Hilliard, Ohio

- Northwest Suburb of Columbus, Ohio
- Hilliard Population: ~30,000
- Columbus Metro Population: ~2 million
History of Roundabout Implementation in Hilliard

- 2006 (2)
- 2008-09 (3)
- 2011 (2)
- 2013 (1)
- 2015 (1)
- 2016 (1)
- 2017 (2)
- 2018 - In Construction (2)

Total # of Roundabouts
12 opened & 2 in construction
A Dividing Line in Hilliard’s Roundabout Program

2006 (2)
2008-09 (3)
2011 (2)
2013 (1)
2015 (1)
2016 (1)
2017 (2)
2018 - In construction (2)

2018 Totals
12 opened & 2 in construction

The Honeymoon Years
The Child-Rearing Years
Toddler-Teen

The Demon Twins
Types of Roundabouts in Hilliard

- Single Lane
- 2x1 (hybrid) multilane
- 2x2 multilane

The Honeymoon Years
- 1 @ SL
- 3 @ hybrid ML
- 3 @ 2x2 ML

“Young & Naive”
- 3 @ SL
- 4 @ hybrid ML
- 0 @ 2x2 ML

The Child-Rearing Years
- 3 @ SL
- 4 @ hybrid ML
- 0 @ 2x2 ML
Main St & Cemetery Rd
Peak Hour = 3,200 vph entering
ADT= ~35,000

Main St & Scioto Darby Rd
Peak Hour = 3,100 vph entering
ADT = ~33,000
Skewed Angle

Three Major Arterials
Built-up corridor (retrofit)
5 Schools within ½ mile
~4,500 students (K-12)
High peaks & turning volumes
Main St/Cemetery Rd: Top of the List!?

2015-17 Top 100 High Crash Intersections (MORPC)

✓ 2\textsuperscript{nd} highest crash frequency = 262 crashes
  (nearly edging out Cleveland & Morse at 265)

✓ Highest crash rate (MEV rate) = 7.12
  (2\textsuperscript{nd} highest is Livingston & Hamilton at 4.57)

✓ Lowest severity index = 1.40
Main Street Roundabouts:
Crash Timeline

Oct. 2011
Construction Complete


Mar 2012
1st S&PM Changes

Aug 2014
2nd S&PM Changes

Aug 2015
2012-14 Top 100 High Crash List Released

Aug 2016
2013-15 Top 100 High Crash List Released

Aug 2017
2014-16 Top 100 High Crash List Released

Aug 2018
2015-17 Top 100 High Crash List Released

Over 60 crashes at 2 intersections in first 6 months

2011-13 Crash Review
problems brewing???

2012-14 Total Crashes
Main/Cemetery: 241
Main/SD: 121

2013-15 Total Crashes
Main/Cemetery: 233
Main/SD: 141

2014-16 Total Crashes
Main/Cemetery: 231
Main/SD: 135

2015-17 Total Crashes
Main/Cemetery: 262
Main/SD: 140

Oct 2017
Infrastructure & Education/Outreach Tiered Recommendations Presented

Mar 2017
Study Began
Hilliard Roundabout Study - 2017

Traditional Study Components
- Review Crash Reports
- Collect Volume & Speed Data
- Geometric & Capacity Review

Non-Traditional Study Components
- Read individual crash statements
- Public Survey
- Review Video

2x1+

2x2

Most Valuable Information!
Public Survey # 1 (Spring 2017) Results
General Roundabout Questions

Over 3,000 Respondents

- 60% of drivers had a favorable opinion roundabouts
- 65% of drivers feel there is less delay at roundabouts
- 52% of drivers feel less safe at a roundabout than a signal
- 70% of pedestrians feel less safe at a roundabout than a signal
- 65% of cyclists feel less safe at a roundabout than a signal
- 89% thought single lane roundabouts are easy to use and understand
- 54% thought multilane roundabouts are easy to use and understand

PDO crash problem likely contributing to public’s “feelings” about safety
Findings: Primary Crash Pattern at Main St & Scioto Darby Road

- 2x1+
  - Failure to yield on entry, especially right lane entering

Largest single crash location
Main St/Scioto Darby Rd: Skewed Angle

- Flat entry
- Restricted View Entry
- Irregular Exit Geometry (gives the impression that driver in roundabout will continue circulating and not exit)

Geometry Matters!

