ADOT Research Center
Style Guide

July 2021

ADOT

Arizona Department of Transportation Research Center

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July 2021

Contents

Acronyms and Terms

ADOT	Arizona Department of Transportation
Chicago	*The Chicago Manual of Style*; a manual providing rules on language style and usage
DOT	department of transportation; ADOT's counterpart in another state
dpi	dots per inch
FHWA	Federal Highway Administration; joint sponsor with ADOT on many research studies
NCHRP	National Cooperative Highway Research Program
NTIS	National Technical Information Service; federal depository for US research findings
PI	principal investigator; the researcher leading the consultant team
PM	project manager; the ADOT contact who oversees a research study
SPR	State Planning and Research
TAC	technical advisory committee; advises the project manager on a research study
TOC	table of contents
TRB	Transportation Research Board
TRDP	technical report documentation page; the first page in an ADOT technical report; provides information about the report to NTIS; required by ADOT for technical reports; also called Form DOT F 1700.7
URL	uniform resource locator

Introduction

Sources Used

The *ADOT Research Center Style Guide* uses two primary published sources for editing standards and decisions. They are:

- *The Chicago Manual of Style* (15th ed. or later)

- *Merriam-Webster's Collegiate Dictionary* (10th ed. or later)

The guidance in the style guide and these sources may not answer all questions that a consultant may have. The Research Center encourages consultants to contact the project manager (PM) or the technical editor for clarification **prior** to submitting a file for review and approval.

Working with the ADOT Research Center

The Research Center is dedicated to inquiry and innovation at the Arizona Department of Transportation (ADOT). Research Center studies deliver information that can be applied to improve ADOT processes and products, and address the full range of topics of interest to the department. Studies are managed by Research Center staff and conducted by consultants from the private sector, public sector, and universities under contract with ADOT. The consultant team includes a principal investigator (PI), a technical writer, and other key members, each of whom must be experienced and qualified.

Each study's work plan typically requires the consultant team to develop and deliver a *technical memorandum*, or technical memo, following the completion of each major task, and a *final report* at the conclusion of the study. The Research Center manages the production of a summary, or *research brief*, after the final report has been written.

The Technical Writer's Role

The research contract requires the technical writer to write the final report. To capably develop the report, the technical writer must comprehend the core of the study's complex content. The PI must communicate enough Information so that the writer understands:

- The study objectives
- The work being done to fulfill the contracted tasks in the work plan
- The concepts associated with the study
- The direction and adjustments received from ADOT

INTRODUCTION

The PI is responsible for ensuring that the writer has enough context, knowledge, and direction to write the final report and the research brief. This process would start with:

- Sharing the scope of work and the approved work plan
- Defining needs and expectations for the writer
- Discussion the concepts, content, and development of technical memos to ensure understanding
- Providing notes and developments from ADOT meetings, emails, and phone calls
- Involving the writer at key ADOT meetings

The technical writer, in turn, is responsible for:

- Asking, at every stage, enough questions to build a thorough understanding of the study, its, process, and its findings
- Honestly assessing and giving clear feedback to the PI regarding the information provided
- Writing the report, not merely editing it

Complying with Section 508

Authority

The ADOT Research Center requires that consultants make technical memos and final reports electronically accessible in compliance with Section 508 of the Rehabilitation Act of 1973, as amended. This style guide gives only basic requirements for research consultants to abide by when producing study documentation. For more specific guidance, use the links in the Resources section below.

Resources

For more specific information on creating compliant documents in Microsoft Word, stay up to date by checking the U.S. General Services Administration's (GSA) website at Create Accessible Documents.

Short video training modules are linked at Section 508 video training. The recommended modules for ADOT purposes are:

- Module 2: Use Styles to Create Headings
- Module 3: Use Built-in Features to Create Lists
- Module 5: Use Built-in Features to Create Layout and Data Tables
- Module 7: Create Unambiguous Names for Links
- Module 9: Create Accessible Images and Other Objects
- Module 10: Create Accessible Textboxes
- Module 11: Use Color and Other Sensory Characteristics Plus Text to Convey Meaning
- Module 12: Create the Required Color Contrast

Resources for writing alt-text include the following Social Security Administration's Alternative Text Guide and the University of Washington web site: What Constitutes Good Alt-Text.

For writing formulas and equations in text, refer to pages 37-45 in the Communication Reference Guide (CRG) published by the Federal Highway Administration's (FHWA) Turner-Fairbank Highway Research Center: FHWA Research Communication Reference Guide. Further assistance in making equations accessible can be found at Creating Accessible Equations in Word.

