Airport Cooperative Research Program
Synthesis of Airport Practice

National Cooperative Highway Research Program
Synthesis of Highway Practice

and

Transit Cooperative Research Program
Synthesis of Transit Practice

Information for Principal Investigators Preparing Syntheses

TRB
Transportation Research Board
Washington, D.C.

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1.0 OVERVIEW OF THE PROCESS FOR AN AIRPORT, HIGHWAY, OR TRANSIT SYNTHESIS OF PRACTICE

The online document titled *Syntheses* provides insight on the “philosophy” and objectives of a synthesis study. Principal Investigators (PIs) should be familiar with information on the synthesis overview page at http://www.trb.org/SynthesisPrograms/SynthesesNCHRP.aspx

Each report should synthesize the state of knowledge and practice for the topic in accordance with the scope. This requires a review of pertinent literature and research, and an examination of current practice, and typically includes surveys of transportation agencies. Information gained from these sources is then organized into a concise document that describes current knowledge and practice.

2.0 THE SYNTHESIS STUDY PROCESS

The staff officer (SO) assigned to the project will assist the PI in delivering a synthesis study that is consistent with TRB standards. The typical synthesis study process is described below; however, the SO and PI might modify or add steps and deliverables to the process in order to reach a publishable report in a timely manner

2.1 Scope

Topics are selected by the ACRP 11-03, NCHRP 20-05, and TCRP J-07 oversight panels. The scope that guides the Principal Investigator’s work is a modification of the preliminary scope found online and revised by a topic panel at its first meeting.

2.2 Topic Panel

Topic panel members are selected for their expertise in the topic. At the first topic panel meeting, panel members prepare the detailed scope of work, select the PI, guide and assist the PI during the research process, pretest the survey or interview guide, review the technical content of the PI’s work, how well the report communicates with the intended audience, and at the end vote on the acceptability of the study.

Staff forwards discussion notes from the first topic panel meeting to the PI and arranges a conference call between the PI and the topic panel at the approximate date of contract execution.

2.3 Teleconferences

Staff will initiate a teleconference with the selected PI to inform him/her about the selection and the Synthesis process based upon these *Instructions to Principal Investigators Preparing Syntheses*.

Staff arranges a one-hour teleconference between the topic panel and PI at a date approximate with contract execution. The teleconference is designed to introduce the panel members and PI, have the panel members offer guidance and assistance, and resolve any questions on the scope of work or level of effort required. The PI will provide questions in advance to guide the discussion. The conference is also the time to solicit assistance from the panel (e.g. which AASHTO committee to send the survey to) and to confirm the schedule of deliverables and meetings.

2.4 Work Plan, Outline, and Questionnaire—Stage 1 (First) Deliverable

The PI prepares a draft work plan, report outline, survey/questionnaire, and list of proposed recipients for review and comment by project staff and panel members. The work plan should cite the major elements necessary to perform the work, a project schedule, survey/questionnaire, proposed interview/survey recipients, and methodology for identifying case examples. The project schedule should conform to the contract dates. The report outline should include a list of chapter titles, major headings and subheadings. In preparing the report outline the PI should include a summary, literature review, synthesized survey results, case examples, and summary of findings to include knowledge gaps and further research to address identified gaps.

The draft survey/questionnaire/interview guide should be prepared in a manner that follows the report outline and balances the need for information with the need for brevity. Close-ended multiple-choice or yes/no questions should be used unless data collection is by interview. Specific procedures for the formulation, review, and distribution of survey instruments are required.

Questionnaires, surveys, distribution lists and related materials must be approved by the project staff. Survey recipients/interview targets may include topic panelists.

2.5 Survey/Interview

NCHRP requires online surveys to be sent to one recipient at each state DOT including Washington, DC. The survey questions must be approved by the panel. The email distribution list must be approved by the TRB project manager. *If a survey is used for the synthesis study, the PI is responsible for providing a web-based survey tool.* The survey software plan that is used for the synthesis must not display advertising or polls. Survey questions must be yes/no or multiple-choice (no open-ended questions). The PI shall provide a link in order for panel members to pretest the final online survey. Responses from at least three panel members are required before undertaking data collection for the targeted population. The PI should strive for 80% to 100% survey response rate. The final report should show one consolidated survey response from each of the responding DOTs.

ACRP requires the panel approve the interview or survey questions, and the airports that the PI suggests to interview or survey. Airports surveyed will depend on the topic statement, but a diverse classification of airports should be interviewed or surveyed (Large Hub, Medium Hub, Small Hub, Nonhub, Nonhub Nonprimary, Reliever, and General Aviation.)

