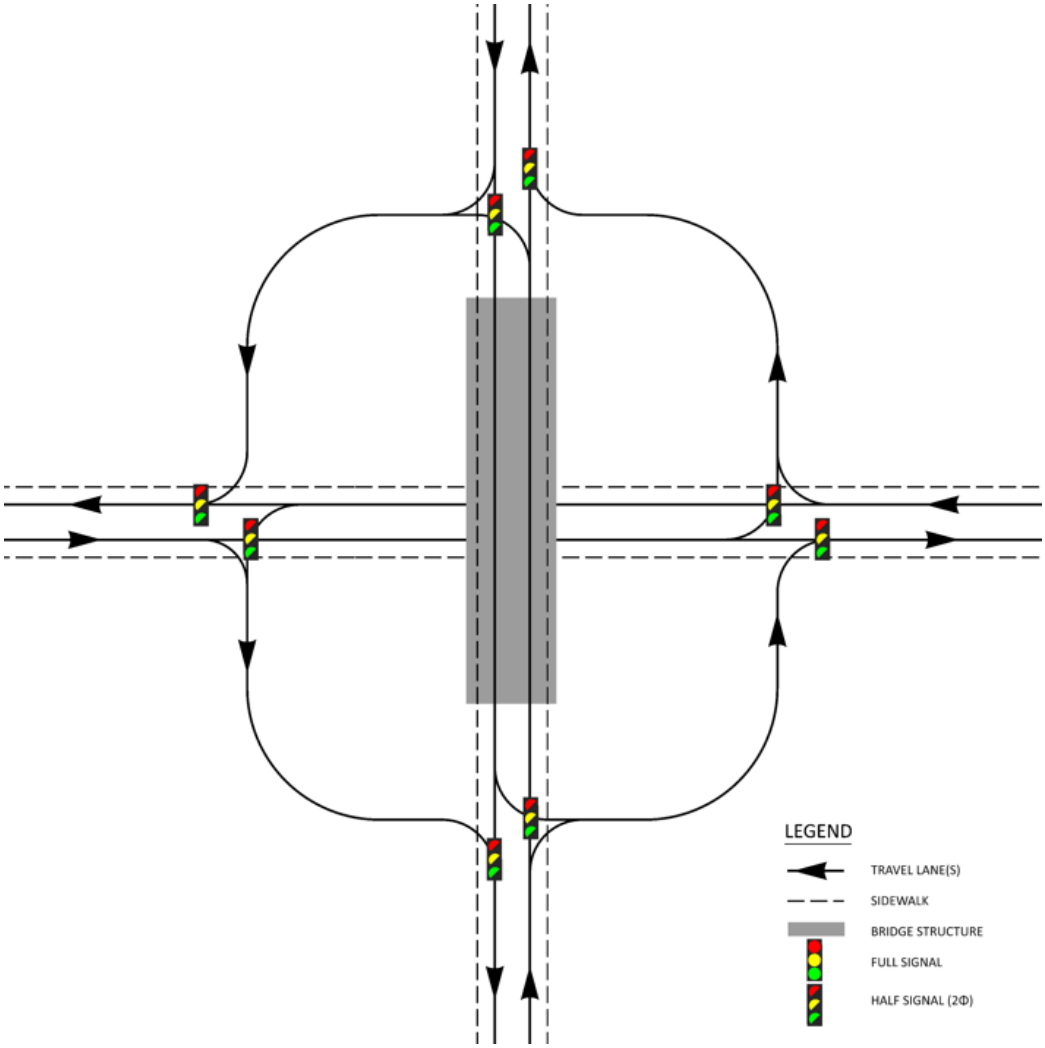
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	5	2	5	4	3	5	0	2	1	0	14	19	3	36



04-04, Four leftovers

Summary: Like several 04 designs, features superb efficiency and safety scores but poor cost scores. Could be competitive in a high-demand spot or as a standard diamond or cloverleaf retrofit.
History: This is a new design that is under development at US-15/501 and NC-54 in Chapel Hill, NC.
Rank: 14 of 85.

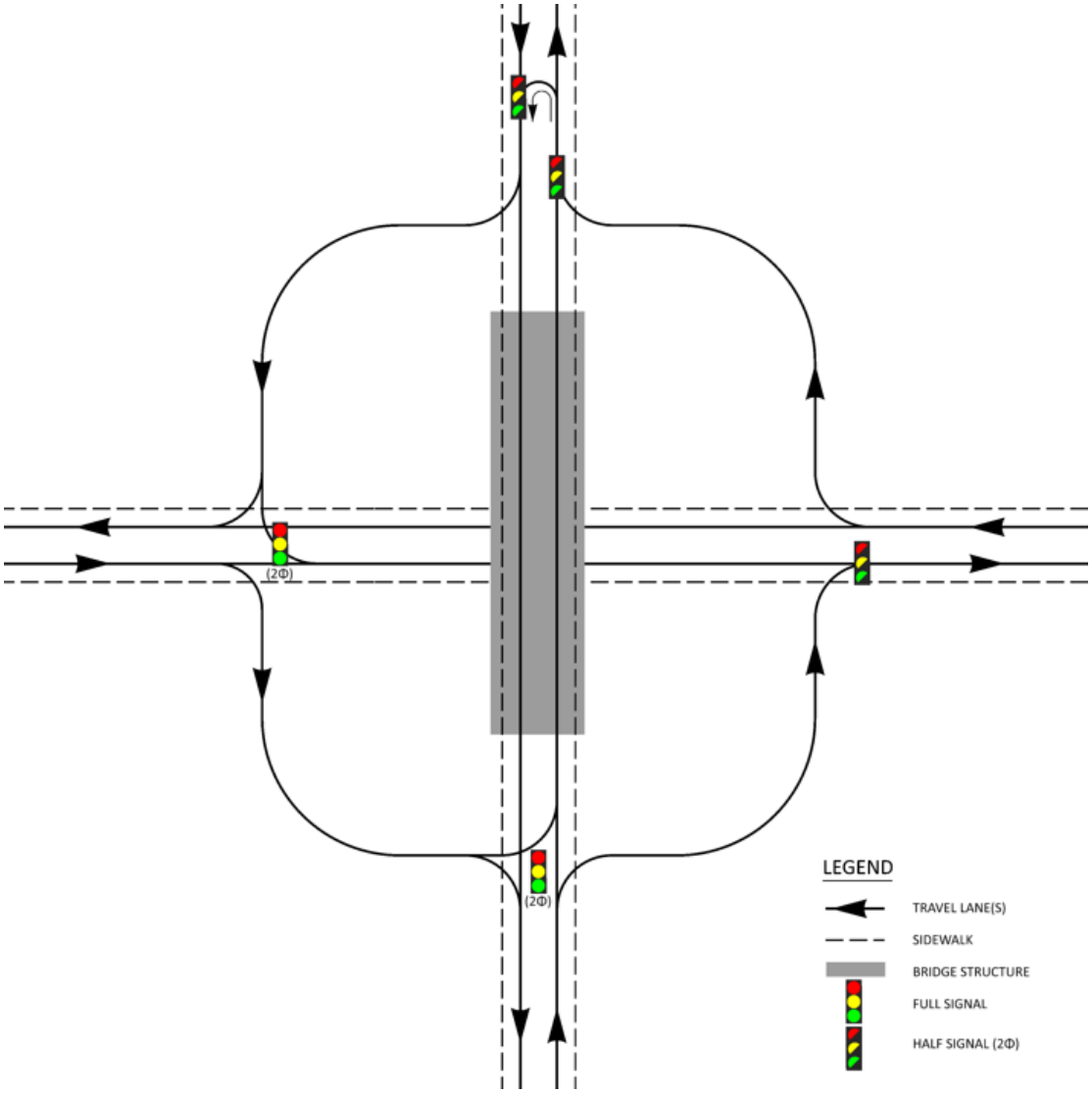
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	4	2	5	4	3	5	2	2	1	0	13	19	5	37



04-05, Right, 1 u-turn

Summary: A small bridge and a smaller number of conflict points, but otherwise low scores. No real improvement over the related 04-22, Windmill design.
History: This is a new design.
Rank: 85 of 85.

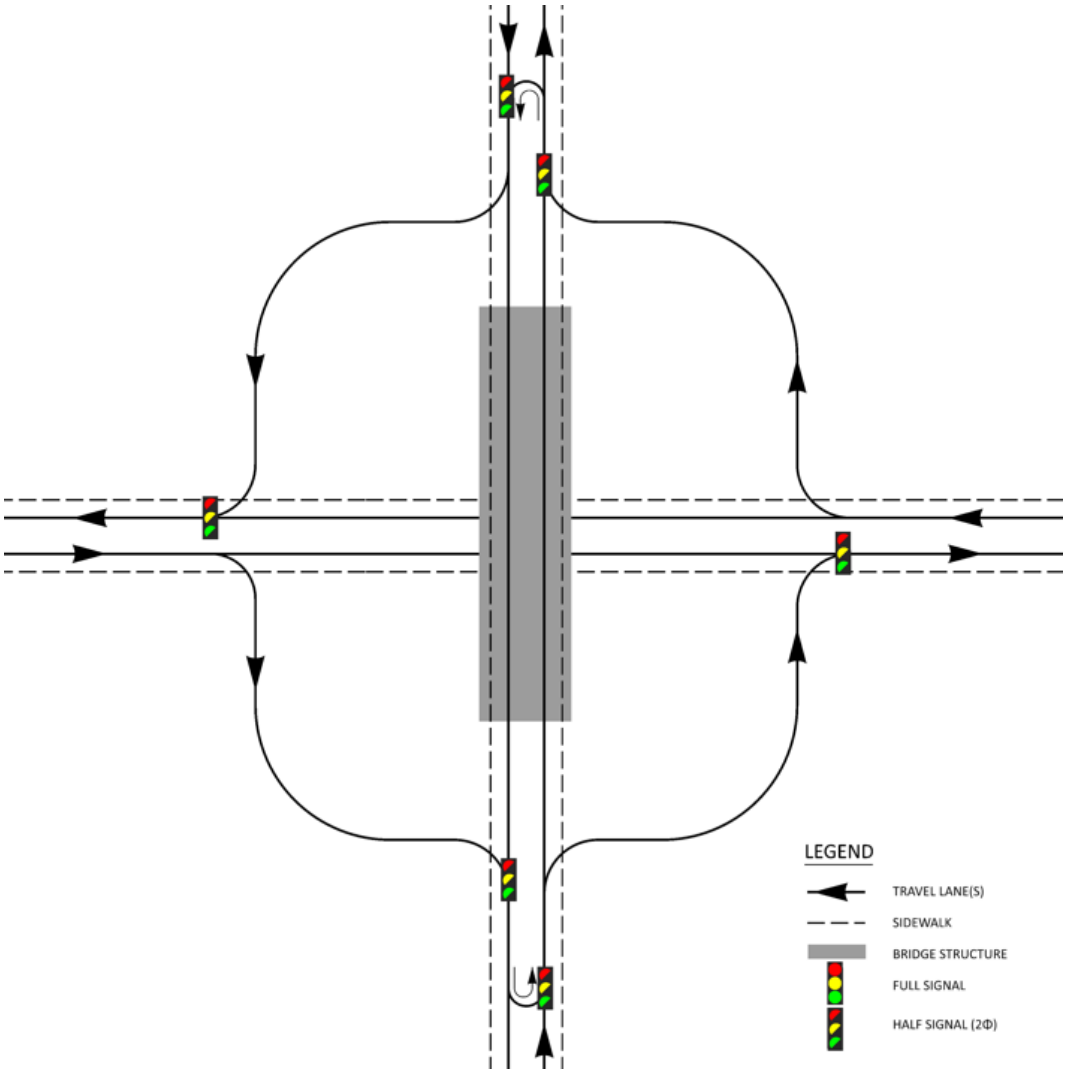
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	1	2	4	2	2	1	1	5	2	1	0	6	10	8	24



04-06, Right, 2 u-turns

Summary: This design tends to the extremes, with five strong scores and five weak scores. The design is an improvement over the related 04-22, Windmill design.
History: This is a new design.
Rank: 63 of 85.

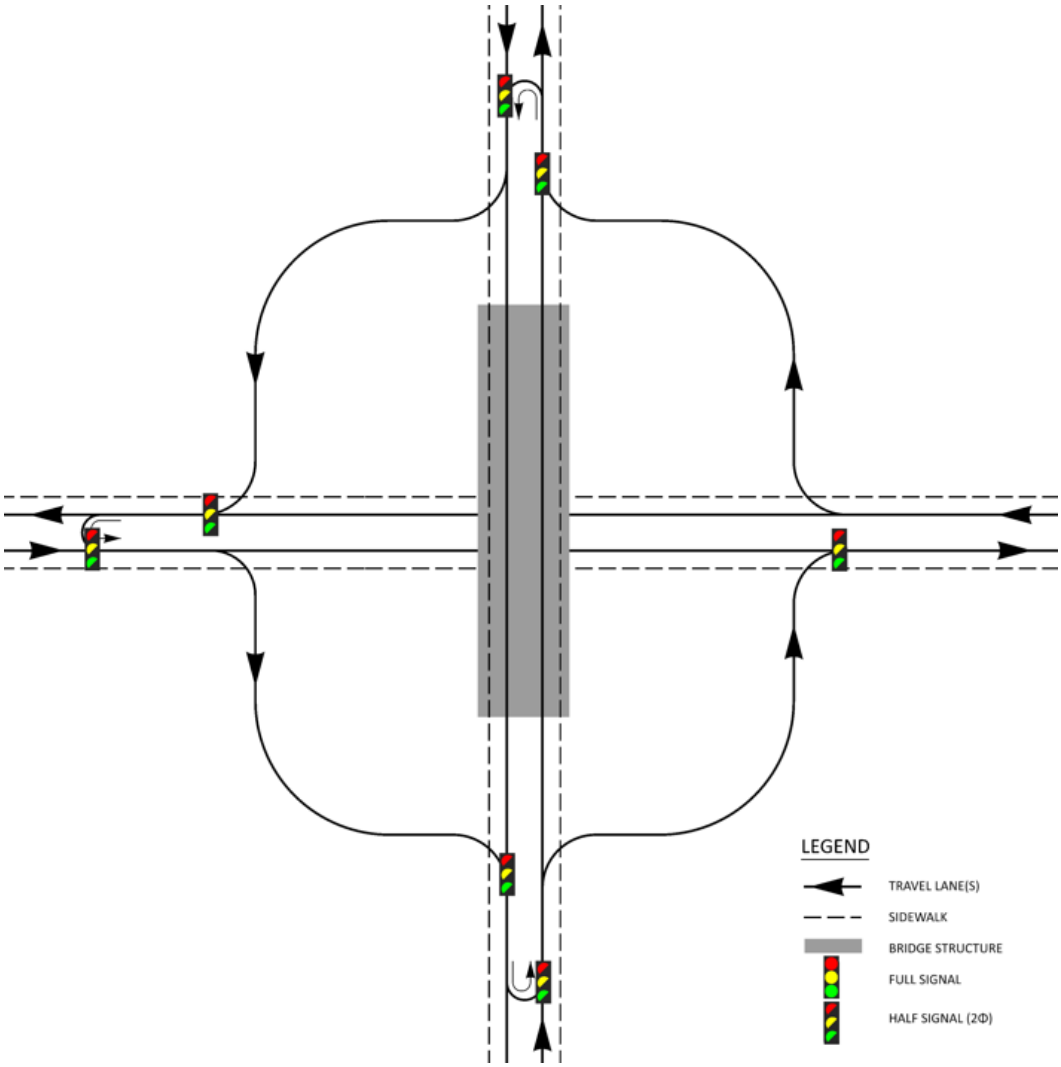
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	5	1	4	1	4	5	2	0	0	8	15	7	30



04-07, Right, 3 u-turns

Summary: Has identical scores to the 04, Right, 2 u-turns design, so the third u-turn crossover does not seem to provide a significant improvement.
History: This is a new design.
Rank: 65 of 85.

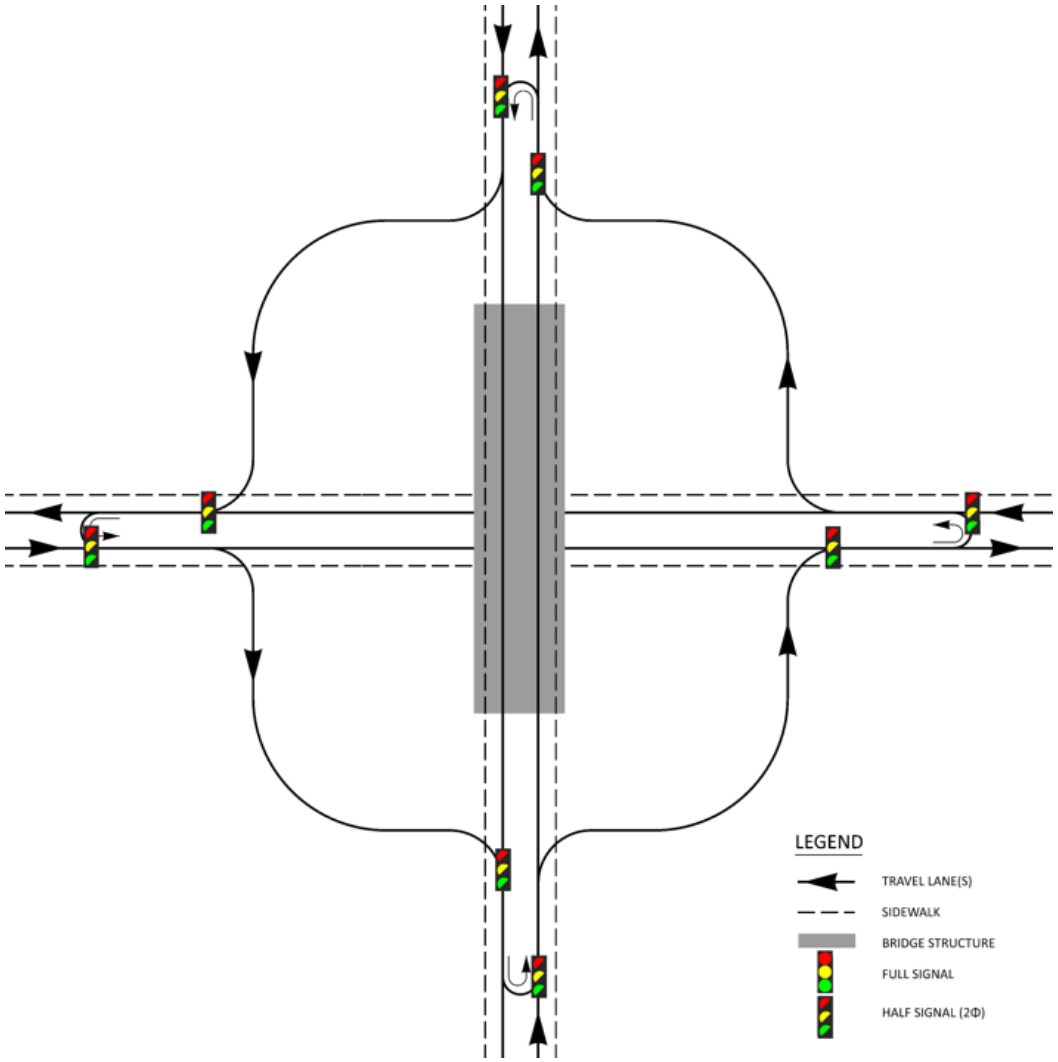
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	5	1	4	1	4	5	2	0	0	8	15	7	30



04-08, Right, 4 u-turns

Summary: With very similar scores to the 04, Right, 2 u-turns design, the third and fourth u-turn crossovers do not seem to provide a significant improvement.
History: This is a new design.
Rank: 64 of 85.

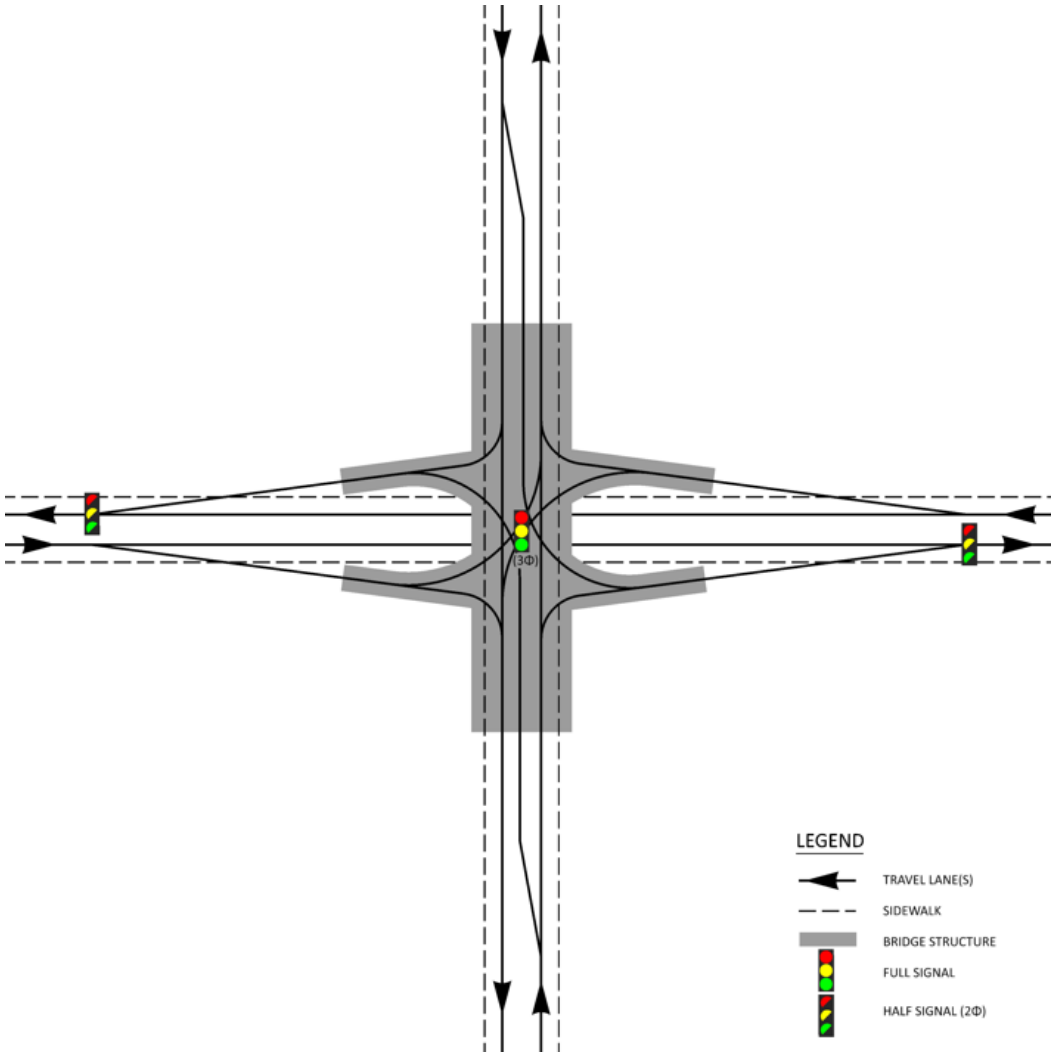
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	4	1	4	1	5	5	2	0	0	8	15	7	30



04-09, Single point

Summary: Good efficiency scores but poor safety and cost scores. This does not appear to be a competitive grade-separated intersection design.
History: This is common interchange design in the US, particularly at high-demand locations. There are at least a few in place as grade-separated intersections.
Rank: 78 of 85.

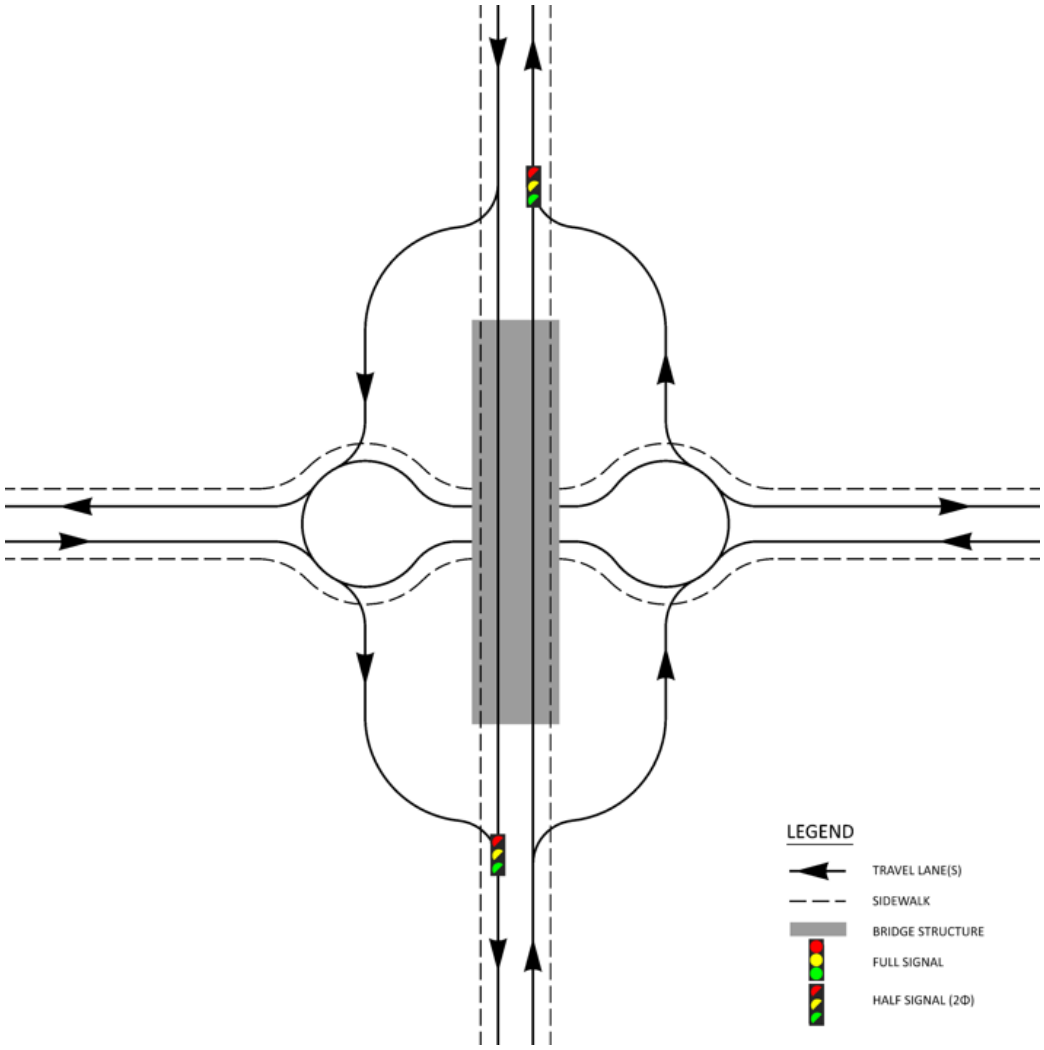
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadway	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	3	5	0	4	3	3	1	2	3	1	0	10	11	6	27



04-10, Single roundabout

Summary: This is a high-ranking design for safety, and has some other strong categories as well. It is fairly high cost and weaker for pedestrian service however.
History: This has become a fairly common interchange design in the US in the past 20 years and has probably been constructed as a grade-separated intersection as well.
Rank: 10 of 85.

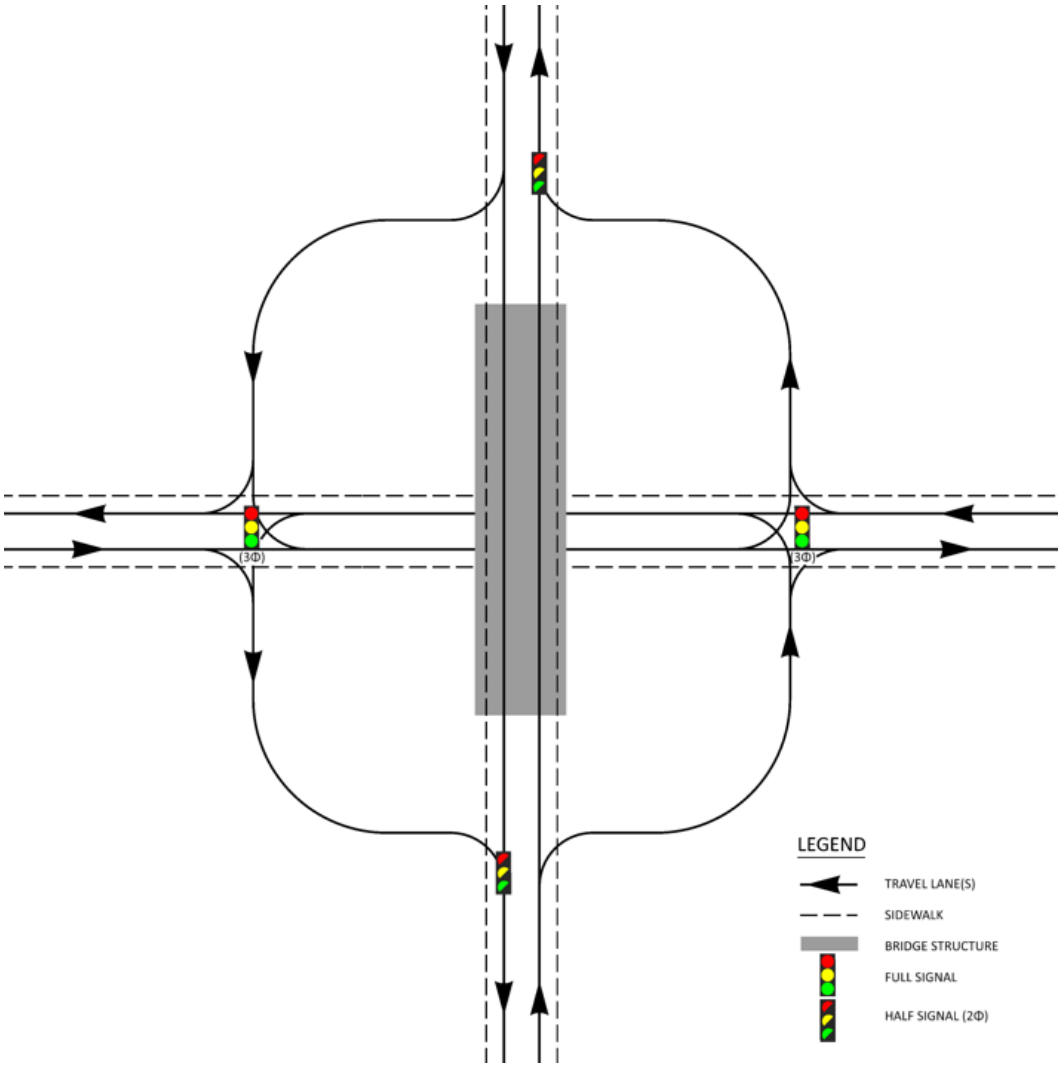
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	4	5	5	4	5	1	3	5	3	1	0	12	18	9	39



04-11, Standard diamond

Summary: The design has mostly dismal scores across the board. Agencies should strongly consider alternatives.
History: This is the most common interchange design and the most common grade-separated intersection design in NC.
Rank: 83 of 85.