Section 508 Guidance

Formatting

- Use left justification for text. Do not use full justification.
- Apply orphan control for text.
- Insert page breaks when needing a new page. Do not use multiple hard returns until the end of the first page is reached. Assistive technologies read each return out loud.
- Always spell out degrees, hash tag, and percent in text. Do not use the symbols except in figures and tables.
- Use the style function to set up headings. Do not make headings by formatting body text, but select the style to designate the text as a heading, whether first, second, third, or fourth level. Mark all headings using the style tab. (The 2021 technical memorandum template distributed to consultants already has these heading styles programmed in.)
- Use bold or italics to indicate emphasis or for other text formatting purposes, but do not underline. No heading style will require underlining. The only use for underlining is for indicating an active hyperlink (see below).

Alternative Text

Not all users can see images, graphs, equations, and tables clearly. Instead, they must use assistive technology to read aloud a preset description. This description is called alternative text, or alt-text. Microsoft Word provides fields for inserting alt-text. To understand how to use this feature in Word, refer to the applicable version of Word listed at the GSA Section 508 website (see Resources section below). Complete alt-text for figures, tables, equations, and formulas.

- Complete the title field that is above the alt-text description field. If the title is empty, the alt-text will not be recognized in the document.
- Write a clear explanatory description with fewer than 125 characters.
- There are limited characters in the alt-text field. So don't use unnecessary words. Write, "This graph's axes show….." Do not say "This is an image of" or "This is a graph of."
- For the alt-text, write original text that specifically explains the feature and does not merely repeat text from the report's body.

Hyperlinks

- The underline indicating an active hyperlink is the only underlined text allowed in a Section 508-compliant document.
- Check to be sure that the hyperlinks are not broken before submitting the document.
- Complete the title information for the hyperlink so that assistive technology can read it.
- Use clear names; do not write the hyperlink that says "click here."

Equations and Formulas

- Create with an equation/formula tool in Word and then insert it in the technical memo as a .jpg file. Do not use external equation builder programs; assistive technology cannot read them and they sometimes break upon conversion to PDF files.
- Proofread an equation or formula before converting it to a .jpg file. Ensure that italics are used properly.
- Because the equation is a .jpg, remember to use alt-text. Assistive technology cannot read the .jpg, but it can read the alt-text.
- The alt text must spell out the names of each of the symbols in the equation.

Figures and Tables

- Limit a figure to a single element, whether a graph, chart, or photograph; do not combine multiple elements like graphs and photographs and do not use sets or collages of photographs. Treat each element as a single numbered figure with its dedicated caption.
- Write a caption for each figure and a title for each table clearly and completely.
- For figures, use picture boxes and insert the picture box as a.jpg. Do not use text boxes.
- For tables, create and maintain the table in Word. Do not insert the table as an image.
- For figure resolution, use a minimum of 300 dots per inch (dpi).
- When charting data in graphs or charts, use colors that can be discerned by color blind readers; do not use red, yellow, or green -- the "stoplight" colors.
- Use color shades with enough contrast to be clearly distinguishable from each other.
- Use texture with fill colors or chart with different styles of lines to add options so that charted data can be read clearly.
- To distinguish types of data when using pie charts, separate pieces of the pie for emphasis.
- Keep figures as simple as possible.
- Label each axis or any other component on a chart clearly and informatively.
- Place a figure or table immediately following the paragraph that first refers to it. Make sure that the paragraph discussing the relevant information also refers to the figure or table.
- Build simple tables in text. Do not use complex, or nested, tables.
- In Table Properties, designate the header row and/or header column.
- In the Table Properties section, under rows, select repeat as header row and do not allow rows to break across pages.
- Label table column and row headings clearly so that the information is readily identifiable.
- Do not merge cells in a table.
- If a cell contains no data, find a way to note in the cell that there is no data. Depending on the data being presented, this can be done with a pair of hyphens, a zero, or possibly "N/A." Do not leave cells blank.
- If a complex, or nested, table is essential, insert it in a picture box as a .jpg file. This is the only time when using a picture box for a table is advisable.

Technical Memoranda

Content

Technical memoranda, or technical memos, fully document major tasks and subtasks from the research study's approved work plan. It is expected that the content often will be highly technical and will be intended for an audience of subject matter experts. The content must always be accurate, complete, and clear.

Always write clearly and professionally. Eliminate jargon or buzzwords. If industry terms are appropriate, make sure that their meaning is clear and define on first use if necessary. Convert field shorthand and colloquialisms to polished plain speaking. Use generic, third-person references like "the team" rather than personal names or first-person references. Do not refer to internal processes, so refrain from mentioning procurement documents, technical advisory committee (TAC) directives, project manager decisions, or other internal workings of a study.

