

Design & Utility Exception Crash & B/C Analysis

**Design Conference Session 14
2:00PM to 2:45 PM**

Speaker

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Presentation Objectives?

- **Share some Do's & Don'ts**
- **Share some important overlooked concepts that impact critical conclusions!**

Outcomes?

They can facilitate expeditious review & approval of exceptions

Presentation Issues?

1. **Using crash reports versus the crash history/summary!**
2. **Identifying alternative crash analysis techniques!**
3. **Crash Reduction / Accident Modification Factor Use!**
4. **Mitigation!**

Presentation Issues?

1. Using crash reports versus the crash history/summary!

WARNING!

A crash history/summary is ONLY a list of SYMPTOMS! The problems often lie elsewhere!

Quick Example?



Quick Example?



Quick Example?



Appendix G Long Form HSMV - 90003

A valid conclusion must be based upon fact!

All Non-New Const. Exception submittals must be supported by a Benefit / Cost Analysis that begins with a review of the crash reports!

The image shows a detailed Florida Traffic Crash Report form (HSMV-90003). The form is divided into several sections:

- Time & Location:** Includes date, time, county, and location details.
- Vehicle Information:** Details for the involved vehicles, including make, model, year, and license plate.
- Driver Information:** Information about the driver, including name, address, and license status.
- Contributing Causes:** A list of potential causes for the crash, such as 'No Improper Driving/Action', 'Careless Driving', 'Failed to Yield Right-of-Way', etc.

 The form contains checkboxes and fields for recording specific details of the crash event.

CONTRIBUTING CAUSES DRIVER/PEDESTRIAN

- 01 No Improper Driving/Action 1 2 3
- 02 Careless Driving (Explain in Narrative)
- 03 Failed to Yield Right-of-Way 77 01
- 04 Improper Backing
- 05 Improper Lane Change
- 06 Improper Turn
- 07 Alcohol – Under Influence
- 08 Drugs – Under Influence
- 09 Alcohol & Drugs – Under Influence
- 10 Followed Too Closely
- 11 Disregarded Traffic Signal
- 12 Exceeded Safe Speed Limit
- 13 Disregarded Stop Sign
- 14 Failed To Maintain Equip./Vehicle
- 15 Improper Passing
- 16 Drove Left of Center
- 17 Exceeded Stated Speed
- 18 Obstructing
- 19 Improper Load
- 20 Disregarded Other Traffic Control
- 21 Driving Wrong Side/Way
- 22 Fleeing Police
- 23 Vehicle Modified
- 24 Driver Distraction
- 77 All Other (Explain in Narrative)

FIRST/SUBSEQUENT HARMFUL EVENT(S)

- | | |
|--|---|
| 01 Collision W/MV in Transport (Rear End) | 22 MV Hit Tree/Shrubbery |
| 02 Collision W/MV in Transport (Head On) | 23 Collision With Const. Barricade Sign |
| 03 Collision W/MV in Transport (Angle) | 24 Collision With Traffic Gate |
| 04 Collision W/MV in Transport (Left Turn) | 25 Collision With Crash Attenuators |
| 05 Collision W/MV in Transport (Right Turn) | 26 Collision With Fixed Object Above Rd |
| 06 Collision W/MV in Transport (Sideswipe) | 27 MV Hit Other Fixed Object Narrative |
| 07 Collision W/MV in Transport (Backed Into) | 28 Collision With Moveable Object On Rd |
| 08 Collision With Parked Car | 29 MV Ran Into Ditch/Culvert |
| 09 Collision With MV on Roadway | 30 Ran Off Road Into Water |
| 10 Collision With Pedestrian | 31 Overturned |
| 11 Collision With Bicycle | 32 Occupant Fell From Vehicle |
| 12 Collision With Bicycle (Bike Lane) | 33 Tractor/Trailer Jackknifed |
| 13 Collision With Moped | 34 Fire |
| 14 Collision With Train | 35 Explosion |
| 15 Collision With Animal | 36 Downhill Runaway |
| 16 MV Hit Sign/Sign Post | 37 Cargo Loss or Shift |
| 17 MV Hit Utility/Pole/Light Pole | 38 Separation of Units |
| 18 MV Hit Guardrail | 39 Median Crossover |
| 19 MV Hit Fence | 77 All Other (Explain In Narrative) |
| 20 MV Hit Concrete Barrier Wall | |
| 21 MV Hit Bridge/Pier/Abutment/Rail | |

Summary Coding Issues

Each crash summary code has contributory factors that may invalidate a crash from consideration!