TCRP requires the panel approve the interview or survey questions, and the transit systems that the PI suggests to interview or survey. Transit systems surveyed will depend on the topic statement, but a diverse number of transit systems should be interviewed or surveyed (Large, Medium, Small, Rural and/or Tribal).

2.6 Literature Review

A literature review is conducted to obtain information on current knowledge, practices, and relevant research pertaining to the synthesis topic. Conducting a literature review involves collecting, evaluating and analyzing publications that relate to the study question. The PI should search TRB's Transportation Research Information Documentation (TRID), an integrated database of more than 1.3 million records of transportation research worldwide.

The literature review should answer the question of what is known or not known about this particular topic. A good literature review does not just summarize sources; it is *not* an annotated bibliography. Instead, a good literature review analyzes, synthesizes, and evaluates sources to give a clear picture of the state of knowledge on the subject.

2.7 Case Examples

Case examples are concise descriptions that effectively illustrate an agency's current practice. Agencies/sites (usually 4 or 5) may be selected for more in-depth documentation of their current practices than a close-ended survey allows. Information is typically developed through telephone interviews, with review and approval by the interviewee before publication.

For TCRP syntheses, the PI's chosen case examples should be submitted to the topic panel for its input and approval.

2.8 First Draft Report—Stage 2 (Second) Deliverable

The PI shall prepare and submit a complete draft final report at least two weeks prior to the second meeting of the topic panel. The date of this meeting is set at the first topic panel meeting; *this is a firm date*. First draft reports must be complete, including summary, all report sections and appendices; all graphics (figures and tables) are embedded and line numbers provided on each page to assist panel review efficiency.

The RSO and PI may set some interim deliverable dates (for example, for the literature review chapter, survey results chapter, etc.)

2.9 Second Topic Panel Meeting with Principal Investigator to Review First Draft Report

The purpose of this second meeting is to work face-to-face with the topic panel to review the first draft of the synthesis report. TRB funds travel and lodging for the PI to attend the meeting to discuss the first draft and receive comments from the panel as well as their marked-up drafts. The staff travel coordinator will provide information on how to reserve travel and lodging, typically one month in advance of the meeting date. At the close of the second panel meeting, staff will provide the PI with a list of principal panel comments needing attention and requiring written responses. If the panel deems it necessary, conference call(s) interim to the next deliverable will be scheduled at this time.

2.10 Second Draft Report and Written Response to Topic Panel Comments—Stage 3 (Third) Deliverable

After the second topic panel meeting, the PI delivers a second draft to respond to the topic panel review of the first draft. This draft shall be accompanied by a document of point-by-point responses to the panel comments on the first draft. The response to comments document should include page numbers of the new document where revisions have been made. This second draft is sent by staff to the topic panel and at least two members of the ACRP 11-03, NCHRP 20-05, or TCRP J-07 oversight panel for final panel review and ballot. This deliverable should take the form of a completed PI report with embedded graphics and appendices placed appropriately.

2.11 Final Draft and Written Response to Oversight Panel Comments—Stage 4 (Final) Deliverables

Upon receipt of written comments from the topic panel and members of the ACRP 11-03, NCHRP 20-05, or TCRP J-7 oversight panel, the PI delivers a third and final draft and written responses to comments.

2.12 Internal Reviews, Editing, Typesetting, and Publication

The final draft report is forwarded and internally reviewed and approved by the TRB Division Committee. After approval, the final draft report will be edited, typeset, and published by CRP Publications, whose staff may contact the PI for small clarifications during this process.

2.13 Schedule

Below provides a generalized schedule for the synthesis programs.

ACRP/TCRP Synthesis Schedule	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1st Topic Panel Meeting-Scope, Consultant, Schedule	◆													
Contract Executed and Teleconference		◆												
Workplan, Outline, Data Collection Instrument and Recipients		◆												
Literature Review, Survey/Interview			▬	▬	▬	▬	▬							
1st Draft Report							◆							
2nd Topic Panel Meeting to Review 1st Draft Report								◆						
2nd Draft Report and Response to Topic Panel Comments									◆					
Final Deliverables										◆				
Internal Review, Technical Editing, Publication										▬	▬	▬	▬	▬

NCHRP Synthesis Schedule	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1st Topic Panel Meeting-Scope, Consultant, Schedule	◆															
Contract Executed and Teleconference		◆														
Workplan, Outline, Data Collection Instrument and Recipients			◆													
Literature Review, Survey/Interview			▬	▬	▬	▬	▬	▬								
1st Draft Report								◆								
2nd Topic Panel Meeting to Review 1st Draft Report									◆							
2nd Draft Report and Response to Topic Panel Comments											◆					
Final Deliverables												◆				
Internal Review, Technical Editing, Publication													▬	▬	▬	▬

3.0 DELIVERABLES

There may be slightly different requirements for ACRP, NCHRP, and TCRP synthesis submittals. All deliverables are submitted through the Workfront CRP Project Management tool.