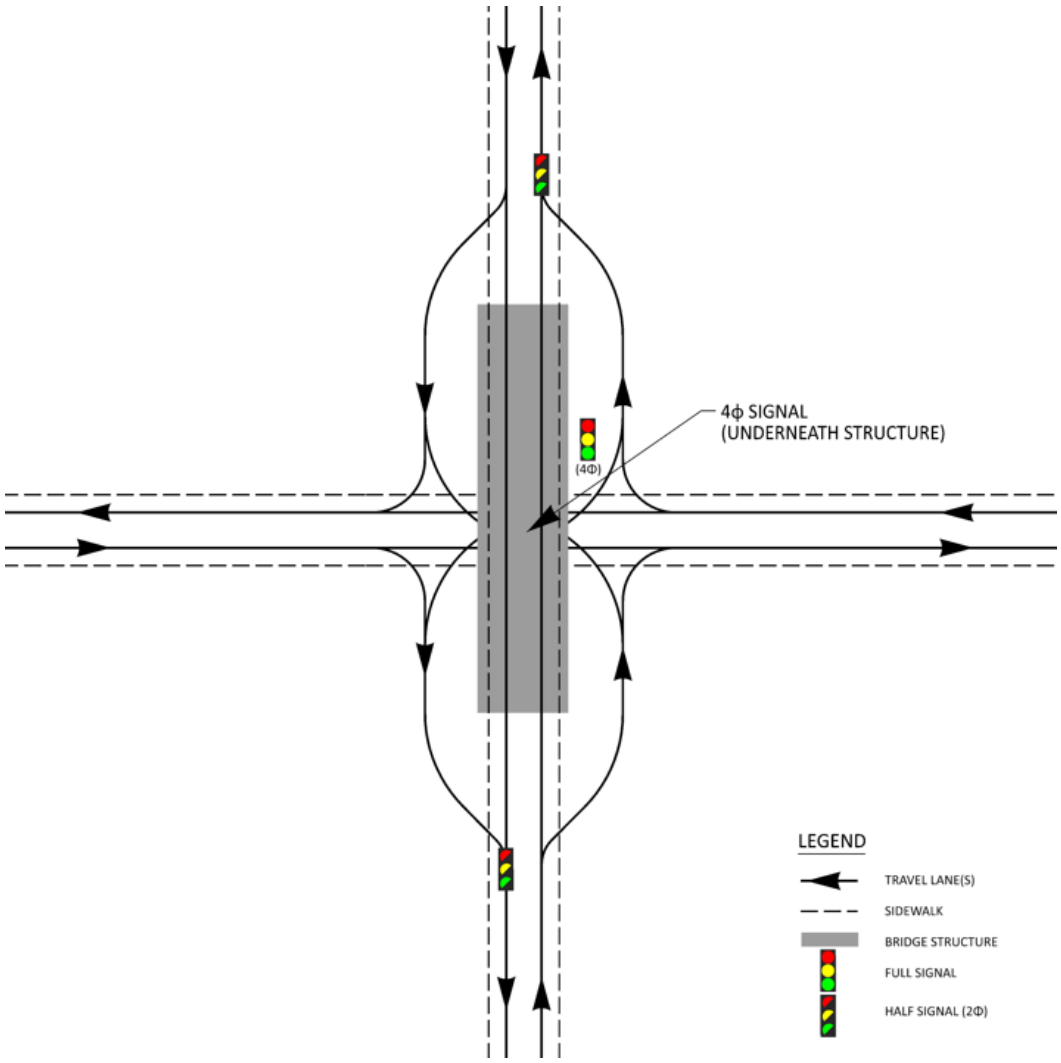
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	2	4	1	4	3	2	1	4	2	1	0	7	11	7	25



04-12, Tight Diamond

Summary: Excellent for distance travelled, and good scores in a couple other categories, but otherwise there is not much to be excited about.
History: This is a popular interchange design that has likely been employed a few times as a grade-separated intersection.
Rank: 79 of 85.

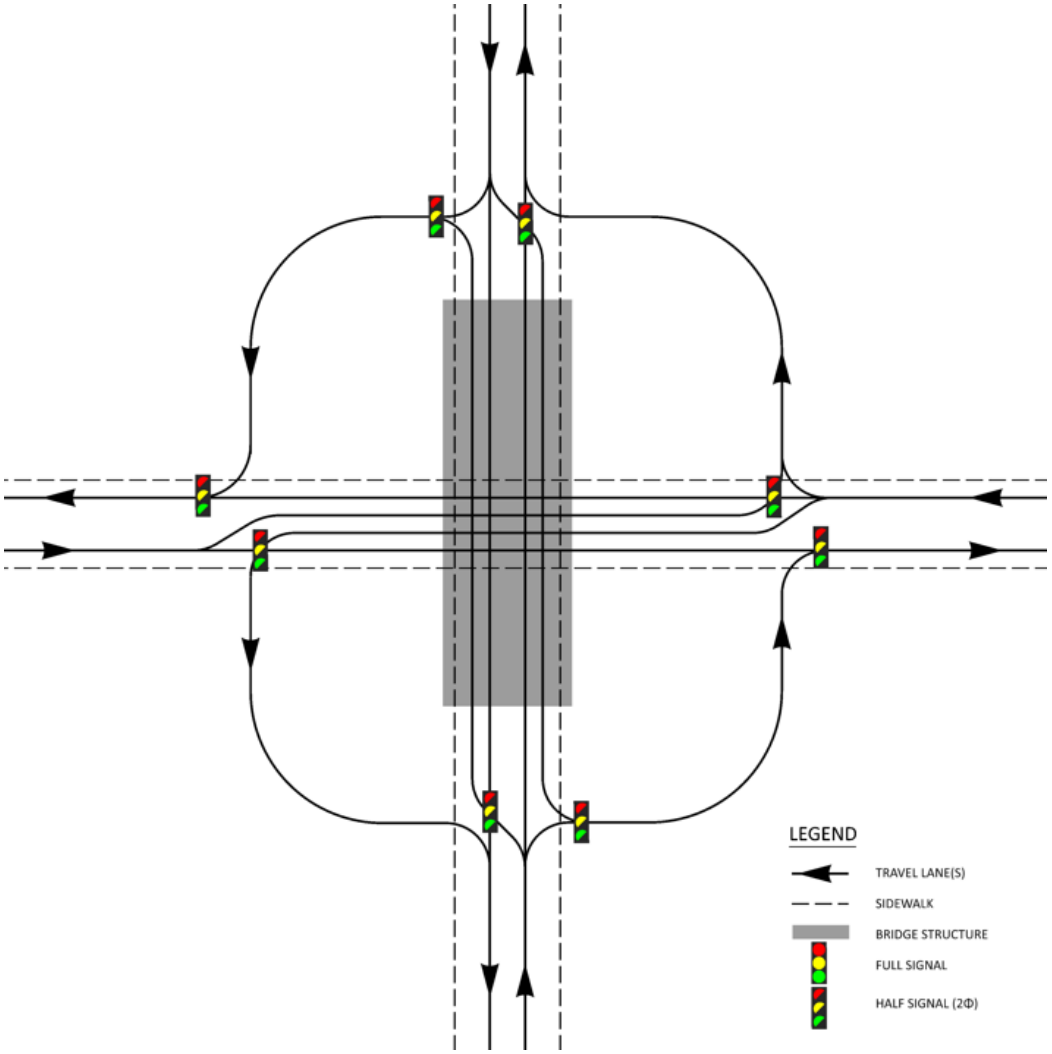
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
0	3	5	1	4	2	3	1	4	3	1	0	8	11	8	27



04-13, Top and bottom different, CFI, contraflow

Summary: Like several 04 designs, features superb efficiency and safety scores but very poor cost scores. Could be competitive in a high-demand spot.
History: This is a new design.
Rank: 37 of 85.

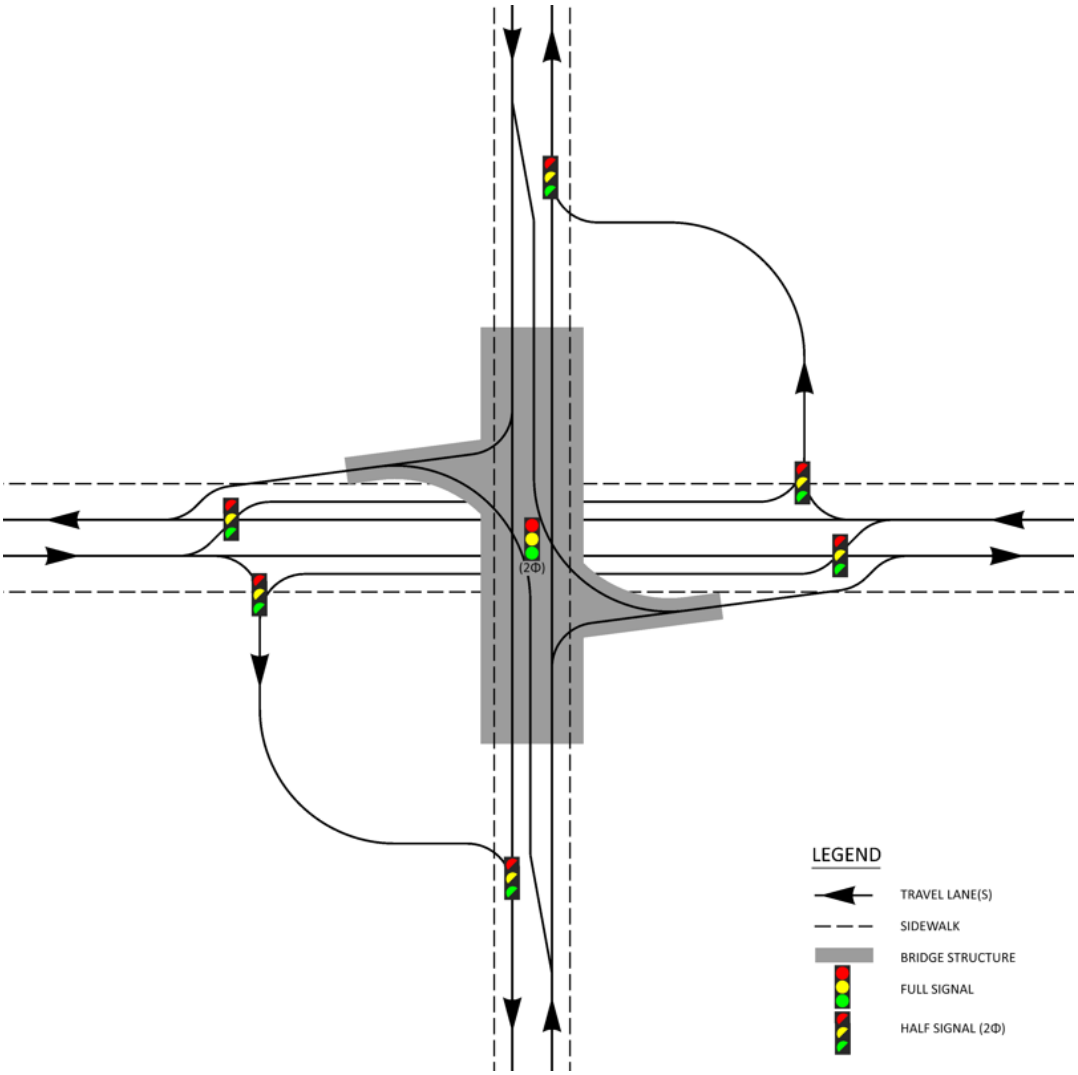
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
5	5	4	2	5	3	3	4	0	2	1	0	14	17	3	34



04-14, Top and bottom different, CFI, single point

Summary: Like several 04 designs, features superb efficiency and safety scores but very poor cost scores. Could be competitive in a high-demand spot.
History: This is a new design.
Rank: 30 of 85.

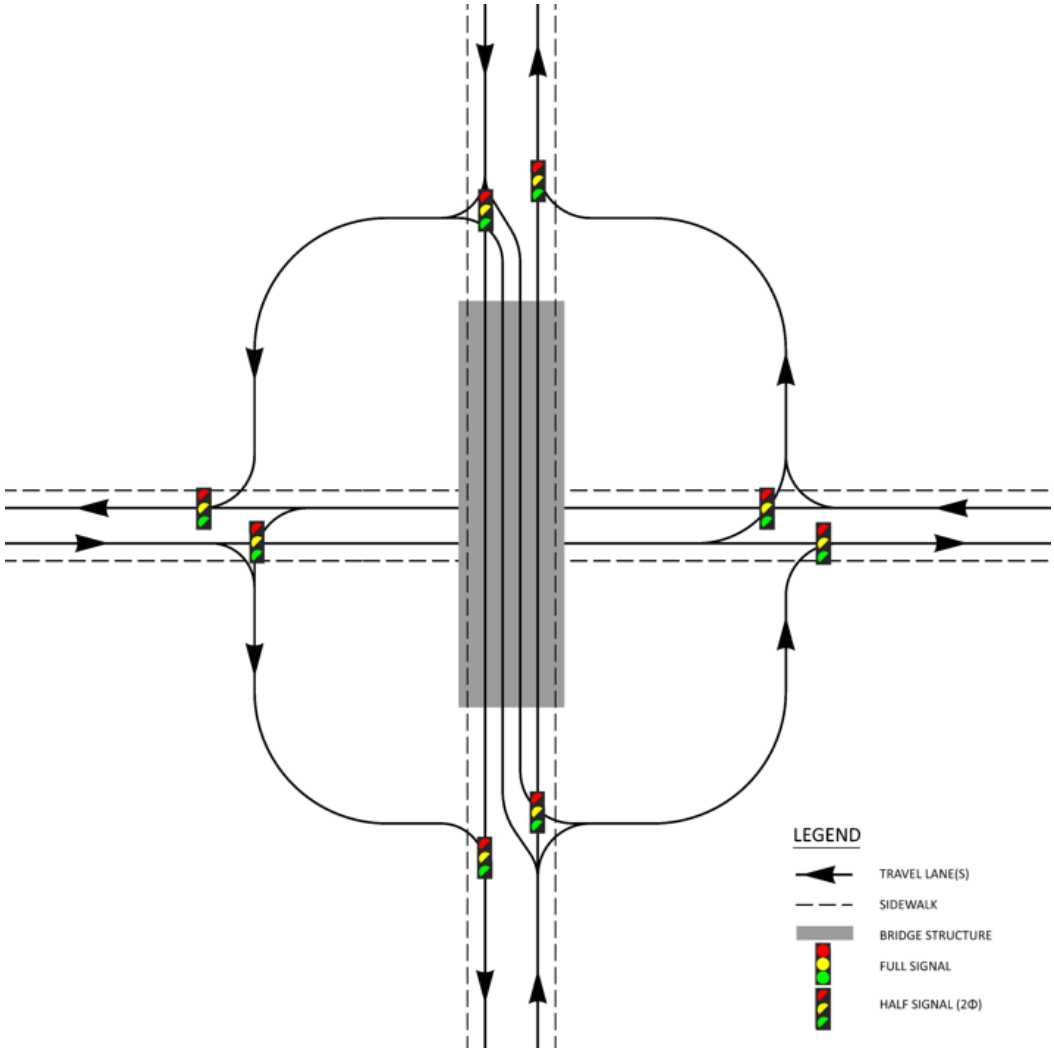
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
5	5	5	2	5	3	3	4	0	2	1	0	15	17	3	35



04-15, Top and bottom different, contraflow, leftover

Summary: Like several 04 designs, features superb efficiency and safety scores but very poor cost scores. Could be competitive in a high-demand spot.
History: This is a new design.
Rank: 35 of 85.

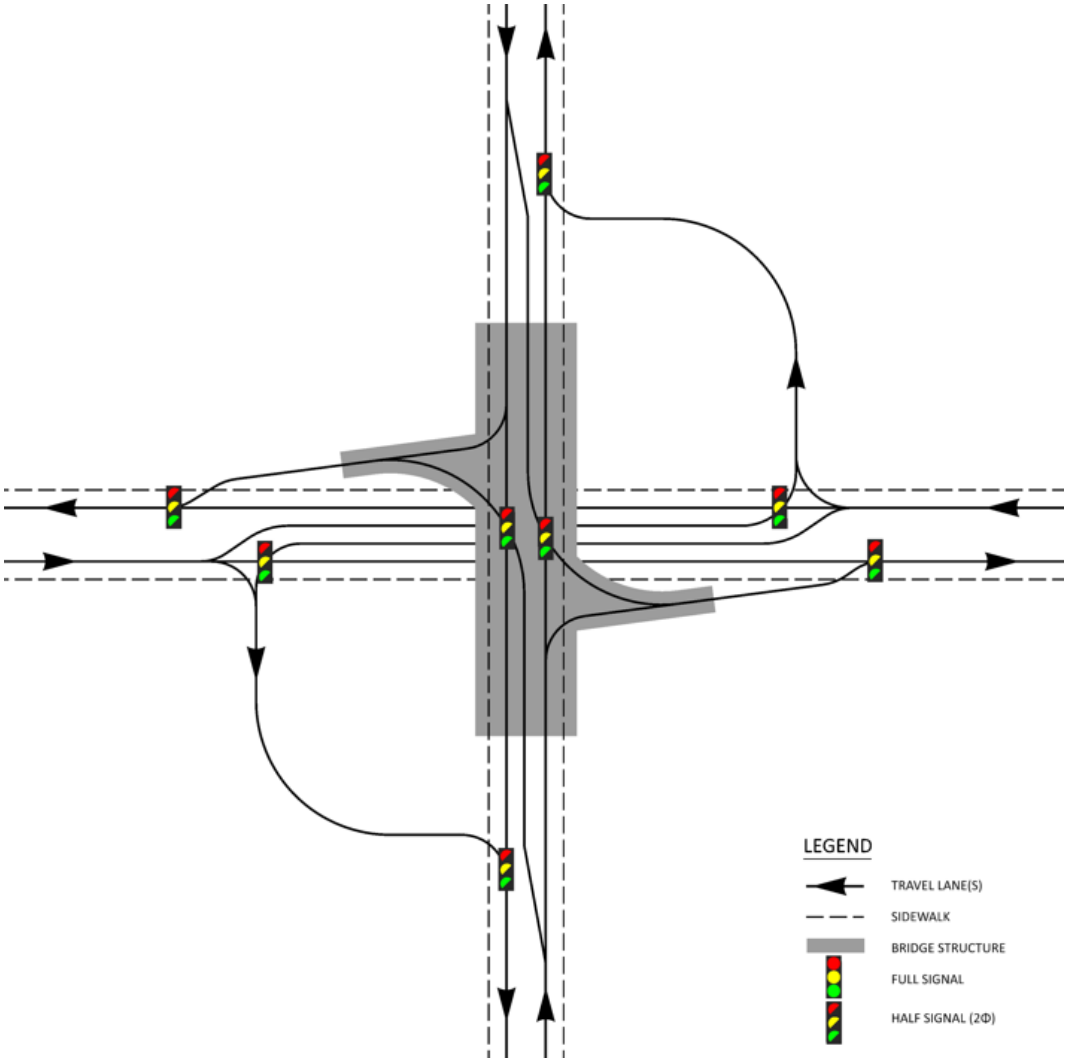
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	4	2	5	3	3	5	0	2	1	0	13	18	3	34



04-16, Top and bottom different, contraflow, single point

Summary: Like several 04 designs, features superb efficiency and safety scores but very poor cost scores. Could be competitive in a high-demand spot.
History: This is a new design.
Rank: 23 of 85.

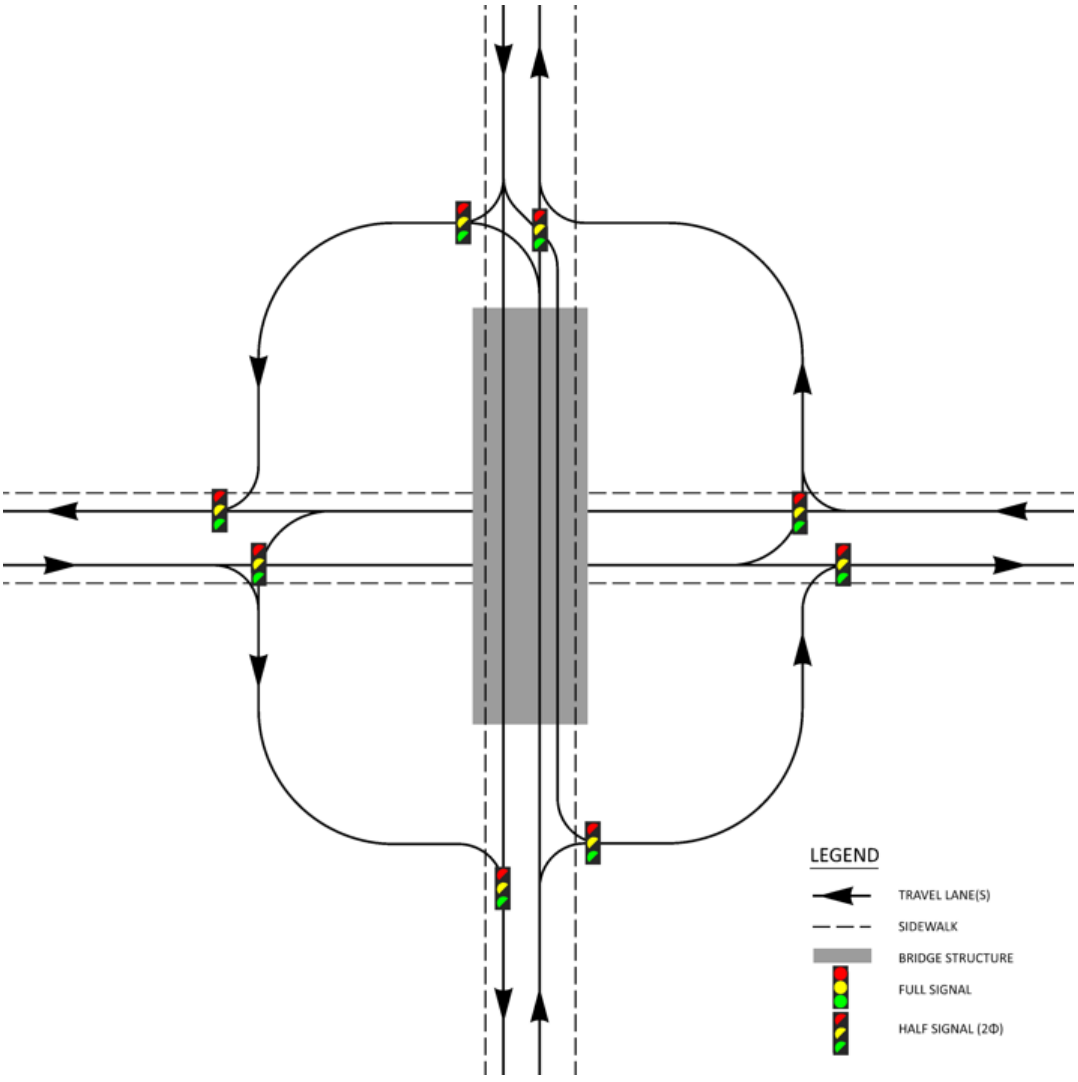
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
5	5	5	2	5	3	3	5	0	2	1	0	15	18	3	36



04-17, Top and bottom different, one CFI

Summary: Like several 04 designs, features superb efficiency and safety scores but very poor cost scores. Could be competitive in a high-demand spot.
History: This is a new design.
Rank: 28 of 85.

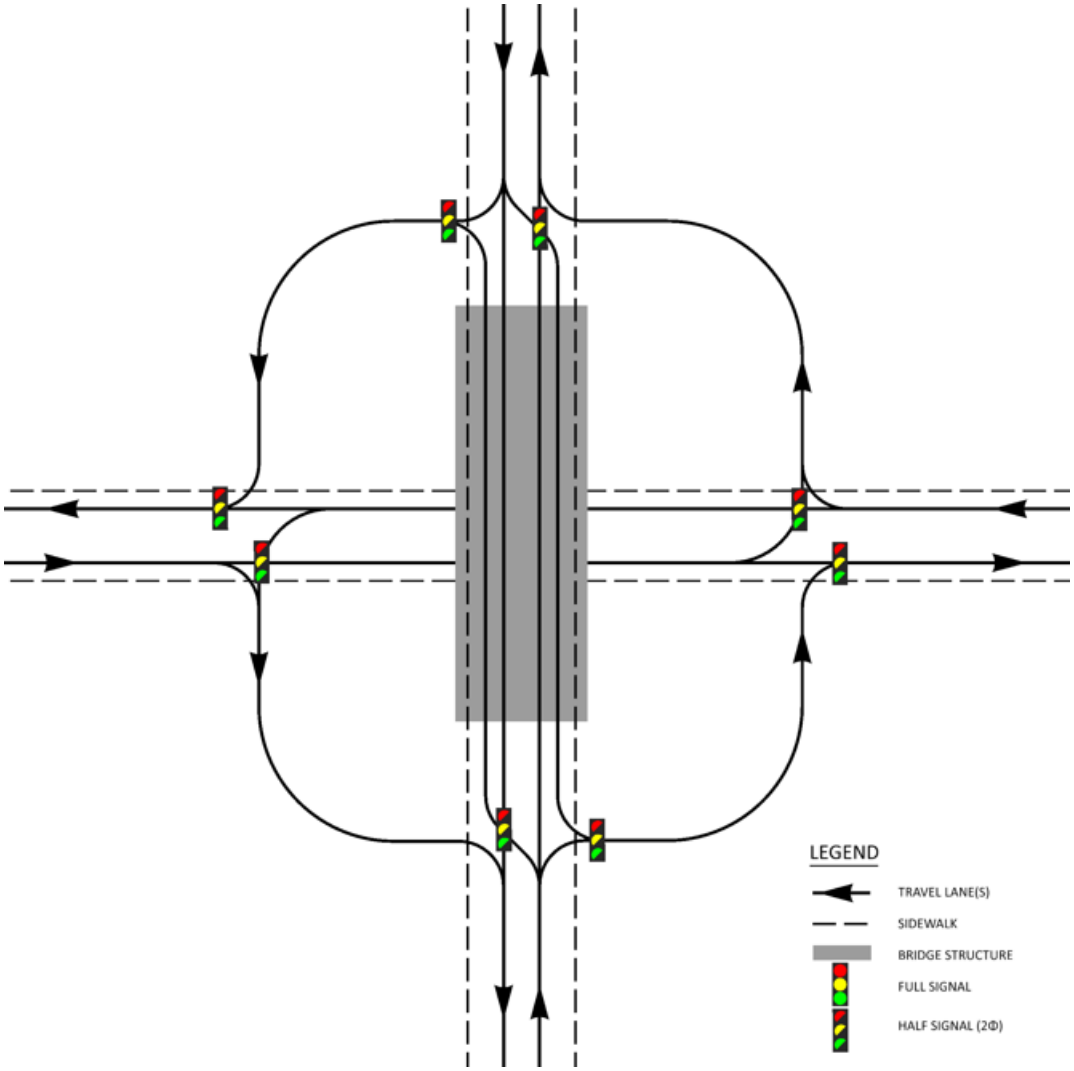
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	4	2	5	3	3	5	1	2	1	0	13	18	4	35



04-18, Top and bottom different, two CFIs

Summary: Like several 04 designs, features superb efficiency and safety scores but very poor cost scores. Could be competitive in a high-demand spot.
History: This is a new design.
Rank: 36 of 85.

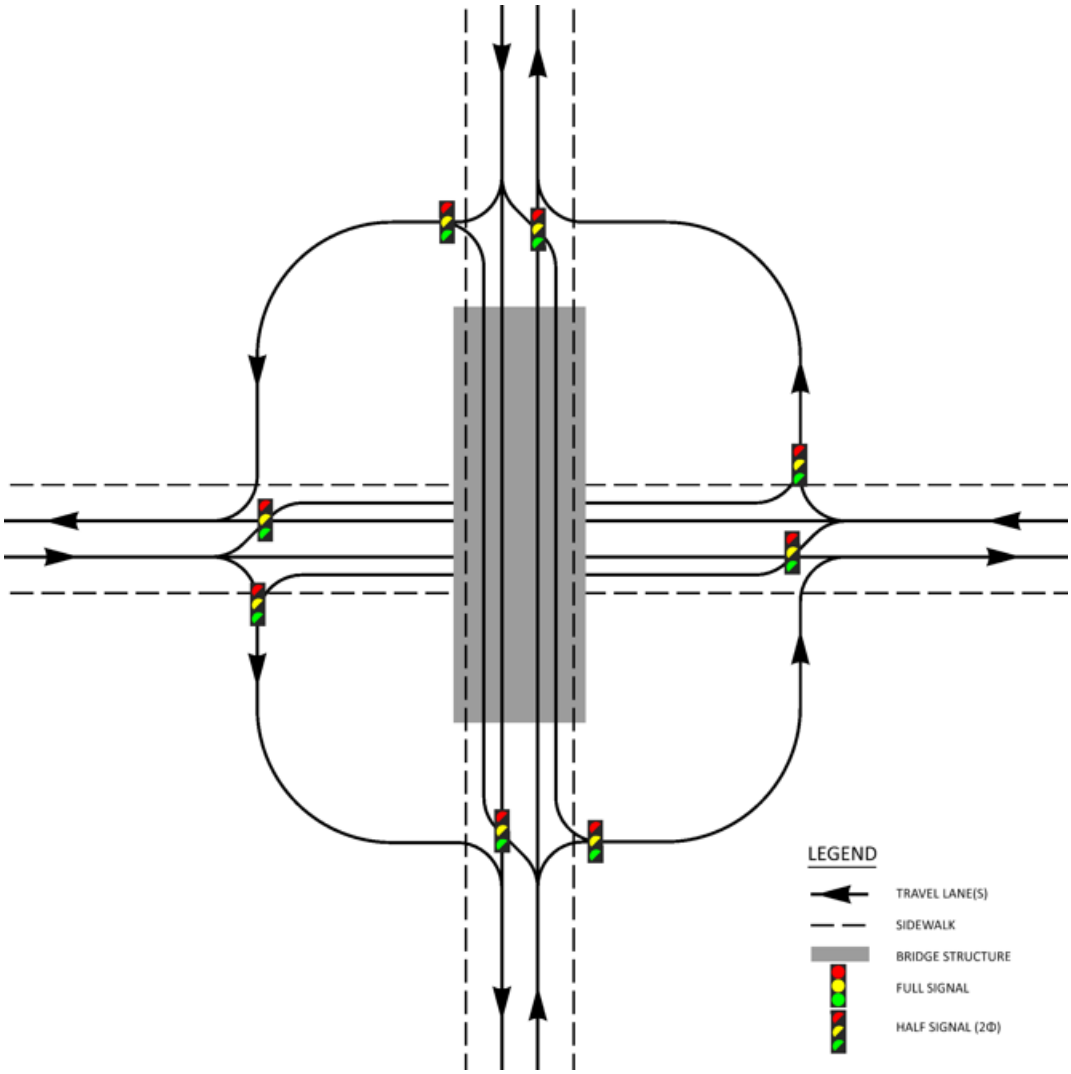
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	4	2	5	3	3	5	0	2	1	0	13	18	3	34



04-19, Top and Bottom same, CFI

Summary: Terrific efficiency scores are balanced by poor cost scores.
History: This is a new design.
Rank: 44 of 85.