Technical memos are not necessarily long, but will thoroughly document the following for each task:
- Brief statement of the purpose or objectives of the task
- Description of the method(s) used
- Presentation of findings
- Figures and tables that may add clarification
- Other elements specified in the work plan, including appendices providing technical data or other essential details
- Text citations with reference list

Formatting

The technical memo cover uses a template provided by the ADOT project manager (PM) The body of the memo uses a Word template also distributed by the study's ADOT PM. In that template, use the following required format.

Table of Contents

Using the prescribed technical memo template produces an auto-generated table of contents.

Columns

Use a single-column, full-page format.

Font

Use Calibri 11-point type for text, including table captions, figure captions, equations, explanatory text for equations, and text within figures and tables. Print figure and table captions in bold. Text in figures and tables can be smaller than 11-point type but not less than 8 points.

Margins

One-inch side margins and top margins are required on all pages. Margins for pages with figures and tables may be slightly smaller if necessary.

Spacing

Use line spacing of 1.15.

Paragraphs

Separate paragraphs with a single blank line. Do not set up paragraphs to have extra spacing before or after the paragraph. Do not indent paragraphs.

Justification

Left-justify report text. Do not full-justify text.

Align columns of numerals entered in tables by decimal points.

Headers and Footers

Headers and footers, including footnotes, are not permitted.

Widows and Orphans

Do not leave a single line of text alone at the top of a page (widow) or bottom of a page (orphan). Use Word's automatic feature to prevent these. Do not leave a heading at the bottom of a page without at least two lines of text to accompany it. If feasible, do not split bulleted lists from their introductory sentences or leave a single bullet alone at the top or bottom of a page.

Headings

To comply with Section 508, use the headings from the prescribed style gallery in the technical memo template. Number the chapters using numerals without decimals (Chapter 2, not Chapter 2.0). Subsections may be titled, but are never numbered. Keep headings concise and do not extend beyond the page's halfway point. Below are the required formats for headings.

CHAPTER 1. TITLE OF FIRST CHAPTER

(14 pt. bold, all caps, centered)

FIRST-LEVEL HEADING

(11 pt. bold, all caps, flush left, separate line, skip a line before and after)

Second-Level Heading

(11 pt. bold, initial caps, flush left, separate line, skip a line before and after)

Third-Level Heading

(11 pt. italic, initial caps, flush left, separate line, skip a line before and after)

Fourth-Level Heading. (11 pt. bold, initial caps, paragraph indent followed by period, two spaces, and subsequent text; skip a line before only)

Page Numbering

Page numbers are centered at the bottom of the page. Number the body of the text with Arabic numerals (1, 2, 3, etc.) beginning with page 1. Page numbers run consecutively throughout the entire report, including appendices (i.e., 1, 2, 3, etc.).

Page Breaks

When using Microsoft Word, it is sometimes advisable to insert a page break or a Next Page section break to end a page. *Never* insert the following section breaks (options under Page Layout) for any reason:

- Even Page section break
- Odd Page section break

Appendices

Certain files that were compiled during a study task may be useful to practitioners and other researchers and will be made available upon request through a public records request. Those will be kept as appendices to the technical memoranda.

When documenting an appendix, if there is only one, name it "Appendix," not "Appendix A." If there

are two or more appendices, designate each appendix with a letter (e.g., Appendix A, Appendix B). If an appendix also has references cited in the text or as sources of figures and tables, include a reference section with it. Do not use special page numbering, but continue from the main body of the technical memo (see *Page Numbering* above).

There are two ways to format appendices. Pick one and use it for all the appendix files that are submitted for the study:

- Heading — The appendix may simply have a heading at the top of the page (e.g., Appendix A: Survey Results) followed by the beginning of the contents on the same page.
- Cover page — If using a cover page, center the appendix designation (Appendix B) and the title at the top of the page. Leave the next page blank, and then begin the appendix information on the third page without repeating the heading.

Developing Recommendations

Unless it directs otherwise, ADOT expects each research study consultant to develop recommendations from their findings. According to federal requirements, these recommendations are documented in the final report. Development of recommendations, though, starts much earlier, as captured in the applicable technical memorandum.

