Members, Technical Committee on Geometric Design

Dear Members,

The annual meeting of the AASHTO Subcommittee on Design, Technical Committee on Geometric Design was held in Des Moines, Iowa during the period July 13 through July 16, 2015. Mr. James Rosenow, Vice Chair, called the meeting to order at 8:00 a.m. on July 13.

Attendance

The following members were present:

Mr. Kent R. Belleque, Oregon Department of Transportation
Mr. James O. Brewer, Kansas Department of Transportation
Mr. R. Marshall Elizer, American Public Works Association
Mr. Chad Frisinger, North Dakota Department of Transportation
Mr. Mike Fugett, Arkansas State Highway and Transportation Department
Ms. Elizabeth Hilton, Federal Highway Administration
Mr. Jeff C. Jones, Tennessee Department of Transportation
Mr. Mark A. Leiferman, South Dakota Department of Transportation
Ms. Deanna L. Maifield, Iowa Department of Transportation
Mr. Eric E. Marabello, Maryland Department of Transportation
Mr. James A. Rosenow, Minnesota Department of Transportation
Mr. Joe W. Ruffer, National Association of County Engineers
Mr. Brent Story, Georgia Department of Transportation
Mr. Barton A. Thrasher, Virginia Department of Transportation
Mr. Stanley W. Wood, Massachusetts Department of Transportation
Mr. Robert Wunderlich, National League of Cities
The following members were not present:

Mr. Kevin M. Herritt, California Department of Transportation  
Mr. Reza Maleki, Port Authority of New York and New Jersey  
Mr. Richard D. Wilder, New York State Department of Transportation

Also attending during all or part of the meeting were:

Ms. Greta Smith, AASHTO Project Delivery  
Ms. Patricia Bush, AASHTO Project Delivery  
Mr. Clayton Chen, Federal Highway Administration  
Mr. Ricky Mitchell, Mobile County Public Works  
Mr. Ray Derr, Transportation Research Board  
Mr. Doug Harwood, MRI Global

Working Draft Review: A Policy on Design Standards Interstate System (Interstate Standards) (Elizabeth Hilton)

- Last published 2005  
- Draft updates reviewed last year  
- Edits made, circulated, comments received  
- Version 2.1 on May 27, 2015 for review  
- Finalized ballot language. Decided to change to English units first, then metric in [ ]. Changes will be made and sent to AASHTO, who will send to committee to ballot. Once approved by committee, it will go to SCOD to ballot.

On-going Research Projects (Updates by Doug Harwood)

- NCHRP Project 15-47 (PI is Neuman): Improved Geometric Design Process  
- Project to develop flexible design process that meets needs of geometric designers in the future.  
  - What should design process and GB of the future look like?  
  - Presentation to SCOD likely in Seattle  
  - Looking at performance-based design process, instead of standards-based design. May require more process discussion in the GB.  
  - Recommend separate policies for new construction and reconstruction. Already have a separate policy for 3R. New construction might be about the same as now. Reconstruction process now does not incorporate known performance of existing road (safety, speed, LOS, etc.). That information should inform the design process.  
  - Project recommends a “unified highway design process” which is multimodal in application. Ties to P&N of project (improving safety, LOS, replace pavement surface, etc., not just upgrade to standards).  
    - Infrastructure condition – use 3R process  
    - Substantive safety: Look at the Highway Safety Manual (HSM) and benefit/cost (B/C) if keeping road type. If not keeping road type, look at GB for
reconstruction process (makes max use of existing info relevant to future roadway).

- Traffic operational issue: Look at HCM if keeping road type. If not keeping road type, look at GB for reconstruction process.
- Road on new alignment: use GB new construction process
  - Also looking at how we classify things in our design process. May revise “functional classification” system. New classification should influence outcomes. Showed chart from arterial thoroughfares project (now ITE). Various context zones from rural to urban and predominant crash types in different zones.
  - Discussion:
    - How do you follow this project when multiple paths on this chart apply? Projects are not always in one bin or another.
    - Politics may drive projects
    - If concepts from this report are adopted, it could result in major revision of the GB. Think about now even if not incorporated until revision after this one.
    - NCHRP 15-52 looking at functional classification system. Moving in this direction toward context zones.
    - NCHRP 15-25 (design speed) dead-ended
    - Authors hope to summarize which GB dimensions are not well-supported.
    - Dimensional guidance - GB mins imply nominal safety. Project will evaluate whether these values should be in the GB when we know that substantive safety is a sliding scale.
    - Potential shifts in the future form of the GB and design process would be long transition, and more possible as HSM becomes more robust.
    - Application of the GB to reconstruction projects may be the biggest shift.
  - Results of this research will be topic for discussion at meeting with TRB committees next summer.

