







## TRANSPORTATION RESEARCH RECORD: JOURNAL OF THE TRANSPORTATION RESEARCH BOARD

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Before you start, please have ready:

- All coauthor names, affiliations, and email addresses
- [ORCID numbers](#) (optional, but encouraged)  *New*
- Word or LaTeX manuscript file  *New*
  - Table and figures embedded in text
  - 8.5x11 page (not A4) with normal margins
  - Times Roman font, 10 pt size or larger
  - Single spaced
  - Line numbers (Restart each page)
  - Abstract (250 words max)
  - Author contribution statement (before references)  *New*
  - Word count (7500 max minus 250 for each table)  *Revised*

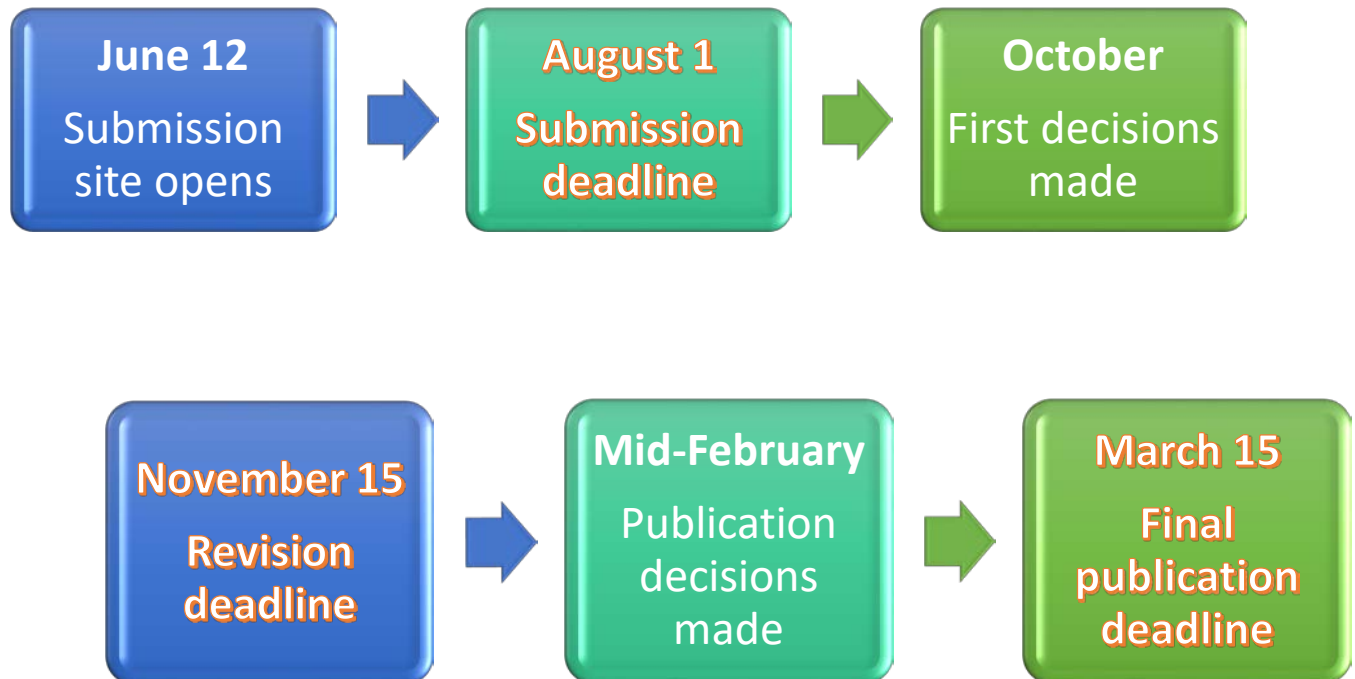
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### REVIEW CRITERIA:

- Is your narrative clear and easy to understand?
- Does the abstract clearly communicate the scope and outcome of the study?

- What is your important contribution to the state of the art or practice?
- Are the methods clear enough for a knowledgeable reader to repeat the study?
- Is the paper free of statements advocating special interests or recommendations on government policies or programs?
- Is existing work well described and referenced?
- Are your data valid and important to the findings?
- Is the conclusion clear and properly supported?