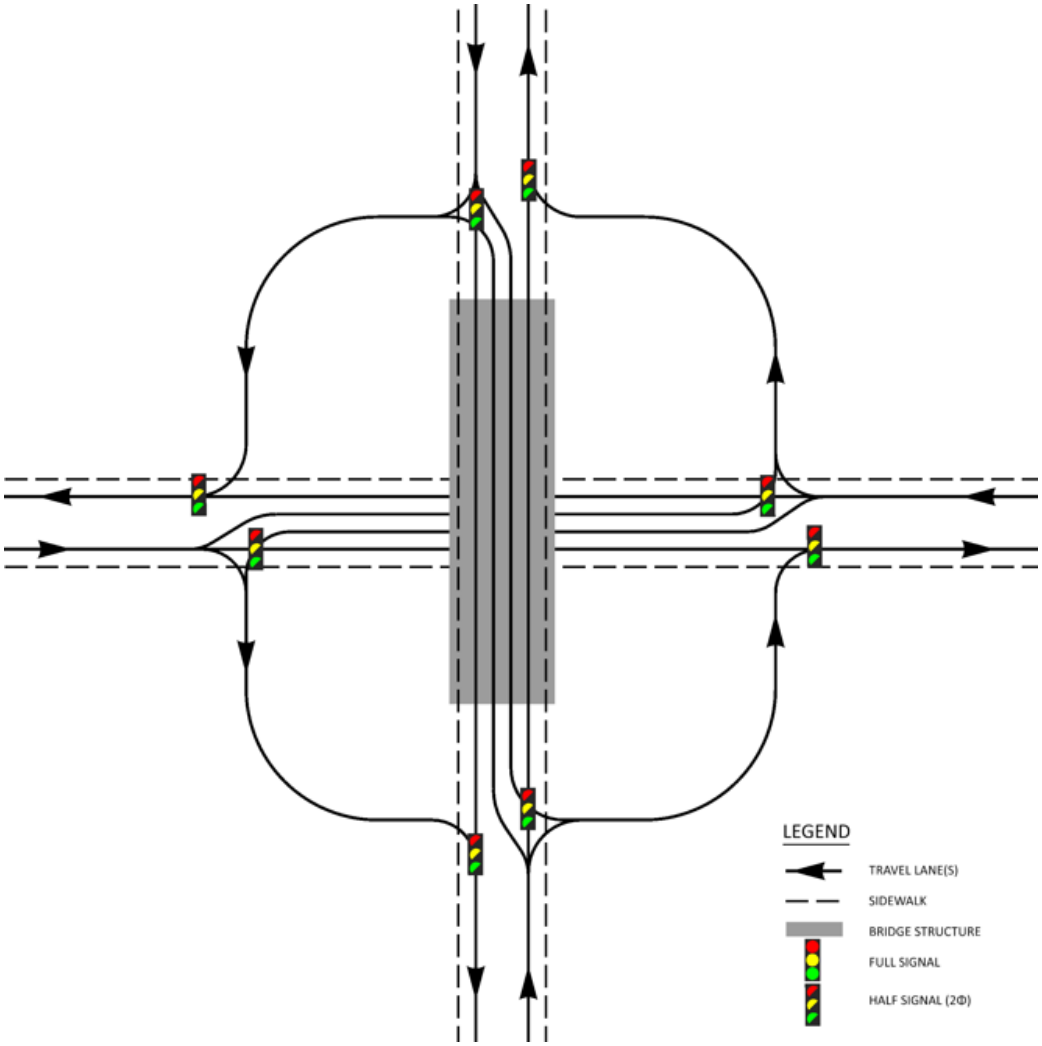
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
5	5	4	2	5	3	3	3	0	2	1	0	14	16	3	33



04-20, Top and bottom same, contraflow

Summary: Terrific efficiency scores are balanced by poor cost scores. This design has better speed control than the similar design with CFI left turns.
History: This is a new design.
Rank: 27 of 85.

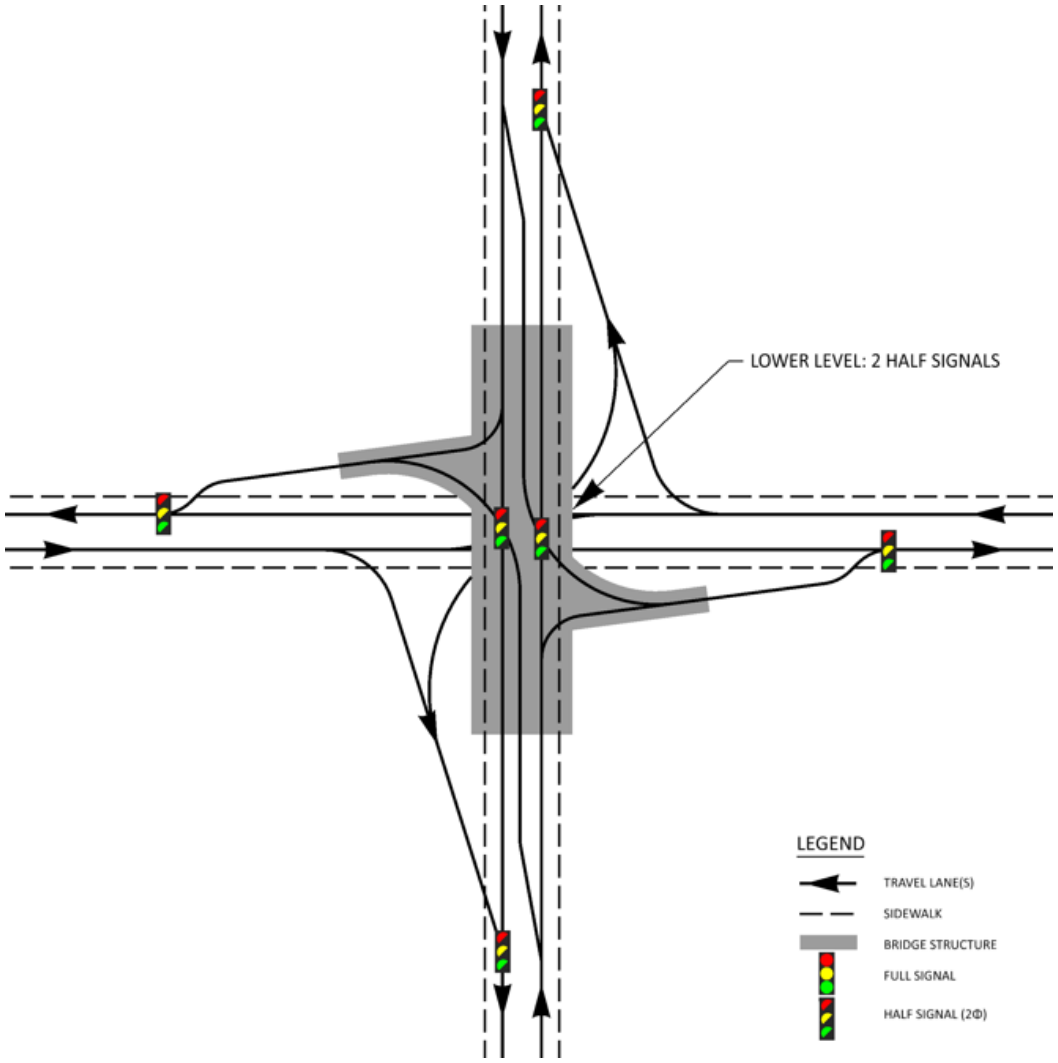
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
5	5	4	2	5	3	3	5	0	2	1	0	14	18	3	35



04-21, Two level signalized

Summary: This design, with single point left turns top and bottom, features perfect scores for efficiency and the top scores of all designs for safety offset by poor cost scores.
History: Published in 2008 (Shin, et al.) and patented, we do not believe any have been built yet. The design may still be patented.
Rank: 9 of 85.

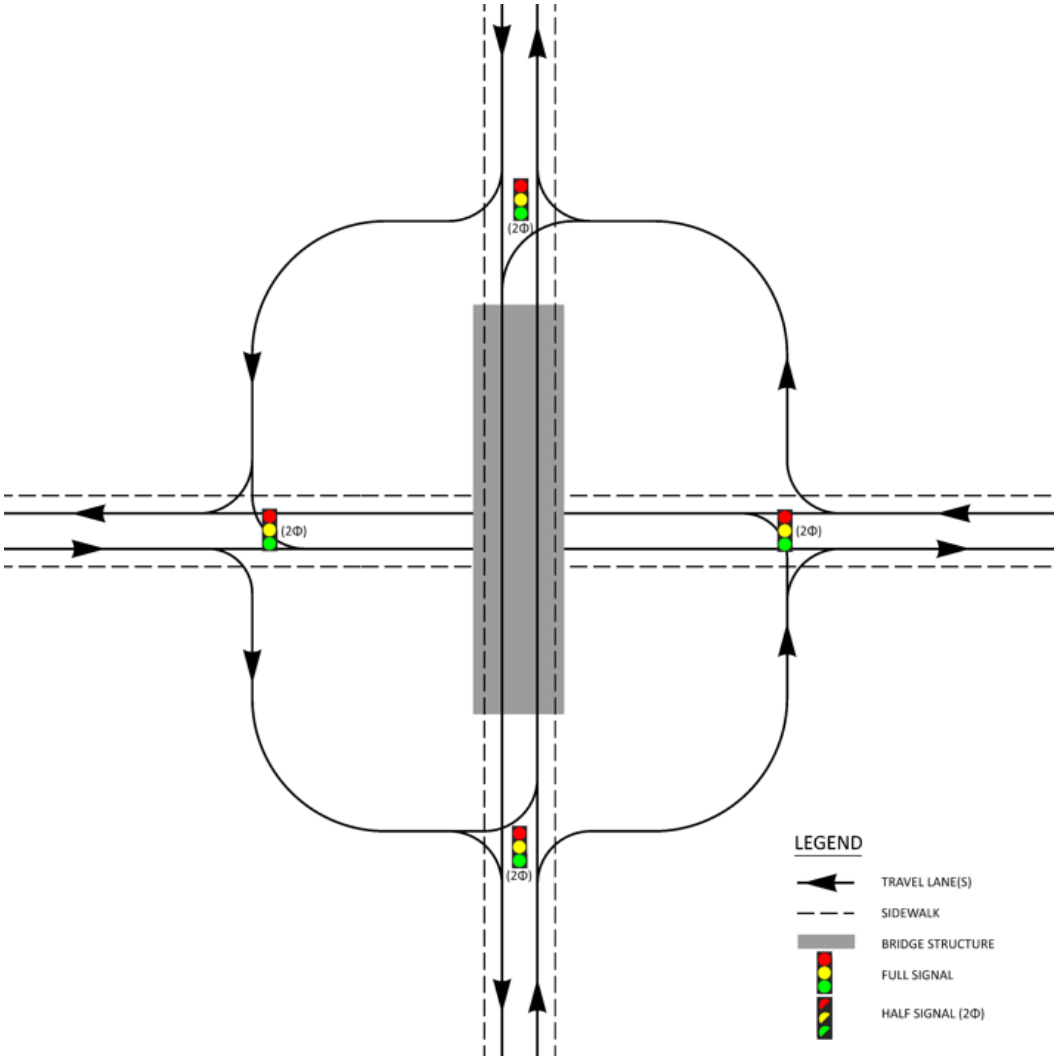
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
5	5	5	2	5	5	3	5	0	3	1	0	15	20	4	39



04-22, Windmill

Summary: This design needs only a small bridge, but otherwise has mostly dismal scores.
History: At least one has been built, at US-35 and OH-32 in Jackson, Ohio.
Rank: 84 of 85.

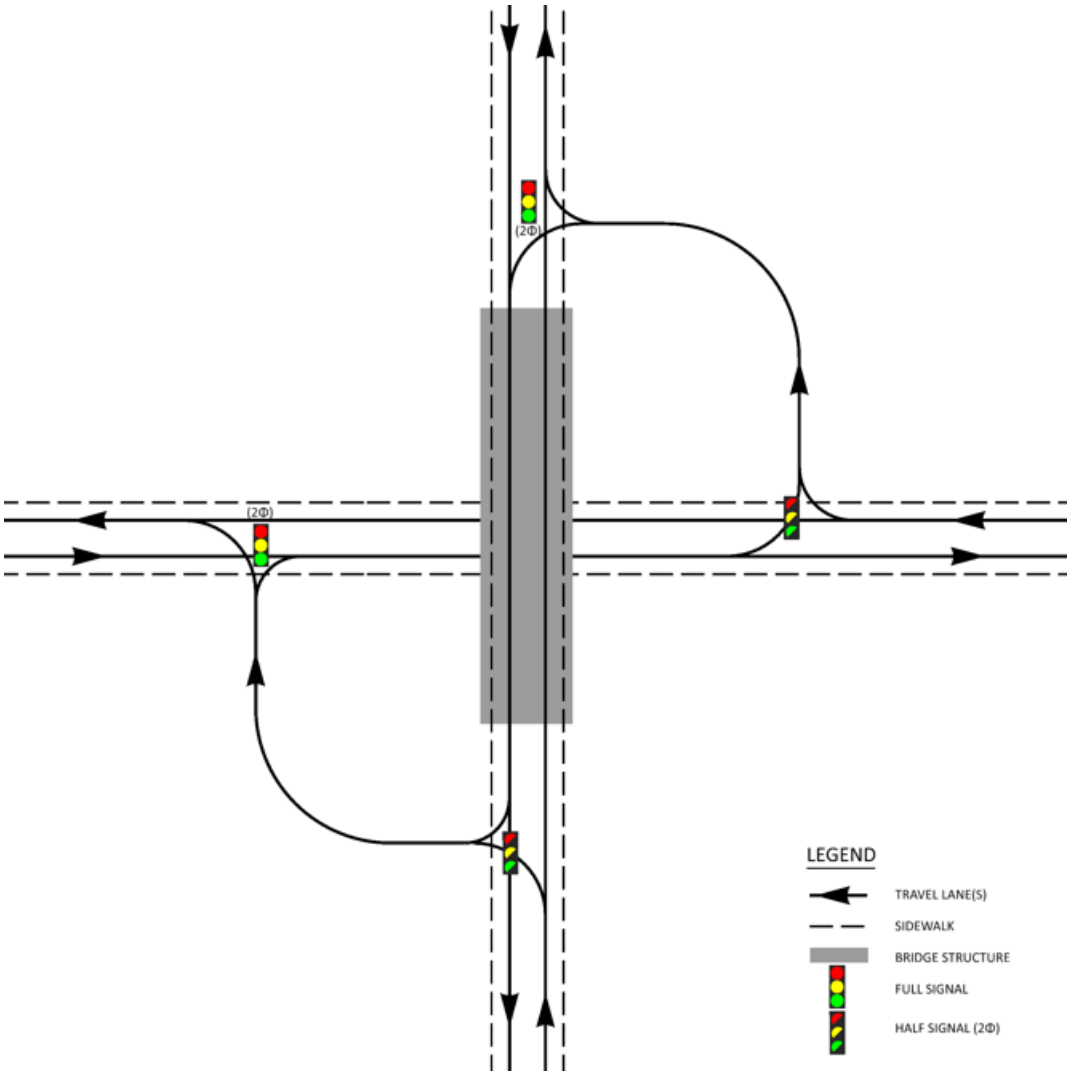
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	0	4	2	3	2	1	0	5	2	1	0	8	8	8	24



11-01, Diagonal, left, left

Summary: A lower-cost design that struggles for efficiency and safety.
History: This is a new design.
Rank: 53 of 85.

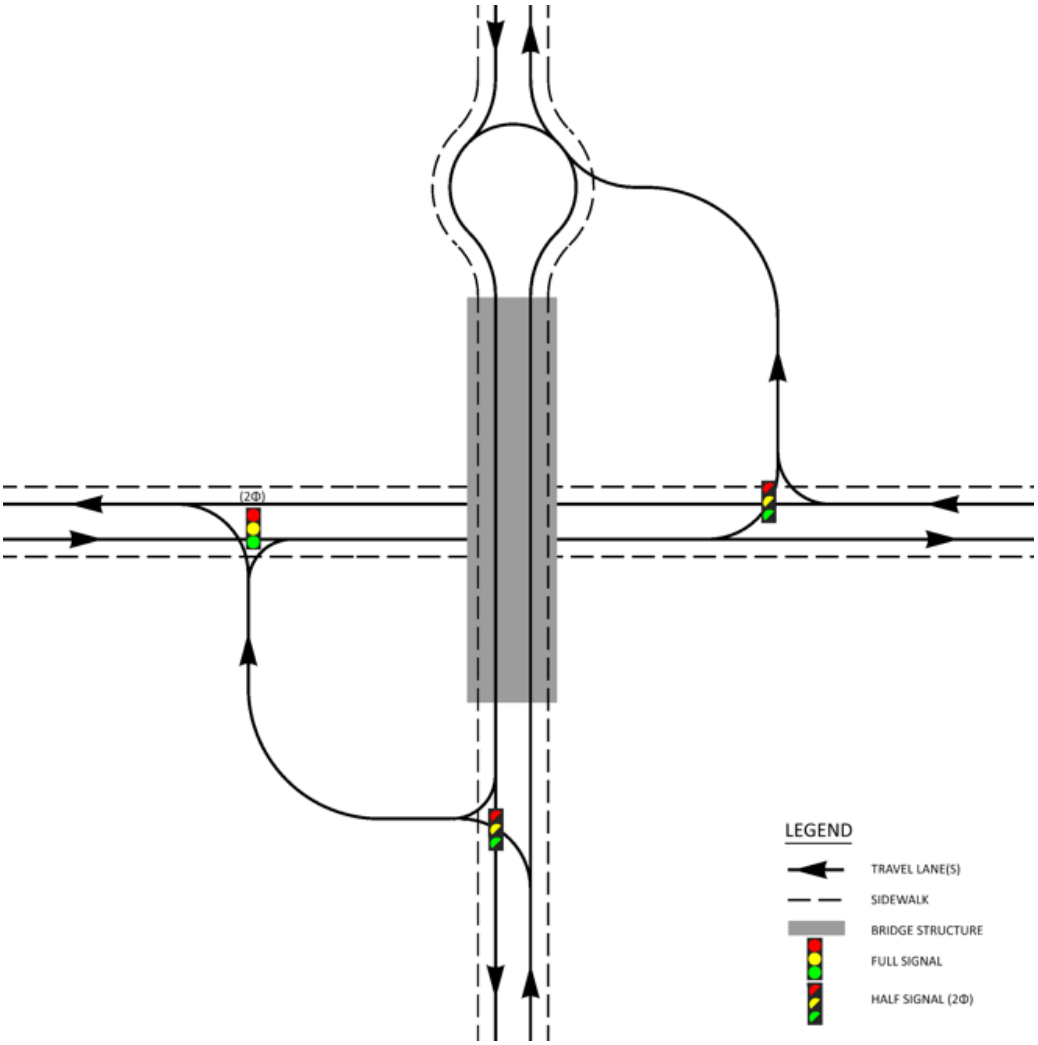
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	1	2	3	1	1	5	0	4	5	4	3	6	10	16	32



11-02, Diagonal, left, roundabout

Summary: A lower-cost design that struggles for efficiency and safety. This version scores a bit better than the version without roundabouts.
History: This is a new design.
Rank: 34 of 85.

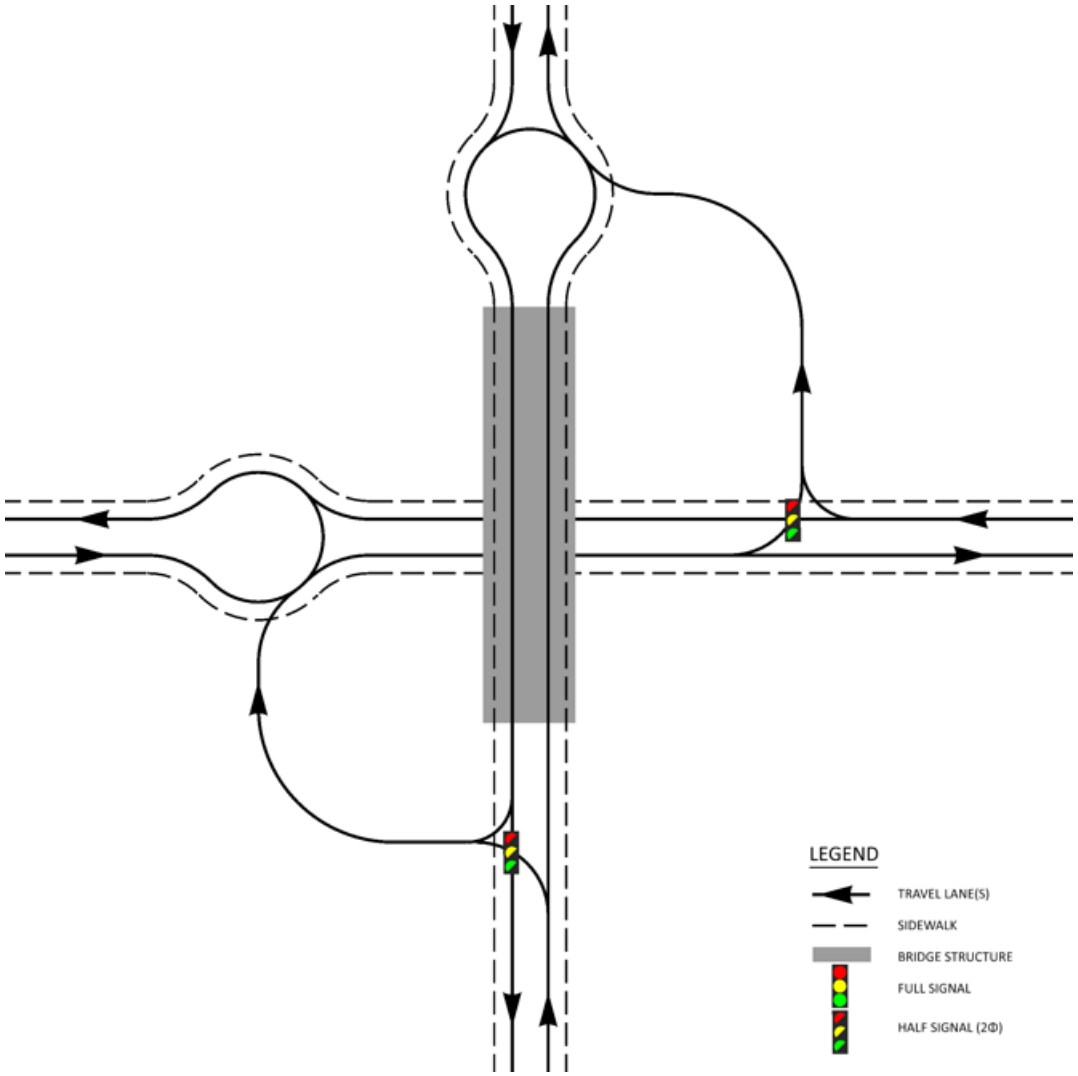
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	3	2	4	1	1	5	1	4	5	3	3	8	12	15	35



11-03, Diagonal, roundabout, roundabout

Summary: This design has poor efficiency scores but good safety and cost scores. It might be a good competitor in a spot with lower demands and available right of way in diagonal quadrants.
History: This is a new design.
Rank: 25 of 85.

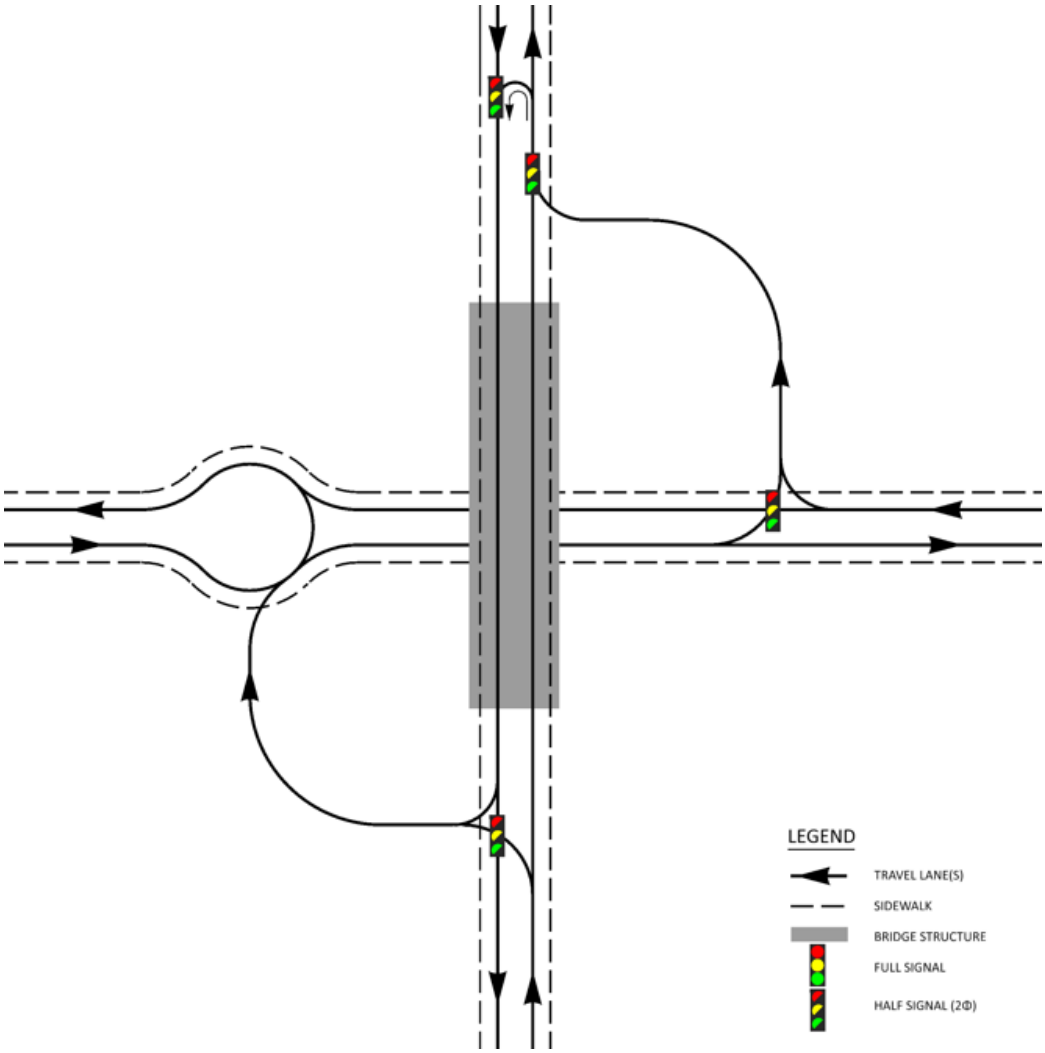
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	3	2	4	1	3	5	3	4	4	3	3	6	16	14	36



11-04, Diagonal, roundabout, u-turn external

Summary: This design has poor efficiency scores but good safety and cost scores. It might be a good competitor in a spot with lower demands and available right of way in diagonal quadrants.
History: This is a new design.
Rank: 26 of 85.

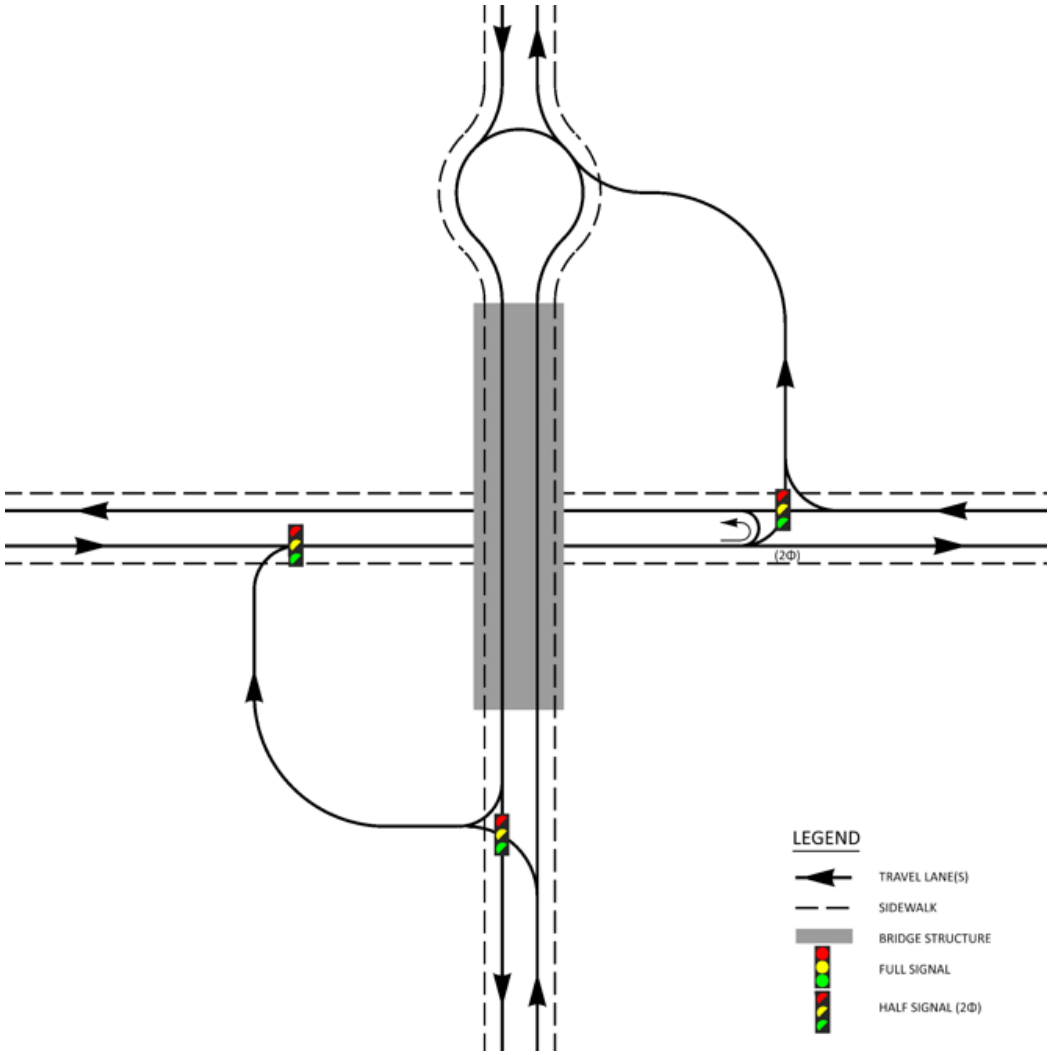
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	4	0	4	1	3	5	3	4	5	3	3	5	16	15	36



11-05, Diagonal, roundabout, u-turn internal

Summary: This design has poor efficiency scores but good safety and cost scores. It might be a good competitor in a spot with lower demands and available right of way in diagonal quadrants.
History: This is a new design.
Rank: 39 of 85.

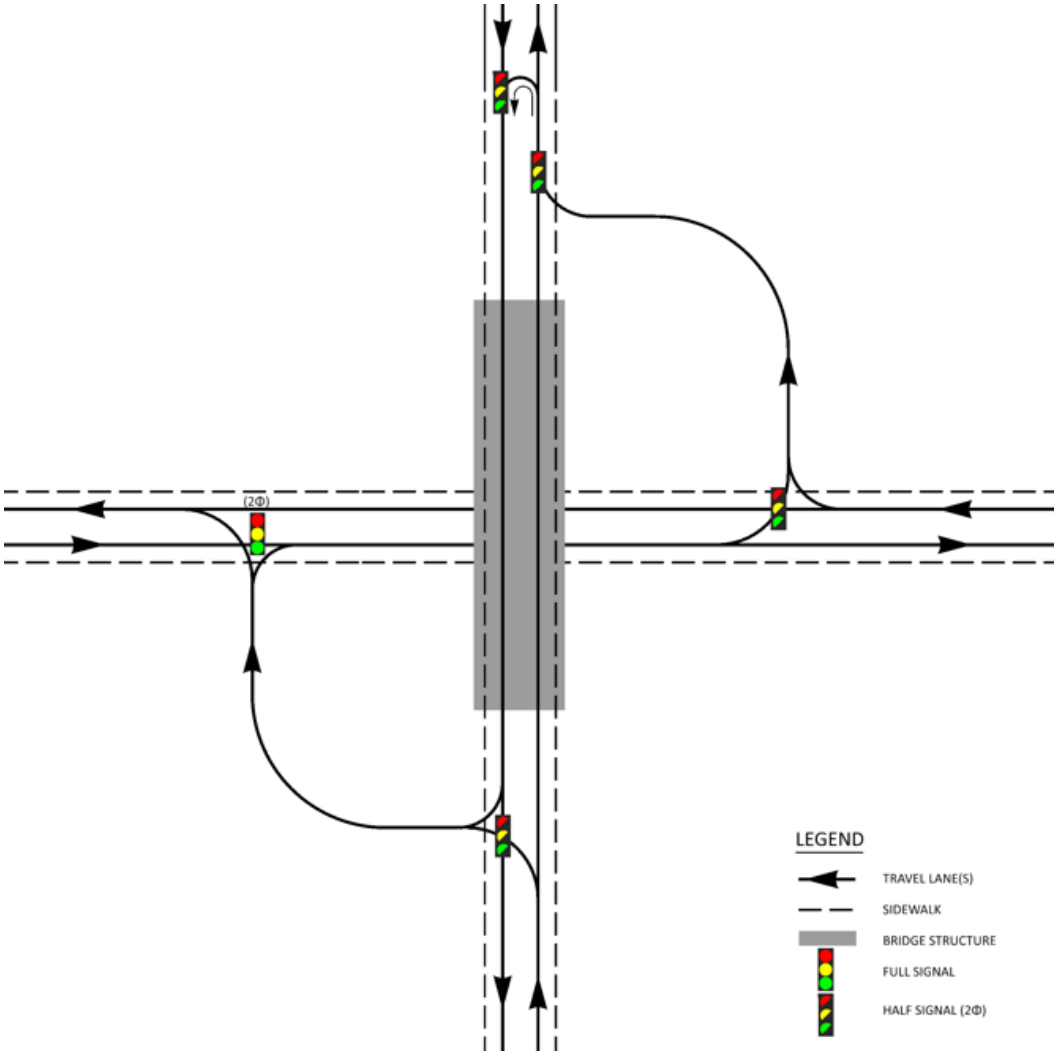
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	4	0	4	1	3	5	3	2	5	3	3	5	16	13	34



11-06, Diagonal, u-turn external

Summary: This design scores well for cost but does not score well for efficiency or safety.
History: This is a new design.
Rank: 42 of 85.