3.1 Stage 1—Work Plan, Outline, Questionnaire

This submittal is prepared for review by the topic panel and should be delivered electronically. A sample submittal is provided in the Start-up Memo.

3.2 Stage 2—First Draft Report

The first draft report shall be a complete report in MS Word and PDF with all sections and embedded graphics. Footnotes are not used in a synthesis report. Because the report will be reviewed and commented upon by the topic panel during this stage, line numbers are required for each page of the report. Appendices do not require line numbering. *Syntheses* *cannot* *make recommendations.* Therefore, the report must avoid directive words such as best, should, must, require, recommend, etc.

3.3 Stage 3—Second Draft Report and Written Response to Topic Panel Comments

The second draft report shall be a complete report in MS Word and PDF with all sections and embedded graphics. Line numbering should be removed in this version of the report. A point-by-point response to comments document should be included in Word and PDF and should indicate the page number of the new version of the report where revisions were made. Appendices can be in PDF format if needed.

3.4 Stage 4—Final Deliverables

Comments from the review of the second draft are returned to the PI for final revision. The PI shall provide written point-by-point responses to the review comments as well as action taken, cross referenced to the revised report pages. Otherwise, the response should state the reasons why revisions were not considered necessary.

The final draft report shall be a complete synthesis report with all sections and embedded graphics. All final deliverables shall be delivered electronically.

The final report is reviewed by the TRB Division Committee. It must be approved to be published.

The following files are required for the final submittal:

- Final report with cover page with all graphics embedded, no line numbers, all appendices. MS Word and PDF versions are needed for technical editing and publication.
- Separate files for figures and tables that were not created in Word provided in their native format (e.g., .pptx, .ai) or in a cross-platform format (e.g., .jpg, .tiff, .png). Doing so enables the graphics in the final document to be clearer. The separate figure and table files should *not* be created by copying them out of the Word file into a .jpg, etc. Doing so may actually create *less* clear graphics in the final. If the original graphic files aren't available, we will make do with what is in the Word file.
- A report cover that includes author names, affiliations, and locations as should appear in the publication.
- Report cover picture with description and release. The description and release can be included as an element of the Certification of Compliance with Copyright.

- Completed and signed Certification of Compliance with Copyright form (See Section 5.8).
- Appendices can be in one separate file or in multiple files, one for each appendix.
- Ballot comments and point-by-point responses including page numbers and actions taken to the panel comments. You can insert your response underneath each comment set off in *italic* or **bold**, such as "*Response: xxxx*" Please submit in MS Word.

Submit report files, responses to comments document, and certification of copyright compliance through the CRP Workfront Project Management tool. Please upload all of the final deliverables as one zip file to Workfront. Also, please provide notification via an email to staff when upload to Workfront is complete.

3.5 Invoices

All invoices are submitted electronically per direction provided at the time of contract execution.

4.0 ELEMENTS OF THE REPORT

Following is a discussion of the principal elements of a typical published synthesis report, ordered as they should be in the published report. **These instructions are part of the contract.** Reports not in conformance may be returned to the author for revisions.

4.1 Cover

Provide high-quality art for synthesis cover photo(s), including a brief description and picture credit. The cover art will be display in color online and in B/W or color in printed paper format.

4.2 Title Page

The PI will provide a title page that includes author information (names, affiliations and locations) as should appear in the published report.

4.3 About the Synthesis Program and Foreword

TRB staff writes this.

4.4 Table of Contents

The table of contents should show chapter and appendix titles and level one (or "A") headings and page numbers. A list of figures and a list of tables should be included after the table of contents.

Chapters in a typical synthesis report include: Summary, Introduction, Literature Review, State of the Practice (e.g., survey results), Case Examples, and Summary of Findings.

4.5 Summary

The summary is the part of the report most likely to be read by the executive audience and others with more interest than time to spare. We therefore expect synthesis study authors to write excellent summaries from which the lay reader can get a solid, workable picture of the report's findings.

- No more than four pages (1,700 to 2,100 words)
- No headings
- No text boxes
- No footnotes or citations. If reference to a document is needed, provide the full title of the document and list the authors of the document within the text.
- Non-technical prose
- All sections should end with transition sentences that carry the thought from the previous paragraph into the following paragraph
- The Summary should be able to stand on its own.

