



Alternative Intersections & Interchanges Symposium

July 20-24, 2014
Hilton Salt Lake City Center
Salt Lake City, Utah

Organized by

Operational Effects of Geometrics (AHB65)
Geometric Design (AFB10)
Access Management (AHB70)
Safety Data, Analysis, and Evaluation (ANB20)
Pedestrian (ANF10)
Traffic Signal Systems (AHB25)

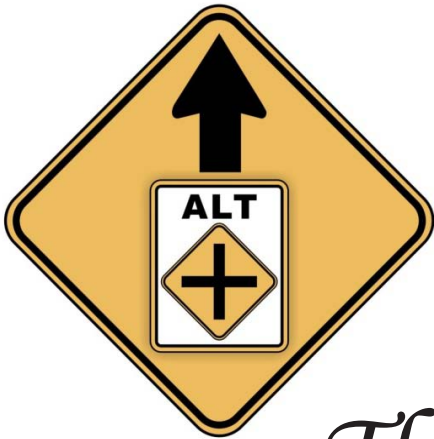
Supported by

PTV Group
Transoft Solutions
Rodel Interactive Roundabout Analysis Software



TRANSPORTATION RESEARCH BOARD

OF THE NATIONAL ACADEMIES



Alternative Intersections & Interchanges Symposium

Thank you Patrons!



the mind of movement



Rodel
Interactive Roundabout Solutions
Roundabout Analysis Software

Conference Planning Committee

Jeffrey Shaw, Federal Highway Administration, **Conference Organizer**
Gilbert Chlewicki, Wallace, Montgomery and Associate
Christopher Cunningham, Institute for Transportation Research and Education
Joseph Hummer, Wayne State University

TRB Staff

Rich Cunard
Freda Morgan
Mary Kissi
John Nettles
Ted Jamele



AGENDA AT A GLANCE

Sunday, July 20

7:00 a.m. - 5:00 p.m.	Registration	Registration Office
8:00 a.m. - 5:00 p.m.	Pre-Symposium Workshop	Seminar Theater
1:00 p.m. - 6:00 p.m.	Committee Meetings	
	• AHB70 Access Management Committee Meeting	Canyon A
	• AFB10 Geometric Design Committee Joint Subcommittees Meeting	Canyon B

Monday, July 21

7:00 a.m. - 5:30 p.m.	Registration	Registration Office
7:00 a.m. - 8:30 a.m.	Committee Meetings	
	• AHB65 Performance-based Design Subcommittee Meeting	Topaz
	• AHB65 Freeways Subcommittee Meeting	Alpine West
7:30 a.m. - 8:30 a.m.	Continental Breakfast	Grand Ballroom C
8:00 a.m. - 10:00 a.m.	Welcome and Opening Presentations	Grand Ballroom AB
10:00 a.m. - 10:30 a.m.	Break	Grand Ballroom C
10:30 a.m. - Noon	Concurrent Sessions 1A, 1B, 1C	
	1A) Alternatives Evaluation	Alpine East
	1B) Safety Performance Part I	Grand Ballroom AB
	1C) Operational Effects Part I	Alpine West
Noon - 2:00 p.m.	Lunch	Grand Ballroom C
2:00 p.m. - 3:30 p.m.	Concurrent Sessions 2A, 2B, 2C	
	2A) Implementation Lessons Part I	Alpine East
	2B) DDI Insights - Design	Grand Ballroom AB
	2C) Screening Tools and Methods	Alpine West
3:30 p.m. - 4:00 p.m.	Break	Grand Ballroom C
4:00 p.m. - 5:30 p.m.	Concurrent Sessions 3A, 3B, 3C	
	3A) Integrating Peds & Bikes Part I	Alpine East
	3B) DDI Insights - Adaptability	Grand Ballroom AB
	3C) Exploring New Concepts Part I	Alpine West
5:30 p.m. - 7:30 p.m.	Networking Reception/Video Theater	Grand Ballroom C