No skew: See the difference?
Proposed Infrastructure Modifications to combat skewed angle challenges

- Cut back splitter islands
- Reshape central island with Qwick-Kurb initially
Findings: Primary Crash Patterns at Main St & Cemetery Rd

- Failure to yield on entry, especially to inside lane of roundabout exiting
- Incorrect lane choice
  - Left from right circulating lane
  - Right from left entering lane
Failure to Yield on Entry (sort of...)
Merge vs Yield
Q20 How should a motorist enter a multi-lane roundabout?

Answered: 2,645   Skipped: 362

- Merge into circulating traffic: 26%
- Wait for appropriate gap in traffic: 74%
- Wait for circulating traffic to stop: 2%
- Wait for roundabout to be clear of all traffic: 0%
Incorrect Lane Choice

Reported Crashes from 2014-2016

Cemetery Road

Main Street
Possible contributing factors to incorrect lane choice

Do U.S. drivers exhibit “lane ownership”? (this is my lane and no one else can have it!)

Or do they just pick the lane that “feels” right? (I need to be in the left lane, so I should start in the left lane & “connect the dots”)

Top 2 Mistakes Drivers Make at Multi-Lane Roundabouts

**Failure to yield on entry to BOTH lanes in the roundabout**

**PROBLEM:** Many drivers entering a multi-lane roundabout in the right lane are not yielding to traffic in the multi-lane entry lane out of the roundabout.

**SOLUTION:** Yield to both lanes of traffic already in the roundabout when entering a roundabout.

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**Incorrect lane choice**

**PROBLEM:** Many drivers are not following the signs and pavement marking for the correct lane. For example, drivers try to make a left turn from the right lane (circulating around the outside lane).

**SOLUTION:** Similar to traditional intersections, always follow the signs and pavement markings to get in the correct lane before entering a roundabout. In most cases, drivers should not make left turns from the right lane or right turns from the left lane unless the signs and markings indicate that these movements are permitted at a particular intersection.
The “Twofer”
Other Factors that contribute to crash frequency at 2x2 roundabouts?

- Volume thresholds?
  - Will all 2x2 roundabouts eventually experience similar crash patterns when they reach capacity?

- Entry (phi) angle?
  - Did concern over path overlap lead to greater “no-man’s land” and feeling of merge?

- What role does driveway location or dropped lanes on exits play?
Proposed Infrastructure Modifications to combat lack of driver understanding

- Overhead lane control signs
- Use traditional arrows (no fishhooks)
What’s the common theme with both crash types?

Many drivers do not understand that the inside lane can exit at some roundabouts.

[Note: many of these drivers think that the “other guy” is wrong]
...maybe “human factors” plays a bigger role into the operation of roundabouts than we thought...

...perhaps drivers are *conditioned* to do the *wrong* thing
Are US motorists *conditioned* to apply the rules at freeway entries & exits to roundabouts?

Yield on entry on short freeway ramps? Yes

Signal, move over & exit on the right? Yes

Q: Do you need to worry about what the adjacent lane driver is doing? (General Rule of Thumb)

<table>
<thead>
<tr>
<th></th>
<th>Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway Ramp</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2x2 Roundabout</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Every Driver In Roundabout Just Winging It

MT. HOREB, WI—Saying they have “no earthly clue” exactly when it’s okay to enter and exit, all of the drivers currently in the roundabout at Springdale and 8th Street admitted Monday that they’re pretty much “just winging it” whenever they pass through. “Who has the right of way? What does a yield sign really mean? I haven’t needed to know since my driver’s ed test. Why are there two lanes? Should I stop to let this guy in? Wait, no way, that seems dangerous. Who’s honking at me? Is that coming from behind me or from the approaching car on my left?” said driver Alan Sommer, 42, one of countless aimless motorists flicking their blinkers on and off, gesturing at other drivers, halting suddenly after their car is halfway into traffic, and otherwise performing whatever dangerous and unpredictable action felt right to them. “I’ve driven this way every day for 15 years, and I still have no idea if I’m supposed to signal before exiting or what the sign with those arrows means. Oh, a pedestrian now?” At press time, the ambulance driver on his way to a six-car pileup in the roundabout confessed that he, too, was just winging it.
What are we teaching? How is it being taught? Who are we reaching? Is it accurate?

ROUNDABOUT

What Is It?
A roundabout is a circular intersection that has no traffic signal. Vehicles flow around a center island.