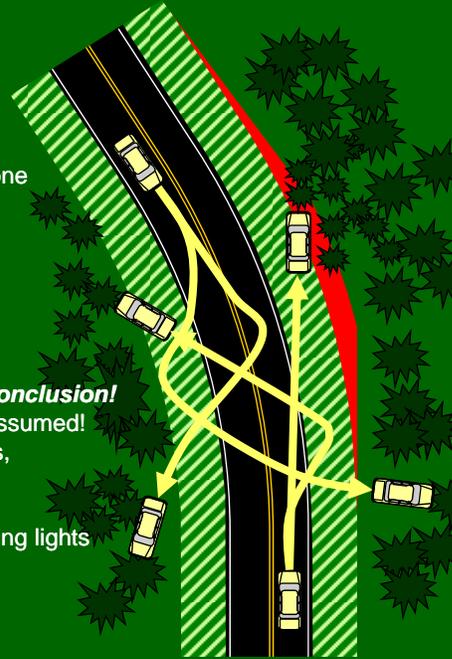
Crash Type	Possible Contributory Factor(s)
Right - angle	Poor visibility of signals
	Inadequate signal timing
	Excessive speed
	Wet pavement surface
	Inadequate sight distance
	Drivers running red light
Rear - end or Sideswipe	Inappropriate approach speeds
	Poor visibility of signals
	Unexpected lane changes on approach
	Narrow lanes
	Unexpected stops on approach
	Wet pavement surface
	Excessive Speed

Horizontal Curves

A review of crash histories of curves was done
 that were **below standard!**

Conclusion! - Add extra clear zone width to
 the outside of the curves/crashes.

- Review crash reports of **all curves = bad conclusion!**
 - Address crashes that happen – not the assumed!
 - So! Should you increase the radius,
 improve superelevation,
 Or Mitigate,
 by providing advance warning signs / flashing lights
 Lighting
 Advisory speed / rumble strips
 Any other appropriate method?



You have to know the OPERATIONAL CONDITIONS

VISION OBSTRUCTED

- 01 Vision Not Obstructed
- 02 Inclement Weather
- 03 Parked/Stopped Vehicle
- 04 Trees/Crops/Bushes
- 05 Load On Vehicle
- 06 Building/Fixed Object
- 07 Signs/Billboards
- 08 Fog
- 09 Smoke
- 10 Glare
- 77 All Other (Explain)

ROAD SURFACE CONDITION

- 01 Dry
- 02 Wet
- 03 Slippery
- 04 Icy
- 77 All Other (Explain)

LIGHTING CONDITION

- 01 Daylight
- 02 Dusk
- 03 Dawn
- 04 Dark (Street Light)
- 05 Dark (No Street Light)
- 88 Unknown

TRAFFICWAY CHARACTER

- 01 Straight – Level
- 02 Straight – Upgrade/
Downgrade
- 03 Curve – Level
- 04 Curve – Upgrade/
Downgrade

You have to know the OPERATIONAL CONTEXT

SITE LOCATION

- 01 Not At Intersection/RR X-ing/Bridge
- 02 At Intersection
- 03 Influenced By Intersection
- 04 Driveway Access
- 05 Railroad
- 06 Bridge
- 07 Entrance Ramp
- 08 Exit Ramp
- 09 Parking Lot – Public
- 10 Parking Lot – Private
- 11 Private Property
- 12 Toll Booth
- 13 Public Bus Stop Zone
- 77 All Other (Explain)

TRAFFIC CONTROL

- 01 No Control
- 02 Special Speed Zone
- 03 Speed Control Sign
- 04 School Zone
- 05 Traffic Signal 11 Posted No U-Turn
- 06 Stop Sign 12 No Passing Zone
- 07 Yield Sign 77 All Other (Explain)
- 08 Flashing Light
- 09 Railroad Signal
- 10 Officer/Guard/Flag person

Why did these crashes occur?



ONLY crash reports tell the story!



ONLY crash reports provide clues!