Tuesday, July 22		
7:00 a.m. – 5:00 p.m.	Registration	Registration Office
7:00 a.m. – 8:30 a.m.	Committee Meetings	
	• AHB65 Low/Moderate Speed Roadways Subcommittee Meeting	Canyon A
	• AHB65 High Speed Roadways Subcommittee Meeting	Topaz
7:30 a.m. – 8:30 a.m.	Continental Breakfast	
8:30 a.m. – 10:00 a.m.	Concurrent Sessions 4A, 4B, 4C	
	4A) Implementation Lessons Part II	Alpine East
	4B) Safety Performance Part II	Grand Ballroom AB
	4C) Exploring New Concepts Part II	Alpine West
10:00 a.m. – 10:30 a.m.	Break	Grand Ballroom C
10:30 a.m. – Noon	Breakout Sessions 5A, 5B, 5C	
	5A) Integrating Peds & Bikes Part II	Alpine East
	5B) State DOT Perspectives	Grand Ballroom AB
	5C) Operational Effects Part II	Alpine West
Noon – 1:30 p.m.	Lunch	Grand Ballroom C
1:30 p.m. – 6:00 p.m.	Guided Bus Tour	Salon III
1:30 p.m. – 6:00 p.m.	Mini Workshops	
	1) Diverging Diamond Interchanges - Design Insights and Innovations	Canyon C
	2) Operational Analysis Tools & Techniques for Alternative Intersections	Canyon A
	3) Overview of New FHWA Informational Guides	Alpine West
	4) Managing Access & Expectations	Alpine East
	5) AASHTO TCGD (members only)	Topaz
3:30 p.m. – 4:00 p.m.	Break	Grand Ballroom C
6:30 p.m. – 8:00 p.m.	Committee Meetings	
	• Joint 2015 International Symposium Planning Committee Meeting	Topaz



Wednesday, July 23		
7:30 a.m. – Noon	Registration	Registration Office
7:00 a.m. – 8:30 a.m.	Committee Meetings	
	• Intersections Joint Subcommittee Meeting	Canyon C
7:30 a.m. – 8:30 a.m.	Continental Breakfast	
8:30 a.m. – 10:00 a.m.	Concurrent Sessions 6A, 6B 6C	
	6A) Implementation Lessons Part III	Alpine East
	6B) DDI Insights - Signalization	Grand Ballroom AB
	6C) Exploring New Concepts Part III	Alpine West
	• AASHTO TCGD (members only)	Topaz
10:00 a.m. – 10:30 a.m.	Break	Grand Ballroom C
10:30 a.m. – Noon	Closing Plenary Session	Grand Ballroom AB
Noon – 1:00 p.m.	Lunch	Grand Ballroom C
	Committee Meetings	
1:00 p.m. – 2:00 p.m.	• AFB10 + AHB65 + AASHTO TCGD Joint Meeting	Grand Ballroom AB
1:00 p.m. – 3:00 p.m.	• AHB25 Traffic Signal Systems Committee Meeting	Alpine East
2:00 p.m. – 3:00 p.m.	• AFB10 + AHB65 Joint Committee Meeting	Grand Ballroom AB
	• AASHTO TCGD (members only)	Topaz
3:00 p.m. – 3:30 p.m.	Break	Grand Ballroom C
3:30 p.m. – 5:00 p.m.	• AFB10 Geometric Design Committee Meeting	Canyon C
	• AHB65 Operational Effects of Geometrics Committee Meeting	Alpine West
	• AASHTO TCGD (members only)	Topaz
	• AHB25 Traffic Signal Systems Committee Meeting	Alpine East
Thursday, July 24		
7:30 a.m. – 8:00 a.m.	Breakfast	Canyon BC
8:00 a.m. – 5:00 p.m.	Committee Meetings	
	• AHB25 Traffic Signal Systems Committee Meeting	Canyon A
	• AASHTO TCGD (members only)	Topaz
10:00 a.m. – 10:30 a.m.	Break	Canyon BC
Noon – 1:00 p.m.	Lunch	Canyon BC
3:00 p.m. – 3:30 p.m.	Break	Canyon BC



CONFERENCE AGENDA

Sunday, July 20

7:00 a.m. - 5:00 p.m., Registration Office

Registration

8:00 a.m. - 5:00 p.m., Seminar Theater

Pre-Symposium Workshop

1:00 p.m. - 6:00 p.m.