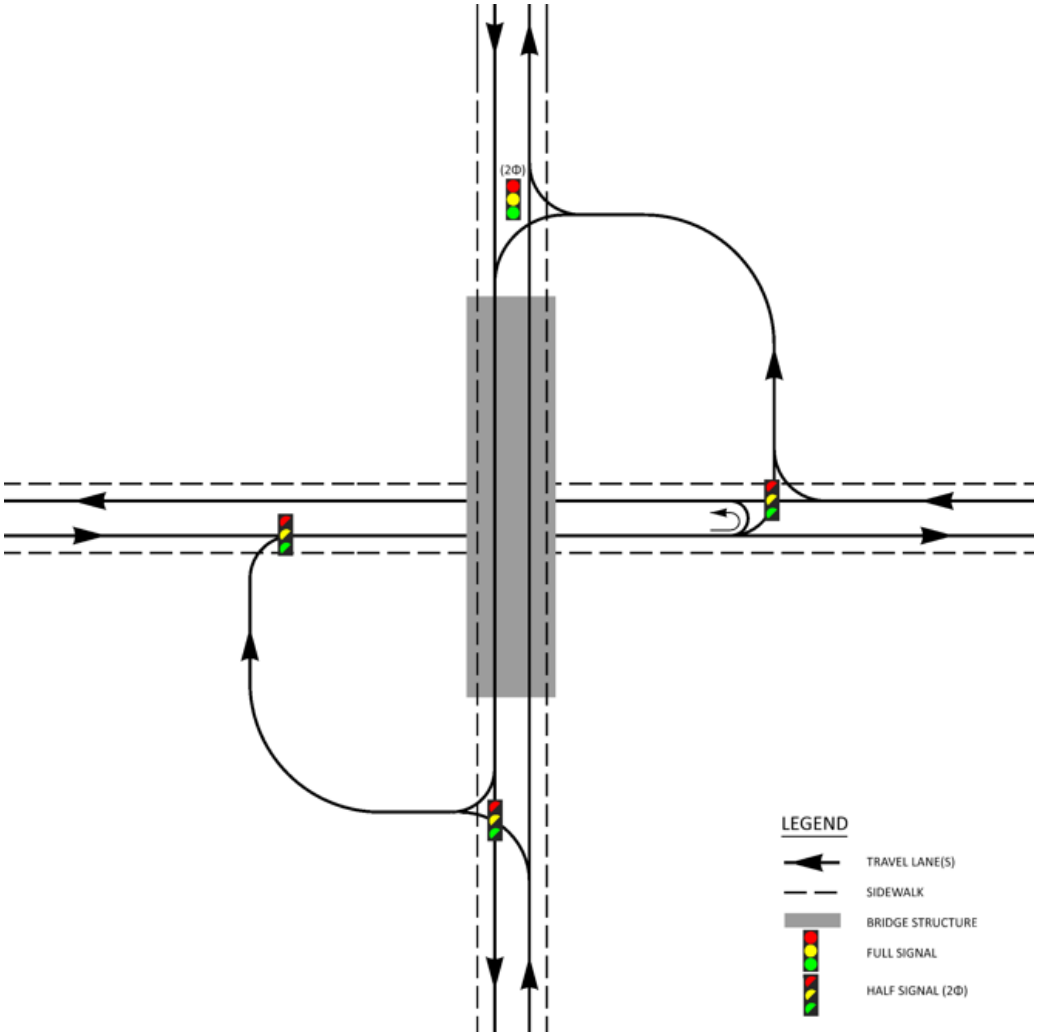
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	4	0	4	1	1	5	1	4	5	3	3	7	12	15	34



11-07, Diagonal, u-turn internal

Summary: This design scores well for cost but does not score well for efficiency or safety.
History: This is a new design.
Rank: 60 of 85.

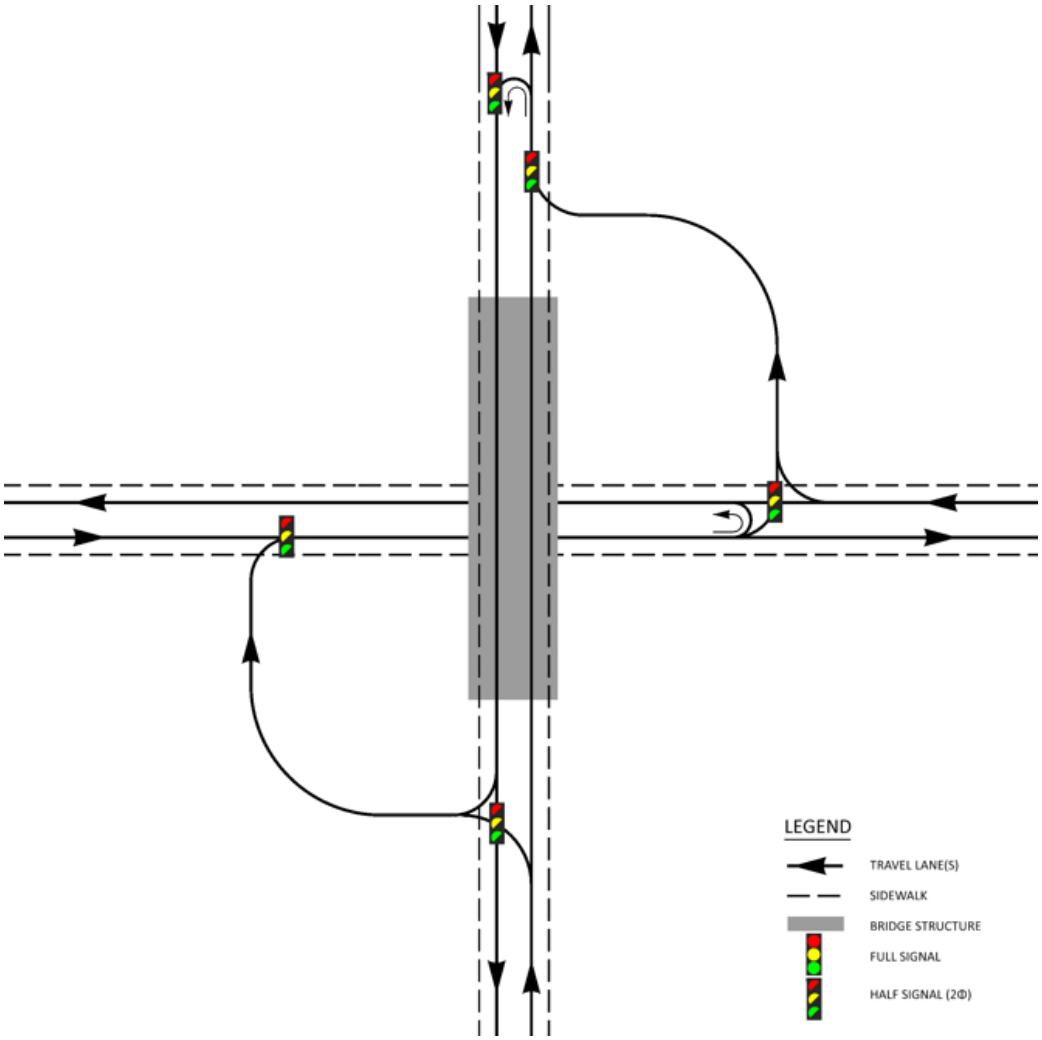
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Fight of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	4	0	4	1	1	5	1	2	5	4	3	5	12	14	31



11-08, Diagonal, u-turn, u-turn

Summary: This design scores well for cost and safety, but poorly for efficiency. This design may compete at lower-demand sites.
History: This is a new design.
Rank: 31 of 85.

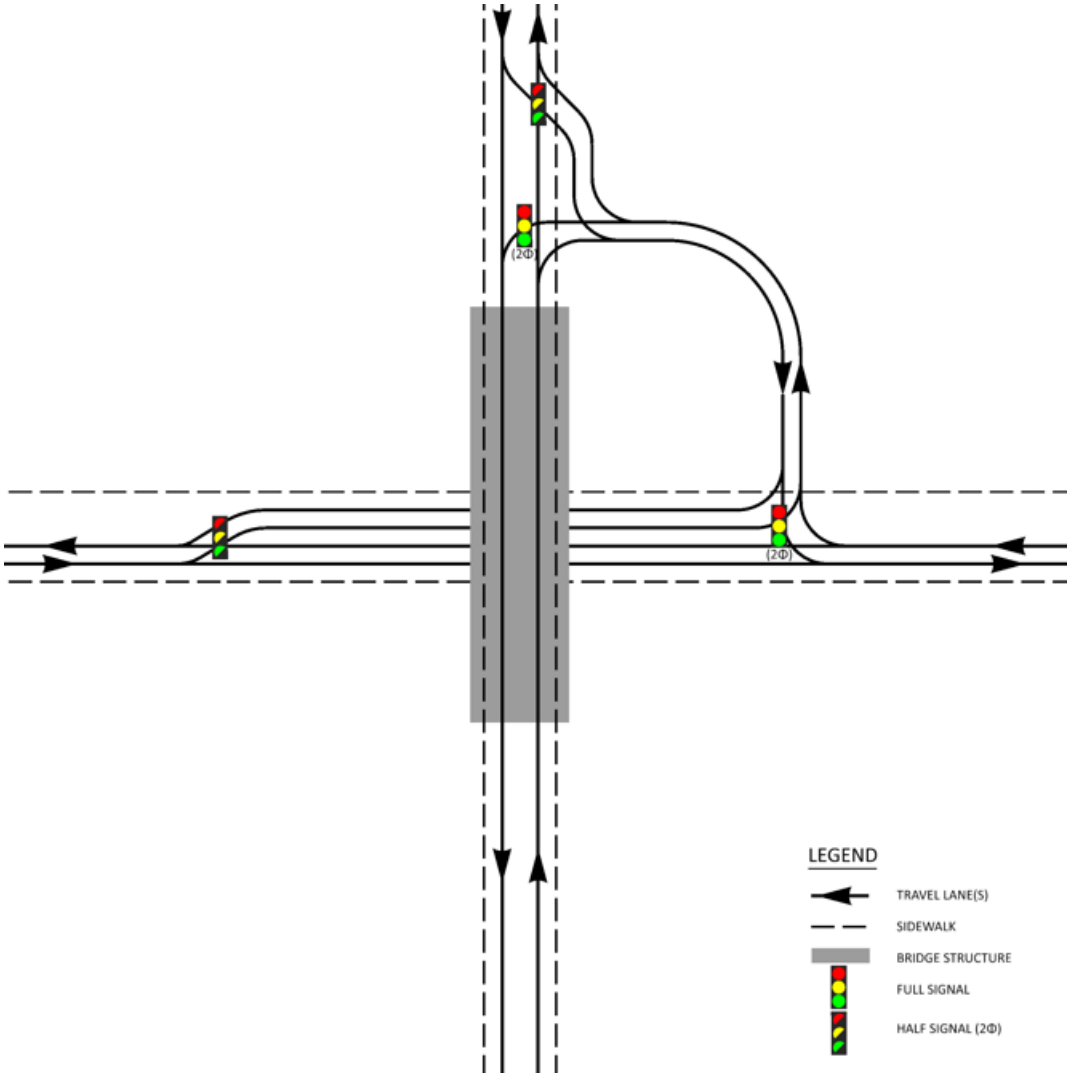
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	5	0	4	1	3	5	3	2	5	3	3	6	16	13	35



11-09, One quadrant, CFI, CFI

Summary: Has several outstanding attributes, like capacity, pedestrian quality, and right of way size, but otherwise the scores are not good.
History: This is a new design.
Rank: 69 of 85.

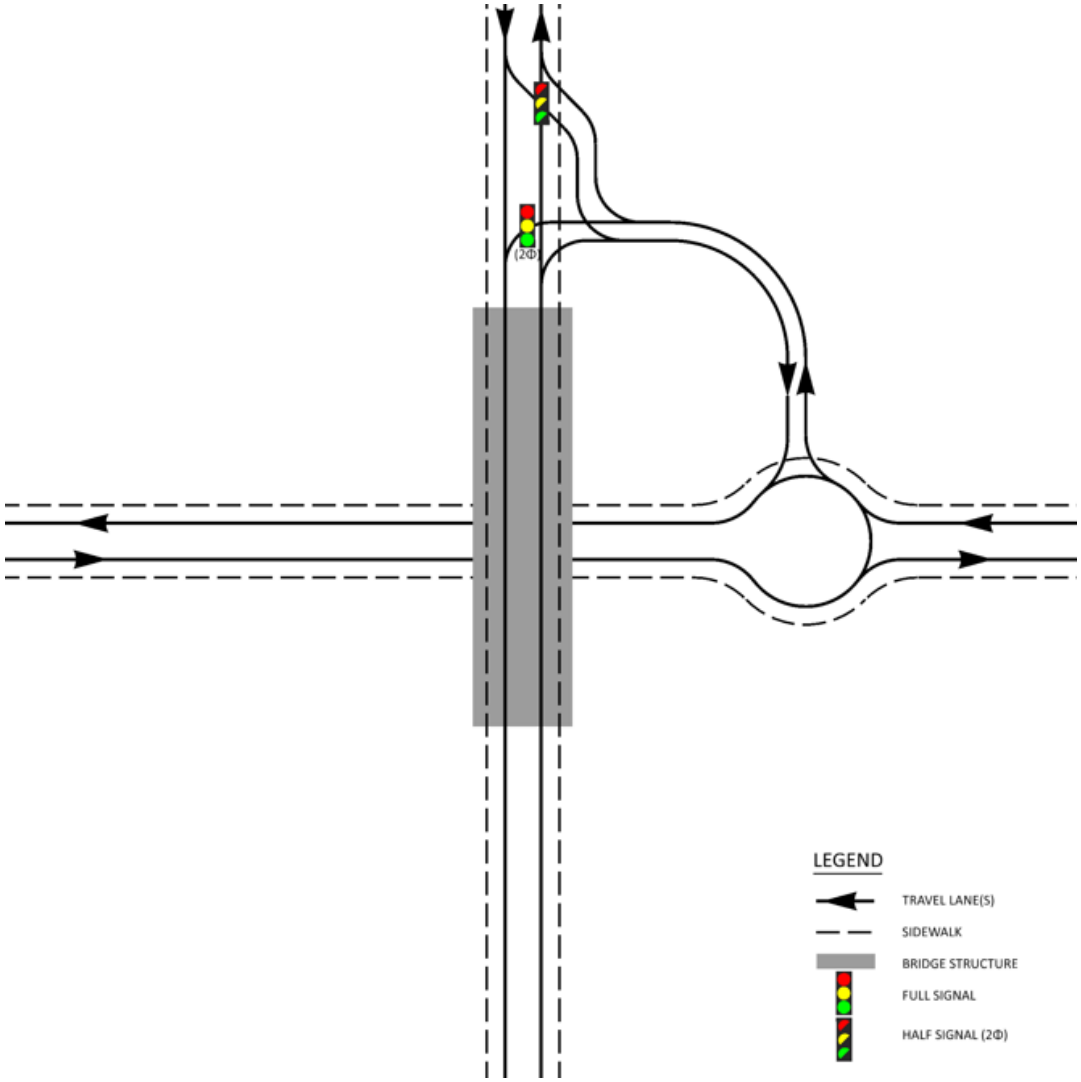
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
5	1	2	2	1	1	5	0	1	5	3	4	8	9	13	30



11-10, One quadrant, CFI, roundabout

Summary: Outstanding cost scores should give this design a chance. May make sense where a road with a higher demand meets a road with a lower demand.
History: This is a new design.
Rank: 18 of 85.

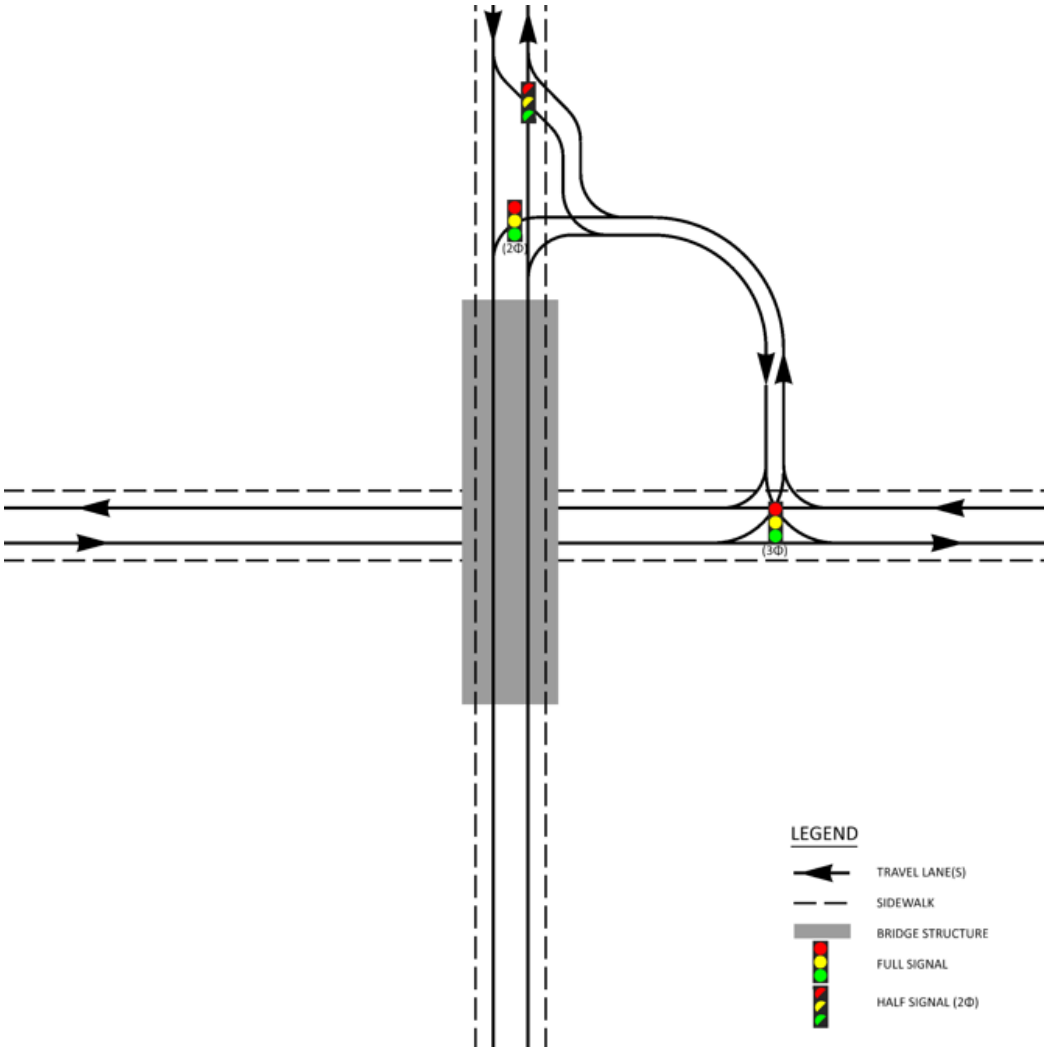
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	3	2	4	1	1	4	1	5	5	3	5	8	11	18	37



11-11, One quadrant, CFI, three-phase

Summary: Compared to some other 11, One quadrant designs, this design gave up some ground in safety. The cost scores are still outstanding.
History: This is a new design.
Rank: 52 of 85.

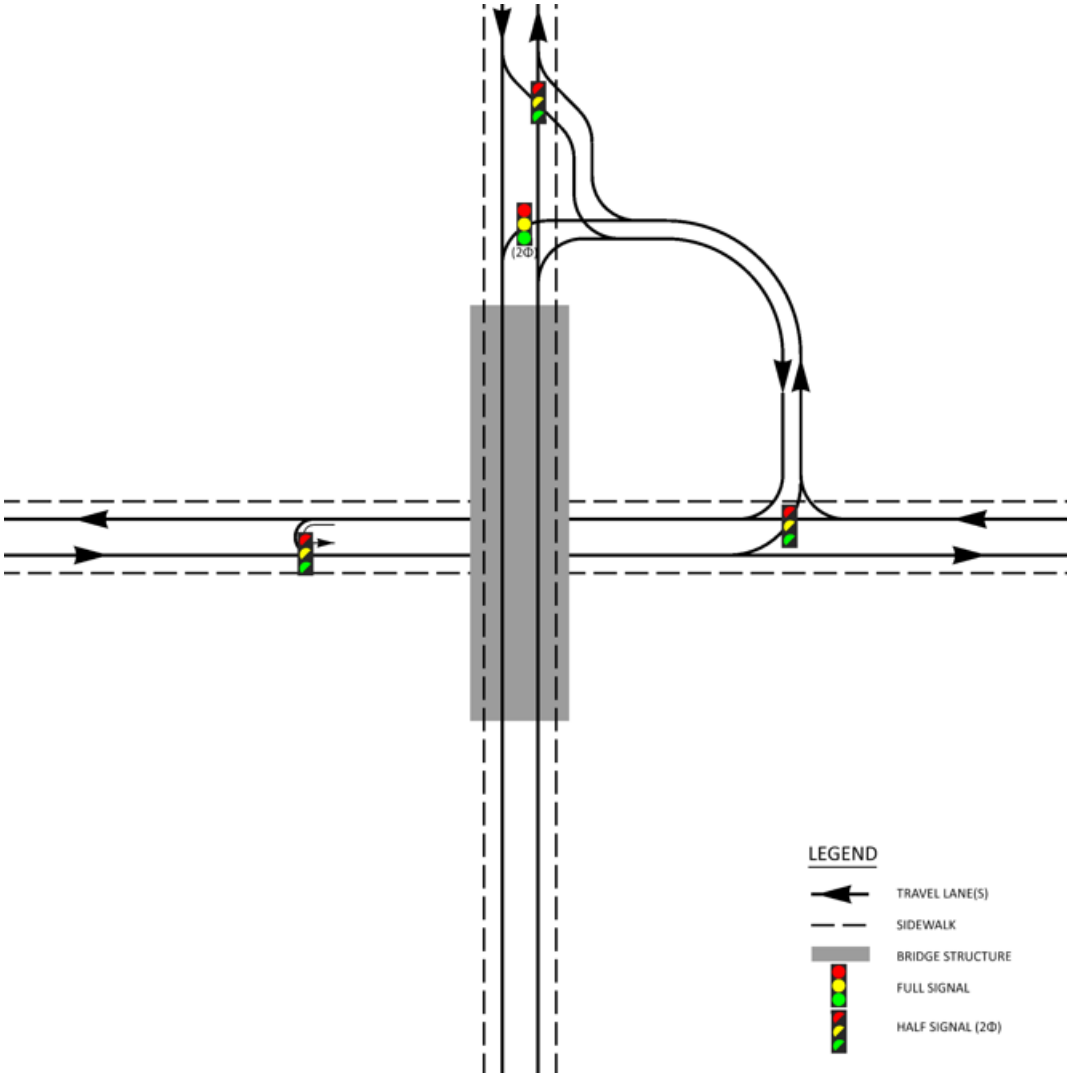
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	1	2	2	1	1	5	0	4	5	4	5	5	9	18	32



11-12, One quadrant, CFI, u-turn

Summary: Has several outstanding attributes, like pedestrian quality, right of way size, and right of way flexibility, but otherwise the scores are generally not good.
History: This is a new design.
Rank: 47 of 85.

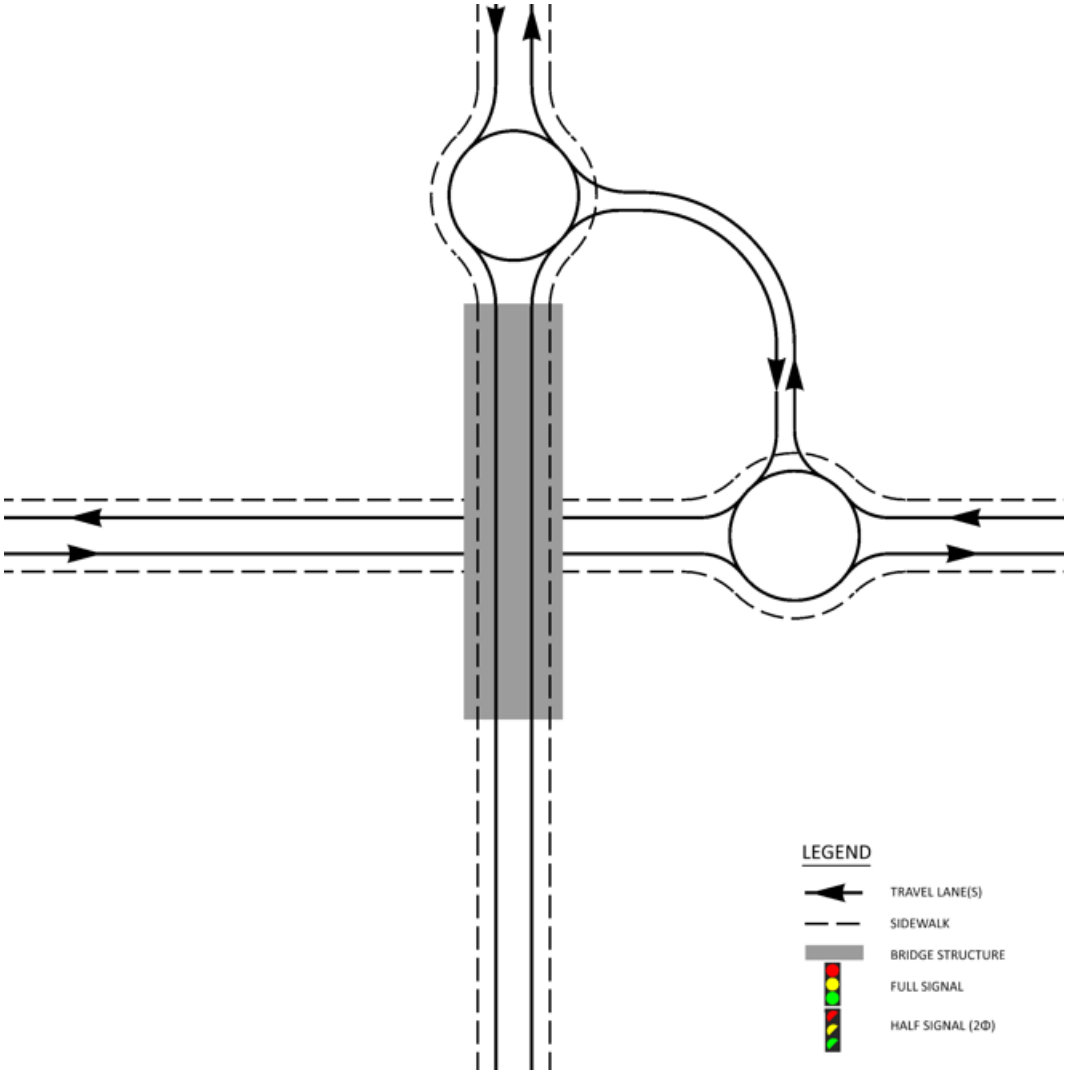
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	4	0	3	1	1	5	1	2	5	3	5	7	11	15	33



11-13, One quadrant, roundabout, roundabout

Summary: This simple design landed at the top of the charts. The efficiency is not great, but the safety and cost scores are superb. Should be considered strongly at lower-demand sites.
History: This is a new design.
Rank: 1 of 85.

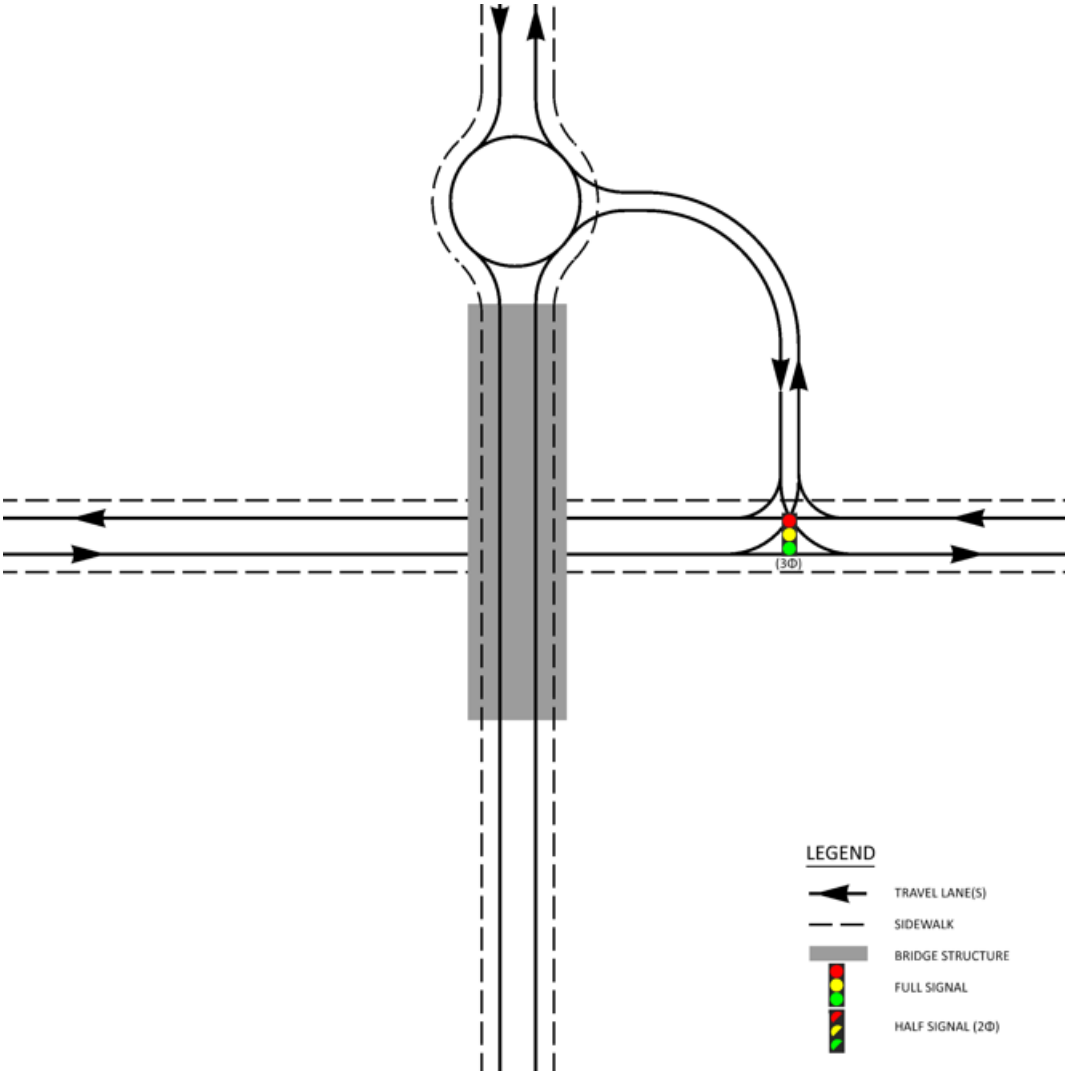
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	3	2	5	1	5	4	3	5	5	4	5	8	18	19	45



11-14, One quadrant, roundabout, three-phase

Summary: Not quite as stellar as the version with two roundabouts, but this design still scores well overall. Top cost scores are the highlight.
History: This is a new design.
Rank: 11 of 85.