- NCHRP 3-112 (Pi is Potts): Operational and Safety Considerations in Making Lane Width Decisions on Urban and Suburban Arterials
  - Interim report submitted and meeting with panel next week
  - GB Ch 7 gives lots of flexibility for 10-12-ft lanes, but it does not inform reader whether there is a safety difference depending on context.
  - Purpose: to gather knowledge on effects of lane width, and formulate language for GB
  - Recommendations from contractor but not vetted through panel yet. Five work plans developed. Cannot pursue all with available funds. Panel will have to make choices. They also asked state survey respondents which of these were highest priorities (bold indicates priority based on survey results)
    - Safety evaluation to develop lane width CMFs, including differential lane widths (not all lanes the same width)
    - Effect of lane width on lateral placement of vehicles (including vehicles of various sizes, such as bus, truck, etc.)
    - Effect of lane width on saturation flow rates for intersection approaches. Looked at in NCHRP report years ago except did not look at differential lane widths
    - Effect of lane width on midblock vehicle speeds
    - Effect of lane width on pedestrian and bicycle safety
Discussion:

- Recommendation that study needs to control for traffic volume
- FHWA (through HSIS undertaking) study is looking at shoulder width on arterials, and shoulder vs curb and gutter, and safety performance of each. Also looking at effect on safety of horizontal curves in urban/suburban context. Coordinating with this project for cohesive results.
- Busses have gotten wider to meet ADA requirements. Mirror hits are a big issue that should be looked at.

NCHRP 15-50 (Harwood): Guidelines for Integrating Safety and Cost-Effectiveness into Resurfacing, Restoration and Rehabilitation Projects
http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3418

- Scope
  - Update TRB Special Report 214 (1987)
  - Focus on rural two lane highways but also consider rural multilane and urban/suburban arterials
  - Consider both roadway and roadside improvements
  - Considering 3R projects regardless of funding source.
  - Freeway 3R projects are being added to the scope at the request of AASHTO TCGD.

- 2nd meeting with panel was last month
- Products: updated guidelines and B/C tool. These are guidelines and are not recommended national policy.
- Key issues:
  - What resurfacing projects can be done without geometric improvements
  - Which resurfacing projects should include geometric improvements, and which improvements should be implemented (project specific decision making)
  - Focusing on technical issues, not administrative issues
  - Focusing on safety issues rather than traffic operational issues
  - Focus on issues that can be addressed quantitatively with safety effectiveness measures, while providing some qualitative guidance.
  - Developing spreadsheet-based benefit-cost analysis tool that can be customized by individual agencies
  - Sample benefit-cost analyses were shared and resulting table showing the ADTs at which lane widening from 11-ft to 12-ft has a B/C ratio higher than 1. Similar tables developed for many other scenarios.

- Potential alternative approaches for presenting design guidelines
  - Dimensional criteria different from GB
  - Minimum ADT levels to initiate consideration of specific improvements
  - Role of crash history reviews
  - Site specific B/C

- Next Steps
  - Developing guidelines for non-freeway facilities
  - Develop B/C tool for non-freeway facilities
  - Expand guidelines and B/C tool to freeway facilities
  - Expected completion Summer 2016

- Discussion about the wide range of values used by entities for the cost of a fatality.
• Question about how this interacts with RSRAP (Resurfacing Safety Resource Allocation Program)? RSRAP based on predecessor to HSM. Used more for program of projects, this is for single projects.