ONLY crash reports tell the story!



Accessing crash history/reports

STEPS

1. District Safety Office Request
2. Central Office Approval Required

1.3.1. Log On to Hummingbird Webtop.

1. Select the Safety Library
2. For User Name, type your FDOT PC logon User Name
3. For Password, type your FDOT PC logon Password
4. Leave the Network Name blank
5. Click the log on button to continue

The screenshot shows the 'Hummingbird DM' login page. The interface includes a header with a hummingbird logo and the text 'Hummingbird DM N. I.H.S.'. Below the header are four input fields: 'User Name', 'Password', 'Network Name', and 'Library'. The 'Library' dropdown menu is open, showing 'CO_EDMS' selected. At the bottom of the form are 'Log On', 'Guest Log On', and 'Help' buttons. Callout boxes provide the following instructions:

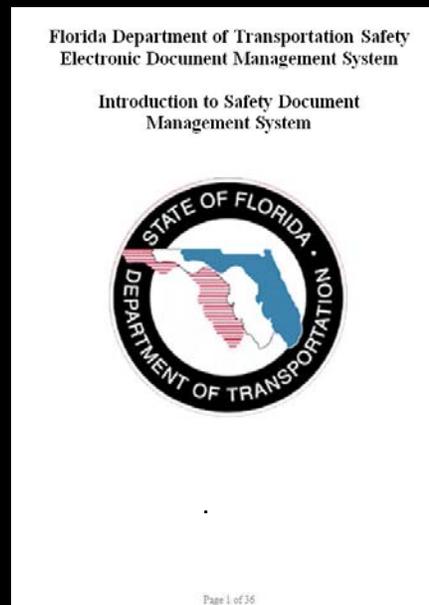
- 'FDOT log on assigned User Name:' points to the User Name field.
- 'Your PC log on Password goes here' points to the Password field.
- 'Leave the Network Name box blank.' points to the Network Name field.
- 'The Library box drops down for selection; make sure you are in the CO_SFDM Library' points to the Library dropdown menu.
- 'When you are done, click the Log On button' points to the Log On button.

6. Guest Log On will not function, it has been disabled in this application. External consultants will not have access to this WebTop application they will need to use the Export Tool along with a copy/paste from a CAR detail to obtain images. Should a consultant wish to pay for a Hummingbird license they may contact the District EDMS Administrator.

Accessing crash history/reports

STEPS

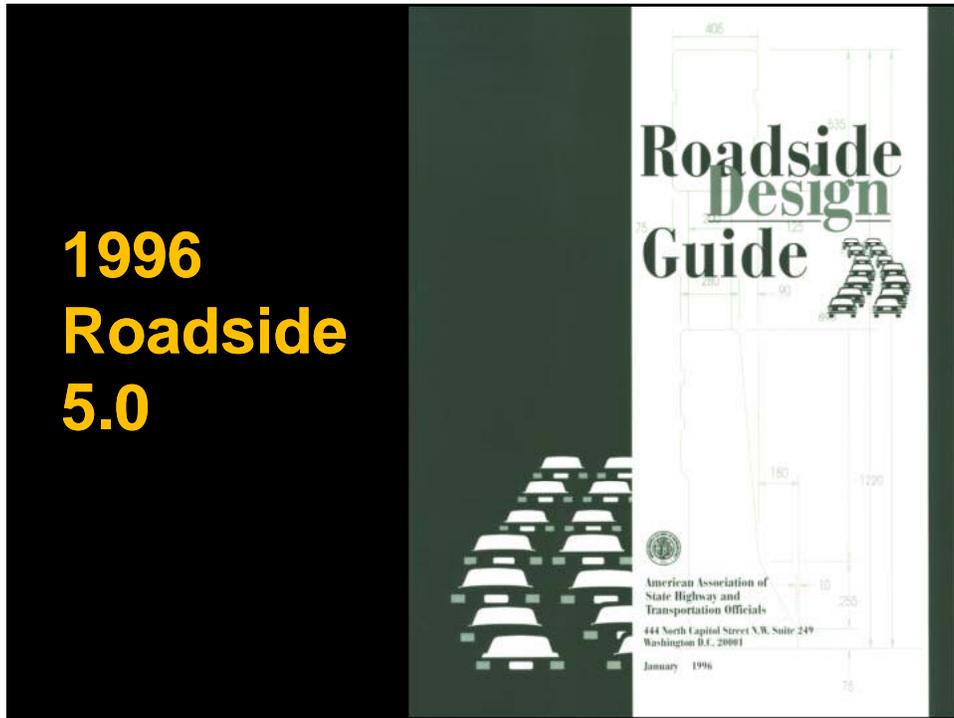
3. Study CBT document
4. Access Crash Records