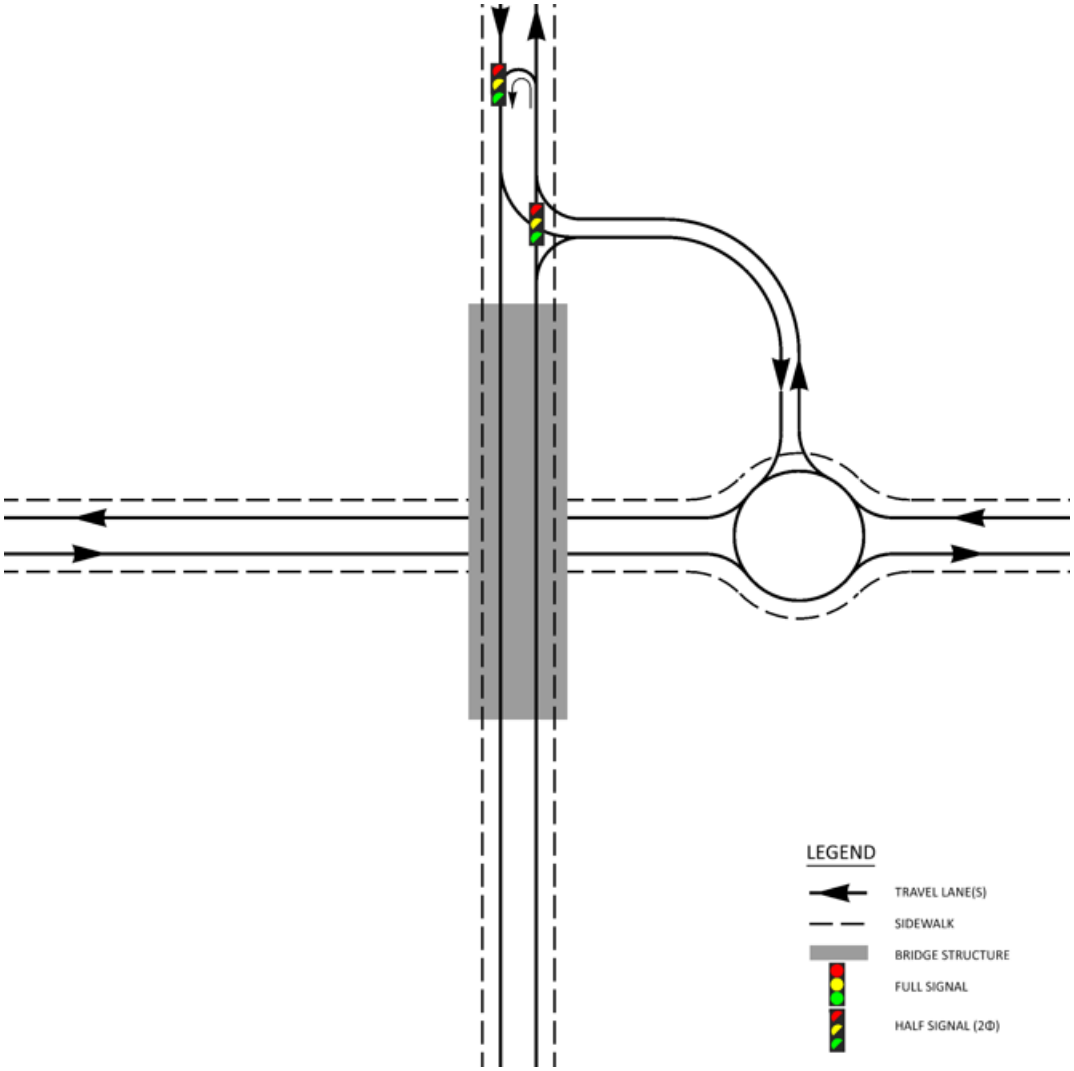
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	2	2	4	1	3	5	1	4	5	5	5	6	14	19	39



11-15, One quadrant, roundabout, u-turn

Summary: This is a highly ranked design with good safety scores and superb cost scores. Long distances traveled and the unusual maneuvers it requires are the two largest drawbacks.
History: This is a new design.
Rank: 2 of 85.

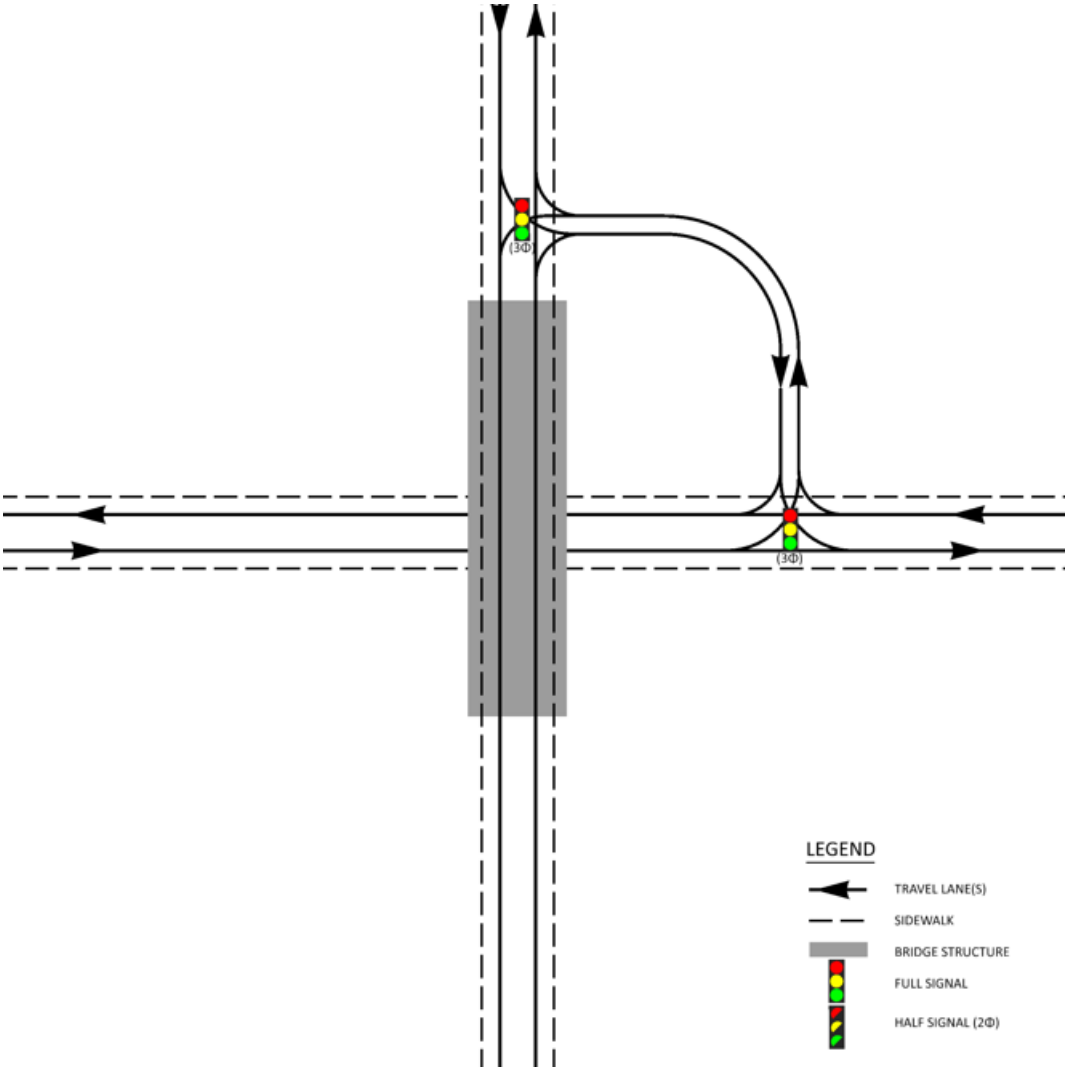
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	4	0	5	1	3	5	3	5	5	4	5	7	17	19	43



11-16, One quadrant, three-phase, three-phase

Summary: Not good for efficiency or safety, this design is likely popular due to superb cost features.
History: This is a common design.
Rank: 41 of 85.

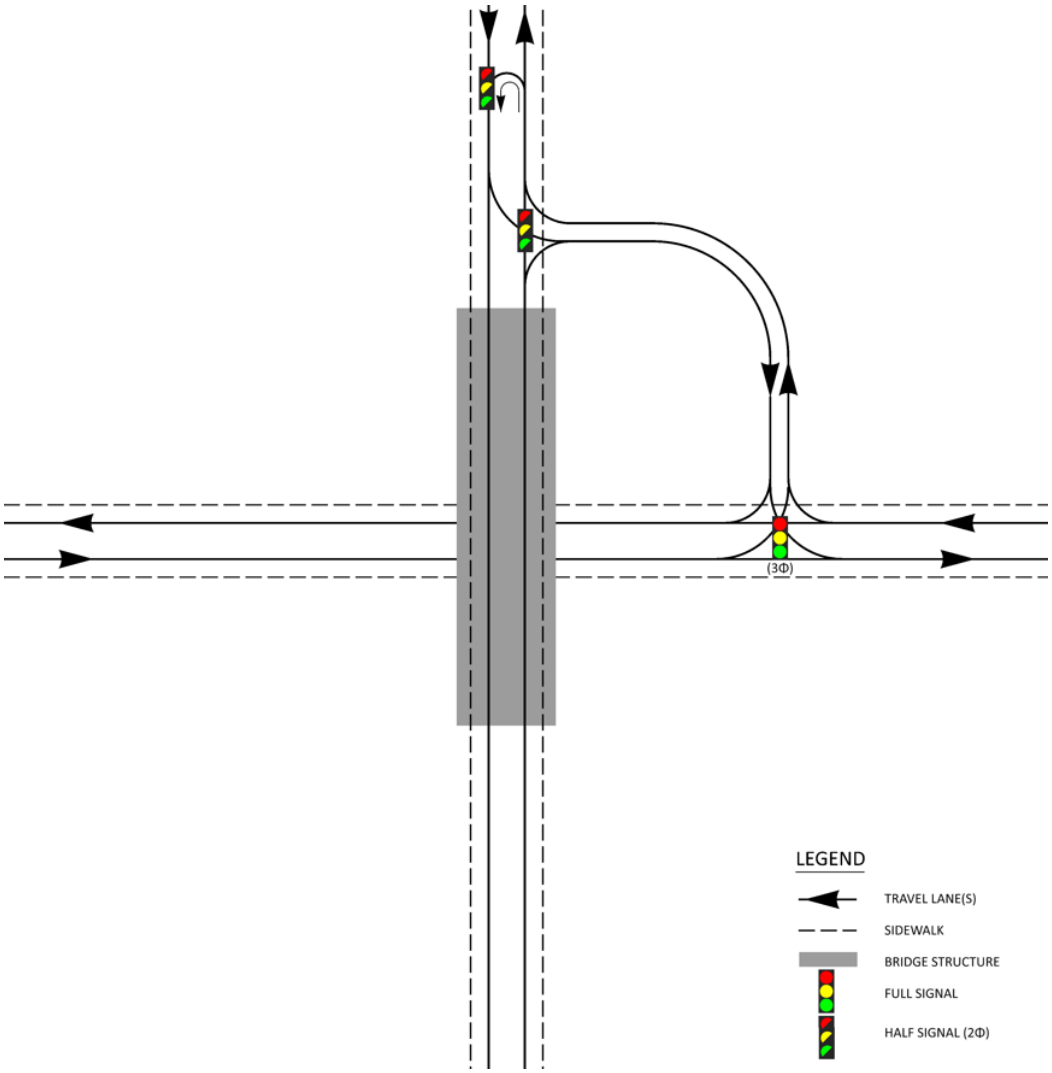
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	1	2	2	1	2	5	0	4	5	5	5	5	10	19	34



11-17, One quadrant, three-phase, u-turn

Summary: The addition of a u-turn would likely help the safety of the 11-16, One quadrant, three-phase, three-phase design at a relatively small cost.
History: This is a new design.
Rank: 32 of 85.

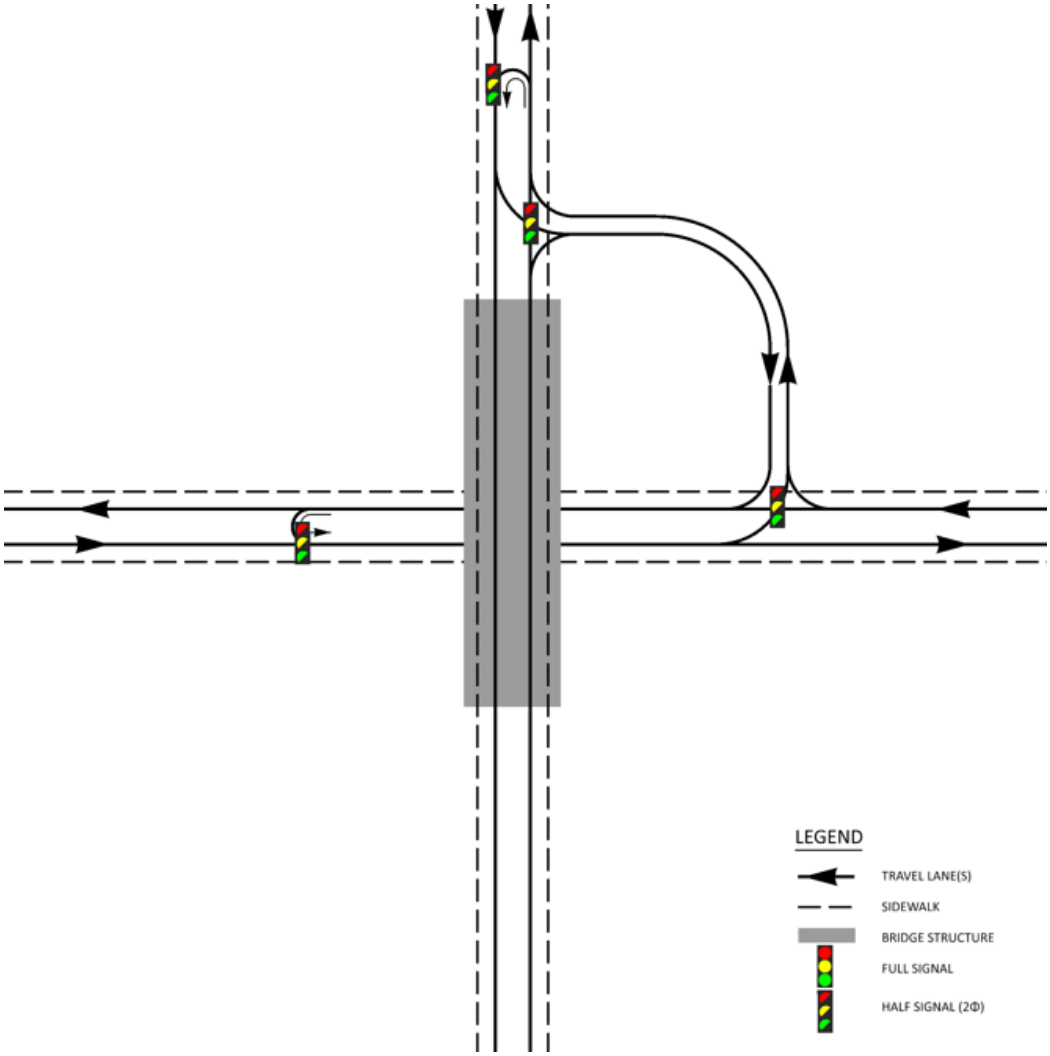
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	3	0	3	1	1	5	1	4	5	5	5	5	11	19	35



11-18, One quadrant, u-turn, u-turn

Summary: Another competitive 11, One quadrant design. If there is space for the u-turn crossovers on the arterials this design should merit some attention.
History: This is a new design.
Rank: 7 of 85.

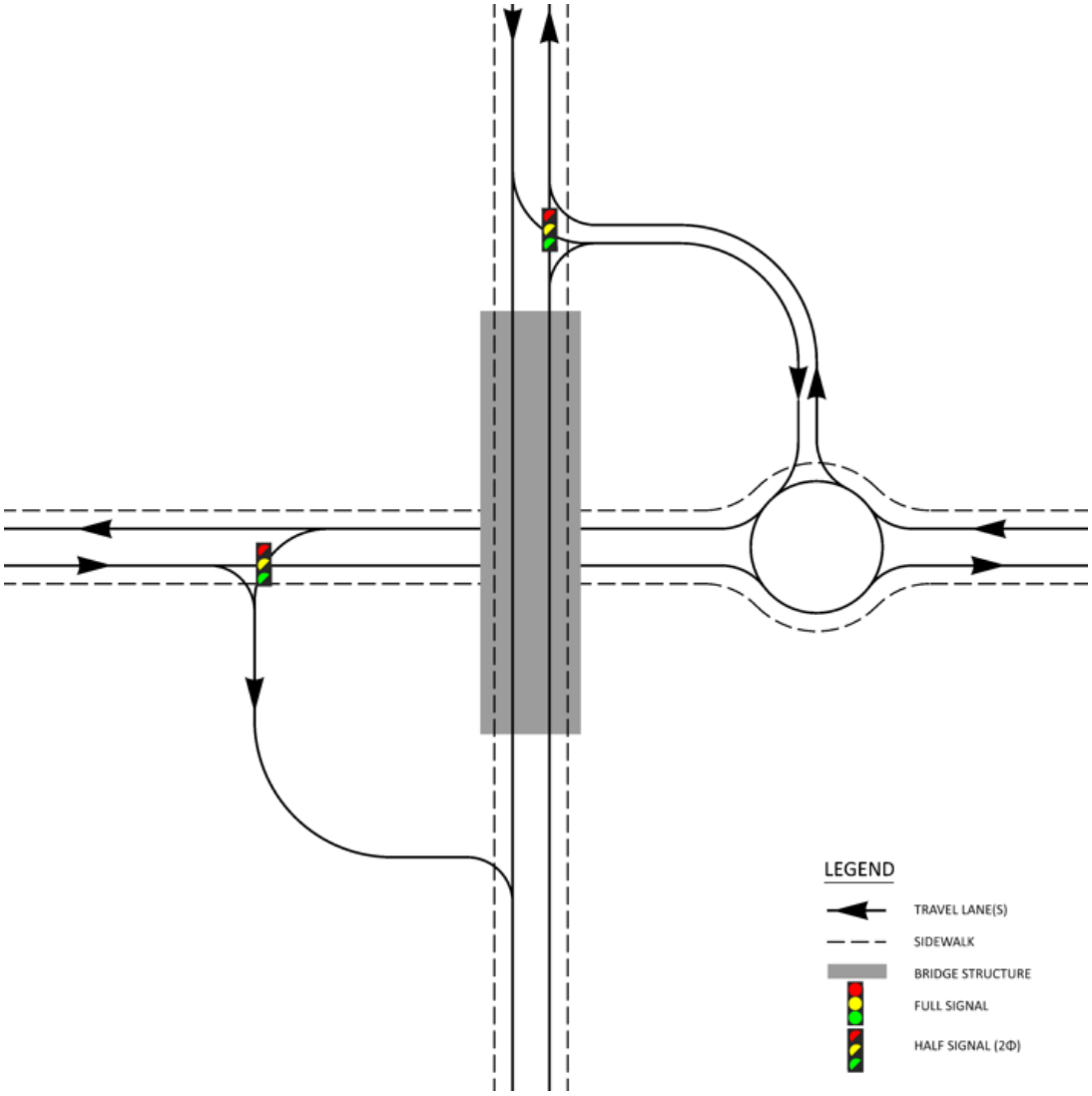
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	4	1	3	5	3	2	5	4	5	8	16	16	40



12-01, Right turn ramp diagonal, roundabout

Summary: Solid scores across the board with no glaring weaknesses. Should compete well in many contexts.
History: This is a new design.
Rank: 6 of 85.

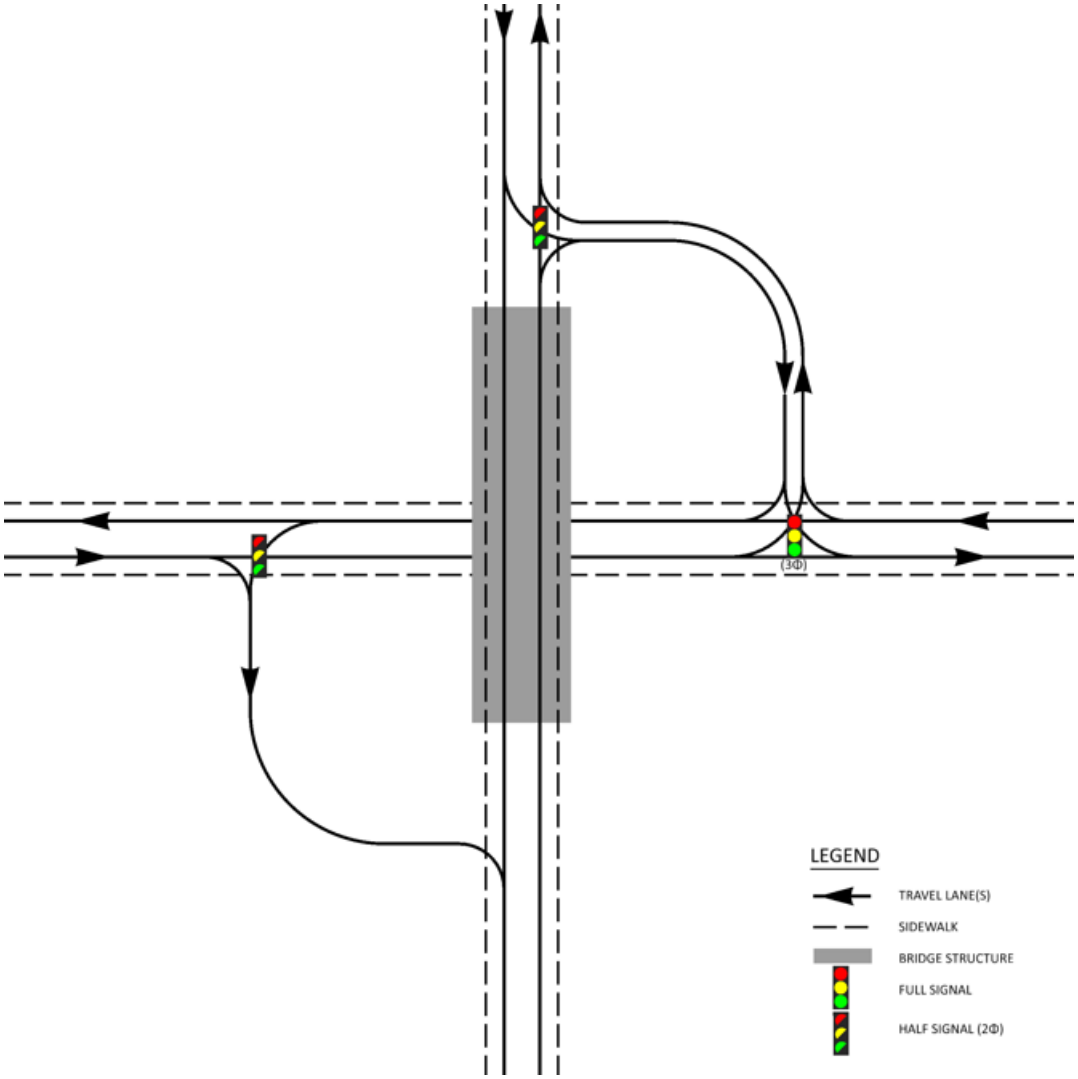
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	4	3	4	3	3	4	3	4	4	3	3	9	17	14	40



12-02, Right turn ramp diagonal, three-phase

Summary: Good cost scores, but the other versions of the 12, Right turn ramp diagonal design seem to have advantages over this one.
History: This is a new design.
Rank: 40 of 85.

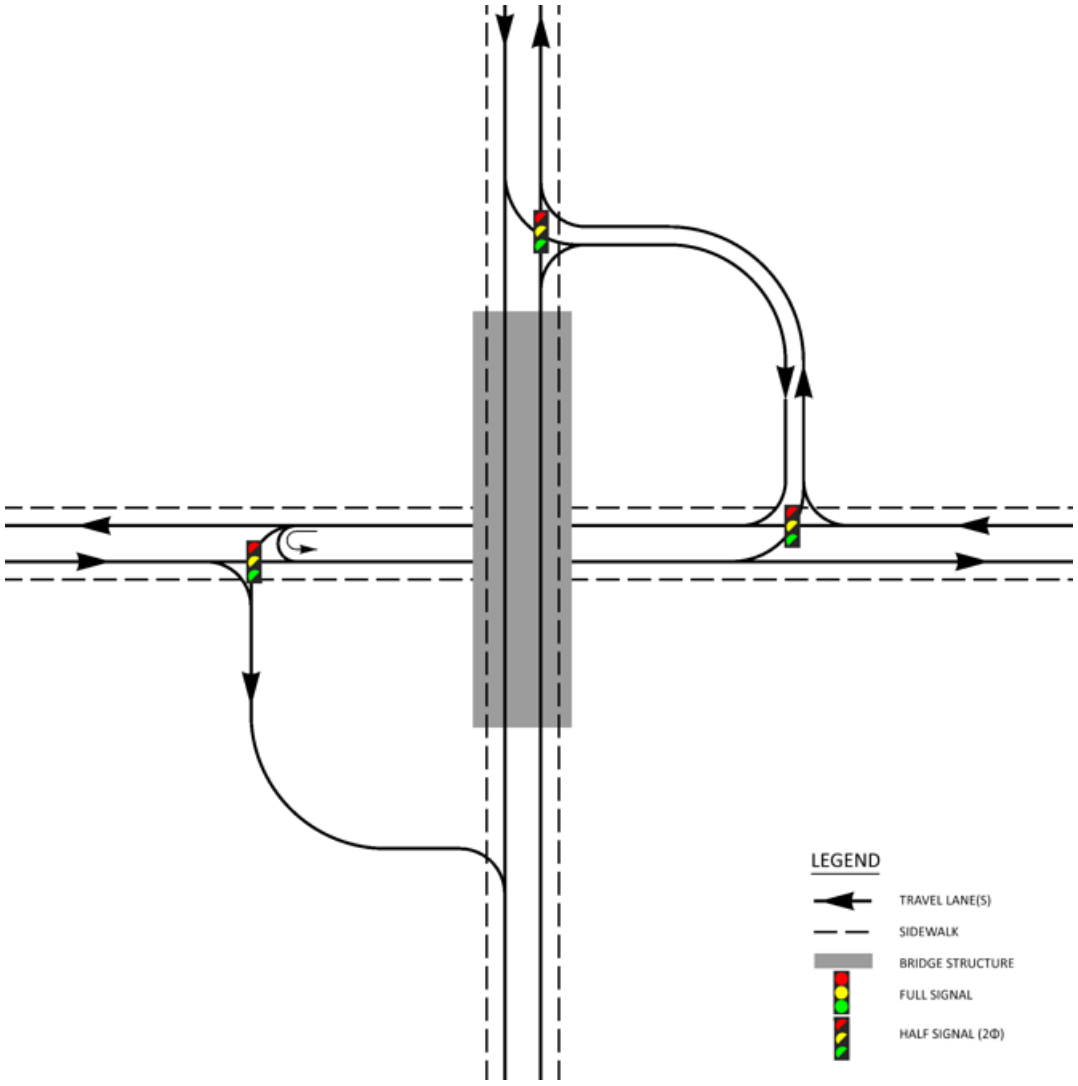
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	3	3	2	3	1	5	1	4	4	4	3	7	12	15	34



12-03, Right turn diagonal, u-turn

Summary: Struggles for capacity and distance traveled, but scores well in every other category. Maybe with a particular turning movement pattern this design could work well.
History: This is a new design.
Rank: 12 of 85.

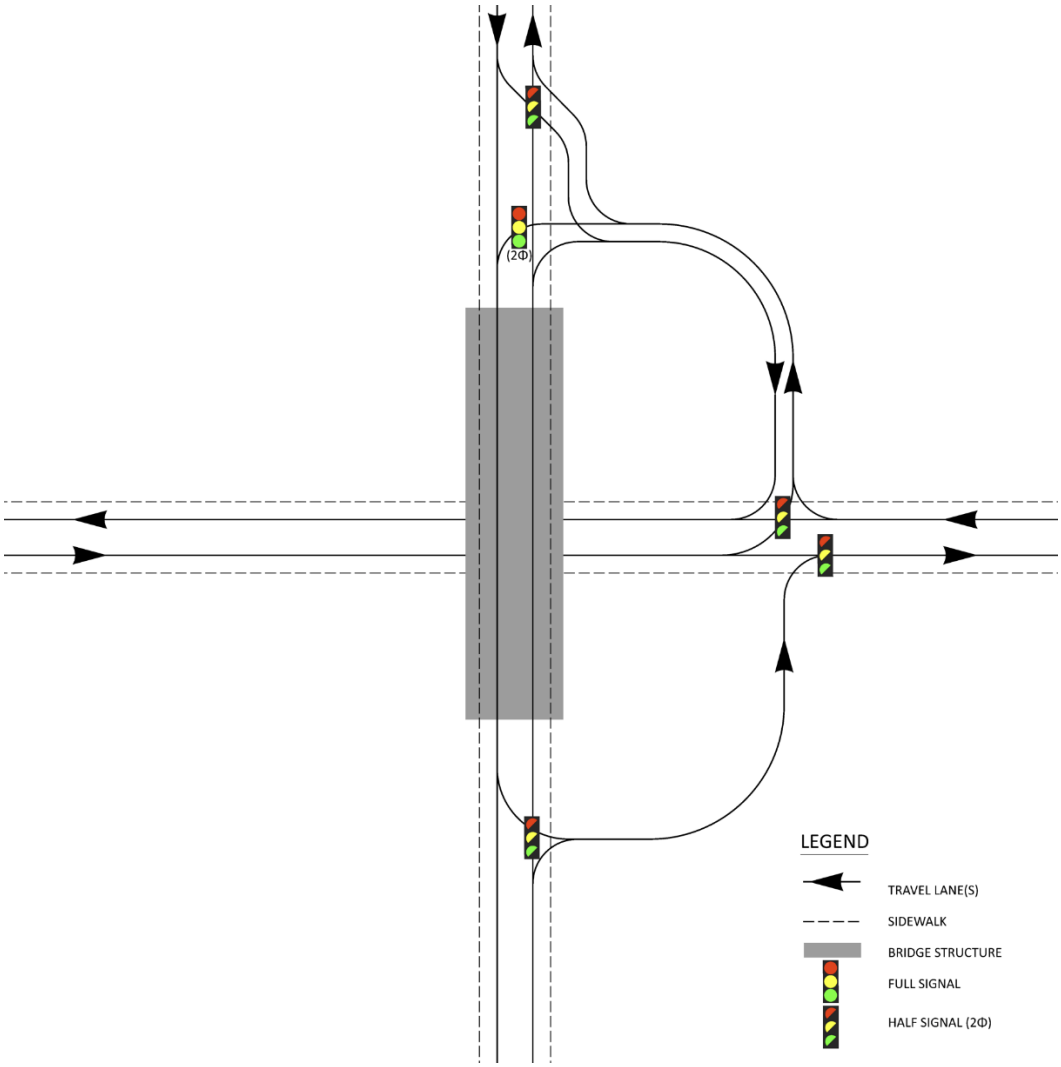
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	5	0	3	3	3	5	3	3	4	4	3	7	17	14	38



12-04, Right turn ramp to right, CFI

Summary: With good capacity and progression scores, this design may be competitive as a retrofit for an inefficient parclo AB.
History: This is a new design.
Rank: 59 of 85.