## Presentation and Publication Timeline



## AUTHOR RESPONSIBILITIES

### *Manuscript Length*

The length of each paper, including the abstract, text, references, and tables, must not exceed 7,500 words. Each table counts as 250 words. For example, if five tables are submitted, the abstract, text, and references may total no more than 6,250 words. Tables that have been converted to figures will be applied to

the word count. Papers not meeting this requirement may be rejected without review or withdrawn from the peer review process.

### ***Language and Readability***

All papers must be submitted in English. It is the author's responsibility to ensure that the nature and conclusions of the work are easily understood. **Authors are encouraged to engage editorial services prior to the paper submission.**

### ***Submission to Other Journals***

The content of a paper must not have been published elsewhere and must not be submitted to another journal while it is under consideration for the TRR. If your paper is accepted for presentation only, please reference the published work and submit an extended abstract with your revision (see below for details).

### ***Author Contribution Statement***

The TRR requires that all authors take public responsibility for the content of the work submitted for review. The contributions of all authors must be described in the following manner:

**The authors confirm contribution to the paper as follows: study conception and design: X. Author, Y. Author; data collection: Y. Author; analysis and interpretation of results: X. Author, Y. Author. Z. Author; draft manuscript preparation: Y. Author. Z. Author. All authors reviewed the results and approved the final version of the manuscript.**

An author name can appear multiple times, and each author name must appear at least once. For single authors, use the following wording:

**The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.**

### ***Plagiarism***

Plagiarism is the use of information or concepts from another article, website, or report without clearly attributing the source. Plagiarism is not acceptable. Phrases, sentences, or sections taken from another document, even if written by the same author(s), must appear within quotation marks and the source must be credited.

### ***Fragmented Publication***

Breaking a single piece of work into many papers dilutes the information and makes it difficult for reviewers and readers to assess the advances that may have been made. Papers submitted for review should stand on their own; **papers submitted as Part I, Part II, etc., will not be accepted for review.**

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The generally accepted rules for authorship credit are stated in the 2003 Annual Report of the Committee on Publication Ethics (COPE) are as follows: “(1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; (2) drafting the article or revising it critically for important intellectual content; and (3) final approval of version to be published. All three of these conditions should be met for authorship, (4) anyone credited as an author should have played a significant role in the research and in the writing of the paper (Albert & Wagner 2003).”

### ***Commercial or Special Interests***

Authors are responsible for ensuring that submitted papers do not advocate special interests and are of a commercial nature. Papers that fall within this category will be removed from the peer review process. A paper also may be removed from peer review if it describes the properties of a product without disclosing its composition or manufacture. Generic names of products and equipment should be used unless the author considers the trade names or manufacturer's names essential to the purpose of the paper.

### ***Clearances and Copyrighted Material***

Authors must secure necessary clearances and written permissions for presentation or publication from any contracting or supervisory agencies involved in the research or from holders of copyrights on material used in the paper. Authors must have concurrence from coauthors or coworkers before submitting papers for presentation or publication by TRB, and all contributions to the work must be properly acknowledged. If a paper accepted for publication contains previously copyrighted material, **authors must obtain written permission from the copyright holder(s)**. TRB will assume the authors have obtained this

permission before submission of the manuscript for inclusion on the TRB Annual Meeting Online. TRB will retain unrestricted rights to the material.

## Reference Guidelines

### *Searching and Citing Transportation Research Record Papers*

TRB provides a tool to assist authors in conducting a literature review and identifying references for papers—[Access TRR for Authors](#)

This tool is available to provide access to the extensive information on research published in past volumes of the *Transportation Research Record*.

#### *Guidelines for References*

1. The reference list should contain only references that are cited in the text, numbered in the order in which they are first cited. Bibliographic lists will not be published. Papers that do not conform to the numbered reference style may be rejected.
2. Denote a reference at the appropriate place in the text with an italicized Arabic numeral in parentheses, e.g., (2). Do not denote text references with superscripts.
3. Do not include in the reference list personal communications or similar material that would not be available to readers. Instead, cite the unpublished work in the text and enclose the author's name along with the term "personal communication" in parentheses.
4. Do not repeat a reference in the list, and do not use *ibid.*, *idem*, *op. cit.*, or *loc. cit.* If a reference is cited more than once in the text, repeat the number first assigned to the reference.
5. Use the following content guidelines and samples in preparing reference lists:

#### *TRR Journal Articles*

**Note: Do not add "In" before the journal title; do not include the publisher or place of publication.**

Dewan, S. A., and R. E. Smith. Creating Asset Management Reports from a Local Agency Pavement Management System. *Transportation Research Record: Journal of the Transportation Research Board*, 2018. Volume: doi or page range.