The summary should include a brief overview of the main points including:

- Paragraph or two of background on the topic.
- A clear statement of the objective of the synthesis. (e.g., "The objective of this synthesis was to document state DOT practice on...")
- Brief details of the study methodology (one or two sentences)—How was the information gathered (e.g., literature review, survey, interviews, case examples)? If a survey was used, to whom was the survey sent? What was the survey response rate (including number of surveys sent, number of survey responses, and response rate as a percentage)?
- Major findings of the synthesis. Findings should be concise and to the point; drawing from, but not repeating, the analytic "Summary of Findings" section.
- Further research, if applicable—what are the gaps in knowledge identified in this Synthesis and what research could be carried out to address those gaps.

4.6 Introduction or Background Chapter

The first chapter should provide brief, relevant background; define terms; clearly identify the issues to be addressed; and, if applicable, what "high profile" issues are not addressed and why. It should note any problems common among agencies concerning these issues and include a paragraph that succinctly describes how the synthesis is organized (methodology and chapter outline). The first chapter should also include a concise statement of the synthesis objective and a description of the methodology used to gather the information.

4.7 Intermediate Chapters

These chapters discuss the information outlined in chapter one (topics required by the scope of work, literature search, survey results, case examples, etc.). Begin each chapter on a new page.

4.8 Summary of Findings

The concluding chapter of a synthesis, probably the second most widely read section of the report, is intended to portray the current state of practice. Findings must be supported and documented in the report. It is acceptable for a synthesis to highlight practices that are viewed as "effective" by many of the entities surveyed in developing the synthesis or that are characterized as such in the literature reviewed by the report author; however, such practices should not be presented as "best" practices or "recommended" practices.

- A brief reiteration of the background and objective of the synthesis—no more than two or three sentences to place the information in context.
- Summary of the findings from the previous chapters—no more than two or three sentences for each chapter. The report author has conscientiously grounded his/her findings in the project survey responses, literature review, and interviews and does not recommend particular practices except as recommended by others.
- Statements of barriers to widespread implementation of promising methods or practices—should be presented as observations <u>not as recommendations</u>.
- Further research—should be limited to statements of the knowledge gaps that limit practice and suggested research that could fill those gaps.
- No new information should be presented in this section. However, the PI should not repeat verbatim information from the introduction or other chapters.

4.9 References

PIs are responsible for the accuracy and completeness of all reference citations. Cite references in the text by author/date, with the citations listed in alphabetical order in the References section. *Do not use footnotes in the text*; cite all such information within the text or references. A reference style guide is shown beginning in Section 5.4.

4.10 Bibliography

A bibliography should be provided if documents are used as background materials in the preparation of the synthesis, but are not specifically cited in the text. A bibliography may also be used to list documents that supplement the information given in the text. Publications listed in the bibliography should contain the same information as those cited in the references, and must be arranged alphabetically by initial author surname. In the document, the bibliography follows the reference list. If circumstances warrant inclusion, an annotated bibliography may be provided. These entries should include all information given in a standard bibliography, plus a description and evaluation of the information contained in the document.

4.11 Glossary

If there are a number of terms used in the report whose definition might be misinterpreted or be unfamiliar to the reader, these terms should be provided, with definition, in a glossary.

4.12 Abbreviations and Acronyms

Abbreviations and/or acronyms should be provided in a list that will follow the glossary. If the topic panel feels that abbreviations and acronyms are important to understand the text they may be placed earlier in the report or before the Summary.

4.13 Appendices

Appendices are used to present material that supplements the information given in the text, but that cannot be conveniently inserted into the text. Appendices should not be used to present information that is crucial to understanding the subject matter; this information should appear in the body of the synthesis. There is no limit on the number of appendices that can be included in a synthesis; however, each must be lettered and titled. Provide a list of appendix titles with the draft report in the Table of Contents. Appendices follow the References section in the Table of Contents. Appendices of substantial length may be considered as web-only portion(s) of the document and should be provided in the first draft report.

The following appendices are required:

APPENDIX A

Survey Questionnaire/Interview Guide (title as appropriate) Provide the blank questionnaire or unanswered interview guide.

APPENDIX B

Survey Responses

NCHRP synthesis report Appendix B must include agency responses to each survey question as an aggregate and responses by individual agencies displayed. ACRP and TCRP synthesis reports have many more potential respondents that provide confidential information on their practices, so responses should not attach the facility or organization name with a particular response. The names of individual survey respondents or interviewees should not be used in the synthesis report. When surveys are sent, PI needs to indicate to respondents that survey responses by agency are displayed in the final report, however individual names will not be attached to responses.