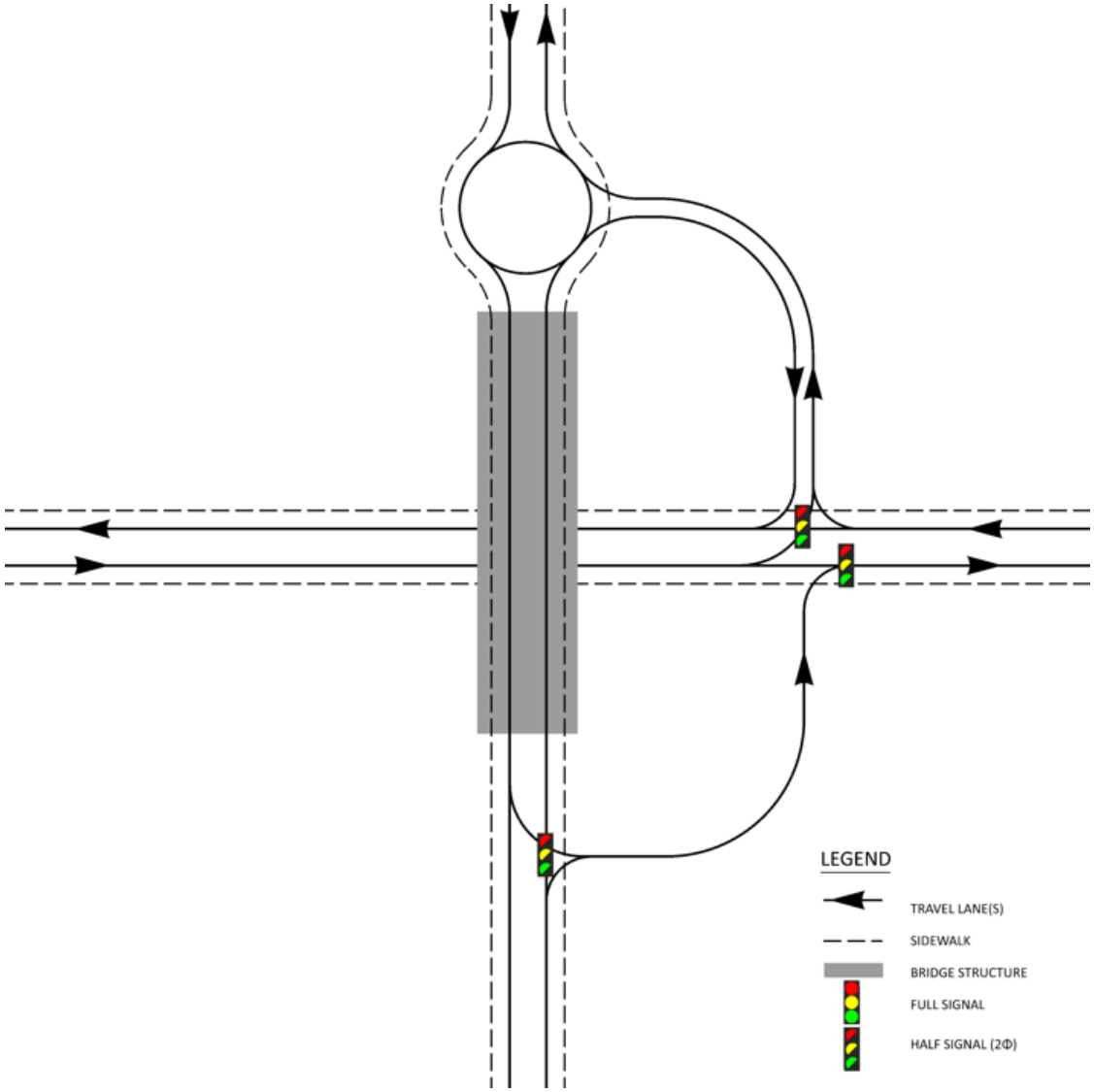
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	4	2	2	2	1	4	1	2	4	2	3	10	10	11	31



12-05, Right turn ramp to right, roundabout

Summary: With no obvious weaknesses, this design should earn consideration at a variety of sites.
History: This is a new design.
Rank: 13 of 85.

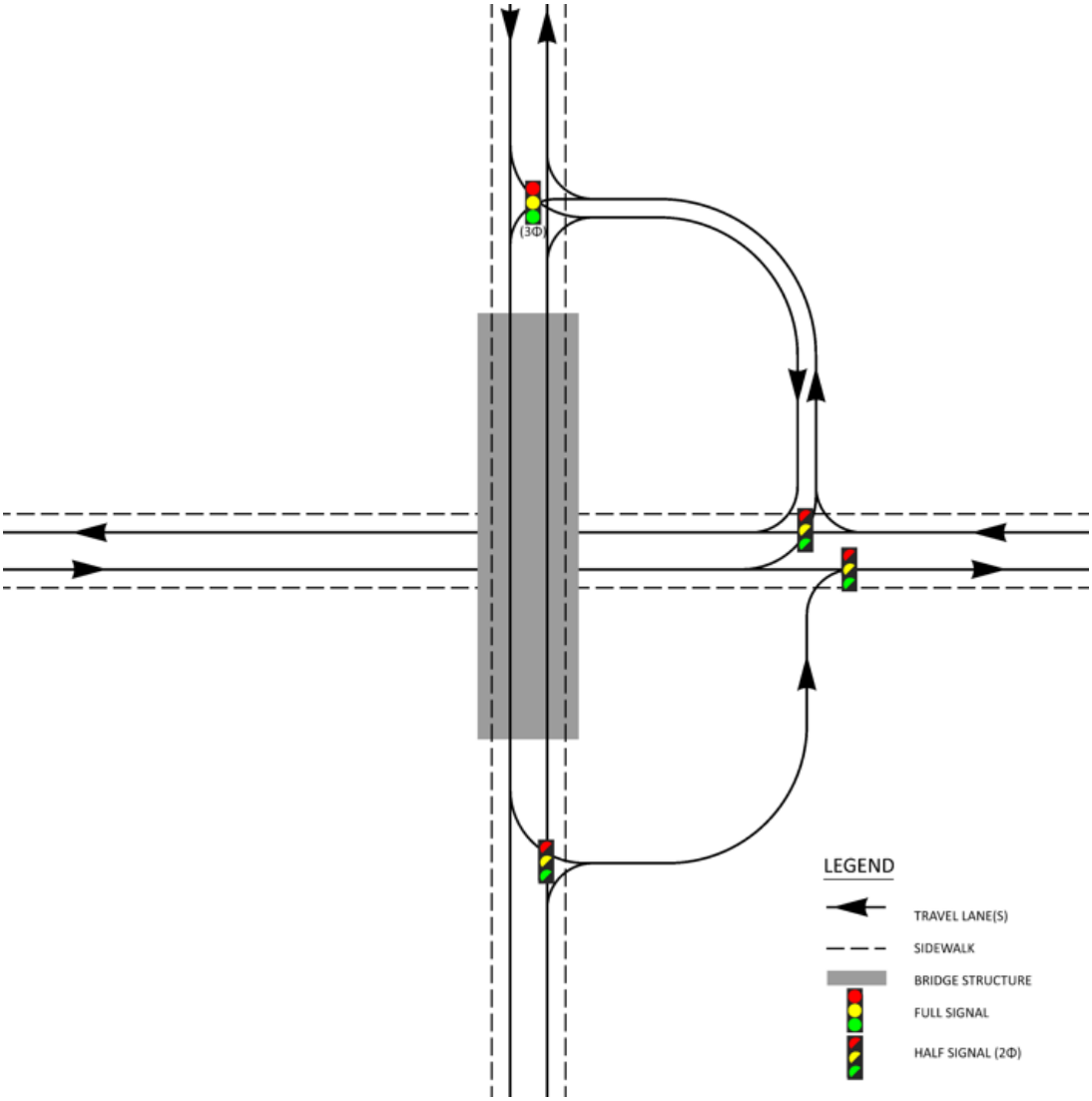
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	4	2	4	2	4	4	3	2	4	3	3	9	17	12	38



12-06, Right turn ramp to right, three-phase

Summary: Excellent for pedestrians and good cost scores, but otherwise underwhelming.
History: This is a new design.
Rank: 67 of 85.

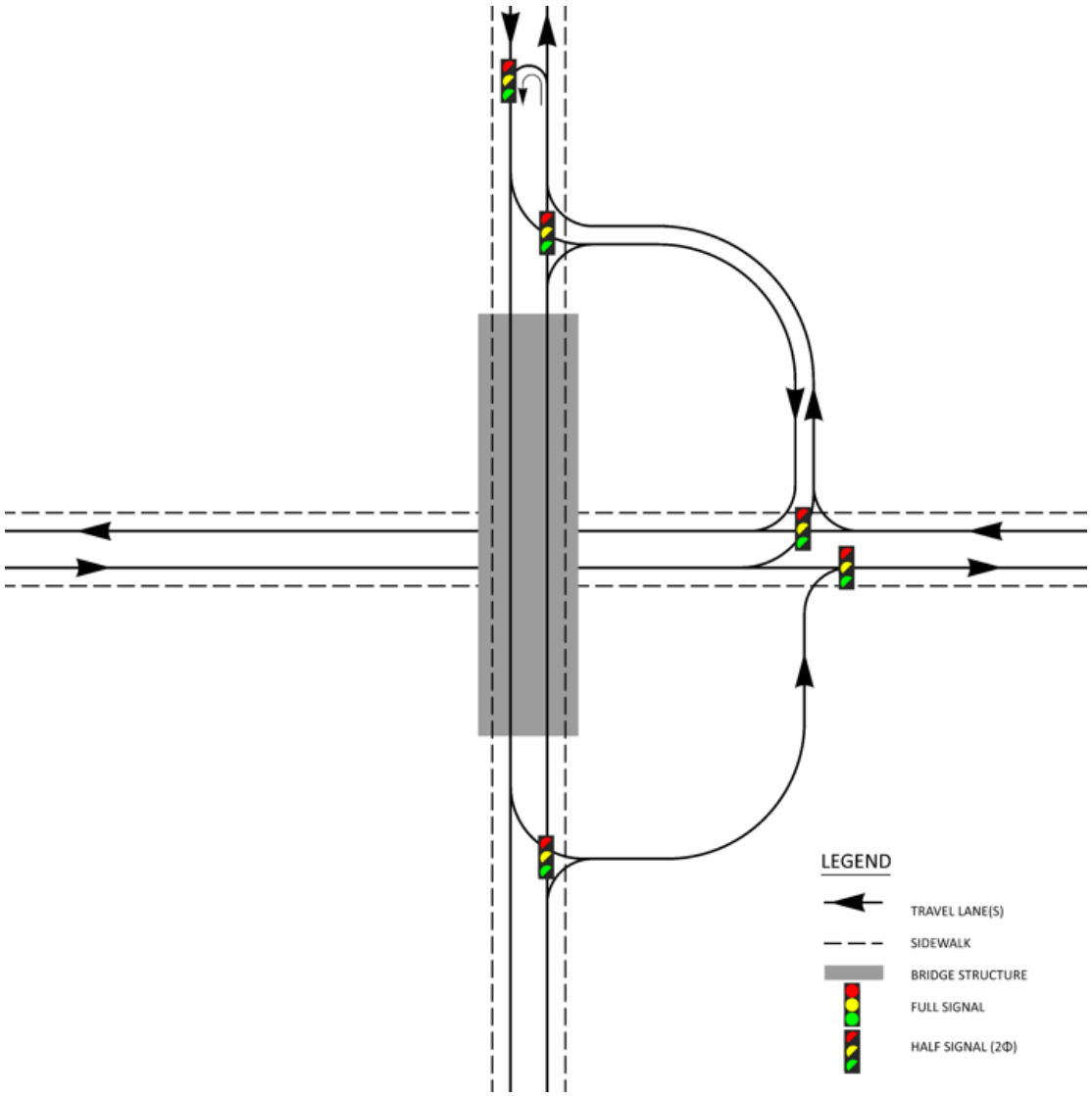
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
2	3	1	2	2	1	5	1	2	4	4	3	6	11	13	30



12-07, Right turn ramp to right, u-turn

Summary: A long distance to travel is the only weakness. The concept could compete with a parclo AB.
History: This is a new design.
Rank: 22 of 85.

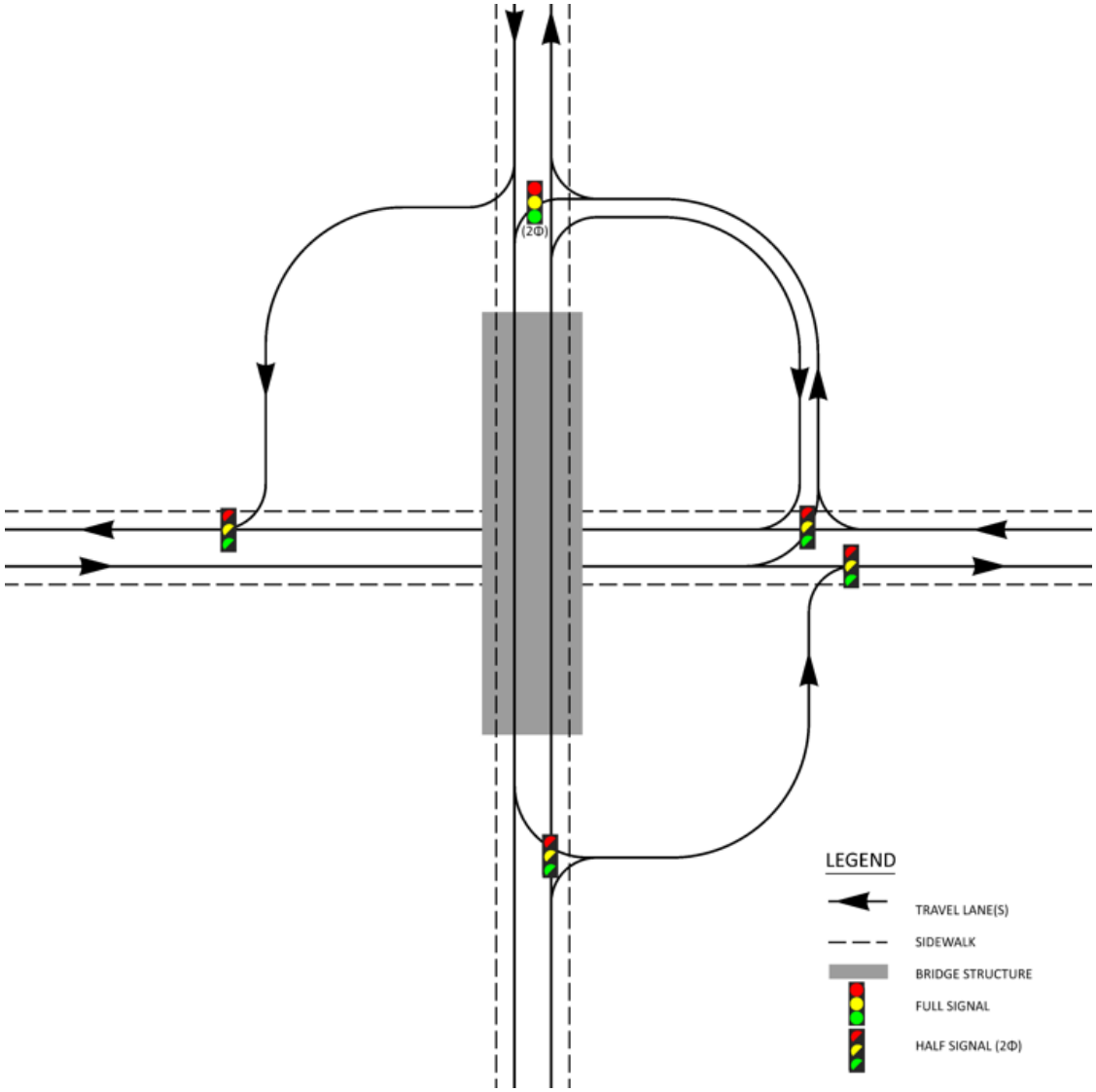
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	3	2	3	5	3	2	4	3	3	8	16	12	36



13-01, Vacant diagonal, left

Summary: Good capacity and progression, but otherwise low-to-middling scores.
History: This is a new design.
Rank: 72 of 85.

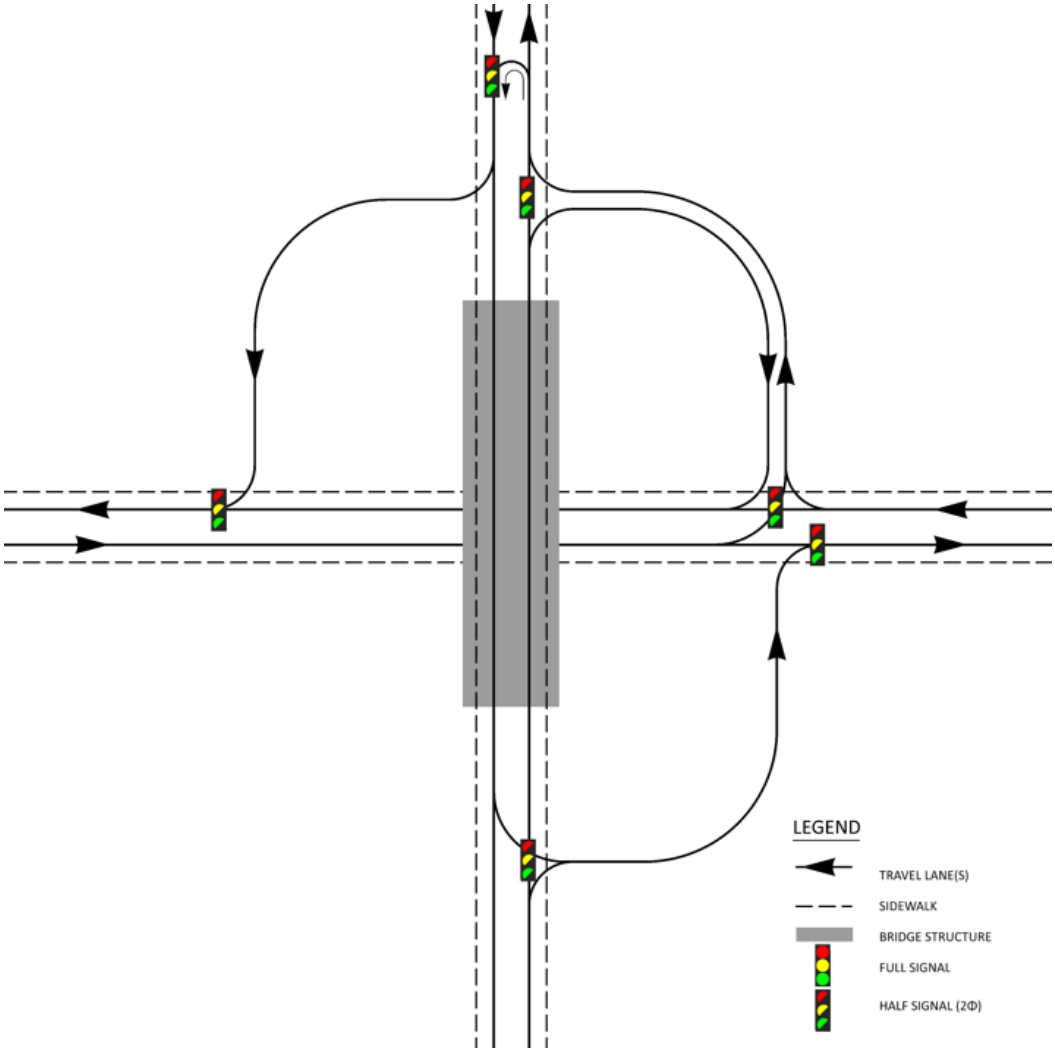
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	4	2	3	2	2	3	1	2	3	2	1	10	11	8	29



13-02, Vacant diagonal, u-turn

Summary: The u-turn improves progression and some of the safety scores compared to the version with a direct left turn, but there are long distances to travel and the cost scores decline further.
History: This is a new design.
Rank: 55 of 85.

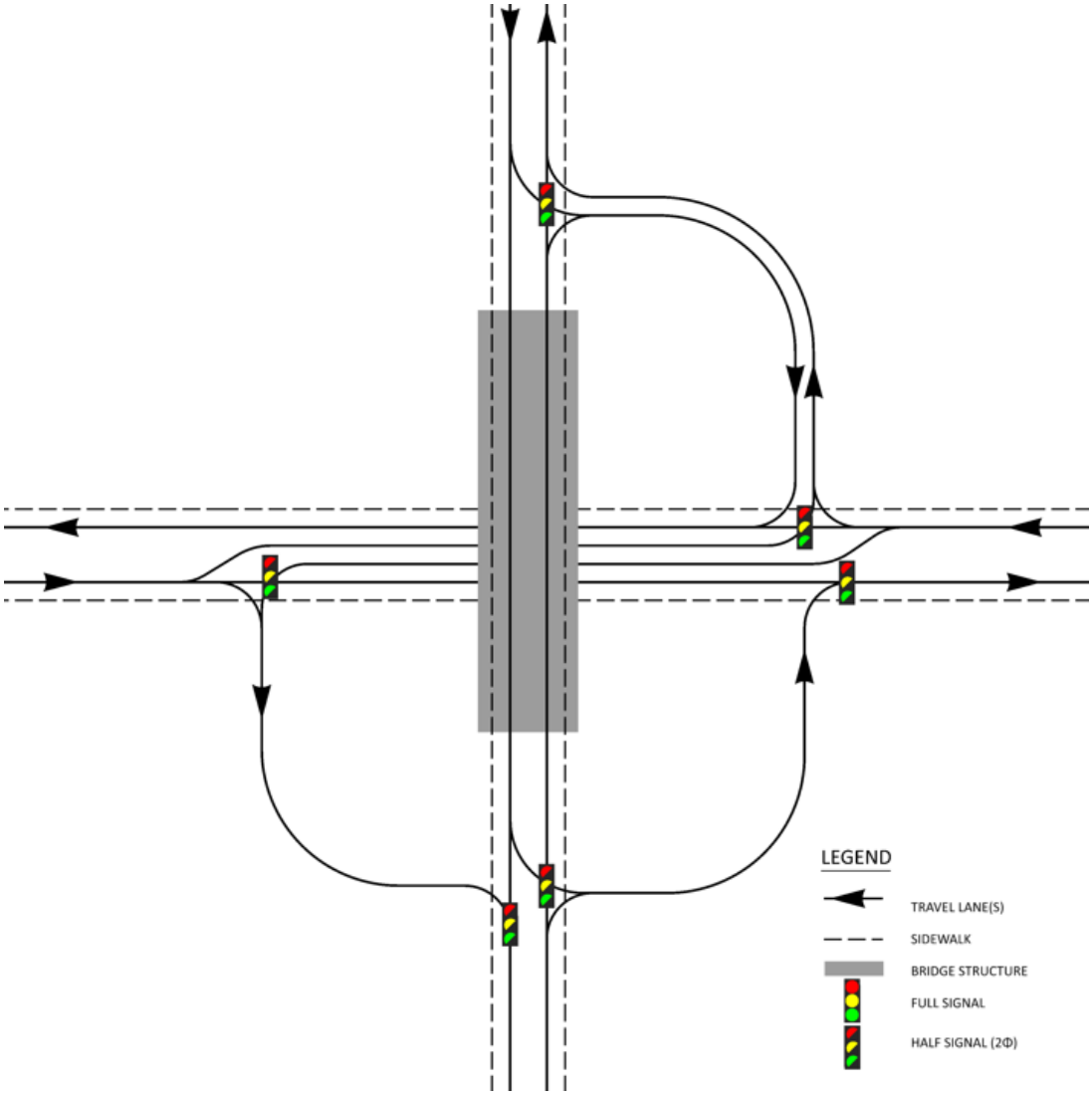
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	4	2	4	2	3	2	3	2	1	8	15	8	31



13-03, Vacant to left, contraflow

Summary: Strong efficiency and safety scores but will likely be expensive to install.
History: This is a new design.
Rank: 29 of 85.

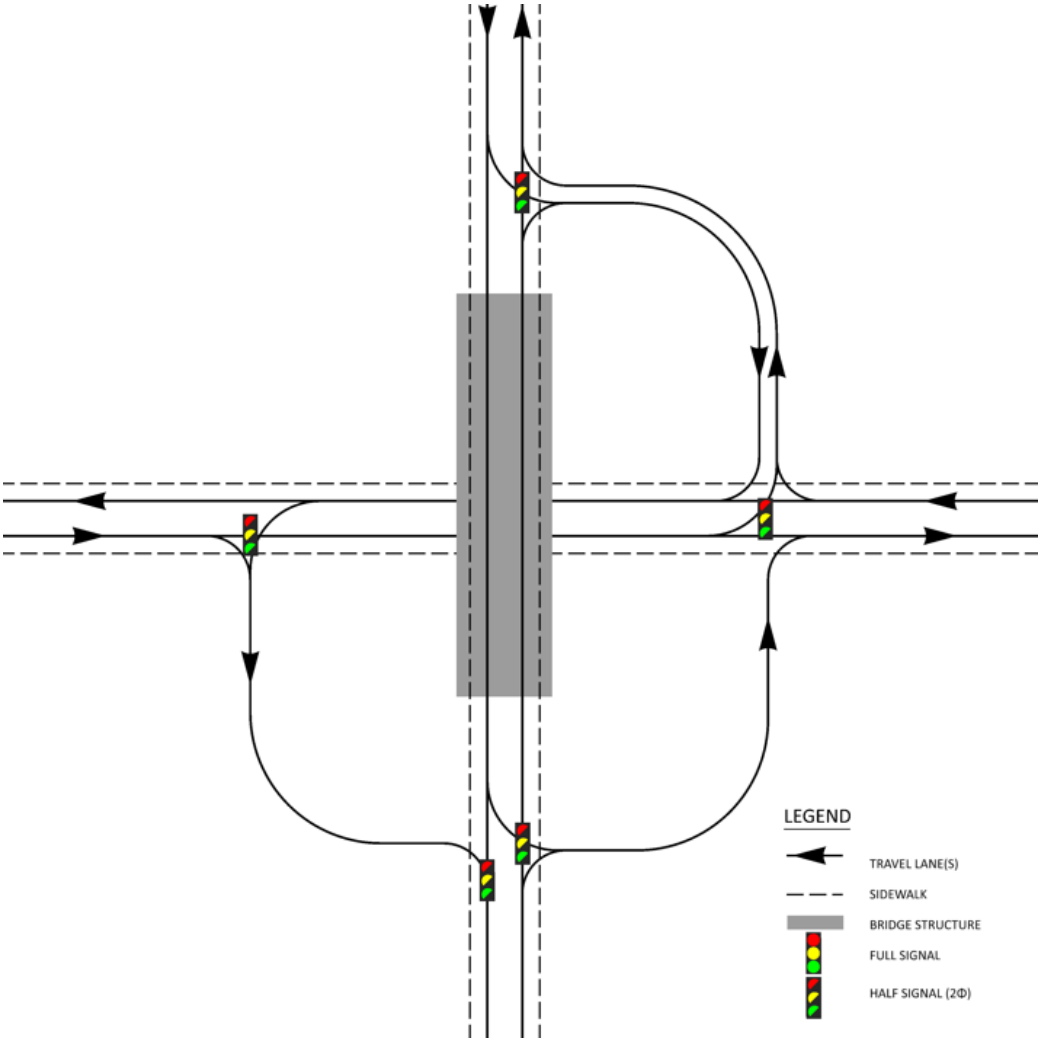
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	3	2	4	3	4	3	1	3	2	1	12	16	7	35



13-04, Vacant to left, leftover

Summary: Cost is the major weakness, but this concept is a bit less costly than the 13-03, Vacant to left with contraflow left turns.
History: This is a new design.
Rank: 20 of 85.

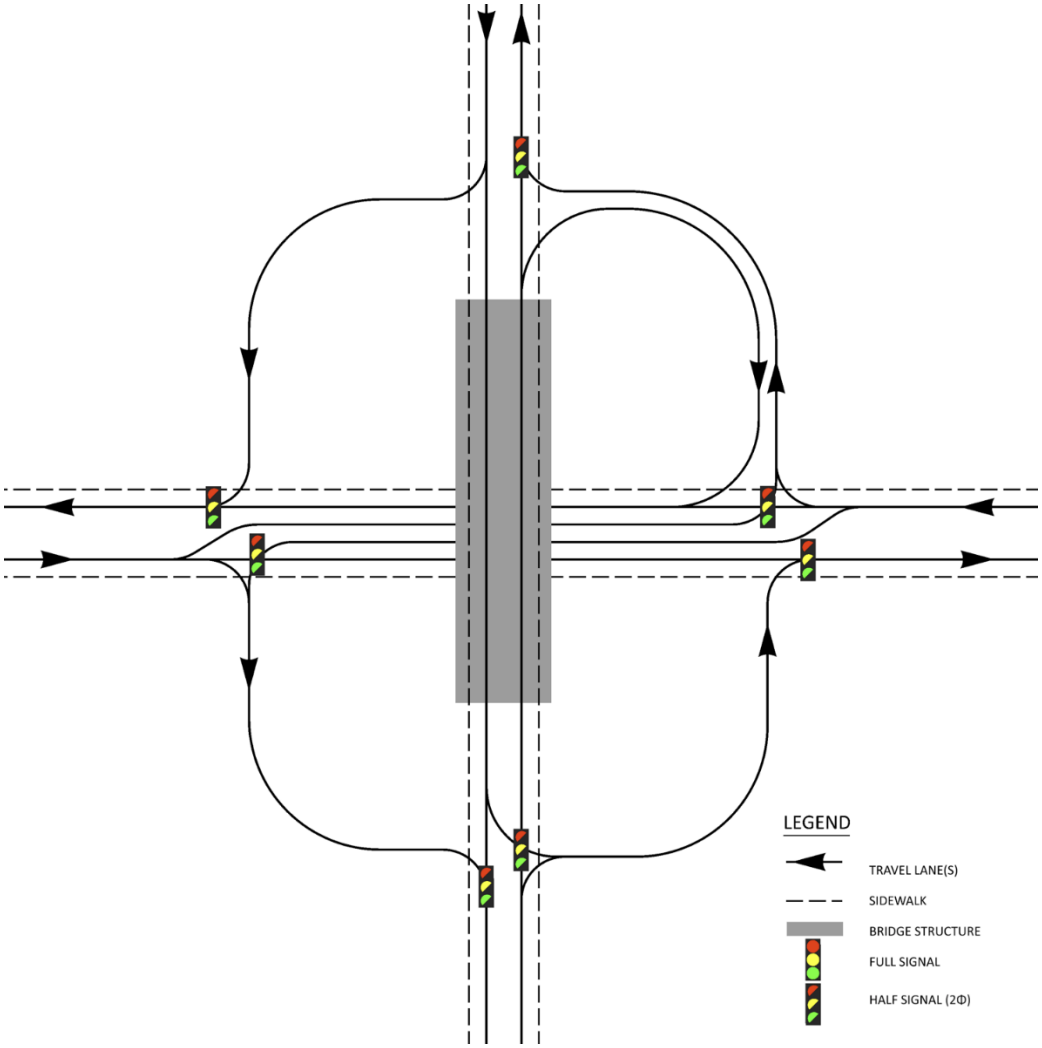
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	3	2	4	3	4	3	2	3	2	1	12	16	8	36



14-01, Contraflow

Summary: Good efficiency scores and competitive safety scores. However, the cost scores are at the bottom of the charts.
History: This is a new design.
Rank: 70 of 85.