How To Drive Through a Roundabout:
Roundabouts require simple decision-making. Drivers entering the roundabout must yield to traffic already in the circle and are directed in one way, counterclockwise direction. For multiline roundabouts, drivers should stay in the right lane if intending to exit less than halfway around the circle and to the left if intending to exit more than halfway. Pavement markings typically direct you.

What’s wrong with this picture?
What are we teaching? How is it being taught? Who are we reaching? Is it accurate?

What’s wrong with this picture?

GET USED TO THEM!
The federal government is a big supporter of roundabouts. More traditional four-way intersections are being converted to roundabouts every year to reduce injuries and improve traffic flow. There are hundreds more in the planning stages throughout the U.S. mostly using federal dollars.

WHERE AM I SUPPOSED TO BE?
The correct way to go through a roundabout using designated lane markings
We need to do better!

• The Engineering Community needs to step up
• We need a consistent, **accurate** message that focuses on the Top 2 Mistakes
• We need to clarify & **simplify** (use graphics instead of words)...peel back the onion
• Quit using “engineer-speak” and assuming that roundabouts are intuitive
• Foster Relationships & Develop Champions in all sectors: legislators, government officials, consultants, emergency services, education, non-profit, automotive, trucking, ped/bike
The tide is turning...but are we too late?
Education/Outreach Campaign
#roundaboutrules

- Improved website
- Flyers
  - Yield to BOTH lanes
  - Choose the correct lane
- T-Shirts
- Hands-On Activities
- Social Media Campaign
- Roundabout Rules Video
Letty’s Lessons Learned
Lesson Learned #1: **2x2** is very different from **2x1+**

- Only one lane to yield to
- There is no outside lane to continue around in

We need to do a better job of differentiating between multilane roundabouts in our language.
Lesson Learned #2: Re-think Messaging

Example

We say: “Do not switch lanes in the roundabout”

It is interpreted differently by motorists...

A. “I didn’t switch lanes! I stayed in the outside lane all the way around the circle”

B. “The other guy switched lanes when he exited from the inside lane!”

(NOTE: many drivers assume that only the outside lane can exit - like on a freeway ramp)
Lesson Learned #2A: Re-think Messaging
Drivers do not understand a Spiral
Lesson Learned #2A: Re-think Messaging
Drivers do not understand a Spiral

Conversation from a public meeting

Citizen: Your signs are wrong. The sign says I should make a left turn from the left lane.

Engineer: The signs are correct - you do make a left turn from the left lane.

Citizen: But I need to be in the right (outside) lane to exit.

Engineer: No, you enter in the left lane and then you “spiral” out.

Citizen: What??

Engineer: You spiral out - you move to the outside lane.

Citizen: I thought you weren’t supposed to switch lanes.

Engineer: You’re not switching lanes - you’re “spiraling” out.

Citizen: WT*#?? This is the stupidest thing ever!
Lesson Learned #3: Use the word “safety” carefully

Engineers focus on eliminating this:

But we lose credibility if we disregard a huge increase in PDOs
Safety: A day in the life of a Hilliard Police Officer....

If you show up late to role call one more time, I’m going to put you on traffic duty at the roundabouts!

No!!
Please no!!

Police officers want to catch bad guys not respond to lots of PDOs at roundabouts.
Lesson Learned #4: Driveways on exit lanes at 2x2s can be problematic

- Encourages LTs from outside lane to get into driveways

School Entrance - student drop-off (Attendance boundary west & south)
Lesson Learned #5:

Do not underestimate the importance of an aggressive Education/Outreach Campaign for 2x2 Roundabouts

Note to Engineers:
We are typically not good at this, but the acceptance & effectiveness of a 2x2 roundabout will be very dependent on it
My Words of Advice on 2x2 Roundabouts

Researchers: Focused research on the 2x2 crash problem is critical in the implementation of roundabouts in the US (failure to address this problem could result in more serious injuries if roundabouts are not implemented)

Feds/DOTs: Differentiate better between 2x2 and other multi-lane hybrids in resources (standards, guidance & education/outreach)

Designers: Before recommending a 2x2 to your client, make sure you are very confident of the lane configuration and make sure your client understands what they are getting into

Locals: Make sure you have strong political support for roundabouts before you install a 2x2 and be prepared for the education/outreach efforts
Thank You!

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