Committee Meetings

- **AHB70 Access Management Committee Meeting** - Canyon A
- **AFB10 Geometric Design Committee Joint Subcommittees Meeting** - Canyon B

Monday, July 21

7:00 a.m. - 5:30 p.m., Registration Office

Registration

7:00 a.m. - 8:30 a.m.

Committee Meetings

- **AHB65 Performance-based Design Subcommittee Meeting** - Topaz
- **AHB65 Freeways Subcommittee Meeting** - Alpine West

7:30 a.m. - 8:30 a.m., Grand Ballroom C

Continental Breakfast

8:00 a.m. - 10:00 a.m., Grand Ballroom AB

Welcome and Opening Presentations

Moderator: Jeffrey Shaw, Federal Highway Administration

Presenters

- **Mike Griffith**, Federal Highway Administration
- **Shane Marshall**, Utah DOT
- **Robin Hutcheson**, Salt Lake City
- **Gilbert Chlewicki**, ATS-American

10:00 a.m. - 10:30 a.m., Grand Ballroom C

Break

10:30 a.m. - Noon

Concurrent Sessions

1A) Alternatives Evaluation - Alpine East

Moderator: Brian Ray, Kittelson

Presenters

- **Nathaniel Coley**, Federal Highway Administration - *Intersection/Interchange ROI Analysis*



- **David Gerstle**, Caliper - *Microsimulation for AI's: Operations, Visualization, and Route Choice*
- **Milan Zlatkovic**, University of Utah – *Performance Matrix for Evaluating Alternative Designs*

1B) Safety Performance Part I - Grand Ballroom AB

Moderator: Ingrid Potts, MRI Global

Presenters

- **Wei Zhang**, Federal Highway Administration - *Crash Prediction Models for Rural Restricted Crossing U-Turn intersections*
- **Chris Cunningham**, ITRE/NCSU - *Safety Effects of Unsignalized Superstreets in NC*
- **Thomas Hall**, Purdue University - *Safety-related Behavior of Car and Truck Drivers on Roundabouts with High-speed Approaches*

1C) Operational Effects Part I - Alpine West

Moderator: David Cox, Federal Highway Administration

Presenters

- **Shaikh Ahmad**, Purdue University - *Capacity-related Driver Behavior on Roundabouts – Speed, Trucks, and Nighttime Conditions*
- **Xianfeng Yang**, University of Maryland - *Design and Performance Evaluation for Superstreet Intersections*
- **Eric Rasband and Matthew Luker**, Utah DOT - *Utah Experience with CFI and DDI Corridors*

Noon - 2:00 p.m., Grand Ballroom C

Lunch

2:00 p.m. - 3:30 p.m.

Concurrent Sessions 2

2A) Implementation Lessons Part I - Alpine East

Moderator: Larry Sutherland, Parsons Brinckerhoff

Presenters

- **Brenton Bogard**, Ohio DOT; **Brian Toombs**, Burgess Niple - *Implementation of the First DDI in the State of Ohio*
- **Mike Wahlstedt**, Transsystems - *Diverging Diamond Interchanges in Kansas City*
- **Hermanus Steyn**, Kittelson – *OR213: I-205 to Redland Road Overcrossing (OR213 Jughandle Project)*

2B) DDI Insights - Design - Grand Ballroom AB

Moderator: R.J. Porter, University of Utah

Presenters

- **Joel Leisch**, Consultant - *DCD/DDI Interchanges*
- **Chris Vaughan**, ITRE/NCSU - *Common Problems at Double Crossover Diamond (DCD) Interchanges and Nearby Intersections*
- **Gang-Len Chang**, University of Maryland - *Development of a Multi-stage Design System for Diverging Diamond Interchange*



2C) Screening Tools and Methods - Alpine West

Moderator: Katy Salamati , ITRE/NCSU

Presenters

- **Yao Cheng**, University of Maryland - *Maryland Unconventional Intersection Design (MUID): A Useful Tool to Design and Evaluate Alternative Intersections*
- **John Sangster**, Leidos - *Operational Limitations of Alternative Intersections: Implications of the CAP-X Software*
- **Brian Ray**, Kittelson - *Intersection Control Evaluations*

3:30 p.m. - 4:00 p.m., Grand Ballroom C

Break

4:00 p.m. - 5:30 p.m.