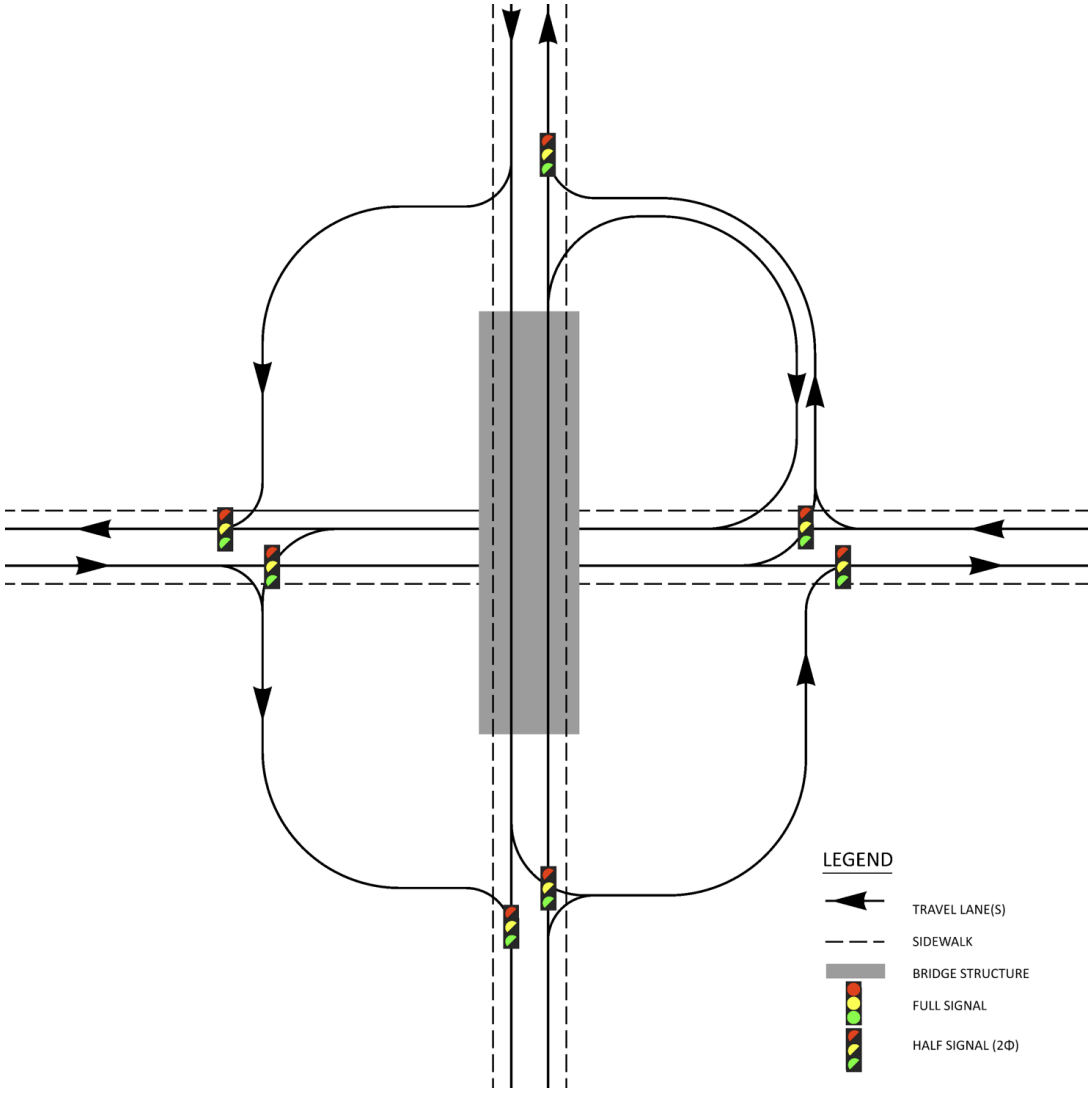
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	3	3	4	2	1	4	1	1	1	0	12	14	3	29



14-02, Leftover

Summary: Good efficiency scores and competitive safety scores. Likely a bit less costly than the 14-01 design with contraflow left turns, but still very expensive.
History: This is a new design.
Rank: 48 of 85.

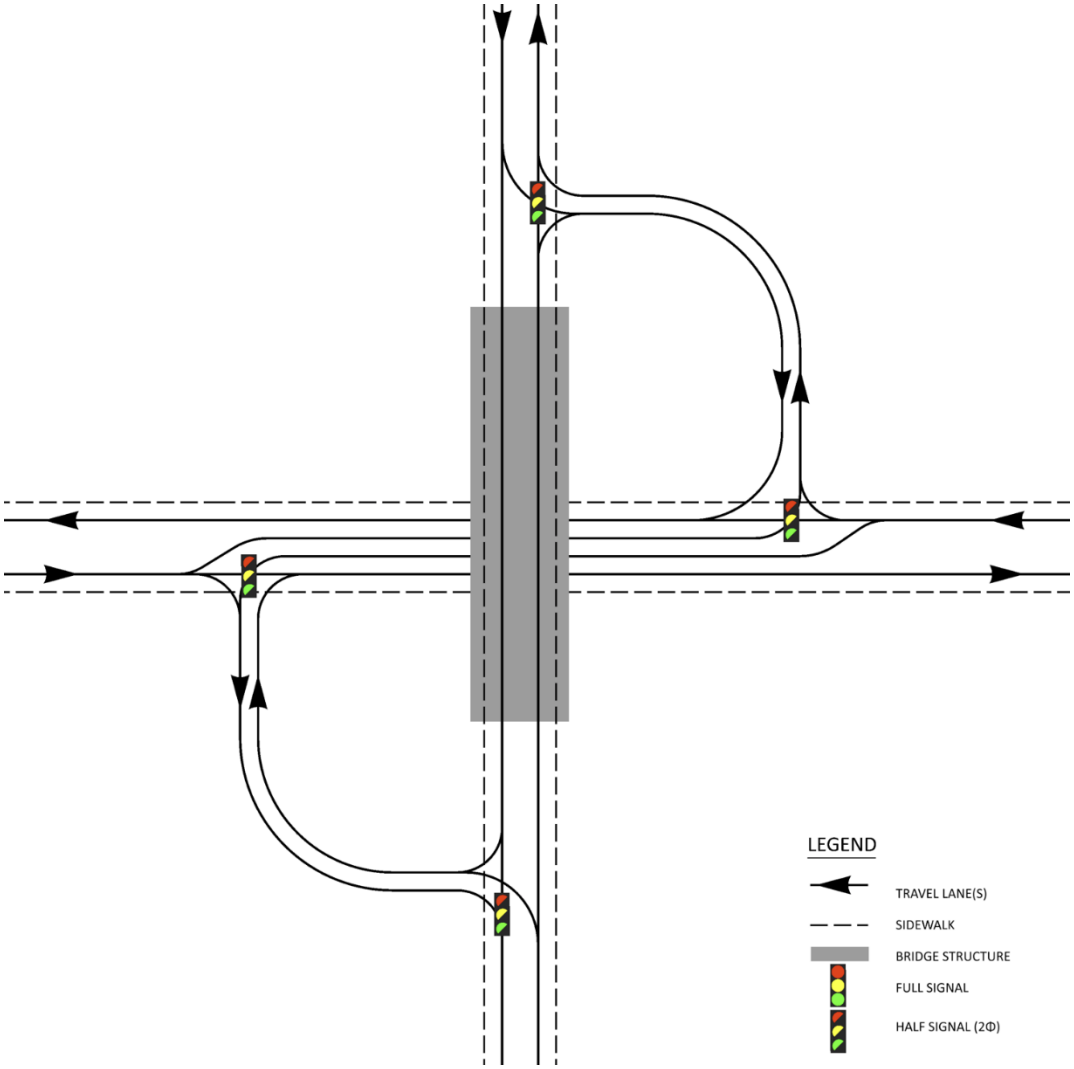
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Freeway	Extent Along Arterial	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	3	3	4	3	2	4	2	1	1	0	12	16	4	32



22-01, Diagonal, contraflow

Summary: With top scores for capacity, progression, and pedestrian service, and strong scores in most other categories, this design should be a tough competitor in many settings.
History: This is a new design.
Rank: 4 of 85.

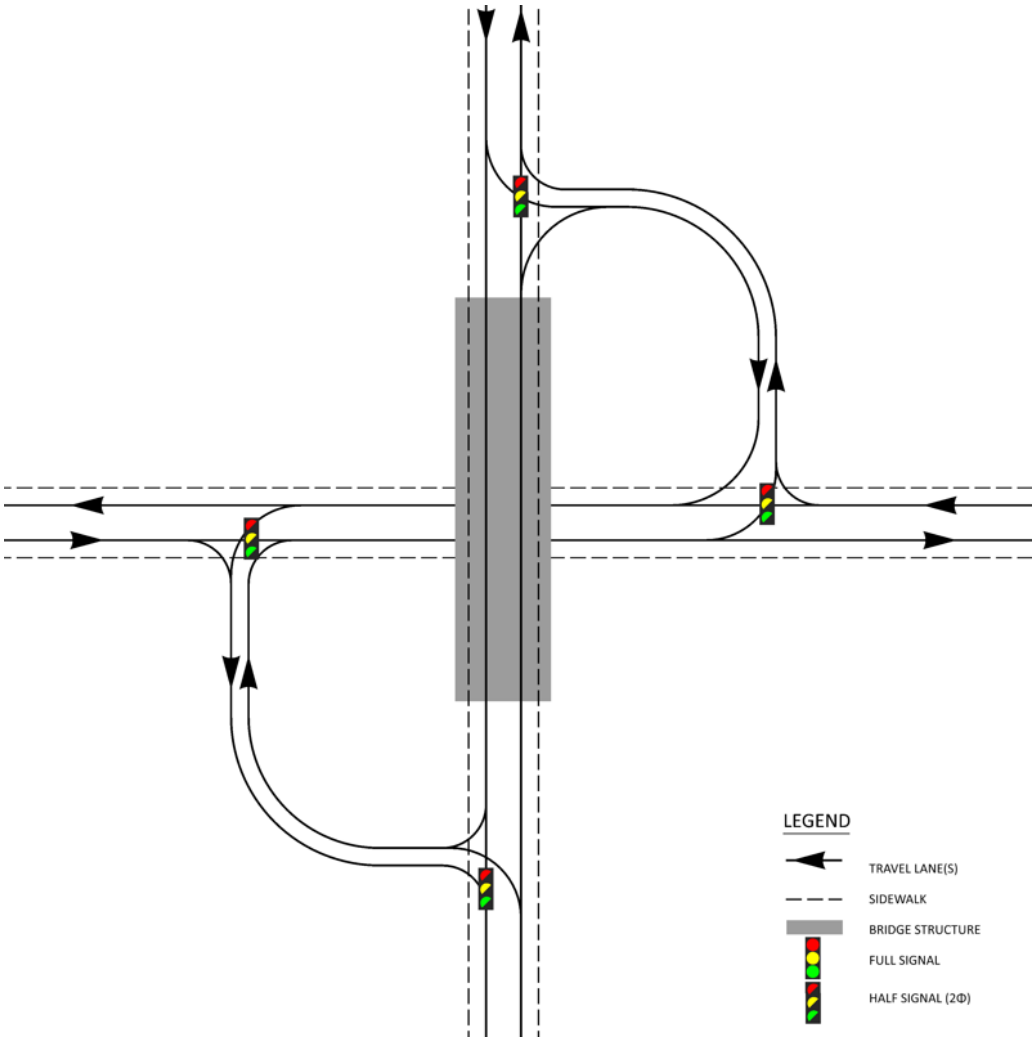
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
5	5	2	2	3	3	5	3	3	4	3	3	12	16	13	41



22-02, Diagonal, leftover

Summary: With top scores for capacity, progression, and pedestrian service, and strong scores in most other categories, this design should be a tough competitor in many settings.
History: This is a new design.
Rank: 5 of 85.

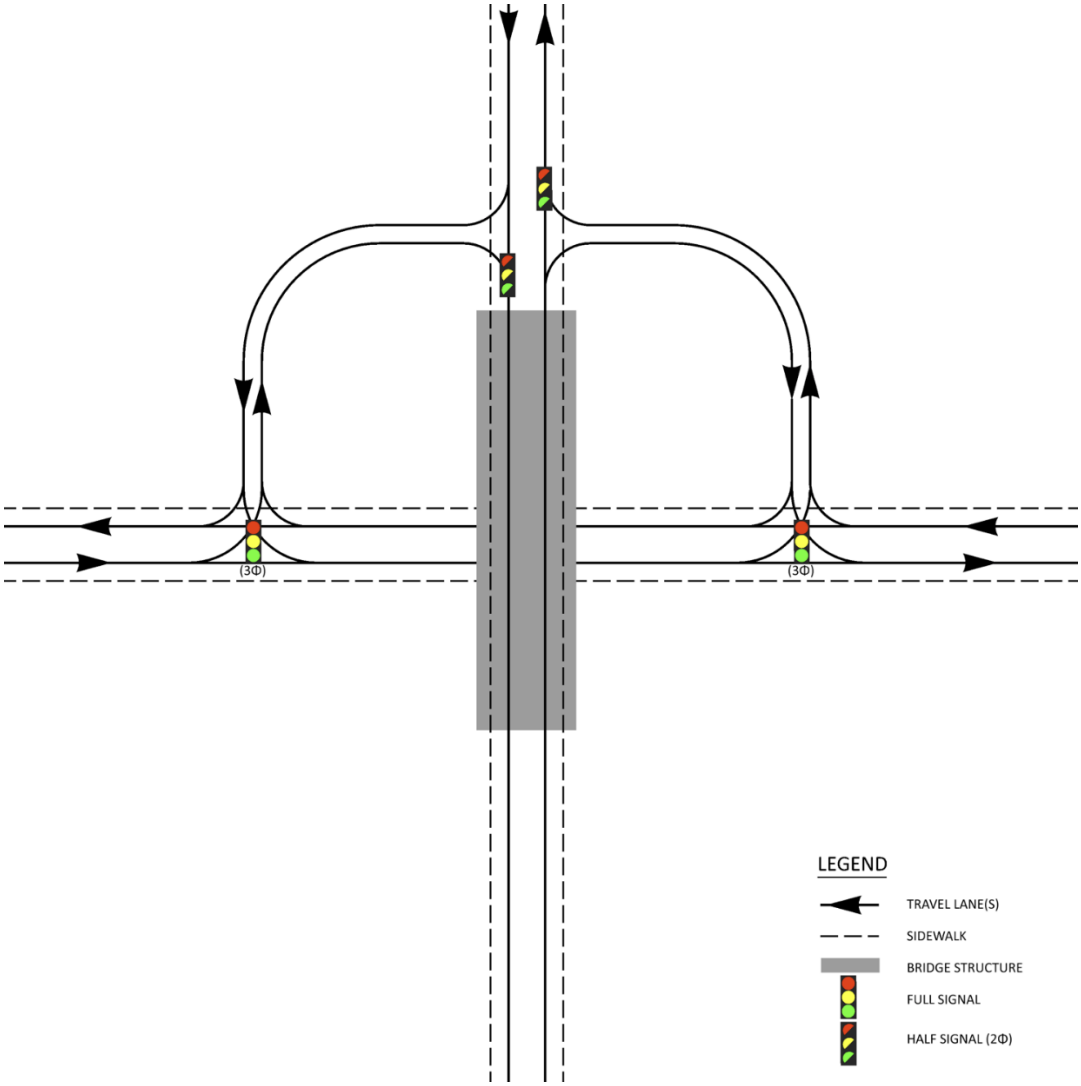
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	2	2	3	3	5	3	4	4	3	3	11	16	14	41



22-03, Parclo AB

Summary: Likely lower installation cost but poor efficiency and safety performance will be the result. Project teams considering this design should investigate other options as well.
History: This is a popular interchange design that has been employed occasionally at intersections.
Rank: 74 of 85.

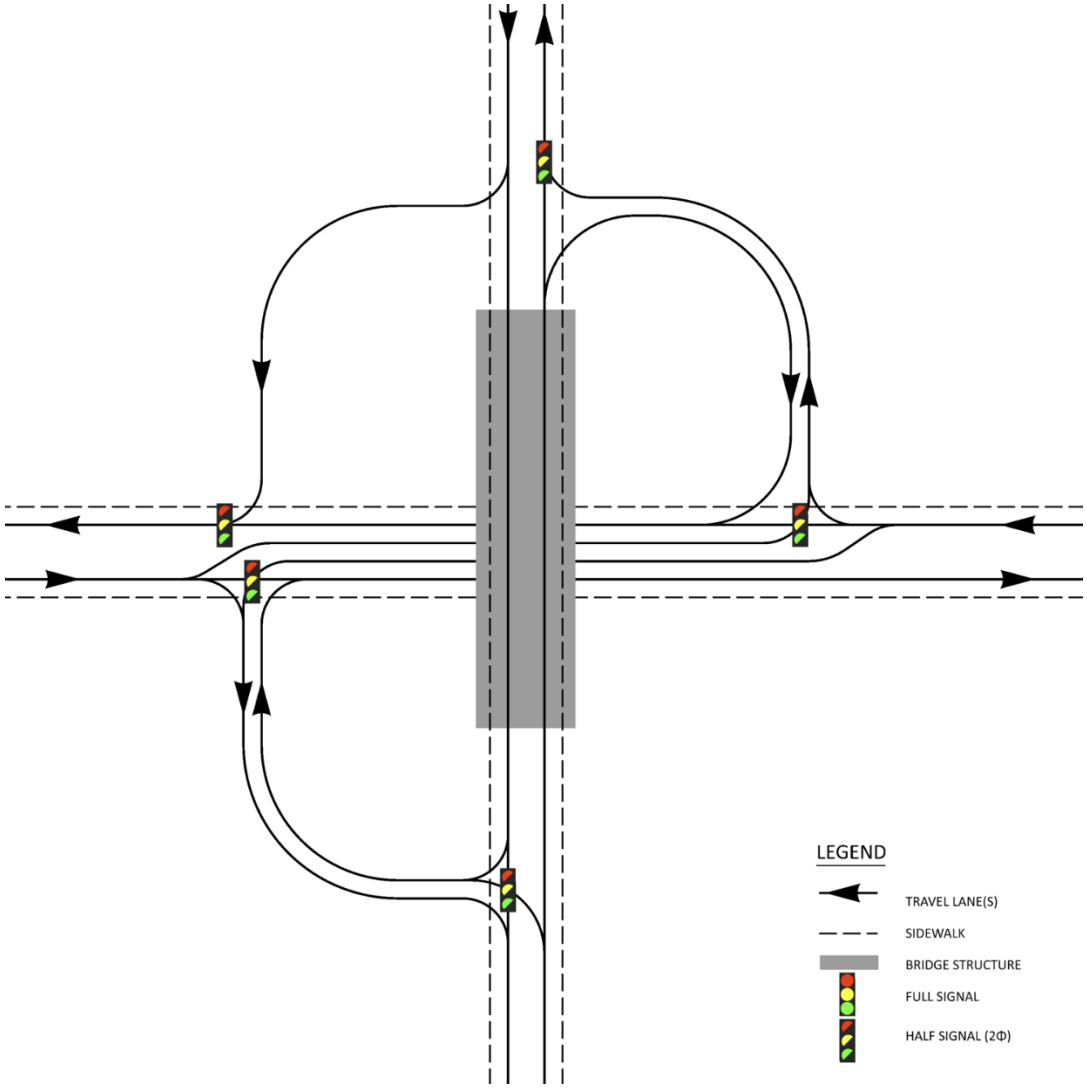
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
1	2	2	1	2	3	3	1	4	4	3	3	5	10	14	29



23-01, Loops diagonal, contraflow

Summary: Top score for progression, but otherwise middling scores. Compared to 22 Diagonal designs, the extra right turn ramp in this design does not seem to help much.
History: This is a new design.
Rank: 50 of 85.

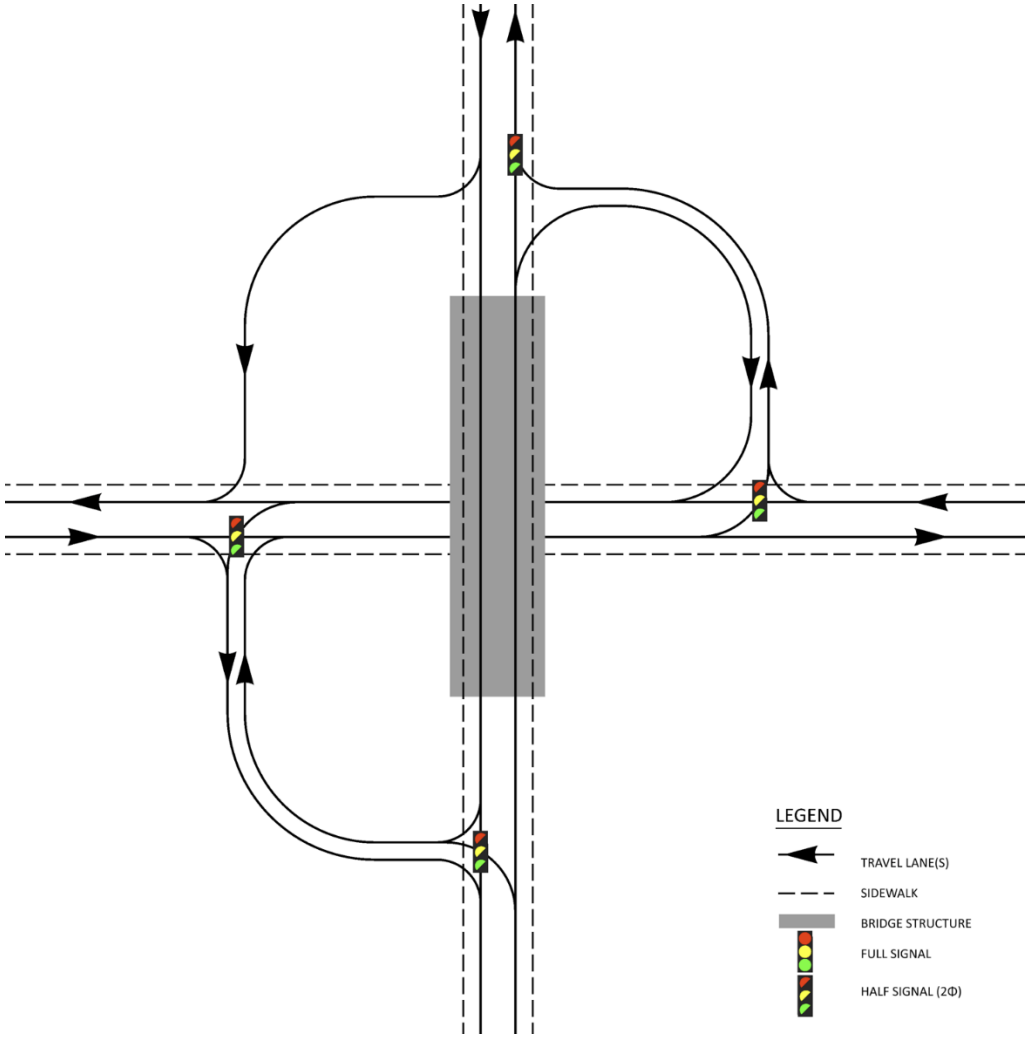
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	2	3	3	2	2	3	3	2	2	1	11	13	8	32



23-02, Loops diagonal, leftover

Summary: Top score for progression, but otherwise middling scores. Compared to 22 Diagonal designs, the extra right turn ramp in this design does not seem to help much.
History: This is a new design.
Rank: 45 of 85.

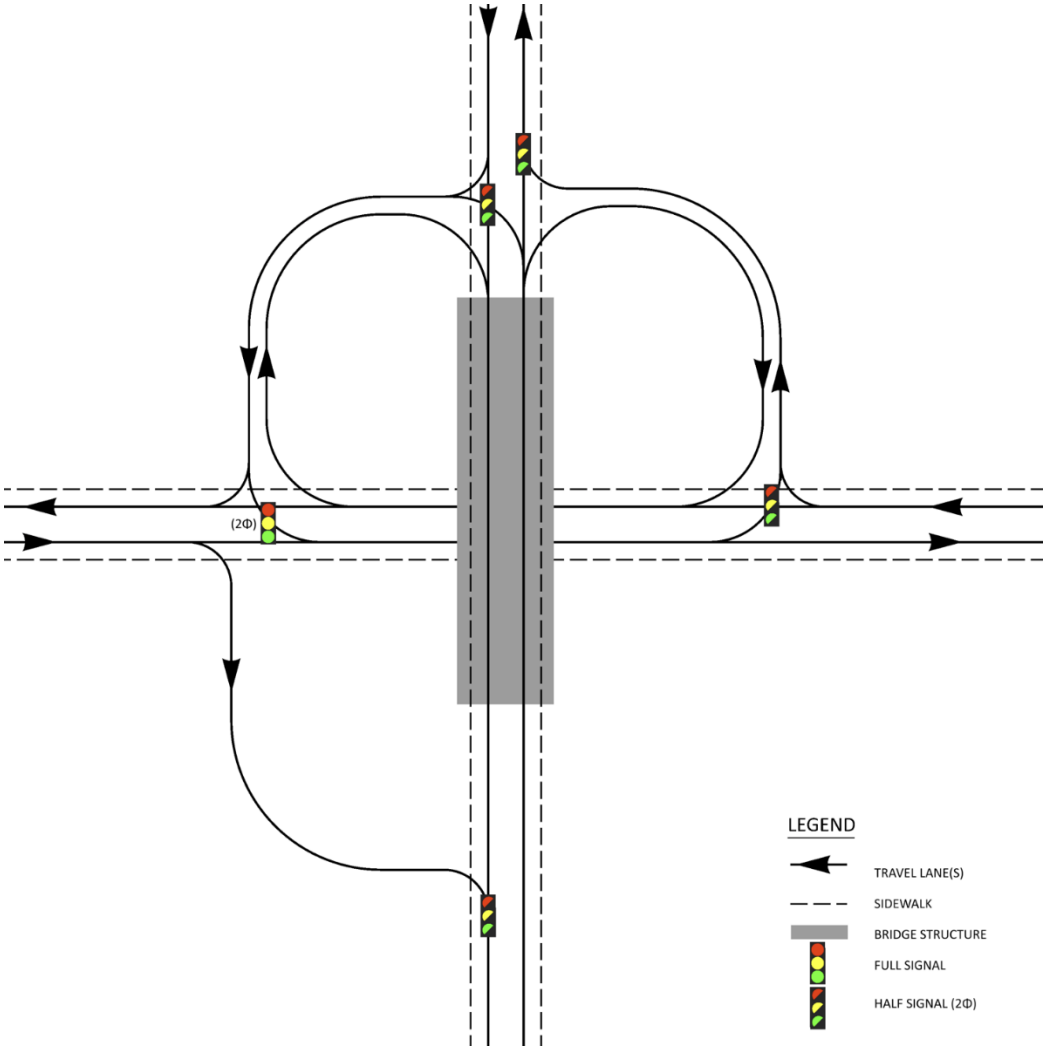
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Freeway	Extent Along Arterial	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	2	3	3	2	2	3	4	2	2	1	11	13	9	33



23-03, Right turn ramp to left, left

Summary: Good capacity and progression, but otherwise mostly dismal scores. Designers seeking to improve upon a Parclo AB should consider a right turn ramp to the right instead of to the left.
History: This is a new design.
Rank: 80 of 85.

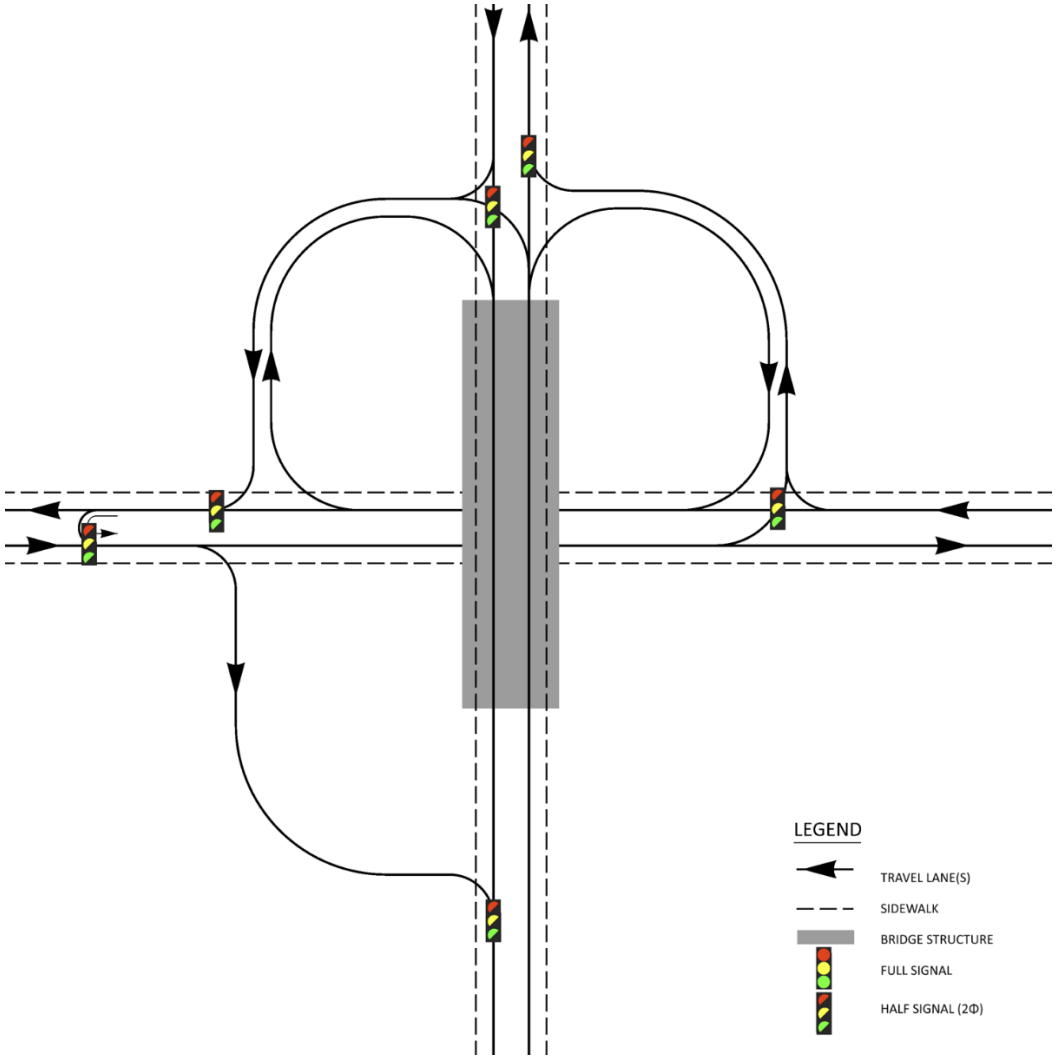
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	4	1	3	2	1	2	1	3	2	2	1	9	9	8	26



23-04, Right turn ramp to left, u-turn

Summary: Great progression, but otherwise mostly dismal scores. Designers seeking to improve upon a Parclo AB should consider a right turn ramp to the right instead of to the left.
History: This is a new design.
Rank: 77 of 85.

