Modern Roundabouts – A Case Study and Brief Overview

Presented by:
Matt Loeffler, PE, Traffic Engineer, Butler County Ohio
And
Jack Pflum, PE, Transportation Planning Consultant
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Circular Junctions

- Bath Circus – Somerset, England – 1768
- Columbus Circle – New York City – 1904
- Arc de Triomphe – Paris, France – 1907
- Constructed in US – East Coast – mid 1900’s
Modern Roundabouts

- Letchwork Garden City – England - 1903
- Re-engineered Traffic Circles - England – 1960’s
- United States – Summerlin, Neveda – 1990
- Estimated 3,000 Roundabouts in US – 2011
- Carmel Indiana – more the 80 roundabouts
Rule of Priority

- “Offside”, or “give way” mandatory rule in England since 1966 and in New York State since 1920’s

- *Traffic approaching a roundabout is required to give priority to circulating traffic in the roundabout and to traffic exiting from the roundabout.*
Safety Benefits

• 45% of all crashes in the US are at traditional intersections

• Intersection side impacts are most dangerous

• Generally, roundabouts have 40% fewer crashes, 80% fewer injuries, 90% fewer serious and fatal injuries

• Pedestrians and bicyclists need careful design considerations
Comparison of Conflict Points

VEHICLE TO VEHICLE AND VEHICLE TO PEDESTRIAN CONFLICT POINT COMPARISON FOR INTERSECTIONS WITH SINGLE-LANE APPROACHES
Capacity and Delay

- Single lane roundabouts - 20,000 to 25,000 vehicles per day
- Multi lane roundabouts – 40,000 to 50,000 vehicles per day
- Overall delay is usually reduced. Some drivers may experience an increase in delay
Driver Education

- Many drivers in the US have never used a roundabout

- Public Opinion – Before and After Survey
  1998 – 68% Opposed before; 23% after
  2007 – 66%-78% Opposed before; 13%-43% after
“A Rose By Any Other Name…”

- Traffic Circle
- Rotary
- Gyratory
- Mini
- Raindrop
- Turbo
- Stacked

- Controlled
- Magic
- Tram
- Railway
- Hamburger
- Through-about
- Cut-Through
- Roundabout Dog
A Mini _Where is it?
Butler County’s Experience
Hamilton Mason & Liberty Fairfield

BEFORE:
• 49 ACCIDENTS in 4 ¾ years
  (WITHIN 200 FEET OF THE INTERSECTION)
  – CRASH RATE = 2.1 per MEV
  – 11 INJURY (22%) and
  – 1 FATAL ACCIDENT

AFTER:
• 9 ACCIDENTS in 3 ½ years
  (WITHIN 200 FEET OF THE INTERSECTION)
  – CRASH RATE = 0.6 per MEV
  – 2 INJURY (22%) and
  – 0 FATAL ACCIDENT
Butler County’s Experience
Hamilton Mason & Liberty Fairfield

- **75% accident reduction**

- **Summary of Accident Types**
  - 1 Failure to Yield
  - 5 Failure to Control (single vehicle crash)
  - 3 Following to Closely/ACDA

- **3 hit light pole / 3 involved snow or ice**

- **Eliminated peak hour delays**

- **Very positive feedback**
Butler County’s Experience
Lakota Drive West & Eagleridge Drive

BEFORE:
- **19 ACCIDENTS** in 4 ½ years (WITHIN 200 FEET OF THE INTERSECTION)
  - CRASH RATE = 1.0 per MEV
  - 4 INJURY (21%) and
  - 95% INVOLVED MULTIPLE VEHICLES

AFTER:
- **13 ACCIDENTS IN 3 ¾ YEARS** (WITHIN 200 FEET OF THE INTERSECTION)
  - CRASH RATE = 1.0 per MEV
  - 0 INJURY
  - 38% INVOLVED MULTIPLE VEHICLES
Butler County’s Experience
Lakota Drive West & Eagleridge Drive

- Summary of Accident Types
  - 2 Failure to Yield
  - 7 Failure to Control (single vehicle crash)
  - 3 Following to Closely/ACDA
- 1 involved hitting light pole
- Eliminated peak hour delays
- Very positive feedback
Butler County’s Experience
Jacksonburg Road & Morganthaler Road