- Last published 2001
- This project is managed as part of NCHRP 15-47. Bart Thrasher is the panel chair. Tech memo containing 35 recommendations sent to panel.
- Draft of updated guidelines now completed and under review by project panel and TCGD.
- Recommendations include:
  - Referencing USFS Road Preconstruction Handbook
  - Retain focus limited to public roads, not private or off-highway trails
  - Do not require percent trucks as explicit factor in design guidelines. Different road categories already consider the types of vehicles using that road.
  - No separate guidelines for ultra-low volume roads. Already addressed in the functional subclasses they have.
  - Retaining all 10 road types/functional subclasses in current guidelines. Not adding new types.
  - Updating side friction factors for horizontal curve design for consistency with GB.
  - Philosophy that improvements on existing roads should be justified by crash evidence. Systemic improvements generally not appropriate on low-volume roads.
  - Keep low-volume collector roads within the scope of the guidelines. Draft revised to remove limited application only to those roads serving familiar drivers.
  - Change title to *Guidelines for Geometric Design of Low-Volume Roads*.
  - Raise volume threshold to ADT ≤ 2000 and include collector roads, but not arterials.
  - Retain as stand-alone document
- Discussion of issues and input for panel
  - Doug interested in any photos available, especially of urban low-volume roads.
  - Carefully review discussion of residential urban streets, as other publications are suggesting narrower streets.
  - For projects on *existing roads*, recommendation is to increase volume threshold for which the guidelines apply from 400 to 2000 veh/day. Would apply to local and collector roads with AADT up to 2000, but not to arterials. Supported by B/C analyses for 3R projects under NCHRP 15-50.
  - No change in traffic volume threshold for *new construction* design guidelines. No research to support deviating from Green Book in 400-2000 range and resources not available to study that in this project.
  - Discussion about whether this should really just address rural roads. Current guide addresses urban roads and those categories are being used. Increase to 2000 has to be associated with name change to “low volume” because urban roads with 2000 ADT are not “very low-volume”.
  - Suggestion that guide needs clear discussion of whether major reconstruction falls under new construction or existing roads.
o Could low-volume road document just be for 3R projects (on existing roads) with ADT <2000? Discussion about use of the document for new construction by agencies that do not buy the Green Book.

o Suggestion to discuss context more in the document, not just embed it in the different road categories.

Key input from committee:

o Agree with increasing threshold to 2000 ADT for application to existing local roads.

o Rather than adding all collectors (even those that do not primarily serve familiar drivers) for up to 2000 ADT for application to existing roads, recommend limiting application to minor collectors and local roads.

o For new construction, would like thresholds to be consistent and suggest inserting GB values for new construction in 400–2000 range.

Members asked to send any further comments/edits to Doug Harwood with cc to Bart, Deanna and Ray Derr by August 15.

Open discussion of Green Book chapter issues/needs

General editing guidance

- Chair had sent guidance about how to format editing using track changes. AASHTO will post that on SharePoint.
- AASHTO demonstrated their SharePoint site, accessed through design.transportation.org. Login to the design portal through Members Only link. Look on left for Geometric Design TC documents, and in folders for specific documents. Click on document to download, do not check it out. Download documents to edit and save under new name. You can drag revised document back into folder. Trisha added new folders and subfolders for the 7th Edition. We can add/delete folders but they cannot be moved later. Please add details to photo file, such as who took it, description, etc., before uploading.
- Would be helpful if authors put notes about which reports they reviewed and major changes made. Discussion of whether a slide template would be good for each author to summarize changes.
- AASHTO can host GoToMeeting/webinar to facilitate meetings during the year.
- Discussion about image quality, formatting, etc. needed by AASHTO for publication. AASHTO will put guidance for us on SharePoint site.
- Discussed changing this edition to show English units first, followed by metric units in brackets. [Chair talked with AASHTO after the meeting. Chapter authors should NOT flip the units themselves, but let AASHTO technical editors handle this. Authors should focus on the correctness of units, etc. AASHTO will handle formatting text, exhibits, tables, etc.]
- Discussion about how to send comments to Chapter authors. Direct emails preferred.
- Replace “impairment” with “disability” throughout the GB.
- Leave slopes as rise: run with V:H for clarity

General discussion

- General references to HSM are in chapter 2
- NCHRP can arrange for PI to sit in on conference call with chapter authors if desired
• Discussion about NCHRP projects to revise Bike and Ped Guides and need for coordination on these documents with Technical committee on Nonmotorized Transportation and Subcommittee on Traffic Engineering
• To prepare for the Summer 2016 meeting, draft markups are needed by mid-April 2016 for review prior to the meeting.

Committee discussion of completed research

NCHRP Report 383 Intersection Sight Distance
• AASHTO got an inquiry from an engineer questioning why the Green Book verbiage deviates from the GB verbiage recommended in the report.
• FHWA received similar questions about ISD application and time gaps
• Committee members differed on whether they thought the time gap left/right is different or whether you use 7.5 sec both directions. Chapter authors will study further and suggest clarifying text.