Examples of how agency responses to survey questions should be displayed in Appendix B are shown in Figure 1 and Figure 2 below.

Are construction acceptance requirements on pavement warranty projects different than non-warranty projects?

Response	DOTs	No. of Agencies
Yes	Alberta, Idaho, Ontario, Pennsylvania, Virginia, and West Virginia	6
No	California, Florida, Louisiana, Maine, Michigan, Nebraska, New Brunswick, New Jersey, New York, North Dakota, Ohio, and Utah	12

No. responding agencies: 18

Figure 1. Example of agency response to survey question in Appendix B.

10. How are your state's DOT data stored? (select all that apply – note that a user will see 10a if he or she selects GIS or CAD as a storage mechanism)

State	In a relational database system	In tabular format with no spatial reference	In tabular format with route and milepost attribution	In a spatial GIS system	In a CAD-based system	PDFs, drawings or other paper maps	KMZ file	Unknown format	Other
Alaska								x	
Arkansas					x				
California	x		x	x	x	x	x		
Colorado			x	x			x		
Florida									x
Idaho								x	
Illinois				x					
Indiana	x			x					
Iowa				x					
Kansas	x	x	x	x		x	x		x
Kentucky				x					
Louisiana	x								
Maryland				x					
Massachusetts				x		x			
Minnesota				x	x				x
Montana				x					
Nebraska								x	
Nevada						x			
New Hampshire									x
New York								x	
North Carolina				x					
Ohio	x			x		x			
Oklahoma	x			x					
Oregon	x		x	x					x
South Carolina	x		x	x					
Tennessee									
Texas				x					
Utah	x	x	x	x	x	x	x		
Vermont			x	x		x			
Washington	x		x	x	x	x			
Wisconsin				x		x			
Total	10	2	8	21	5	9	4	4	5

Figure 2. Example of agency response to survey question in Appendix B.

5.0 REPORT STYLE GUIDE

The current edition of Webster's *Third New International Dictionary* (2020) and the 17th Edition of the *Chicago Manual of Style* (2017) (and the Chicago Manual of Style Online: http://www.chicagomanualofstyle.org/home.html) are the preferred reference sources for spelling, capitalization, and compound words.

5.1 Headings

The use of headings and subheadings in each chapter (except the Summary) is encouraged. However, the use of more than four levels of headings should be avoided. All headings are set flush left on a separate line except for level four. The following style for headings should be used:

LEVEL ONE ("A"): All caps, bold type, flush left. First paragraph begins flush left. **Level Two ("B"):** Initial cap, bold type, flush left. First paragraph begins flush left. *Level Three* ("C"): Initial cap, italic type, flush left. First paragraph begins flush left. *Level Four* ("D"):

Initial cap, italic type, followed by two spaces, and run into the text.

A heading must be followed by two or more subheadings at the next level, not by a single subheading. References should not be cited in headings. Acronyms previously spelled out may be used in level two, three and four heads, but not level one.

5.2 Quotations

Quotations of five or more lines or two complete sentences (block quotes) should be indented and set off from the text without quotation marks. Quoted material within a block quotation should be enclosed in single quotation marks. Run short quotations into the text (two or fewer sentences), using double quotation marks. Cite appropriate references for all quotations directly following quoted material with page number(s).

Changes should not be made to quoted material; however, interpolations (in brackets) may be added, and obvious misspellings should be corrected.

5.3 Footnotes

Do not use footnotes to the text. Cite all such information within the text or references.

5.4 References

Each reference should contain the standard bibliographic data required in a scholarly reference list *with each section separated by a comma:*

- Last name and initials of up to the first six authors (or editors). The first author/editor is cited surname first, followed by initial(s). Subsequent names are cited initial(s) first, followed by surname.
- Title of work.
- Journal title, if applicable.
- For journal article, cite volume and issue number.
- Publisher, location of publisher (city/state, city/country), and edition if not a journal article. Date of publication (or for website, date site accessed and date of publication).
- For symposium or conference, cite meeting dates and location.
- Inclusive pagination, if applicable. Total number of pages if entire work cited.
- If there are more than six authors/editors for any one citation, cite the first author and et al. (e.g., Smith, J.Y., et al.).
- If the author is also the publisher (e.g., see "Manual, Guide") only show as publisher. If not dated, specify as such where date would normally be cited (n.d.).
- Do not use ibid, idem, op. cit., or loc. cit.
- References to classified documents, personal correspondence (or telephone conversations), or other sources of information that are inaccessible to the reader should be avoided, if possible. If a reference of this type of communication must be included, insert directly into the text (e.g., T.C. Boyle, University of California, Berkeley, personal communication, March 1994).
- Unpublished work can be cited in the References. Provide as much information as possible [author(s), title, web address, other source material, date] and label as

unpublished.