Recommendations

How to develop and present a set of recommendations will vary depending on the research consultant, the research topic, and the stated objectives. Research results are not predetermined, so developing a recommendation and how to document it cannot be prescribed. However, general guidelines should be observed:

- Use objective language.
- Keep the focus on recommendations.
- Reiterate findings and methods only if needed for clarity. Never introduce findings in the recommendations section. Findings that are necessary to support a recommendation are documented separately in the technical memo.
- State the recommendations as a set of feasible options for consideration, rather than as directives. Do not state that ADOT "needs to" or "must" implement a recommendations.
- Ensure that each recommendation is distinct. Avoid redundancy.
- Present practice-ready information rather than theoretical or academic concepts.
- If more research is recommended, be specific as to why and what objectives it would achieve.
- When appropriate, organize recommendations in sequence, such as according to length of time required; level of priority or difficulty; or extent of resources expended.
- Summarize as much as possible without losing essential information.
- Use bullet lists or matrices for organizing thoughts succinctly and coherently. Remember to use parallel construction so that all bullet items are consistent grammatically.

- Use passive voice if helpful for clear wording.
- Since ADOT organizational unit titles might change, refer to work units by distinct function ("environmental planning" or "traffic safety") rather than formal name ("Multimodal Planning Division").

Section 508

ADOT requires that consultants make technical memos electronically accessible according to the **Section 508 of the Rehabilitation Act of 1973, as amended**. For basic accessibility requirements, refer to the previous chapter on Section 508 compliance. For more detailed guidance, check the links under the Resources section in that chapter.

Final Reports

Overview

Each study's work plan calls for a final report. The consultant will submit a draft final report written by the research team's technical writer. The draft final report is a clear narrative that focuses on recommendations and findings that will aid in potential implementation. The report will be written for non-academic practitioners who may apply the results in Arizona. The report is not a compendium of the technical memos, but summarizes the study's key points as documented in the memos.

The draft final report will contain the following sections:
- Introduction of the study's background and objectives
- Recommendations, including, when called for in the study's work plan, an implementation plan
- Findings, including key data relevant to the Recommendations section
- Methods, a very brief summary of methods and tools used to conduct the research
- References listing the sources cited in the report

The draft report will be submitted as a Microsoft Word file of basic text, with any figures and tables submitted separately as Word or Excel files (photographs not needing formatting may be submitted as .jpg files with a minimum resolution of 300 dpi; the final formatting and layout design will be conducted by the Research Center.

Title Page

For the final report, use the front matter template distributed by the ADOT PM and submit a simple title page that states the study title in full, the study's SPR number, and the name, firm affiliation, and address of each contributing consultant. List individual names in descending order of contribution, with the primary contributor first. (Note that ORCIDs must be obtained for all contributors by registering at Register for Your ORCID ID; ORCIDs are listed on the technical report documentation page, next section.)

Technical Report Documentation Page (TRDP)

Requirement

The report author must complete the technical report documentation page (also denoted as Form DOT F 1700.7) for the National Technical Information Service (NTIS). ORCIDs must be obtained for each contributing author and listed on the technical report documentation page

The Research Center PM will provide the consultant with the TRDP template.

Font Size

Use 10-point Calibri for all entries in the TRDP.

TRDP Content

See Figure 1 for a sample TRDP. Use the following instructions for filling out the TRDP. The consultant completes only seven boxes:

> Box 4 (report title and subtitle),
> Box 7 (author name or names),
> Box 9 (performing organization's name and address),
> Box 12 (sponsoring agency name and address),
> Box 15 (supplementary notes),
> Box 16 (report abstract), and
> Box 17 (key words).

Box 4, Title and Subtitle — Enter the entire report title, in title case (initial capital letter on significant words); precede subtitles with a colon.

Box 7, Author(s) — For all authors, list first name, middle initial if the author uses it, and last name. First names must be given; a first initial is not acceptable. List the primary author first. Enter the names of the individuals, not the agency or firm. ORCIDs must be obtained and shown with the full names like this: Kathleen Anderek, https://orcid.org/0000-0001-5900-3976. Place each author on a separate line.

Box 9, Performing Organization Name and Address — Enter name and address of the organization that employs the principal investigator (followed by subcontractor organizations, if applicable).

Box 12, Sponsoring Agency Name and Address — Enter:

Arizona Department of Transportation
206 S. 17th Ave.
Phoenix, AZ 85007

Box 15, Supplementary Notes — Enter "Project performed in cooperation with the Federal Highway Administration."

Box 16, Abstract — Include a brief (200–250 words) summary of the most significant information contained in the report. The abstract must fit in the box provided in the template. Briefly mention key findings. The technical writer will write the abstract as part of the final report file.

Box 17, Key Words — Enter terms or short phrases that identify the important topics in the report; use initial caps. Whenever possible, choose terms from the Transportation Research Board's (TRB) [Transportation Research Thesaurus](#).