NCHRP Report 504 Design Speed, Operating Speed, and Posted Speed Practices
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_504.pdf
• NCHRP 17-76 is a new project to relook at this issue. Discussion about looking at target speed too.

NCHRP Report 605 Passing Sight Distance Criteria
• Incorporated in 2011

NCHRP Report 633 Impact of Shoulder Width and Median Width on Safety
• Included AMFs for shoulder width, median width and median barriers. Applies to HSM. Nothing for GB

NCHRP Report 650 Median Intersection Design for Rural High-Speed Divided Highways
• Some consideration already given in 2011 GB. Report had suggested modifying GB to incorporate all expressway guidance in one chapter.
• May be able to better address some new intersection design types. Asked to review to see if other types need to be added to GB
• Discussion about whether it is appropriate in general to reference NCHRP research documents in the Green Book. Concern about opinions in the reports, etc. and that it is better to drop language into GB when committee agrees.
• NCHRP 15-64 discusses median openings near signalized intersections. More access-management related.
• FHWA has Alternative Intersections Informational Guides (2014) available at http://safety.fhwa.dot.gov/intersection/alter_design/
NCHRP Report 659 Guide for the Geometric Design of Driveways
- Most changes already incorporated in 2011
- Walked through report suggestions with handout
- Discussion about how much to suggest for incorporation in GB vs referencing readers to this report. Also discussed which chapters the material belongs in. How much is essential and should be in GB? Discussed including Ex. 5-24 in Chapter 4 of the next working draft of the GB.
- Discussed including exhibits 5-74 through 5-76 in next working draft of the GB Chapter 4, to be referenced by other chapters

NCHRP Report 672 Roundabouts: An Informational Guide
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf
- Not seeing anything in GB that needs to be updated. GB does not go into a lot of detail.
- Hilton asked FHWA intersections experts to review roundabout and alternative intersections to see if any language needs to be revised. Will forward to chapter authors when received.

NCHRP Report 687 Guidelines for Ramp and Interchange Spacing
- Looked at EN-EX and EN-EN and did not look at complex/system interchanges
- Ramp spacing has more impact than interchange spacing
- Report recommends changes to Fig. 10-68. Discussion about how usable new info is.
- Failure to address system interchanges and C-D roads is a limitation of the research

NCHRP Web-Only Document 208 Design Guidance for Channelized Right-Turn Lanes
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w208.pdf
- Refer to notes on NCHRP Report 780

- Contains a lot of geometric design guidelines
- Discussed adding content to next working draft of the GB vs. adding reference to this report, vs. not mentioning it at all. It seems like this is already common practice on signal projects.

NCHRP Report 730 Design Guidance for Freeway Mainline Ramp Terminals
- Report recommends adding more speed-distance curves to Chapter 3
- Report recommends stating that tapered entrance ramps preferred over parallel (rejected previously). Additional text recommended for parallel exits.
- Report recommends discussion of controlling features at exit/entrance ramps
- Report recommends adding discussion about when accel lane length can be reduced
- Report recommends changes to Tables 10-3 and 10-5
- Discussion about whether accel lanes in GB may be a little longer than needed due to increased horsepower in current fleet. However, committee reluctant to reduce values in GB.
- Plan to add language on DDIs to next working draft of the GB and refer to FHWA informational report
• Discussion about inside merges, which were not addressed by report but many members agreed these are undesirable.
• NCHRP project 3-117 on wrong-way entry. Add discussion on geometrics to next working draft of the GB as appropriate.

NCHRP Report 737 Design Guidance for High-Speed to Low-Speed Transition Zones for Rural Highways
• Specific recommendations for GB on project webpage (15-40 appendices) for rural collector and arterial chapters. Recommendations seem reasonable and will be considered in next working draft of the GB.

NCHRP Web-Only Document 198 Sag Vertical Curve Design Criteria for Headlight Sight Distance
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w198.pdf
• No changes to GB recommended
• Drainage and comfort criteria may be more important
• Look at language about sags in GB for possible revision in next working draft of the GB.

NCHRP Report 745 Left-Turn Accommodations at Unsignalized Intersections (2013)
• Talks about median width and 6 feet needed for ADA/PROWAG
• A lot of info already in GB pp 9-125 thru end of chapter. May be good to incorporate, including Table 6, in next working draft of the GB.
• Discussed whether guidance in report may result in a lot more LTL than Table in GB on p. 9-132
• Discussion about need for flexibility to provide short deceleration with storage when needed. It is still better than sitting in left through lane to make a turn. Need flexibility when full deceleration cannot be provided.