Concurrent Sessions 3

3A) Integrating Peds & Bikes Part I - Alpine East

Moderator: Brooke Struve, Federal Highway Administration

Presenters

- **Janet Barlow**, Accessible Design for the Blind - *Accessible Design Considerations for Intersections*
- **Anne Holzem**, Patrick Eng. - *Impact of Superstreet Operations on Pedestrians and Bicyclists*
- **Gilbert Chlewicki**, ATS-American – *Using the concept of the Continuous Flow Intersection to improve pedestrian movements at intersections*

3B) DDI Insights - Adaptability - Grand Ballroom AB

Moderator: Michael Shepard, Florida DOT

Presenters

- **Smith Siromaskul**, HDR - *Evolving the DDI*
- **Wei Zhang**, Federal Highway Administration - *Unlock DDI's Capacity Potential Using Relaxed Bowtie Design at Adjacent Signal Intersection*
- **Lynn Jacobs**, Fehr & Peers - *How to handle the skew: Introducing the Offset Diverging Diamond Interchange (O-DDI)*

3C) Exploring New Concepts Part I - Alpine West

Moderator: Grant Schultz, BYU

Presenters

- **Ausrius Juozapavičius** - *Interchange of a new generation PINAVIA*
- **Michael Gingrich**, AIC - *Cost and Constructability Comparison of the DCMI Interchange*
- **Blake Unguren**, Avenue Consultants; **Matt Luker**, Utah DOT - *5400 South FlexLanes Corridor*

5:30 p.m. - 7:30 p.m., Grand Ballroom C

Networking Reception/Video Theater



Tuesday, July 22

7:00 a.m. - 5:00 p.m., Registration Office

Registration

7:00 a.m. - 8:30 a.m.

Committee Meetings

- **AHB65 Low/Moderate Speed Roadways Subcommittee Meeting - Canyon A**
- **AHB65 High Speed Roadways Subcommittee Meeting - Topaz**

7:30 a.m. - 8:30 a.m., Grand Ballroom C

Continental Breakfast

8:30 a.m. - 10:00 a.m.

Concurrent Sessions 4

4A) Implementation Lessons Part II - Alpine East

Moderator: Brian Fouch, Federal Highway Administration

Presenters

- **Mike Reese**, North Carolina - *North Carolina's First Quadrant Left: History and Lessons Learned*
- **Jon Nepstad**, Fehr & Peers - *The First One Through the Door – How Utah Got its First CFI*
- **Brandon Bourdon**, Kimley-Horn – *Constructed Diverging Diamond Interchange with Center Running Light Rail Transit*

4B) Safety Performance Part II - Grand AB

Moderator: Betsey Tramonte, Federal Highway Administration

Presenters

- **Adam Kirk**, University of Kentucky - *Quantitative Safety Evaluation of Alternative Intersection Designs*
- **Laurence Lambert**, Stantec - *Safety & Pedestrian Experience of the CFI*
- **Jalil Kianfar**, St.Louis University; **Shawn Leight**, CB&B - *Safety Evaluation of Alternative Intersection Designs in St. Louis Metro Area*

4C) Exploring New Concepts Part II - Alpine West

Moderator: Eric Donnell, Penn State

Presenters

- **Chris Malmberg**, HDR - *Innovative Five-Legged Intersection Concept*
- **Michael Mosely and Sam Lytle**, Kimley-Horn; - *Communicating New Designs using Traffic Simulation Visualization Models*
- **Gilbert Chlewicki**, ATS-American - *Are Left-Side Ramps Inherently Evil or Can There Be Some Benefits?*

10:00 a.m. - 10:30 a.m., Grand Ballroom C

Break



10:30 a.m. - Noon,

Concurrent Sessions 5

5A) Integrating Peds & Bikes Part II - Alpine East

Moderator: Kay Fitzpatrick, TTI/TAMU

Presenters

- **Kristy Jackson**, ITRE/NCSU - *Observations of Pedestrian and Bicycle Behavior and Facilities at Double Crossover Diamond Interchanges*
- **Julie Bjornstad**, Fehr & Peers - *Pedestrian and Bicycle Design Considerations at Innovative Intersections and Interchanges*
- **Nick Falbo**, Alta Planning – *Protected Intersections for Protected Bike Lanes*