#### *TRB Presentation Papers*

Ghiasi, A., J. Ma, F. Zhou, and X. Li. Speed Harmonization Algorithm using Connected Autonomous Vehicles. Presented at 96th Annual Meeting of the Transportation Research Board, Washington, D.C., 2017

**Please check references citing papers presented at the Annual Meeting to see whether or not the paper was subsequently published in the Transportation Research Record (TRR). If the paper was published in the TRR, the reference should be changed to the corresponding TRR citation.**

## Other Journals

Dawley, C. B., B. L. Hogenwiede, and K. O. Anderson. Mitigation of Instability Rutting of Asphalt Concrete Pavements in Canada. *Journal of Association of Asphalt Paving Technologists*, 2018. 59: 481–508.

Sansalone, M., J. M. Lin, and W. B. Streett. Determining the Depths of Surface-Opening Cracks Using Impact-Generated Stress Waves and Time-of-Flight Techniques. *ACI Materials Journal*, 2018. 95: 168–177.

## TRB Publications

Morcous, G., K. Wang, P. C. Taylor, and S. P. Shah. *NCHRP Report 819: Self-Consolidating Concrete for Cast-in-Place Bridge Components*. Transportation Research Board, Washington, D.C., 2016. <http://dx.doi.org/10.17226/23626>.

## Book

Newland, D. E. *Random Vibrations: Spectral and Wavelet Analysis*. John Wiley & Sons, Inc., New York, 1998.

## Chapter in a Book

Shunk, G. A. Urban Transportation Systems. In *Transportation Planning Handbook* (J. D. Edwards, Jr., ed.), Prentice Hall, Englewood Cliffs, N.J., 1992, pp. 88–122.

## Government Report

Von Quintus, H. L., and A. L. Simpson. *Documentation of the Backcalculation of Layer Parameters for LTPP Test Sections*. Publication FHWA-RD-01-113. FHWA, U.S. Department of Transportation, 2002.

- **Websites** References to websites should include corporate or personal authors, title of document, date of document (if available), web address (complete URL), and date accessed by the author.

State and Local Policy Program. *Value Pricing*. Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, Minneapolis. [www.hhh.umn.edu/centers/slp/vp/vp\\_org](http://www.hhh.umn.edu/centers/slp/vp/vp_org). Accessed Feb. 5, 2008.

*Guide to Developing Performance-Related Specifications*. FHWA-RD-98-155, FHWA- RD-98-156, FHWA-RD-98-171, Vol. III, Appendix C. [www.tfhr.gov/pavement/pccp/pavespec](http://www.tfhr.gov/pavement/pccp/pavespec). Accessed March 5, 2003.

- **Unpublished papers.** References to unpublished papers presented at meetings should include name(s) of author(s); title of paper; and title, sponsor(s), location, and dates or year of meeting.

Corbett, J. J. *Toward Environmental Stewardship: Charting the Course for Marine Transportation*. Presented at 83rd Annual Meeting of the Transportation Research Board, Washington, D.C., 2018.

## ***Permissions***

For papers accepted for publication, please refer to [SAGE Guidelines](#).

For papers accepted for presentation at the TRB Annual Meeting, TRB will include all papers on Annual Meeting Online. Upon submission of papers considered for presentation at the TRB Annual Meeting, authors will be required to accept the following Annual Meeting Online Terms and Conditions for Papers Accepted for Presentation:

*Should my paper be accepted for presentation, I understand and agree that my paper will be made available through TRB's Annual Meeting Online ("AMOnLine") unless I opt out and provide an extended abstract of the paper for inclusion in AMOnLine. Papers and extended abstracts made available through AMOnLine are provided by TRB on a complimentary basis as a service for all Annual Meeting registrants, TRB Sponsors, and TRB Patrons. Others may obtain access to papers and extended abstracts on AMOnLine upon payment of a nominal fee. If my paper is accepted for presentation, the presentation acceptance letter will provide me with the instructions and deadlines for submitting an extended abstract for inclusion on AMOnLine in lieu of my paper. The extended abstract must meet all TRB requirements for submission and be approved by TRB. If I do not submit a timely, conforming, acceptable extended abstract, I hereby grant the National Academy of Sciences/Transportation Research Board a nonexclusive, royalty-free, irrevocable, worldwide license to include my paper on AMOnLine. I understand that any agreements with or licenses granted to the National Academy of Sciences/Transportation Research Board are contingent upon my paper being accepted for presentation.*

## ***Metrication***

Authors are encouraged to provide measurements in both SI (metric) and U.S. customary units. The measurement unit of the original research should be followed by the equivalent conversion in parentheses. Papers accepted for publication without unit conversions will be published with the measurement units as submitted. TRB will not supply specific conversions for the papers; a general conversion chart appears in the front pages of each volume of the *Transportation Research Record*. **Table 1** supplies some frequently used unit conversion factors.

Note: When converting U.S. customary measures of weight (force) and mass into SI units, express weight (force) in newtons and mass in kilograms; express poundforce per square inch (psi or lbf/in.<sup>2</sup>) of pressure or stress in kilopascals (kPa). For SI units, use prefixes instead of powers of 10.

For tables and figures, provide only the units of the original research and show the base unit conversion in a footnote; for example, NOTE: 1 mi = 1.61 km. Alternatively, in figures, equivalent units may be shown on the top and right axes of data plots.

**TABLE 1 Measurement Conversions**

When You Know	Multiply by	To Find
<b>Length</b>		
inches (in.)	25.4	millimeters (mm)
feet (ft)	0.305	meters (m)
yards (yd)	0.914	meters (m)
miles (mi)	1.61	kilometers (km)
<b>Area</b>		
square inches (in. <sup>2</sup> )	645.1	millimeters squared (mm <sup>2</sup> )
square feet (ft <sup>2</sup> )	0.093	meters squared (m <sup>2</sup> )
square yards (yd <sup>2</sup> )	0.836	meters squared (m <sup>2</sup> )
acres	0.405	hectares (ha)
square miles (mi <sup>2</sup> )	2.59	kilometers squared (km <sup>2</sup> )
<b>Volume</b>		
fluid ounces (fluid oz)	29.57	milliliters (mL)
gallons (gal)	3.785	liters (L)
cubic feet (ft <sup>3</sup> )	0.028	meters cubed (m <sup>3</sup> )
cubic yards (yd <sup>3</sup> )	0.765	meters cubed (m <sup>3</sup> )
<b>Mass</b>		
ounces (oz)	28.35	grams (g)
pounds (lb)	0.454	kilograms (kg)
short tons (2,000 lb)(T)	0.907	megagrams (Mg)
<b>Temperature (exact)</b>		
Fahrenheit temperature (°F)	(F – 32)/1.8	Celsius temperature (°C)
<b>Illumination</b>		
footcandles (fc)	10.76	lux (lx)
footlamberts (fl)	3.426	candela/m <sup>2</sup> (cd/m <sup>2</sup> )
<b>Force and Pressure or Stress</b>		
poundforce (lbf)	4.45	newtons (N)
poundforce per square inch (psi)	6.89	kilopascals (kPa)



## Equations

All variables should be defined at first use, either in the text or where the equation is listed.

1. Fractions in displayed equations should be stacked, in accordance with preferred mathematical practice.
2. If a displayed equation is numbered, use an Arabic numeral in parentheses, placed flush right.
3. Carefully distinguish the following:
  - All capital and lowercase letters;
  - Capital O (“oh”), lowercase o (“oh”), and 0 (zero);
  - Lowercase l (“el”) and number 1 (one);
  - Letter X, Greek chi ( $\chi$ ), and multiplication sign  $\times$ ;
  - Prime  $\prime$ , apostrophe  $'$ , and superscript one  $^1$ ; and
  - English and Greek letters such as
    - $B$  and beta ( $\beta$ ), upper- or lowercase  $k$  and kappa ( $\kappa$ ),
    - $n$  and eta ( $\eta$ ),  $v$  and nu ( $\nu$ ),
    - $u$  and upsilon ( $\upsilon$ ),  $\mu$  and mu ( $\mu$ ), and
    - Upper- or lowercase  $p$  and rho ( $\rho$ ), and  $w$  and lowercase omega ( $\omega$ ).