NCHRP Web-Only Document 191 Analysis of Managed Lanes on Freeway Facilities
• Focused more on traffic operations, not so much on design
• Managed lanes more an operational project
• International scan report may have related information (http://international.fhwa.dot.gov/pubs/pl11004/pl11004.pdf)
• Perhaps this topic is better discussed in HOV Guide.
• Wait for NCHRP 15-49 and drop in typical cross sections to Chapter 8 of next working draft of the GB

NCHRP Report 766 Recommended Bicycle Lane Widths for Various Roadway Characteristics
• Look for potential changes to next working draft of the GB, but may fit better into AASHTO Bike Guide

NCHRP Report 774 Superelevation Criteria for Sharp Horizontal Curves on Steep Grades
Vice-chair shared his comments with the committee:
- Recommendation to add friction factor curves to show the limit of skidding
- Research did not find a big problem that we were concerned about, for grades over 5%. Issues identified only in special situations (higher emax, etc.)
- Report recommends limiting max super to 12% on downgrade or use spiral
- Report recommends limiting max super to 9% on upgrades of 4% and higher for minimum radius curves
- Found problem with sharp horizontal curves 30mph or less or downgrades of 4% or more. Ex: loop ramps.
- Stay in Lane sign recommendation made because combination of braking and lane change is what produced rollover potential in some cases. Mitigation is traffic control but wanted designers to be aware of it. [NCHRP staff will raise to MUTCD]
- Report recommends adding language discouraging the design of sharp horizontal curves (or near minimum-radius curves) on downgrades of 4% or more for low design speeds (i.e., 30 mph or less)
- Proportion of transition on tangent vs curves. NCHRP: Report 439 recommends putting 90% of the transition on the tangent. NCHRP Report 774 talks about rollover potential if too much super is developed at the PC. Desire expressed to see additional GB flexibility regarding transition placement. Sometimes better to use 1/3 on tangent and 2/3 on curve. Some viewed existing language as flexible.
- Discussion about the benefits of spirals and under what conditions, and possibility of referencing safety benefit reflected in the HSM.

NCHRP Report 780 Design Guidance for Intersection Auxiliary Lanes
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_780.pdf
- Easy report to consider changes to GB. Very comprehensive
- Report recommends reducing intersection skew to 75 degrees, consistent with the updated Handbook for Designing Roadways for the Aging Population
- Report recommends roundabout language, including discussion of turbo design, bypass right turn lanes, and accommodating oversized vehicles
- Discussion about whether recommendations result in decel lanes that are much too long (900 ft)
- Discussion about removing some/all language about 3-centered curves. Designers use turning software instead. (9-55 thru 9-79)
- Discussion about need for consistency between Fig. 2-25 and Table 9-22 (p.126) re: deceleration rates/lengths

NCHRP Report 783 Evaluation of the 13 Controlling Criteria for Geometric Design
- FHWA evaluating for possible revisions to policy. Notice of proposed policy change will be published in Federal Register soon. FHWA will notify committee when it publishes.
- Possible changes for next working draft of GB:
  - Sag design not as important as crests
  - Importance of SSD depends on location and other features. Get SSD on new construction, but think hard about whether to correct deficiencies on existing facilities. Not as “critical and crucial” as GB suggests, and should not suggest providing “above minimum” SSD. Latter not supported by Report 400. Doug clarified that study was for 2-lane highways and crest curves, but results can likely be extended to other situations.
Ch 7: why say shoulders on urban arterials are desirable, when now 783 says they are not beneficial. Doug clarified that there was no benefit of shoulder if curb and gutter is provided. Doug starting a new project looking at shoulder vs curb & gutter (completion late 2016).

- Lane width: recommends great flexibility to provide 11-ft lanes on non-freeway. Language on p. 7-13 allows 11-ft lanes for reconstruction.
- Discussion about differing FHWA division office interpretations of controlling criteria and which numbers in the GB are the standard for the NHS.
- These are examples of how report can influence GB and bridge to HSM

NCHRP Report 790 Factors Contributing to Median Encroachments and Cross-Median Crashes
- Add some suggestions/table to Chapter 4 of next GB working draft and add reference to the report.