- Electronic Sources–The following information is included: Corporate or personal authors, Title of the document or publication, Publisher (if available),
- Place of publication (if available), Publication date (if available), Complete URL, and
- Date accessed (if provided by the author).
- The italicization of titles follows the rules for printed publications and documents.
- The uniform resource locator (URL) identifies the location of the source on the Internet. Case should be preserved because it may be significant. Include "http://" if given.
- In manuscript, do not break URLs. In pages, URLs may be broken across lines after a period, question mark, slash, or hyphen; do not add hyphens.
- Do not edit, delete, or update references to electronic sources.

Examples of references follow.

BOOK:

Haas, R. and W.R. Hudson, *Pavement Management Systems*, McGraw–Hill, New York, N.Y., 1978.

Ogden, K.W., *Safer Roads: A Guide to Road Safety Engineering*, Ashgate, Brookfield, Vt., 1996, 536 pp.

BOOK CHAPTER:

Silverstein, L.G., "Safe Handling of Epoxy Resin Systems," In *Epoxy Resin Technology*, P.E. Bruins, Ed., Interscience Publishers, Boston, Mass., 1968, pp. 123–139.

JOURNAL ARTICLE:

Manning, D.G. and F.B. Holt, "Detecting Delamination in Concrete Bridge Decks," *Journal of the American Concrete Institute*, Vol. 2, No. 11, 1980, pp. 34–41.

Jaraiedi, M., R.W. Plummer, and M.S. Aber, "Incentive/Disincentive Guidelines for Highway Construction Contracts," *Journal of Construction Engineering and Management*, Vol. 121, No. 1, Mar. 1995, pp. 112–120.

NEWSPAPER ARTICLE:

Ringle, K., "D.C. Stoplights: Halt, Lame, and a Pain to Maintain," *The Washington Post*, Mar. 27, 1983, p. A1.

SYMPOSIUM:

Deen, R.C., H.F. Southgate, and G.W. Sharpe, "Evaluation of Asphaltic Pavements for Overlay Design," Presented at the ASTM Symposium on Pavement Maintenance and Rehabilitation, Bal Harbour, Fla., Dec. 1–4, 1983.

REPORT:

Rhodes, J.R., J.A. Stout, R.D. Sieberg, and J.S. Shindler, *In Situ Determination of the Chloride Content of Portland Cement Concrete Bridge Deck*, Report FHWA/RD-80/030, Federal Highway Administration, Washington, D.C., 1980, 58 pp.

New Jersey Pavement Rating System to Determine Resurfacing Priorities, New Jersey Department of Transportation, Trenton, Feb. 1986.

Jeffers, J.P., et al., *Audit Stewardship and Oversight of Large and Innovatively Funded Projects in Europe*, Report FHWA-PL-07-001, Federal Highway Administration, Washington, D.C., 2006, 60 pp.

Hugo, F. and A.L.E. Martin, *NCHRP Synthesis 325: Significant Findings from Full-Scale Pavement Testing*, Transportation Research Board of the National Academies, Washington, D.C., 2004, 201 pp.

Asphalt Institute, *Thickness Design—Asphalt Pavements for Highways and Streets*, Manual Series No. 1, Lexington, Ky., Sep. 1981.

DISSERTATION:

Lee, S.W., *Backcalculation of Pavement Moduli by Use of Pavement Surface Deflections*, Ph.D. dissertation, University of Washington, Seattle, 1988.

PROCEEDINGS:

Horak, E., "The Use of Surface Deflection Base Measurements in the Mechanistic Analysis of Asphalt Pavements," *Proceedings of the 6th International Conference on Structural Design of Asphalt Pavements,* University of Michigan, Ann Arbor, May 5–8, 1987, pp. 5–10.

LAW, STATUTE, REGULATION:

Surface Transportation Assistance Act of 1978 (Public Law 95-599, 92 Stat. 2689).

State of Tennessee, Public Law 699, Tennessee Code Annotated, Title 4, Chapter 11, July 1, 1988.

MANUAL, GUIDE:

AASHTO Standard Bridge Design Specifications, 15th ed., American Association of State Highway and Transportation Officials, Washington, D.C., 1992.

Utah State Department of Highways, *Manual of Instructions, Part 8: Materials,* Utah State Department of Transportation, Salt Lake City, 1966.

PREPRINT:

Bay, J.A., K.H. Stokoe, B.F. McCullough, and D.R. Alexander, "Profiling a Flexible Highway Pavement," Preprint No. 991481, Prepared for the 1999 Annual Meeting of the Transportation Research Board, National Research Council, Washington, D.C., Jan. 11–15, 1999.