Figure 1. Sample Technical Report Documentation Page (TRDP)

1. Report No. FHWA-AZ-YR-XXX(X)	2. Government Accession No. LEAVE BLANK	3. Recipient's Catalog No. LEAVE BLANK
4. Title and Subtitle Title and Subtitle in Initial Capital Letters		5. Report Date MONTH, YEAR
		6. Performing Organization Code LEAVE BLANK
7. Author Names In Conventional Order (i.e., John A. Doe) with ORCID		8. Performing Organization Report No. LEAVE BLANK
9. Performing Organization Name and Address Name Street Address City, State Zip Code		10. Work Unit No. LEAVE BLANK
		11. Contract or Grant No. LEAVE BLANK
12. Sponsoring Agency Name and Address Arizona Department of Transportation 206 S. 17th Avenue Phoenix, Arizona 85007		13.Type of Report & Period Covered FINAL
		14. Sponsoring Agency Code
15. Supplementary Notes Prepared in cooperation with the US Department of Transportation, Federal Highway Administration		
16. Abstract 200-300 words A brief summary of the report stating state the purpose, methods, results and conclusions of the work effort.		

17. Key Words Select specific and precise terms or phrases that identify principal subjects covered in the report. Use the TRB Research Thesaurus.		18. Distribution Statement Document is available to the US public through the National Technical Information Service, Springfield, Virginia, 22161	23. Registrant's Seal
19. Security Classification Unclassified	20. Security Classification Unclassified	21. No. of Pages Leave Blank	22. Price

Table of Contents (TOC)

Use Word's auto generated listings for the TOC. In the table of contents (titled merely "Contents"), list all section headings (Recommendations, References, etc.) with their corresponding page numbers.

Include at least first-level headings within the sections. If second-level headings are used, list the same level of headings for all sections. Do not list subheadings beyond second-level subheadings.

Acronyms, Abbreviations, and Symbols

Content

If the report contains more than five acronyms, list them with their definitions. Always define them upon first reference in both the TRDP abstract and in the main text.

When the term being defined is not a proper name or is a generic term, such as "technical advisory committee," use lower case, even though the acronym, TAC in this case, is in all capitals. If the term is a proper name, such as Arizona Department of Transportation, capitalize it appropriately.

Including abbreviations and symbols used in the document is optional for this list. If there are no abbreviations or symbols, title the page as "Acronyms."

Location

The list of acronyms, abbreviations, and symbols starts on its own page after the table of contents.

Report Sections

The final report format does not have chapter divisions, but instead is divided into sections: Introduction, Recommendations, Findings, Methods, References, and Notes (optional). The report should number approximately 15,000 words total, including figures and tables.

Note that, in addition to the body of the report, the technical writer must also write the abstract for the technical report documentation page (TRDP).

Introduction

The Introduction presents, in brief, the foundational information and context needed to understand the research. This text may include definitions, key statistics, and historical summary. An effective introduction conveys the reasons for and objectives of the research, while avoiding step-by-step discussion of methodology or developments leading to the initiation of the study. Summarize the study's scope of work and indicate the type of transportation personnel, by function, who would use the information (for instance, highway designers and traffic safety engineers).

Recommendations

Most research studies culminate in actionable recommendations for ADOT's consideration. Final reports place recommendations front and center immediately following the Introduction section so that there is no need for the reader to skip to the end of the report to reach "the good stuff." The following points are to help develop this section:

- Use unambiguous language to ensure that recommendations are readily comprehended.
- Do not use terms like "should" and "must" that dictate certain actions to ADOT. Use language that shows the recommendations were developed for ADOT's consideration.
- Use bullet lists whenever helpful in succinctly presenting information clearly.
- Refer to findings sparingly in support of recommendations; allude to the next section (Findings) as need be.
- Recommendations must not introduce new material that has not been already documented in the technical memos.
- Methods are discussed in a later section and should be mentioned here only when necessary to clearly communicate a recommendation.
- Recommendations may be structured based on priorities, resources, or other types of tiers. Here is where a bulleted list may be helpful.
- Summarize the anticipated steps that would be necessary for implementing the recommendations.

Findings

Research findings provide the evidence on which the recommendations were developed. This section summarizes the findings and presents key data relevant to the previous section.

- Be selective. Not every finding or data point necessarily deserves a spot in the final report. What do practitioners want and need to know? What information is essential to establish confidence in the recommendations? Use bulleted lists, figures, and tables where appropriate.
- The Findings section must not introduce new material that has not been already documented in the technical memos.