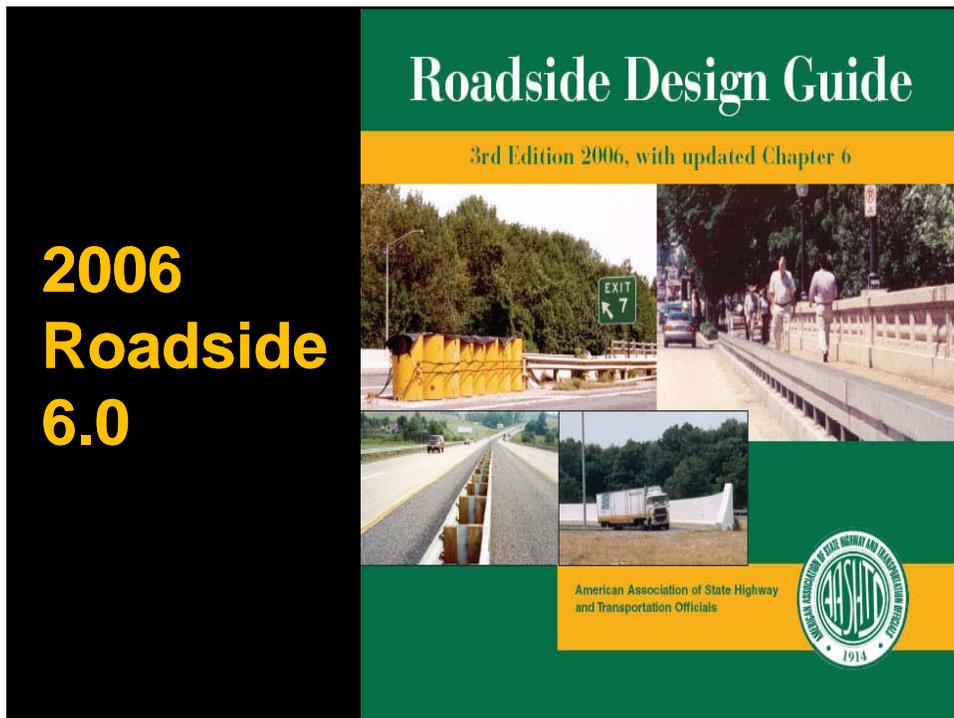
2. Identifying alternative crash analysis techniques!

**6 Current
One Future Method!**

**1996
Roadside
5.0**



**2006
Roadside
6.0**



RSAP Roadside Safety Analysis Program

NCHRP
REPORT 492

NATIONAL
COOPERATIVE
HIGHWAY
RESEARCH
PROGRAM

Roadside Safety
Analysis Program (RSAP)
User's Manual

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Interactive Highway Safety Design Module



5 Evaluation Modules for
2 Lane Rural Hwys.

1. Policy Review (AASHTO/Local)
2. Crash Prediction (Includes Intersections & Crash Modification Factors)
3. Design Consistency (Speed & Horiz. Curves)
4. Intersection Review (Sight window, Radii, Turn Lane)
5. Traffic Analysis (Passing, LOS)

Where can I find additional information?

Go to the IHSDM web site:

<http://www.tfhrc.gov/safety/ihsdm/ihsdm.htm>

Additional Safety information:

<http://safety.fhwa.dot.gov>

Whom can I contact for additional information?