BEFORE:
• 20 ACCIDENTS in 7 years
  (WITHIN 200 FEET OF THE INTERSECTION)
  – CRASH RATE = 3.0 per MEV
  – 9 INJURY AND 1 FATAL (50% SERIOUS CRASHES)
  – RANKED TOP 5 IN COUNTY

AFTER:
• 0 ACCIDENTS IN 1 ½ YEARS
  (WITHIN 200 FEET OF THE INTERSECTION)
  – NO LONGER RANKED
  – BIGGEST ISSUE - VANDALISM
Left Turn Lanes Needed
Washington Blvd. Only
CONFLICT POINT ANALYSIS (EXISTING)

ROUNDABOUT ANALYSIS

CONFLICT POINT: 970

CONFLICT POINT: 940

CONFLICT POINT: 925

Requirements for roundabouts

Conflict Point:
- <1,100 vph → single lane is ok
- 1,100-1,400 vph → needs further analysis
- >1,400 vph → two lanes required

vph = vehicles per hour
CONFLICT POINT ANALYSIS (2032)

ROUNDABOUT ANALYSIS

East/West Street: NW Washington Blvd
South/North Street: Brookwood Avenue
Analysis Time Period: PM Peak
Date Performed:
Analysis Year: 2032
Analyst: MJL
Agency/Co.: BCEO

Requirements for roundabouts
Conflict Point:
<1,100 vph → single lane is ok
1,100-1,400 vph → needs further analysis
>1,400 vph → two lanes required
vph= vehicles per hour
DESIGN PHILOSOPHY

• GAP ACCEPTANCE

• CONFLICT POINTS (vph)
  • <1,100 – One-lane
  • 1,100 > 1,400 - ?
  • >1,400 – Two-lane

• EVERY INTERSECTION

• UPSIDE DOWN PLATE
PLACE CIRCLE
150’ – 200’ DIAMETER
Circular Lanes
16’ width + 8’ Truck Apron
Exit Lanes
R = 400’-800’ (Rural); R = 200’-400’ (Urban)
Offset for Entry Lanes
Entry Lanes

R = 75’-100’
Larger Splitter Island

- Create 2’-4’ center median
- Use tangent line
- Adjust entry radius
Tangent Lines
Center Median
Center Median
Nothing left but the Details...
Left Turn Lanes Needed
Washington Blvd. Only
COST ANALYSIS
Roundabout vs. Turn Lanes

- **Roundabout Construction Cost** = $650k – $800k
  - Depends on Lighting, Landscaping, etc.
  - MOT adds ~ $50k
  - Shorter project limits
  - R/W cost at intersection corners

- **Turn Lane Construction Cost** = $725k
  - Very little R/W cost (Unusual)
  - Much longer project limits
  - Utility relocations
  - Traffic Signal Energy Cost & Maintenance
DECISION TREE HIERARCHY

1. CAPACITY
2. RIGHT OF WAY IMPACTS
3. COST
4. MOT
5. DESIGN VEHICLE
6. GEOMETRY
   - GRADES
   - HORIZONTAL
   - VERTICAL
7. RAILROAD OR CLOSE SIGNAL
Why a roundabout is the BEST choice

- SAFETY - REDUCES SEVERE CRASHES
- CAPACITY/EFFICIENCY (OFF-PEAK, 24/7)
- LEFT TURN EFFICIENCY
- SIGNAL WARRANT NOT MET
- TRAFFIC CALMING
- SAFER FOR PEDESTRIANS (SINGLE LANE)
- AESTHETICS
- ACCESS MANAGEMENT
- SHORTER PROJECT LIMITS = OVERALL LESS IMPACT
Why a roundabout is NOT the best choice

- R/W IMPACTS (CORNERS)
- COST
- CAPACITY
- MOT – ROAD CLOSURE
- TOO CLOSE TO ADJACENT SIGNAL OR R/R CROSSING
- VISUALLY IMPAIRED PEDESTRIANS
Multi-lane Concerns

- PROPER LANE ON APPROACH
- NOT YIELDING TO ALL CIRCULAR TRAFFIC
- CHANGING LANES IN CIRCLE
- TRUCK OVERLAP
- VISUALLY IMPAIRED PEDESTRIANS
- BICYCLISTS
CONTACT INFO

• John “Jack” Pflum, P.E.
  – JEP Consulting Engineering
  – jackpflum@cinci.rr.com
  – 513-919-7814

• Matthew J. Loeffler, P.E.
  – Butler County Engineer’s Office
  – loefflerm@bceo.org
  – 513-785-4109