Methods

This final report section is the shortest. How the research was performed in the study is of prime importance to the researchers, but less so to the practitioners. Remember that methodology has been documented in the technical memoranda, which will be published online.

- Summarize the research process with minimal detail.
- Focus on steps that led to the key findings and recommendations already presented.
- Use bulleted lists as appropriate.

References

> Because the Research Center accepts only the author-date citation style, this section is the alphabetical listing of sources for published information cited in the report text. Guidance for citations and reference list formatting is given later in this document. Do not use a numeric list of sources. In the typical final report, this section will be one to two pages long.

Notes (Optional)

> Use judiciously. This section showcases key supporting data and information — whether qualitative, quantitative, or narrative — that clarifies the information in the preceding sections. The Notes section is similar to an appendix or appendices but much briefer. This section is not a random collection of raw data but is carefully chosen to support and inform specific points made in Recommendations, Findings, and Methods.

> The Notes section will not exceed 10 pages; the fewer pages the better.

Formatting

In the future, the ADOT Research Center may distribute a final report template in Microsoft Word. The following formatting will still be compatible with that template when the time comes to use it.

Word Count

> The word count for final reports is 15,000 words, including figures and tables. Figures and tables count as 250 words each.

Columns

> Use a single-column, full-page format.

Font

> Use Calibri 11-point type for text, including table captions, figure captions, equations, explanatory text for equations, and text within figures and tables. Print figure and table captions in bold. Text in figures and tables may be smaller than 11-point type but not less than 8 points.

Margins

> One-inch side margins and top margins are required on all pages. Margins for pages with figures and tables may be slightly smaller if necessary.

Spacing

> Use line spacing of 1.15.

Paragraphs

Separate paragraphs with a single blank line. Do not set up paragraphs to have extra spacing before or after the paragraph. Do not indent paragraphs. Separate headings and subheadings from text with a single blank line.

Justification and Alignment

Left-justify report text. Do not full-justify text.

Columns of numerals entered in tables should be aligned by decimal points.

Headers and Footers

Headers and footers are not used. This means that footnotes are not allowed.

Widows and Orphans

Do not leave a single line of text alone at the top of a page (widow) or bottom of a page (orphan). Most word-processing programs have an automatic feature to prevent these. Do not leave a heading at the bottom of a page without at least two lines of text to accompany it. If feasible, do not split bulleted lists from their introductory sentences or leave a single bullet alone at the top or bottom of a page.

Headings

To comply with Section 508, use the Microsoft Word style gallery to set up the following headings. The main sections — Introduction, Recommendations, etc. — use the largest heading style, Section Heading. Keep subheadings concise and do not extend beyond the page's halfway point. Below are the required formats for headings.

SECTION HEADING

(14 pt. bold, all caps, centered)

FIRST-LEVEL HEADING

(11 pt. bold, all caps, flush left, separate line, skip a line before and after)

Second-Level Heading

(11 pt. bold, initial caps, flush left, separate line, skip a line before and after)

Third-Level Heading

(11 pt. italic, initial caps, flush left, separate line, skip a line before and after)

Fourth-Level Heading. (11 pt. bold, initial caps, paragraph indent followed by period, two spaces, and subsequent text; skip a line before only)

Page Numbering

Page numbers are centered at the bottom of the page. Number the body of the text with Arabic numerals (1, 2, 3, etc.) beginning with page 1. Page numbers run consecutively throughout the entire report, including appendices (i.e., 1, 2, 3, etc.).

Section 508

ADOT requires that consultants make final research reports electronically accessible according to the Section 508 of the Rehabilitation Act of 1973, as amended. For basic accessibility requirements, refer to the previous chapter on Section 508 compliance. For more detailed guidance, check the links under the Resources section in that chapter.

Figures and Tables

Requirements

The following requirements apply to figures and tables that are submitted in technical memoranda and their appendices and in final reports. (Research briefs do not have figures and tables.) Section 508 compliance — as already described in the Technical Memo and Final Report sections — is required.

Figures—any graphic representation not in text form: photographs, flow charts, graphs, etc.

Tables—any graphic representation of information in a columnar text form, whether alpha or numeric.

Figures and tables must be clear and legible. Labels within figures and text within tables must use a clear, legible sans serif font, like Calibri, which is preferred. Hand-drawn or hand-written graphics (or scanned images of hand-drawn graphics) are not acceptable.

Word Count

Allow a count of 250 words for each figure and table. Including text, the maximum word count for a final report is 15,000 words.

Quality

Clear, dark original line art and photographs of sufficient resolution are acceptable. Shaded areas must not obscure text, parts of figures, or table content.