## Footnotes

Do not use footnotes to the text. Incorporate the information into the text or delete the notes.

## Abbreviations, Acronyms, and Symbols

Abbreviations, acronyms, and symbols must be fully defined at first use in both the abstract and the paper; the full term should be spelled out first, followed by the abbreviated term in parentheses. The following acronyms may be used without definition:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACRP	Airport Cooperative Research Program
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials (known by abbreviation only)
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration

FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
SAE	Society of Automotive Engineers
SHRP	Strategic Highway Research Program
SHRP 2	Second Strategic Highway Research Program
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board

### Acknowledgments

Authors of papers that report results of research sponsored directly or indirectly by federal programs should indicate this sponsorship in an Acknowledgment section at the end of the text, above References. Contract, award, or project codes or numbers are not published in the *Transportation Research Record*.

### Appendixes

*Do not use appendixes.* Include pertinent material in the paper itself or, where necessary, include a note that background material—such as derivation of formulas, specifications, or survey forms—is available from the author or in another report, which should be cited in the reference list.

## EXTENDED ABSTRACTS

Starting with the 2018 TRB Annual Meeting, TRB is requiring that all papers accepted for presentation be included on TRB AMOnline. Authors have the option of submitting a valid extended abstract as a replacement for the full paper for inclusion on AMOnline. **Extended abstracts must be submitted by November 15.** TRB reserves the right to include the full paper on AMOnline if the extended abstract is not submitted by November 15 or if the submission does not meet the requirements.

An extended abstract is a concise summary of the research study that was accepted for presentation at the TRB Annual Meeting. The extended abstract is intended to provide TRB Annual Meeting participants the key points from your study and should provide some insights into the importance and contribution of your work to the transportation community.

The extended abstract should contain a minimum of 1000 words and a maximum of 1750 words. Supporting figures, tables and images of the results (no more

than two figures and two tables) may be included in the extended abstract and are not counted in the word limit. **All extended abstracts must be submitted in PDF format.**

Tables and figures should be centered and numbered and the caption should be placed under the figure or image. Table headers should be placed at the top of the table. Sources (if any) for the tables, figures and images should be placed directly under the tables, figures and images in the form of author name and publication date.

Each extended abstract must contain the following sections:

- **TITLE PAGE**

The title page does not count toward the maximum word limit. The title page must include the paper number, the title of the extended abstract, the names and affiliation(s) for the author and co-authors. You can include an acknowledgement section on your title page identifying funding sources.

- **INTRODUCTION**

The introduction section should (1) present the scope and objective of the paper and state the problem, (2) briefly review the pertinent literature, (3) describe the methods, and (4) provide an overview of the main results of the work. The author also should seek to answer the question “Why this research matters. Is this research making a contribution to theory and/or practice?”

- **METHODOLOGY**

The methodology must be clearly stated and described in sufficient detail or with sufficient references. The author should concisely summarize the research framework, and the research methods applied in the study. The summary should include the identification of valid data sources used in the research.

- **FINDINGS**

The author shall summarize and briefly discuss any findings in this section. The author can use a combination of tables, figures, and text to provide the summary. The number of tables and figures are limited to no more than two each for the entire extended abstract.

- **CONCLUSION**

Conclusions should include (1) the principles and generalizations inferred from the results, (2) any exceptions, problems or limitations of the work, and (3)

theoretical and/or practical implications of the work. All conclusions offered should be supported by the information provided in the “Findings” section

- **REFERENCES** (Not counted in the word limit of the extended abstract)  
This is any relevant information cited with the body of the extended abstract.

## ABOUT THIS GUIDE

The TRB peer review process is used both for papers submitted for presentation at TRB’s Annual Meeting and for papers submitted for publication in the *Transportation Research Record: Journal of the Transportation Research Board*. The peer review process is organized by TRB’s standing technical committees under the supervision of TRB staff. A minimum of three reviews are required for a publication recommendation or a presentation decision. The process also allows for scholarly discussion of any paper scheduled for publication, along with an author-prepared closure.

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The **National Academy of Sciences** was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, nongovernmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

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