Raymond A. Krammes, Highway Research Engineer

E-mail: ray.krammes@fhwa.dot.gov

Sponsoring Agency Name and Address:

Office of Safety, and Office of Safety
Research and Development

Federal Highway Administration, HSA-10
7th St., SW, Washington, DC 20590

FHWA COTR's: Peter Hatzl, Ray Krammes
Program Manager/Developer: Levenson Boodlal
(KLS Engineering)

Multimedia production by:

Capital Webtec
<http://www.capitalwebtec.com>



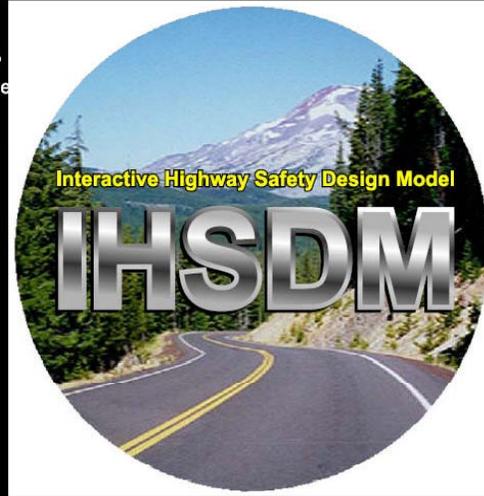
CD ROM content by:

A/E Group, Inc.
Jacobs Civil Inc.



U.S. Department of Transportation
Federal Highway Administration

FHWA-SA-03-005
May 2003



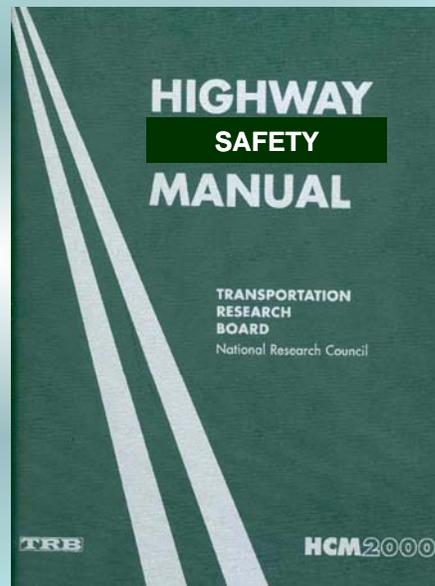
Print this screen

Exit CD ROM

Future AASHTO Highway Safety Manual

Elizabeth Wemple, PE
Kittelson & Assoc., Inc.

Session 38
Tuesday
8:30 AM - 9:15 AM



Home grown techniques!

- **HCM - Historical Crash Method**
(This generally requires a minimum of 10 years of crash data!)
- **Modeling (Similar Projects)**

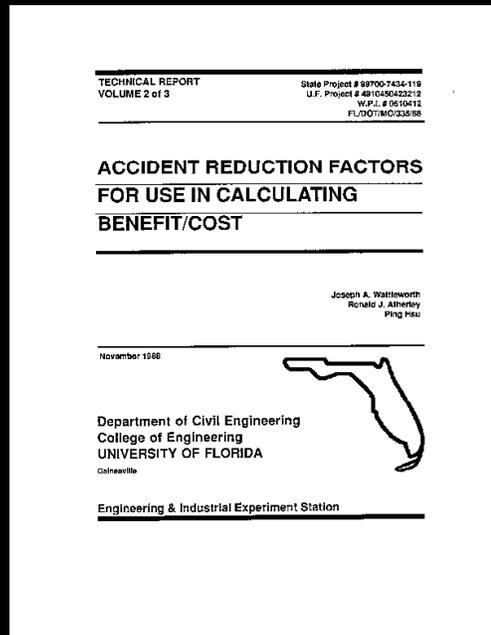
Presentation Issues?

3. Crash Reduction / Accident Modification Factor Use!

Crash Reduction Factors are to be used ONLY when historical data or authorized prediction techniques are unavailable or inappropriate! They should be used as guides...not facts!

Crash Reduction Factor Source

Accident
Reduction
Factors For
Use In
Calculating
Benefit
Cost
USF 11/88



PPM Chapter 23.5 Documentation

NOTE: Accident Reduction Factors For Use In Calculating Benefit Cost -

The above publication often used as a basis to justify exceptions describes the process and anticipates either the Engineer of Record or the Safety Engineer will perform a detailed analysis of individual crash reports in support of their conclusions! This report provides some conclusions reached by various entities by way of comparison. It does not promote using them. It does encourage using the processes defined in the publication because they are in compliance with the Federally required Highway Safety Improvement Program Guidelines.