Provide photographs with clear resolution in electronic form (300–600 dpi).

Create tables in Word. Do not convert a table to a Word object that cannot be edited.

Use consistent formatting for similar tables throughout the document. Label table rows and columns descriptively so that the reader can understand the information at a glance.

Color

See the Complying with Section 508 chapter for requirements regarding the use of color. Use colors in graphs that will be clearly legible on the monitor screen as well as in print. Be aware of how one color "reads" next to another; for instance, is gray distinct next to light blue? Adjust the color scheme accordingly so that all data is clearly represented.

- When charting data in graphs or charts, use colors that can be discerned by color blind readers; do not use red, yellow, or green -- the "stoplight" colors.
- Use color shades with enough contrast to be clearly distinguishable from each other.
- Use texture with fill colors, or chart with different styles of lines to add options so that charted data can be read clearly. Do not limit choices to solid fill colors and solid lines.

Font Size

Figures and tables must have no type smaller than Calibri 8 points. (This is in 11-point type. <small>This is in 8-point type.</small>) Use Calibri in a consistent size for similar tables and graphics throughout the report.

Placement

Photographs and other graphics are to be presented one image per figure. A pair of photographs is acceptable as a single figure when representing a before–and–after scenario. Do not group three or more photographs/images into a mosaic that requires directional captions, i.e. "clockwise from left."

All figures and tables must be referred to in the text in numerical order. Figures must appear close to the first reference in the text, but not occurring before that reference. Place figures so that they do not break text that belongs together (e.g., do not break a paragraph) but so they can be seen while reading the text (i.e., on the same page or facing page).

Tables must appear close to the first reference in the text, but not before. Place tables so that they do not break text that belongs together (e.g., do not break a paragraph).

Alternative Text

To be fully compliant with Section 508 requirements, technical memos and final reports must use alternative text (alt-text) for figures, tables, equations, and formulas. Write clear explanatory material for the alt-text description.

- Complete the title field that's above the alt-text description field. If the title is empty, the alt-text will not be recognized in the document.
- Write a clear explanatory description with fewer than 125 characters. For more information on writing alt-text, refer to the following Social Security Administration's Alternative Text Guide and the University of Washington web site: What Constitutes Good Alt-Text
- There are limited characters in the alt-text field. So don't use unnecessary words. Write, "This graph's axes show….." Do not say "This is an image of" or "This is a graph of."
- For the alt-text, write original text that specifically explains the feature and does not merely repeat text from the report's body.

Cite Sources

Document the proper attribution for any figures or tables taken from another source, whether copied verbatim or just adapted.

See References for information on how to cite sources and on the use of copyrighted materials. Give complete sources if the data shown in a figure or table was not independently collected but was taken from another source.

Copyrighted or Published Material

See Permission to Use Published Materials for more information.

Numbering Figures and Tables

Number figures and tables consecutively (e.g., Figure 1, Figure 2, Table 1, Table 2) in the final report all the way through the Notes section. Figures and tables in appendices are numbered consecutively for each appendix: Figure A-1 or Table B-2.

Word has an automatic feature to help with numbering figures and tables.

Number Alignment in Tables

Columns of numbers listed in tables must be aligned at the decimal point (or assumed decimal point). Do not center the numbers within the column.

Captions, Titles, and Axis Labels

Place figure captions below the figure separated by one blank line. Put a period after the figure number.

Place table titles above the table separated by one blank line. Put a period after the table number.

Graphs must have clearly labeled axes set in a clear, legible font, like Calibri, in a point size large enough to be easily read (8 points or larger).

Continuation of a Table

In the final report, tables do not extend beyond a page. When possible, design the table to fit on one page in technical memos as well. The final report does not focus on reams of data; that type of information, while useful in some circumstances, is to be presented in the technical memos and their appendices. Do not break a table at the bottom of a page. Instead, insert a page break before the table (the extra white space is allowable) and start the table at the top of the next page.

When a table continues for two or more pages in an appendix or technical memo, note the continuation — with "(Continued)" following the table title on each page. Avoid the need for this construction when possible by breaking into separate one-page tables if at all possible.

Units

In tables, clearly identify the units used. State the repeated units of measure or degree in the column headings. Do not repeat these units in the columns. Use the same measurement system that was used in collecting the data. If data are given in metric units (Systeme Internationale [SI] units), give conversions at the bottom of the table.

Section 508–Compliant Figures and Tables

Some Section 508 requirements have been mentioned already in the segments on alternative text and on color. The following also apply in order to be compliant. For further guidance, refer to the Resources section of the Complying with Section 508 chapter.