NCHRP Report 794 Median Cross-Section Design for Rural Divided Highways
- Contains specific recommendations regarding median end slopes
- Recommends flatter median side slopes - discussion about slopes and suggestion to wait to see what the RDG incorporates and then consider GB language. Follow up with Kevin and Rick to see what the results were from discussion at Roadside Safety committee meeting.

In addition to the reports above, several pertinent NCHRP syntheses are good candidates for chapter authors to look at, in addition to other reports cited in the Gresham-Smith summary:
- 412 Speed Reduction Techniques for Rural High-to-Low Speed Transitions
- 417 Geometric Design Practices for Resurfacing, Restoration and Rehabilitation
- 422 Trade-Off Considerations in Highway Geometric Design
  http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_422.pdf
- 432 Recent Roadway Geometric Design Research for Improved Safety and Operations
- 443 Practical Highway Design Solutions

**Chapter Discussion and possible items to be addressed in next working draft of GB**

**Forward**
- Take out 3R philosophy and refer to forthcoming report (when completed) that replaces report 214.
- Moved metric language to near the end
- Revised flexibility language.
• Discussion on cost-effective design language, and whether to keep, revise or delete the language. Recommend keeping language and possible re-wording. Suggest moving to after new performance-based design language.
• Discussion about title - highways and streets, and use within the chapters about terminology and using “roadway”. May move toward “roadway” as broader term.

Chapter 1
• Handout with draft editing was distributed and included content from NCHRP Report 785 (Performance-Based Analysis of Geometric Design of Highways and Streets)
• Discussion about whether dramatic changes to Chapter 1 will fit well with the rest of the GB without major revisions elsewhere.
• Word “accessibility” used in Report 785 has a different meaning than that word used elsewhere in the GB.

Chapter 2
• All figures were revised in 2011 and need to incorporate Errata corrections
• NCHRP 504 (design/op/posted speed) was reviewed again. The report recommended 5 items for the GB
  o Add language about adding posted speed general language
  o Change text to recognize freeways as unique functional class
  o Add discussion about impacts on operating speed
  o Add discussion of speed prediction and IHSDM
  o Add info on state of practice for selecting design speed values
• Looked at 2-67 and design LOS: just guidelines, not minimum standards
• Add 15-34A verbiage regarding performance based design in working draft for review and discussion at next technical committee meeting
• Clarify context when making broad statements
• May add language from FHWA Truck Size and Weight study and possible congressional action
• Verify sources and possibly inconsistency between Fig. 2-25 and Fig. 9-22

Chapter 3
• Why encourage and possibly inconsistency between Fig. 2-25 and?
• Vice chair offered to help with superelevation language
• +85 mph design criteria will be developed by chapter author and included in working draft for review and discussion at next technical committee meeting.
• Look at sag vertical curves and see if we want to retain headlight control or go just to comfort and appearance.

Chapter 4
• We need to better include all users in the definitions. Roadway and traveled way definitions are problematic. They may have been defined this way to be consistent with AASHTO glossary and RDG. May need new term. Clear zone starts at edge of traveled way so that is why bike lane was excluded. Figs 4-1 thru 4-3 are very rural in focus. We may need to add urban sections to show how these terms fit in urban cases. We only define the vehicular part of the cross section and fail to define border area. May need to go to “road designer” in Chapter 1 instead since our definition of roadway only includes vehicular facilities.
• Fig 4-2 Suggestion to change “rollover” to “cross slope break”. Carry through to other locations in GB. Some opposition to making the change because many States use the same term.
• Section 4.3 Good info from Synthesis 432 re: considering use of less than 12-ft lanes. May need to reconsider after lane width language is examined in other chapters. May provide good linkage to HSM language. Others suggested keeping this as overview language.
• Update language on p. 4-8 about low-volume roads based on revised guidelines/publication
• Section 4.5: Add info from NCHRP synthesis 432, regarding rumble stripes. Does discussion of rumble strips belong in the GB? Could modify end of first paragraph to mimic MUTCD language. Leave in but trim info.
• p. 4-36 suggestion to add median language and add table from NCHRP 790
• p. 4-47 add driveway information from NCHRP Report 659
• P. 4-50 add reference to tunnels document, as appropriate
• P. 4-67 add reference to FHWA Separated Bike Lane (SBL) Guide to section 4.18
• In pedestrian discussion, should we talk about changing the street design if we have pedestrian crossings? Impacts the profile design.