Standing Committee on Highway Traffic Safety



Desktop Reference for Crash Reduction Factors

A crash reduction factor (CRF) is the percentage crash reduction that might be expected after implementing a given countermeasure at a specific site. For example, the installation of centerline rumble strips on a two-lane roadway can expect a 14% reduction in all crashes and a 55% percent reduction in head-on crashes.



<http://www.transportation.org/?siteid=35&pageid=1490>

Accident Modification Factor Type!

FHWA has developed a set of resources to assist practitioners in their decision-making process. These resources are developed around FHWA's Office of Safety focus areas of intersection safety, pedestrian safety and roadway departure safety.

[Crash Reduction Factors Desktop Reference Guide](#)

[CRF Intersection Issue - Brief](#)

[CRF Pedestrian Issue - Brief](#)

[CRF Roadway Departure Issue - Brief](#)

[CRF Traffic Signals Issue - Brief](#)

Crash Reduction Factor Source

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Narrow cross section (4 to 3 lanes with two way left-turn lane) (cont'd)	Left-turn	All	Urban	4-lane highway	8,000-17,400	17	24	2			EB Before-After
	Rear-end	All	Urban	4-lane highway	8,000-17,400	17	31	2			EB Before-After
	Right-angle	All	Urban	4-lane highway	8,000-17,400	17	37	1			EB Before-After
Reduce horizontal curve angle	All	All				15	38				
	All	All				15	40				
Reduce shoulder width (6 ft to 0 ft)	All	All	Rural	2-lane		20	-12	3			Cohort
Reduce shoulder width (6 ft to 1 ft)	All	All	Rural	2-lane		20	-17	6			Cohort
Reduce shoulder width (6 ft to 2 ft)	All	All	Rural	2-lane		20	-11	2			Cohort
Reduce shoulder width (6 ft to 4 ft)	All	All	Rural	2-lane		20	-6	2			Cohort
Reduce shoulder width (6 ft to 5 ft)	All	All	Rural	2-lane		20	-2	2			
Reduce vertical grade by 1%	All	All	Rural	2-lane		23	1.6P; P=percent grade (absolute value)				Expert Panel
Resurface pavement and improve superlevation	All	All				15	28				
	Wet pavement	All				15	51				
Stabilize shoulder	All	All				15	25				
Stabilize shoulder and drop-off	All	All	All	All		1	25				
Vary grade	All	All		Freeway		6	100(1-(EXP(bPg-1.0)Ps+1.0)); b=regression coefficient (for values of b, refer to source), Pg=percent grade(absolute value), Ps=proportion of crash type subset (for values of Ps, refer to source).				
	All	All	Rural	Rural Highway		6	100(1-(EXP(bPg-1.0)1.0+1.0)); b=regression coefficient (for values of b, refer to source), Pg=percent grade (absolute value).				

<http://www.transportation.org/sites/scohts/docs/Crash%20Reduction%20Factors%20Desktop%20Reference%202012-19-07.pdf>

Presentation Issues?

4. Mitigation!

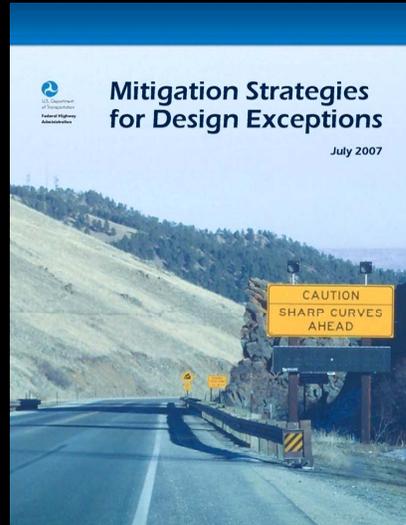
If criteria/standards can't be met, mitigation MUST be addressed in all exception submittals. This includes identifying alternatives and the anticipated benefit/cost.

Some mitigation strategies are defined in accident modification factor resources.

4. Mitigation Strategies for Design Exceptions

<http://www.dot.state.fl.us/rddesign/QA/FHWA-SA-07-011.pdf>

David C. O'Hagan, PE
State Roadway Design
Engineer
Session 47 Tuesday
9:45 AM – 10:30 AM



FINAL QUESTIONS?