5B) State DOT Perspectives - Grand Ballroom AB

Moderator: Kent Belleque, Oregon DOT

Presenters

- **Fred Doehring**, Utah DOT - *Utah DOT - Innovative Intersection Leader*
- **Mike Reese, Sean Epperson and Justin Carroll**, North Carolina DOT - *Innovative Intersection and Interchange Design Concepts in North Carolina*
- **Saed Rahwanji and Minseok Kim**, MD SHA - *State of the Practice, Case Studies and Analysis Tools on Unconventional Intersection & Interchange Designs in Maryland*

5C) Operational Effects Part II - Alpine West

Moderator: Jon Soika, VHB

Presenters

- **Chris Cunningham**, ITRE/NCSU - *Operational Effects of Signalized Superstreets in NC*
- **Samuel Hammond**, Nitsch Engineering - *Effects of Additional Lane Length on Roundabout Operations*
- **Anuj Sharma**, University of Nebraska - *Evaluation of Operational Performance of Median U Turn (MUT)*

Noon - 1:30 p.m., Grand Ballroom C

Lunch

1:30 p.m. - 3:00 p.m., Salon III

Guided Bus Tour

(Register by 5:00pm Monday - \$35.00)

Moderator: Fred Doehring, Utah DOT; Samit Dao, Avenue Consultants

This shuttle bus tour will take participants on a route through several alternative intersections and interchanges in the immediate Salt Lake City area. Local experts will serve as tour guides and provide background information on the projects/locations. The route includes:

- Diverging Diamond Interchange
- Continuous Flow Intersections
- ThrU-Turn intersection
- Single Point Interchanges
- Roundabouts



1:30 p.m. - 3:30 p.m.,

Mini Workshops

1: Diverging Diamond Interchanges - Design Insights and Innovations - Canyon C

With the first few dozen DDIs constructed and operational in the U.S., there are many valuable lessons that have been learned. Expert designers will relate their project experiences on planning and designing DDIs across the United States, including some innovative variants of DDIs.

Presenters

- **Gilbert Chlewicki**, ATS-American
- **Joel Leisch**, Consultant
- **Smith Siromaskul**, HDR

2: Operational Analysis Tools & Techniques for Alternative Intersections - Canyon A

Several operational analysis tools will be highlighted, with tips and techniques demonstrated using case study examples from alternative intersection and interchange projects. The workshop will explore the differences between several of the most popular analysis tools and explain the similarities and differences in the models.

Presenters

- **Ram Jagannathan**, Leidos
- **Lily Elefteriadou**, University of Florida
- **Jim McCarthy**, Federal Highway Administration
- **Bastian Schroeder**, ITRE/NCSU

3: Overview of New FHWA Informational Guides - Alpine West

A “guided tour” of the new FHWA series of stand-alone Informational Guides on the following alternative intersections/interchanges: Diverging Diamond Interchange, Displaced Left Turn Intersection, Median U-Turn Intersection and Restricted Crossing U-Turn Intersection.

Presenters

- **Mark Doctor**, Federal Highway Administration
- **Brian Ray**, Kittelson
- **Hermanus Steyn**, Kittelson
- **Andy Daleiden**, Kittelson
- **Pete Jenior**, Kittelson

4: Managing Access & Expectation - Alpine East

A public outreach and involvement effort on innovative intersection projects is essential to success. Additionally, provisions for access to homes or businesses adjacent to any road project can be as controversial as the project itself, suggesting that managing access is also related to managing expectations and clearly communicating trade-offs. Recent experiences and ongoing research will provide insight on how to approach managing both access and expectations effectively.