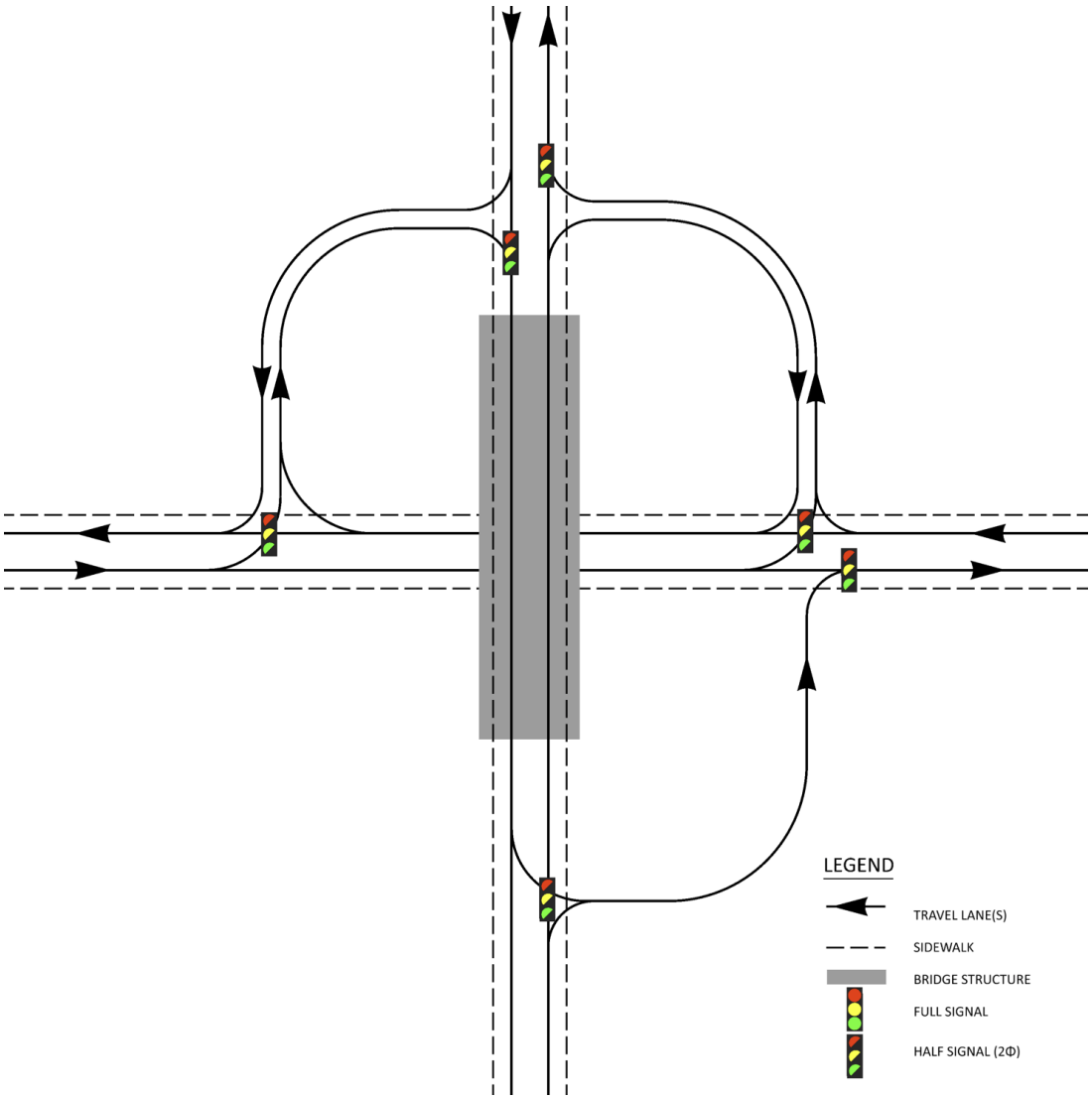
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
3	5	0	3	2	3	1	3	3	2	2	1	8	12	8	28



23-05, Right turn ramp to right

Summary: Good capacity and progression, and otherwise no weaknesses.
History: This is a new design.
Rank: 49 of 85.

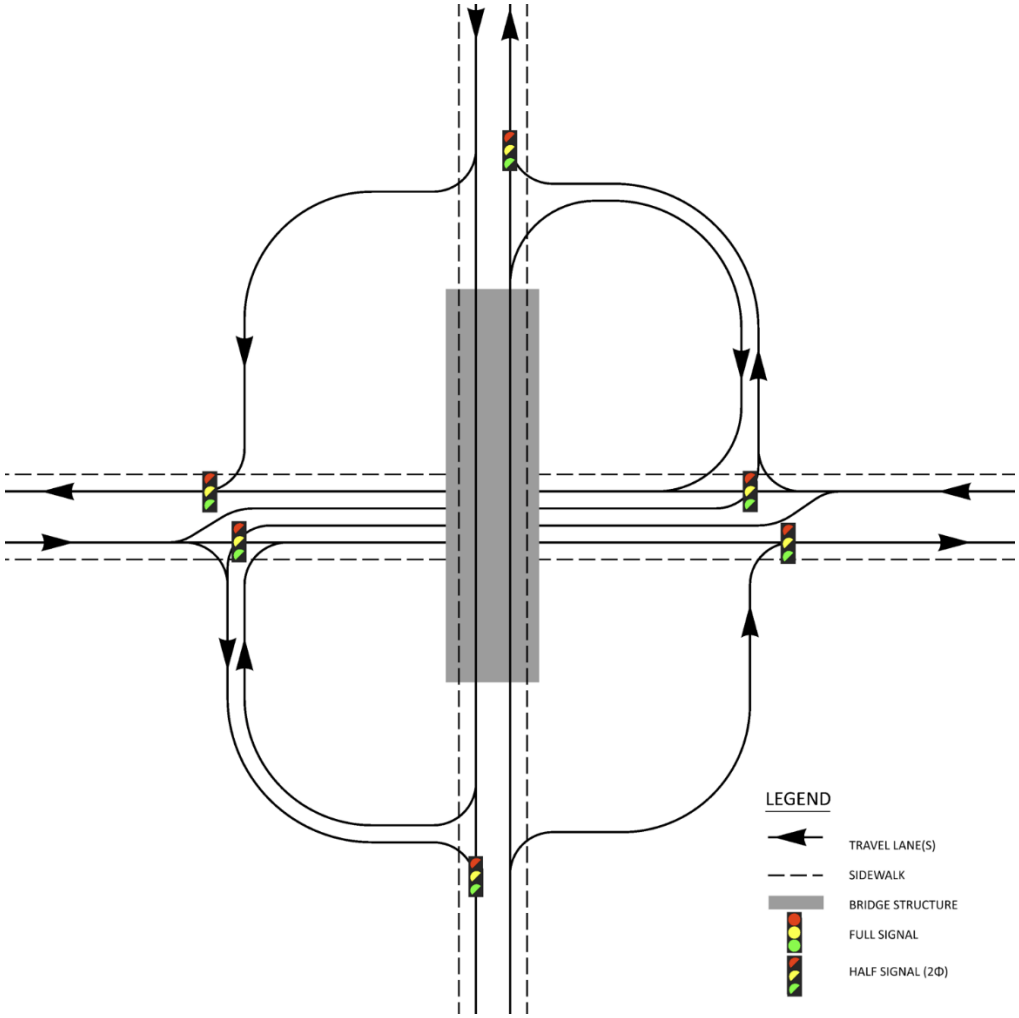
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	2	3	3	2	2	3	3	2	2	1	11	13	8	32



24-01, Folded

Summary: This variation of the parclo B design uses contraflow left turns. It features good efficiency scores but relatively high costs.
History: The interchange design was published by Riniker in 2010. We do not believe anyone has built one at an intersection yet.
Rank: 62 of 85.

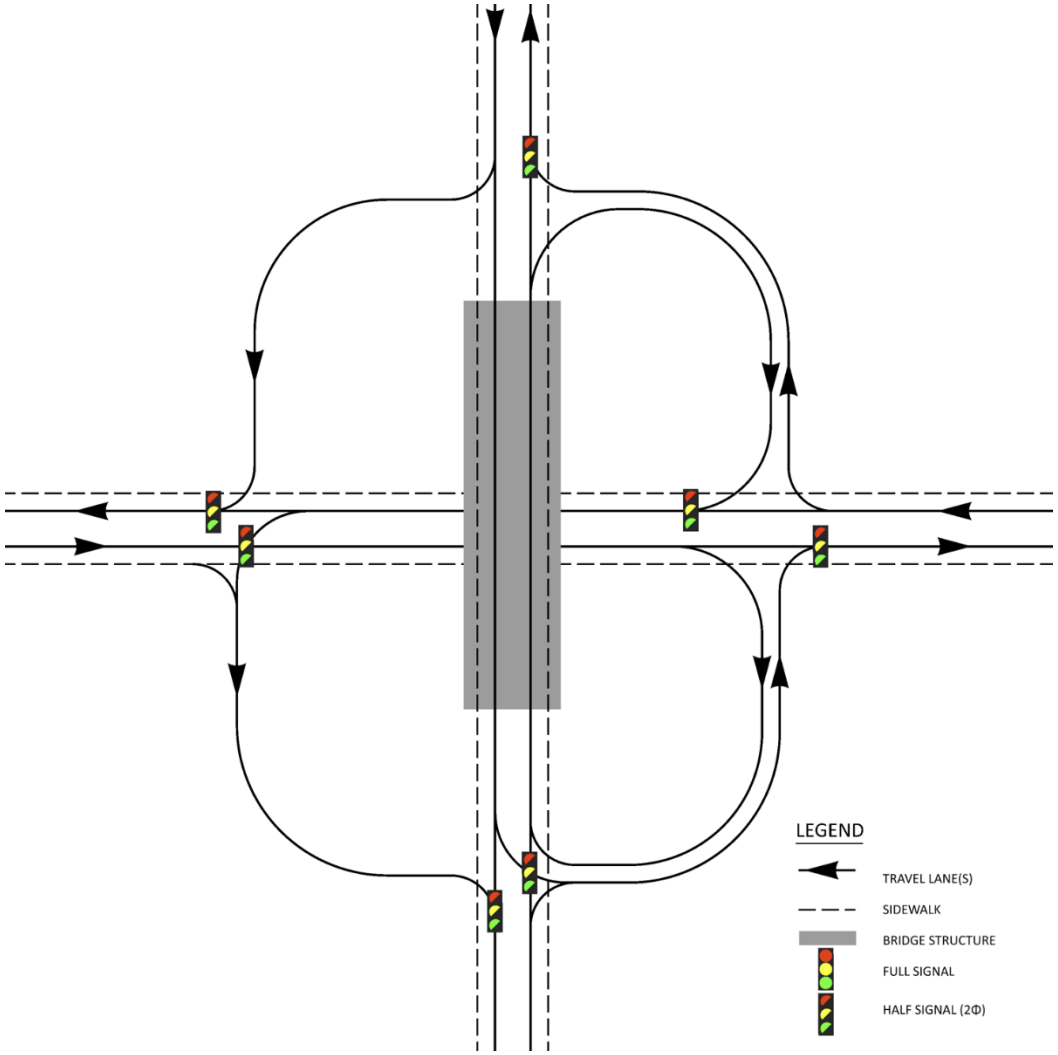
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	3	3	4	2	0	4	3	1	1	0	12	13	5	30



24-02, Loops adjacent

Summary: The highlight is good efficiency scores, but poor service to pedestrians and high costs will likely limit its competitiveness.
History: This is a new design.
Rank: 57 of 85.

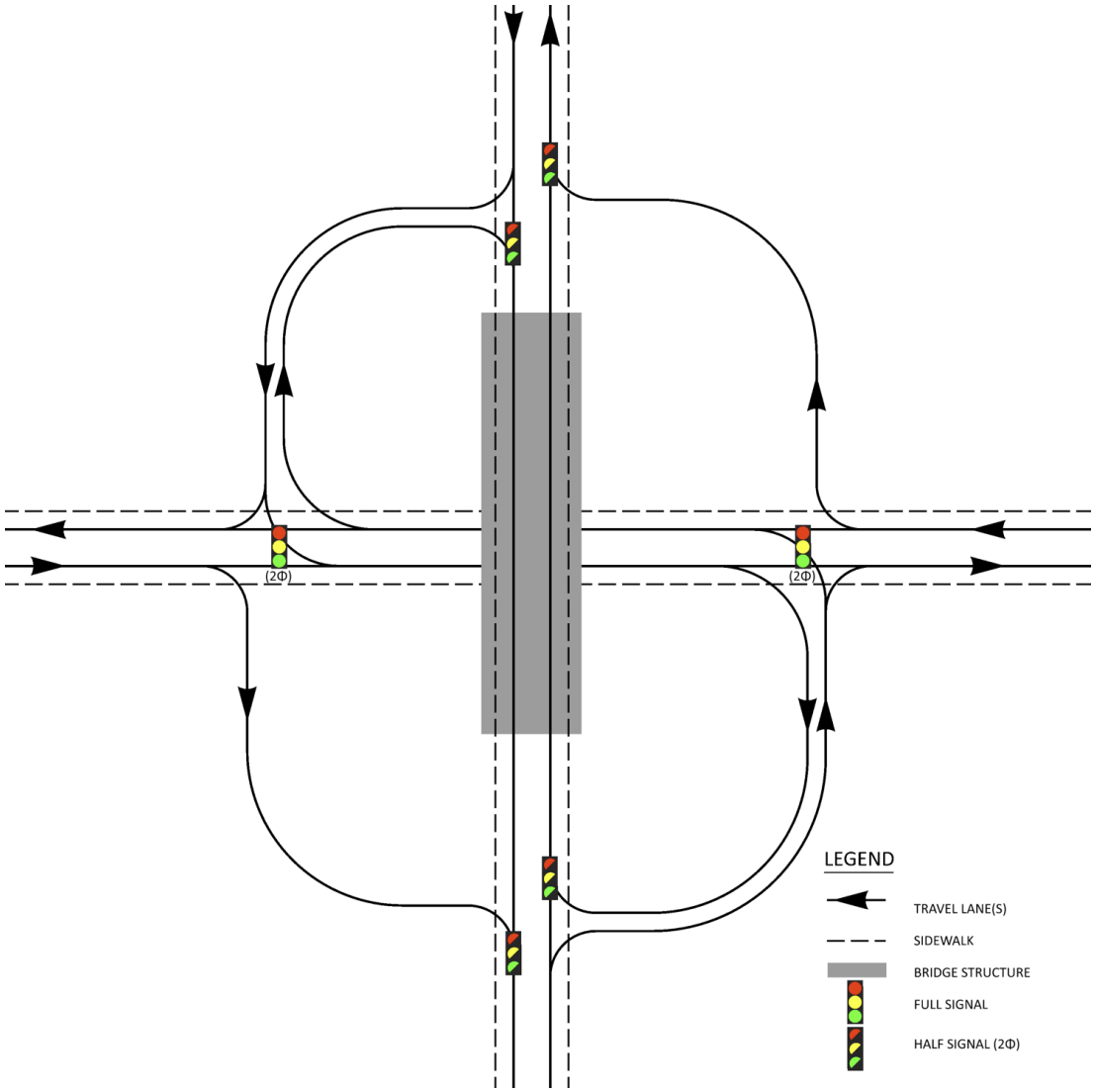
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	3	3	4	3	0	4	3	1	1	0	12	14	5	31



24-03, Parclo A

Summary: The small bridge is the highlight, but there are several substantial drawbacks including poor pedestrian service.
History: This is a popular interchange design that has probably been used at intersections.
Rank: 82 of 85.

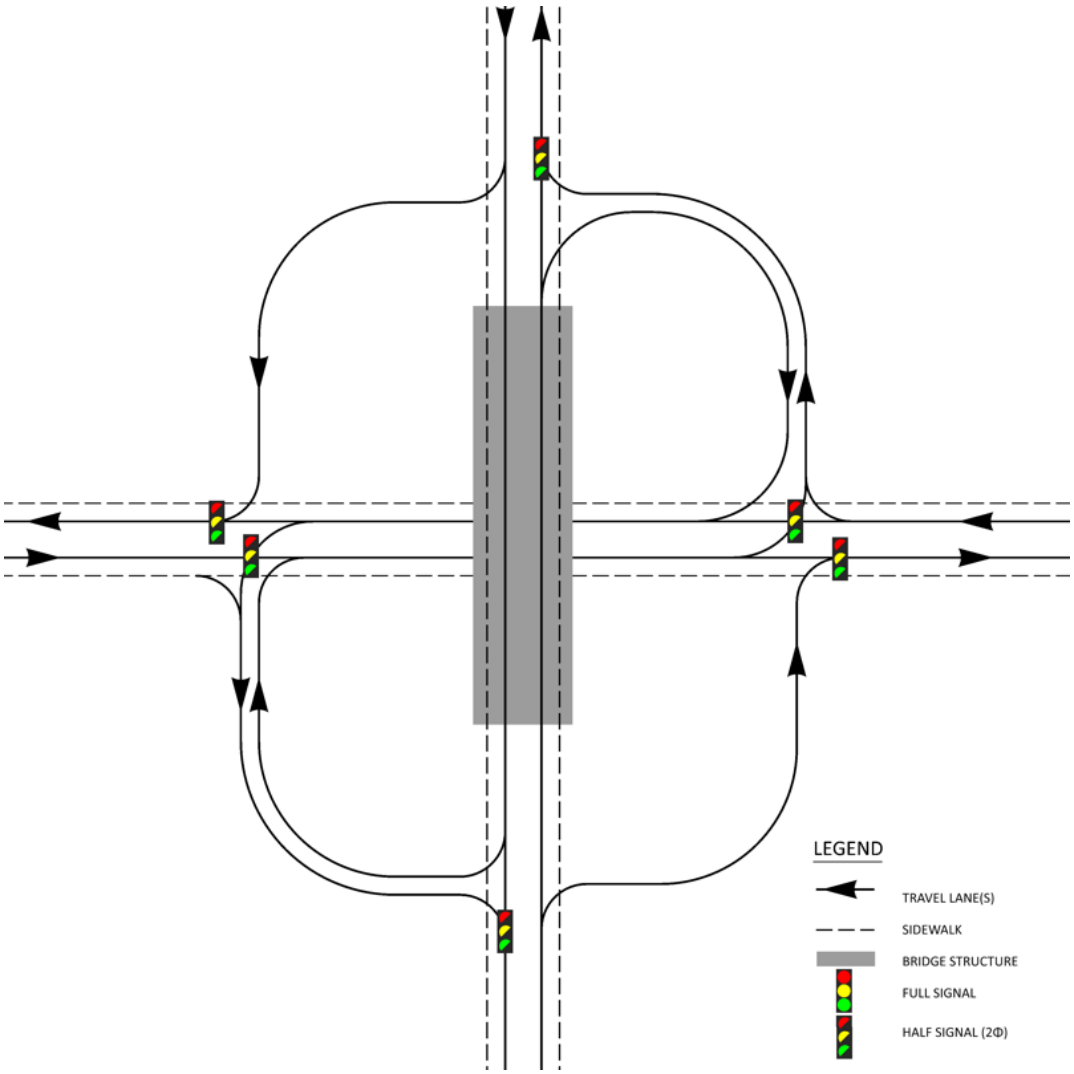
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	2	3	3	3	2	0	2	5	1	1	0	9	10	7	26



24-04, Parclo B

Summary: Features good efficiency and several good safety scores, but poor pedestrian service on one roadway and some high-cost characteristics will limit its usefulness.
History: This is a popular interchange design that has probably been used at intersections.
Rank: 46 of 85.

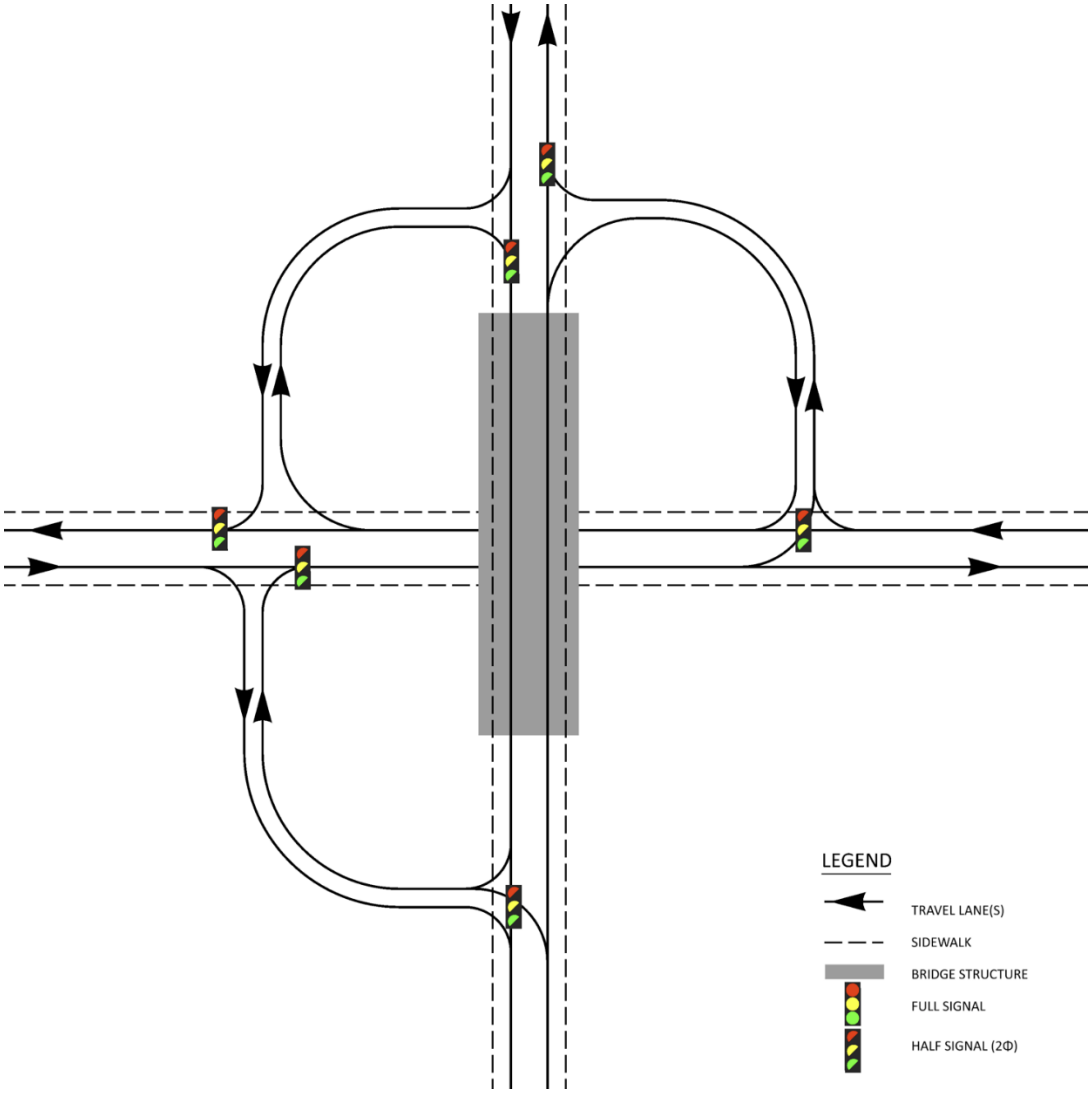
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	3	3	4	4	0	4	4	1	1	0	12	15	6	33



33-01, Leftover

Summary: Good capacity and progression, but mostly mediocre scores after that. It is tough to see the advantage of this design compared to the 22 Diagonal designs, for example.
History: This is a new design.
Rank: 61 of 85.

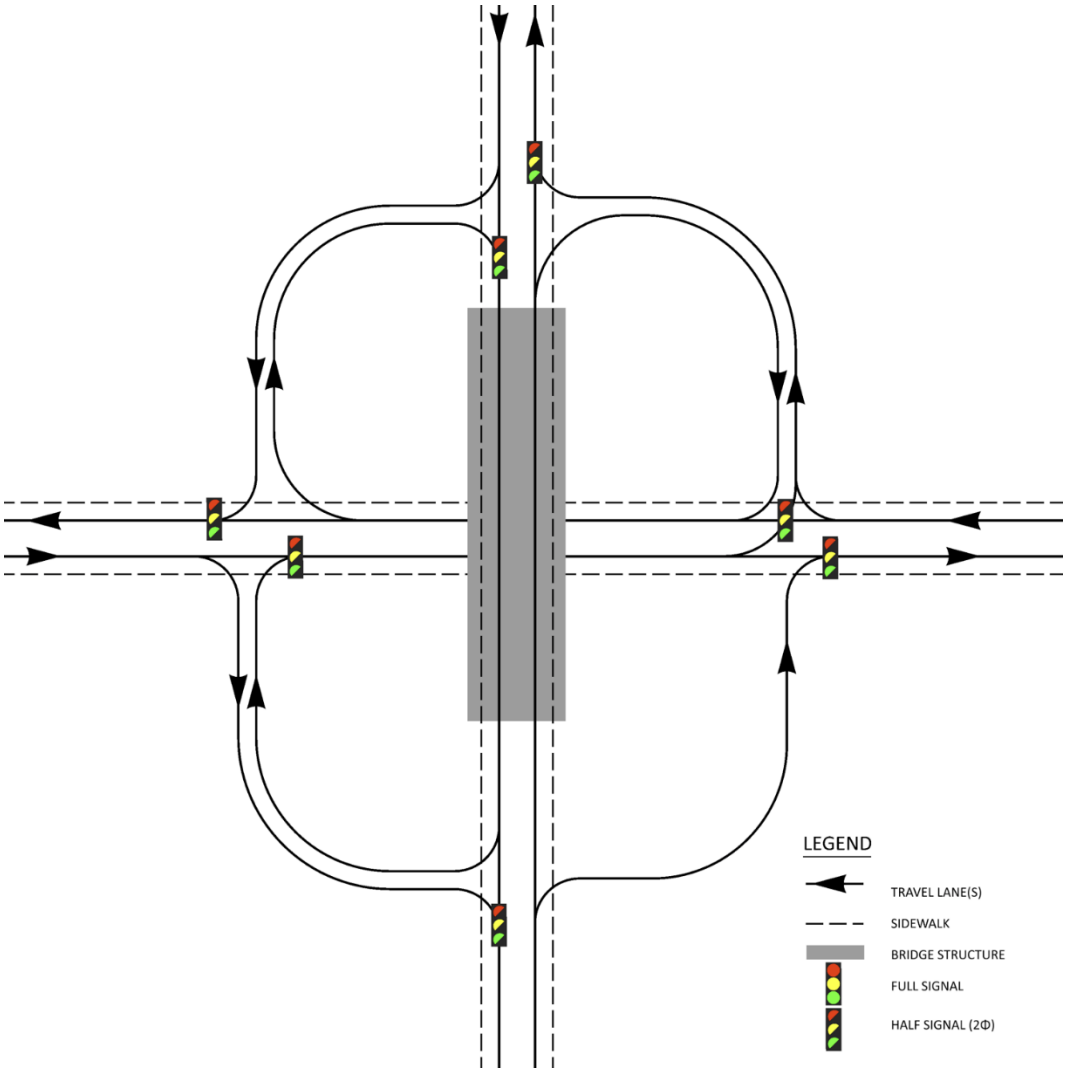
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	1	3	3	2	0	3	4	2	2	1	10	11	9	30



34-01, Leftover

Summary: Scores well in several ways, but sports some serious drawbacks as well.
History: This is a new design.
Rank: 71 of 85.

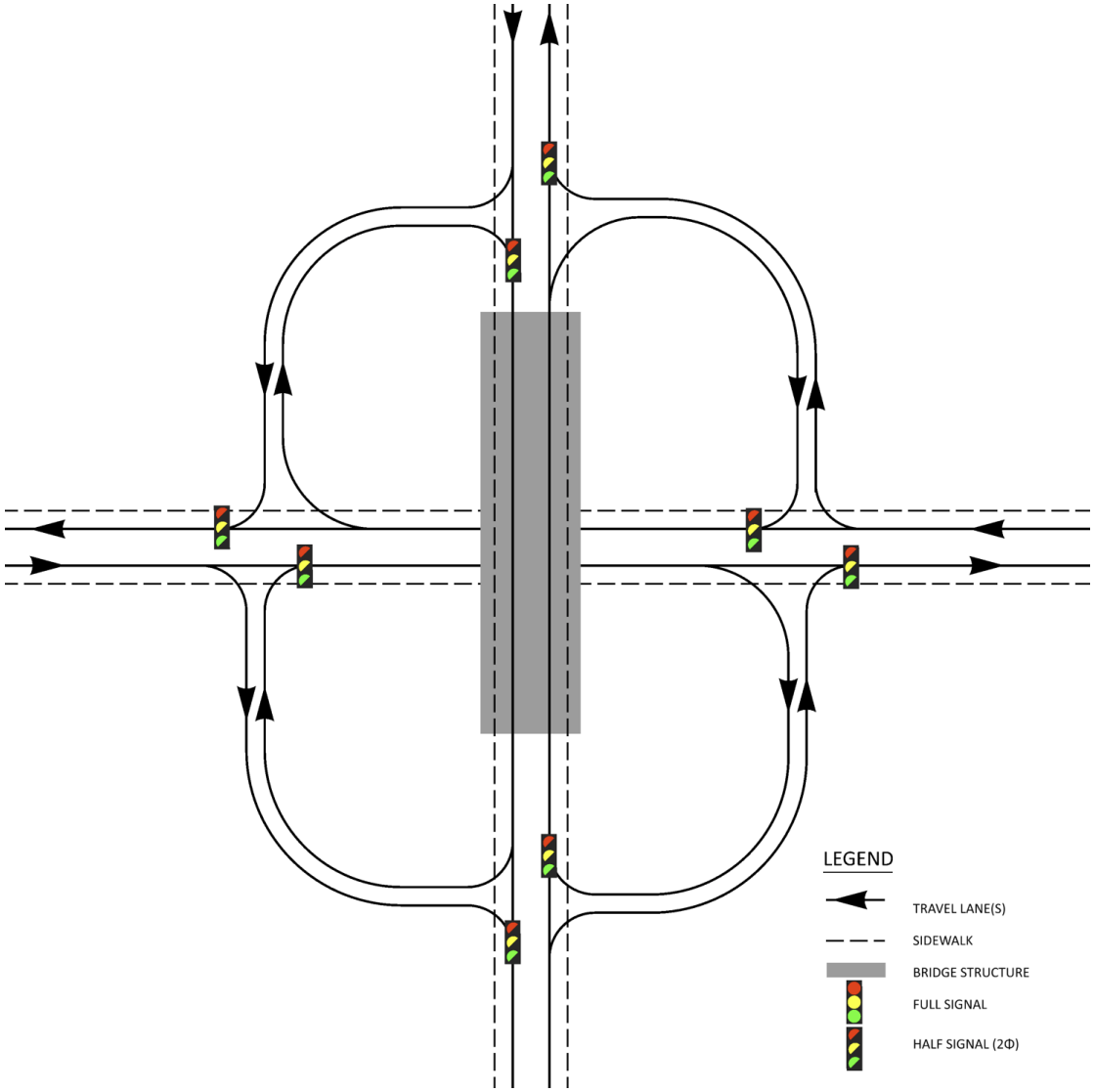
Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	2	4	3	3	0	4	4	0	0	0	11	14	4	29



44-01, Cloverleaf

Summary: The scores do not show much middle ground—they are either quite good or quite poor.
History: This is a common interchange and intersection design.
Rank: 58 of 85.

Capacity	Progression	Distance Traveled	Conflict Points	Unusual Maneuvers	Wrong Way Prevention	Pedestrian Quality	Speed Control	Bridge Size	Right of Way Size	Extent Along Roadways	Right of Way Flexibility	Efficiency (of 15)	Safety (of 25)	Cost (of 20)	Total (of 60)
4	5	1	4	3	4	0	5	5	0	0	0	10	16	5	31



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