Chapter 5
• Update PROWAG references
• Update references consistent with LVR 2nd edition
• Add column for 35mph to Tables 5-2, 5-5 and 5-8
• P. 5-5 reference to bike facilities: delete and rely on separate bike discussion near end of chapter. Others want to keep.
• P. 5-13: Add reference to transit guide? Discussion about putting reference in Ch. 6 instead of Ch. 5.
• P. 5-7: Add reference to SBL guide
• P. 5-19: Reference Chapter 4 discussion on driveway design
• p. 5-27: Correct errors in K-factors in Table 5-9

Chapter 6
• Questions about consistent use of street, highway, roadway, road, etc. Hold for now
• Rural: incorporate NCHRP high/low speed transition text
• P. 6-13: refer to transit guide regarding lane width
• Incorporate errata changes. Appears to already have been done in Word files on AASHTO portal.
• P. 6-14 Parking lane sections: inconsistent between arterials and collectors. Top out width at 10-ft.
• P. 6-15, last paragraph under curb: discussion about whether offset from traveled way is correct terminology
• P. 6-16: reference Ch 4 for driveway discussion

Chapter 7
• Intro says for suburban, use urban. Need to insert more language about context. Look at Chapter 1 proposed revisions regarding rural/urban area types and do not refer to census and functional classification
• 7.2 (rural): should we talk about level/quality of service for non-motorized users
• 7.2.3 (rural width): think about all users and relook at the language
• Distribution of lane/shoulder width
• Table 7-3: do we have arterials with volumes <400
• 7.2.5: make sure we get peds and bikes across structures. Discussion about whether full shoulders are routinely carried across structures.
• Check back that PSD is consistent with Chapter 3
• 7.2.9: try to trim language and talk about how these sometimes become suburban roadways
• 7.2.10: look at language to see if any safety discussion needs improvement
• 7.2.11: lane width. Discussed saying 12-ft new, 11-ft reconstructed
• 7.2.14: look at whether cross slope language in GB is consistent with bike use.
• 7.2.15: refer to transit guide re: bus turnouts
• 7.3: Bear down on guidance re: urban and suburban as these are very different. (design speed, LOS, etc). Need to make more sensitive to bike/ped issues
• Potential for quite a bit of revision re: complete streets, road diets, CSS
• 7.3.9 has potential for extensive revision
• 7.3.10: anything additional needed on utilities? No. May need to reference utility guide.
• 7.3.12&13: Ops control and regulations. Is this discussion needed and does it belong in the GB? May be able to scale way back
• 7.3.18: review/compare with AASHTO Transit guide and redline GB as deemed appropriate.
• Will track NCHRP 15-52 (functional classification) for any chapter revision
• P. 7-30 curb and shoulders: last sentence in 1st paragraph reads like shoulder is an aux lane. Not compatible with bike use.

Chapter 8

• P. 8-4 remove footnotes Table 8-1 consistent with IH standards revision
• 8.2.8 Add IH language about long bridges and 4-ft shoulder
• P. 8-35 Consider how much to add about managed lanes. Not much discussion now. Are full shoulders required next to managed lane? Review Transit guide for consistency. Accessibility discussion needs tweaking. TTI has new study
• Under 8.2: NCHRP study under way... would go in more general section. NCHRP 15-50 (Harwood) can add for 3R coverage of cross slope and hydroplaning. NCHRP 15-55 looking at recommendations for GB and new construction.
• Discussion about whether to add language about ponding water in travel lane when shoulders are reduced to add capacity. MNDOT reports a very small crash incidence related to water ponding so they question whether our design standard of not ponding water is too conservative.

Chapter 9

• ISD update/clarification needed.
• New Handbook for Designing Roadways for the Aging Population recommends 75 degree skew instead of 60 degrees (p. 9-54) & may need to revise Fig. 9-22 accordingly
• Discussion about removing 3-centered curve figures and tables. (p. 9-57 thru 9-79)
• Report 745 (Left turns at unsignalized intersections) will be monitored for any chapter revisions
• Discussion about superelevation language regarding right turn lanes (p. 9-120). Does it belong in chapter 9? Context important to discussion (speed).
• Will show figures 9-16 to 9-21 as deleted in the next working draft
• Report 383 and Case B-1 discussed
• NCHRP 2016 project (15-63) - design options to reduce vehicle conflicts with bike/ped at intersections