WEBSITE:

McCormick, C., "Planning for the Big Event: Making Passengers Feel Welcome and Comfortable Is Paramount. All Else Follows," *Centerlines,* Oct. 2009, pp. 68–73 [Online]. Available: http://www.nxtbook.com/nxtbooks/naylor/ACIQ0309/index.php?startid=68#/68.

"QualServe Fact Sheet," QualServe, 2011 [Online]. Available: http://www.awwa.org/files/QualServe/FactSheet/QualServefact%20sheet2011.pdf [accessed Aug. 6, 2012].

Federal Highway Administration (FHWA), *HSIP Assessment Toolbox,* FHWA, Washington, D.C., 2010 [Online]. Available: http://safety.fhwa.dot.gov/hsip/resources/fhwasa10017/peer.cfm [accessed Dec. 12, 2012].

ACCEPTED FOR PUBLICATION, BUT NOT YET PUBLISHED:

Bronzini, M., *Model Post-Secondary Curricula for the Transportation of Hazardous Materials*, Transportation Research Board of the National Academies, Washington, D.C., forthcoming.

5.5 Tables

Tables provide a useful means of presenting large amounts of detailed information in limited space. Tables should supplement, not duplicate, information given in the text or illustrations. Tables should be understandable without continual reference to the text. Simple lists should *not* be presented as tables. Number tables consecutively in the text using Arabic numerals (e.g., Table 1). Number Appendix tables by using the appropriate letter and Arabic number (e.g., for Table 1 in Appendix C, use C1). Each table should have a number and a title, column headings, a stub column (containing row headings), field column(s) (containing table data), and explanatory notes, if necessary.

- Column heads cannot be changed within a table. If this is the case, the table is actually two (or more) tables and should be redrawn as such.
- A table taken verbatim from another source must be referenced (add reference number or author–date after title or denote source as a note to the table) and permission to use it obtained from the copyright owner (see Section 5.8).
- Notes may be added when the information pertains to the entire table.
- Include a separate list of table titles with the draft report.
- Tables will be placed as close to their initial callout as possible.
- When a dash (—) or a blank is used as data entry, please indicate its meaning in a note to the table (e.g., missing data, data not available).
- Use superscript numbers for identifying noted material in any part of the table. Table notes should be numbered consecutively from left to right, top to bottom.

5.6 Illustrations

All figures should convey information clearly and completely. When submitting digital art, adherence to the following guidelines can help to reduce problems in the conversion of digital images to an acceptable format for black and white printing.

Place figures and tables in text **and** provide separate electronic files for all figures and tables *not* created in Microsoft Word. These separate electronic files should be provided in the native file format of the originating program (for example, .ppt, .pptx, .ai, .psd, .xls, .xlsx) or, if the originating program is not a common one, a standard cross-program format (for example, .jpg, .tif, .pdf, .png). Tables created in Microsoft Word or Excel should stay in Microsoft Word or Excel.

Provide the highest possible resolution of artwork. Photos should be at least 300 dpi. If artwork needs to be scanned (i.e., was not created digitally), scan it at 1200 dpi (dots per inch/pixels per inch) at a minimum of 3 in. x 3 in.

Duplicates will not reproduce as well as glossy prints or computer-generated artwork and are generally not acceptable. Graphs, pie charts, or other artwork with shading must be suitable for black and white printing. Duplicate prints with shading will not reproduce well. Illustrations with several gradations of shading (i.e., more than three or four) will also generally not reproduce well. If possible, use hatching or other distinctive markings (e.g., vertical or horizontal lines or grids) to differentiate between bars. Include a separate list of all figure captions with the draft report. Figures submitted in color will be reproduced as such in the web version of the report.

If possible, submit figures at the actual size they are to be reproduced. A full two-column figure is 41.5 picas (6.75 in. and 17.1 mm).

Type size for external lettering should be in the range of 8–10 points (2.1–2.7 mm) and 6–8 points (1.6–2.1 mm) for all internal lettering.

12 point type 10 point type 8 point type 6 point type

Labels on line drawings should be clear and legible. Interior graph lines in non-original line art tend not to reproduce well and need not be inserted. Similarly, shaded backgrounds should be removed because of inconsistent reproduction quality and replaced by cross-hatching or other distinctive markings.

Illustrations should be labeled by the word “Figure” and numbered consecutively, using Arabic numbers, throughout the synthesis. In the text, cite as “Figure” with number (e.g., Figure 2).