Presenters

- **Phil Demosthenes**, Consultant
- **Karen Dixon**, TTI/TAMU
- **Mike Brown**, Metro Analytics



- **Dan Avila**, Utah DOT
- **Laycee Kolkman**, HDR

1:30 p.m. - 6:00 p.m., Topaz
AASHTO TCGD (members only)

3:30 p.m. - 4:00 p.m., Grand Ballroom C
Break

4:00 p.m. - 6:00 p.m., Salon III
Guided Bus Tour Repeat

4:00 p.m. - 6:00 p.m.,
Mini Workshops Repeat

6:30 p.m. - 8:30 p.m., Topaz
Joint 2015 International Symposium Planning Committee Meeting

Wednesday, July 23

7:30 a.m. - Noon, Registration Office
Registration

7:00 a.m. - 8:30 a.m.
Committee Meetings

- **Intersections Joint Subcommittee Meeting** - Canyon C
- **TBD** - Topaz

7:30 a.m. - 8:30 a.m., Grand Ballroom C
Continental Breakfast

8:30 a.m. - 10:00 a.m.
Concurrent Sessions 6

6A) Implementation Lessons Part III - Alpine East

Moderator: Marcus Brewer, TTI/TAMU

Presenters

- **Brian Walsh**, Washington State DOT – *Washington State Experiences on Temporary Alternative Intersection Applications*
- **Lynn Jacobs**, Fehr & Peers; **Ashford Galbreath**, Wadsworth Bros. - *Temporary Innovative Intersections for MOT During Construction*
- **Jose Rodriguez**, HDR; **Eric Rasband**, Utah DOT - *Constructability Issues and Lessons Learned on I-15 DDI in Utah*

6B) DDI Insights - Signalization - Grand Ballroom AB

Moderator: Zoubir Ouadah, Wilson

Presenters

- **Theresa Rohlfs**, Trafficware - *Understanding Signal Timing Issues of Diverging Diamond Interchanges*



- **Bastian Schroeder**, ITRE/NCSU - *Signal Phasing Options at Double Crossover Diamond (DCD) Interchanges using a Single Controller*
- **Gerry de Camp** - *Signal Phasing Schemes for Operating Diverging Diamond Interchanges*

6C) Exploring New Concepts Part III - Alpine West

Moderator: Mark Doctor, Federal Highway Administration

Presenters

- **Corey Krause**, Federal Highway Administration - *Operational Advantages of Dynamic Reversible Left Lane Control of Existing Signalized Diamond Interchanges*
- **Joel Marcuson**, Consultant - *Signalizing Circulating Intersections/Interchanges*
- **Peng Hao**, CERT/UCR - *Improve Traffic Operation at Signalized Intersections using Four Quadrant Connection Roadways*

8:30 a.m. - 10:00 a.m., Topaz

AASHTO TCGD (members only)

10:00 a.m. - 10:30 a.m., Grand Ballroom C

Break

10:30 a.m. - Noon, Topaz

AASHTO TCGD (members only)

10:30 a.m. - Noon, Grand Ballroom AB

Closing Plenary

Noon - 1:00 p.m., Grand Ballroom C

Lunch

Committee Meetings

1:00 p.m. - 2:00 p.m.

- **AFB10 + AHB65 + AASHTO TCGD Joint Meeting** - Grand Ballroom AB

1:00 p.m. - 5:00 p.m.

- **AHB25 Traffic Signal Systems Committee Meeting** - Alpine East

2:00 p.m. - 3:00 p.m.

- **AFB10 + AHB65 Joint Committee Meeting** - Grand Ballroom AB

2:00 p.m. - 5:00 p.m.

- **AASHTO TCGD (members only)** - Topaz

3:00 p.m. - 3:30 p.m., Grand Ballroom C

Break



Thursday, July 24

7:30 a.m. - 8:00 a.m., Canyon BC

Breakfast

8:00 a.m. - 5:00 p.m.,

Committee Meetings

- **AHB25 Traffic Signal Systems Committee Meeting** - Canyon A
- **AASHTO TCGD (members only)** - Topaz

10:00 a.m. - 10:30 a.m., Canyon BC

Break

Noon - 1:00 p.m., Canyon BC

Lunch

3:00 p.m. - 3:30 p.m., Canyon BC

Break



Hilton Salt Lake City Center Floor Plan



THE NATIONAL ACADEMIES™

Advisers to the Nation on Science, Engineering, and Medicine

The nation turns to the National Academies—National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council—for independent, objective advice on issues that affect people's lives worldwide.

www.national-academies.org

TRANSPORTATION RESEARCH BOARD

OF THE NATIONAL ACADEMIES
500 Fifth Street, NW
Washington, DC 20001
www.TRB.org