Chapter 10
• Traffic engineering committee has volunteers to work with GB Ch 10 authors to reconcile differences. Background information distributed. FHWA will send handout to NCHRP electronically.
• Work with Ch 3 authors to clear up turning roadway width language and cross-references on Table 3-29
• NCHRP 3-105 (Design Guidance for Interchange Loop Ramps) will be monitored for any chapter revisions
• NCHRP 3-113 (Guidance for Traffic Signals at Diverging Diamond Interchanges and Adjacent Intersections) and will be monitored for any chapter revisions
• Additional speed distance curves for trucks. Coordinate with Chapter 3
• P. 10-83: improve language on wrong-way entry and parclo
• P. 10-102: clarify references re: left and right shoulders
• P. 10-93: put grade and profile design into table and add design speeds up to 60mph
• Fig. 10-68 uses term “freeway distributor road” term not used in GB. Drop and change to CD road.
• Info on DLTs will remain in Chapter 9 in the next working draft
• Discussed whether to review access control from ramp terminals whether 100-ft/300-ft should be changed. Fig. 10-2 has been problematic if not new construction. Discussion about whether to pull Fig. 10-2 (from Access Management manual) out and putting text (100/300) back in with more content on access management techniques beyond the full access control limits. (New Access Management Manual just out)
• Reviewing managed lane discussion and needs for left side ramps
• Review draft HSM chapters on freeways and ramps
• FHWA report on Designing Complex Interchanges (FHWA-HRT-10-001) will be reviewed for any chapter revisions
• High speed criteria (TTI/TxDOT - 2007). Coordinate with chapter 3
• Ongoing NCHRP project on sight distance on flyover ramps will be monitored for any chapter revisions
• Fig. 10-69: Ambiguity in definition of where gap acceptance begins. Nose width 2-10 ft is quite a range. What is the source? May be related to entrance ramp angle. More definition would be useful.
• Discussion about inside merges (Fig. 10-73A and elsewhere). Sometimes necessary but can we discourage?
• Basic Number of Lanes - Is dropping lane between interchanges under Fig. 10-51A really so bad? Some states are doing this to avoid inside merge at the entrance ramp. Could text be revised to reference operational analysis and soften the negative tone?
• Do we need to talk about ITS and dynamic lane assignment? Maybe Chapter 8?

Other Committee Business

• FHWA asked for input as they start to consider changes to 23 CFR 625
• HCM highlights (NCHRP) New edition coming out early next year
  o Procedures for travel time reliability analysis. FHWA will have rules on travel time performance measures. HCM will give tools to practitioners.
  o New procedures for work zones
  o Truck PCE model revamped for freeways
  o Managed lanes and alt intersections will be added
o Working on planning and preliminary engineering guide to HCM (less data intensive methods for planning purposes)

• Meeting next year, probably at Woods Hole: July 11-15 subject to room availability. July 10 would be travel day. Meeting jointly with TRB geometric design committees. Wrap up Friday by noon. Jeff working with TRB chairs on details. Will probably have a half-day joint session.

Suggested topics from the committee are updates on:
1. NCHRP 15-47 Design Process
2. NCHRP 15-50 3R Process
3. NCHRP 15-52 Functional Classification System

• 20-7 possibilities (submittals have to come from SCOD) and are due by Aug. 10
  o Develop Green Book recommendations based on NCHRP 785 (performance based design)
  o Technical edits for Green Book (may submit in Spring for next round)
  o High speed design criteria. Tabled. Chapter 3 authors will develop
  o NCHRP project submission by Oct. 15. Bring any drafts forward to SCOD for buy-in
    ▪ Downgrade loop ramps: NCHRP 774 did not make geometric suggestions. Could be related to distribution of super on curve transitions and whether spirals are better.

• Members were reminded to go through all the research in Gresham-Smith list, not just NCHRP projects.
• FHWA mentioned SHRP-2 opportunity under broad agency announcement to study issues of interest to DOTs, university. FHWA will forward announcement to the committee chair for further distribution as appropriate.

Closing

The next meeting of the committee is tentatively scheduled for July 11-15 in Woods Hole, MA in conjunction with the TRB Geometric Design and Operational Effects of Geometrics committees.

The annual meeting of the Technical Committee was adjourned at 11:30 a.m. on July 16.