Number figures in the Appendix using the appropriate letter and consecutive Arabic numeral (e.g., Figure A3 for Figure 3 in Appendix A). Provide a one-line, descriptive caption for each figure, for example:

FIGURE 12 Schematic of a typical drain installation for a highway embankment.

If a figure is taken from another source, reference that source as a note under the figure or as part of the figure caption [e.g., *Source*: Carr and Black 1999 or FIGURE 1 Warren truss bridge (Carr and Black 1999); *Source*: Indiana DOT, used with permission or FIGURE 30 Neoprene boot (*Courtesy*: Indiana DOT).]

5.7 Vendors

Vendors should *not* be cited by name in the report as this may imply an endorsement or risks the possibility of omitting a vendor(s). Vendors can be described under neutral terms, such as Vendor 1 or Training Service 5. Company names and recognizable logos in photographs should be removed before they are submitted to TRB.

5.8 Copyright Permission

To reproduce any copyrighted materials (text, tables, figures, charts, etc.) written authorization must be obtained from the owner of the original copyright. It is the responsibility of the author to secure this permission. Permission is not needed for brief quotations (50 words or less) when the quotation is properly referenced. Permission must be obtained for longer quotations.

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Submission of the final deliverables must include a signed Certification of Compliance with Copyright Requirements indicating that the contractor has obtained all necessary permissions (document available for download in Word format here: http://onlinepubs.trb.org/Onlinepubs/sp/CertificationofCompliancewithCopyright.doc and shown in Figure 3 below). CRP must be notified if only partial permission has been granted for a property or properties (for example, English language rights may be granted, but not other language rights).

Transportation Research Board

Cooperative Research Programs

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Figure 3. Certification of Compliance with Copyright Requirements (available for download at: http://onlinepubs.trb.org/Onlinepubs/sp/CertificationofCompliancewithCopyright.doc).

5.9 Use of Numbers

Always spell out numbers at the beginning of a sentence.

Within a sentence use only Arabic numerals with units of measure, including time (e.g., 5 feet, 18%, 2 months). Otherwise, spell out all numbers one through nine (e.g., five bridges, two departments) and use Arabic numerals for numbers 10 and greater.

When using the International System of Units (SI), provide customary U.S. equivalents. The project staff uses ASTM E 380-91 for metric conversions.

Use Arabic numerals for all numbers with decimals (e.g., 5.7). For numbers of less than one, use a zero to the left of the decimal point (e.g., 0.06).

Spell out the word “number” in the text; “No.” can be used in tabular material.

Commas are used with numerals of four or more digits except for metric, years (date), page numbers, military time, and model numbers.

Hyphenate compound numbers.

5.10 Equations

Equations should be written so that all elements are easily definable and the spatial relations between symbols are obvious. All variables should be in italic type, with numbers, subscripts, and superscripts (unless variables) in Roman type. Display equations should be numbered sequentially throughout the text using an Arabic number in parentheses, set flush right on the same line as the equation; for example,

$$X^2 + Y^2 = Z^2 \tag{1}$$

When referring to an equation in the text, use the abbreviation “Eq.” followed by the number (e.g., This relationship can be illustrated by the use of Eq. 2).

Make sure that all symbols, Greek letters, and mathematical signs are exact, defined, and absolutely unambiguous; for example

- w versus ω [omega]
- p versus ρ [rho]
- Y versus Ψ [psi]
- capital O versus θ [theta] versus 0 [zero]
- capital X versus χ [chi] versus × [multiplication sign]
- lowercase l [el] versus number 1 [one] Label all Greek letters at first mention.

5.11 Lists

Lists may be presented in three ways: (1) as a numbered series within a sentence; (2) as bulleted items, each on a separate line or lines; or (3) as numbered items, each on a separate line or lines. All items in a single list should follow the same grammatical style, either a word, phrase, sentence, or paragraph. All lists should show parallel construction.

5.12 Abbreviations/Acronyms

Abbreviations and acronyms should not be introduced unless they are repeated at least three times in the text or tables (except for units of measurement). Abbreviations used in the Summary and Summary of Findings must be used at least three times as well. An abbreviation or acronym must be spelled out at first use [e.g., Intelligent Vehicle Highway System (IVHS)] unless it appears in a heading.

- A term should be represented by only one form of abbreviation/acronym, and no two terms should have the same abbreviation/acronym.
- Spell out all abbreviations in titles and headings, unless they are used as an adjective (e.g., "IVHS Technologies" is acceptable in a heading, assuming IVHS has been defined previously).
- United States is spelled out when used as a noun and abbreviated (U.S.) when used as an adjective (e.g., U.S. Department of Transportation).