- Limit a figure to a single element, whether a graph, chart, or photograph; do not combine multiple elements like graphs and photographs and do not use sets or collages of photographs. Treat each element as a single numbered figure with its dedicated caption.
- Write captions clearly and completely.
- Use picture boxes and insert the item as a .jpg file. Do not use text boxes.
- For resolution, use a minimum of 300 dots per inch (dpi) for an item at actual size.
- To distinguish types of data when using pie charts, perhaps separate, or "break out," certain pieces of the pie for emphasis.
- Keep figures as simple as possible.
- Label each axis clearly and informatively.
- Place a figure immediately following the paragraph that first refers to it. Make sure that the paragraph discussing the relevant information also refers to the figure.
- Build simple tables in text. Do not use complex, or nested, tables.
- In Table Properties, designate the header row and/or header column.
- Write column and row headings clearly so that the information is readily identifiable.
- Write table titles clearly and completely so that information is readily identifiable.
- Do not merge cells.
- If a cell contains no data, find a way to note in the cell that there is no data. Depending on the data being presented, this can be done with a pair of hyphens, a zero, or possibly "N/A." Do not leave cells blank.
- Place a table immediately following the paragraph that first refers to it. Make sure that the paragraph discussing the table's data also refers to the table.
- If a complex, or nested, table is essential, insert it in a picture box as a .jpg file.

Not Used in Research Briefs

Do not use figures or tables in a research brief.

References in Technical Memos and Final Reports

Overview

Whenever quoting, paraphrasing, or referring to information or ideas (that do not fall into the category of "common knowledge") from a publication or outside source, credit the source in a bibliographic reference. Do not cite secondary sources such as encyclopedias.

Do not use the automated reference listing and citation feature in Word 2010. It may sometimes produce inaccurate results. Follow these guidelines and *The Chicago Manual of Style* instead.

Use of copyrighted material is covered in the section on Permission to Use Copyrighted Materials.

How to Cite References in Text

Author-Date Citation Style

When referring to work by another author or discussing that author's ideas, credit the author with a parenthetical citation at the point of reference in the text. Research Center reports use the author-date system of citation: The reference is given in parentheses in the text and has the surname of the author, the source's publication date, and, if following a quote, the page that the reference was taken from. There is no comma within the parentheses. See *The Chicago Manual of Style* for more detail on this style.

Examples:
- For a single author (Dodd 2002)
- For a pair of authors (Gagnon and Dodd 2007)
- For three or more authors (Peshkin et al. 2010)

Formatting References Page

Placement

The references page comes after the main text of the report but before any Notes section (an optional section in the final report) or before any appendix in a technical memo.

Content

The references section must contain every source cited in the text and only those sources. Carefully check that references are not repeated in different formats.

Source Order

Alphabetize reference entries by the primary author's surname. See *The Chicago Manual of Style* for details on what element is used for alphabetizing when there is no primary author.

Sources Cited More than Once

List a source only once on the references page regardless of how many times it is cited in the document.

Format for Entries

For listings of reference sources, use a modified version of the format given in *The Chicago Manual of Style*. In Word 2010, go to the paragraph menu, and under the indentation section, select a hanging indent for each reference entry. Do not list hyperlinks for references unless noting an exclusive online source; in that case, include the URL, along with the access date.

The first element is the author's name, which is inverted (surname first, given name, middle initial.). If more than one author, list the other authors' names in natural order (given name first, surname last). Give each author's name in full rather than using first and middle initials; using initials is allowed only when the original source does not list the full names.

For sources with three or more authors, list all authors by name in the reference entry and use "et al." in text citations. The exception is when two or more sources have the same author-date citation; see *The Chicago Manual of Style* for treatment of such cases.

A period separates author name from the date, which is a year only. A period separates this from the work's title. If it is a book, it is in italics; if a journal article, it is in quotes. The title is given in title case (initial caps on significant words).

A book's title is followed by the series or report number, if it is part of a series; place of publication followed by a colon; and publisher.

Journal article titles are followed by the journal name in italics and title case, the volume number, then without a space follow with the issue number in parentheses, a colon, and the page range of the entire article. The day or month of the issue may follow the page range, if needed. It is separated by a comma from the page range.

When the publisher's name includes the state name, omit the state abbreviation from the place of publication. When the state abbreviation is needed, use the two-letter postal code.

Examples:
- Phoenix: Arizona Department of Transportation.
- Thousand Oaks, CA: Sage Publishing.

When citing a source like the Federal Highway Administration (FHWA), use the acronym when citing in the text (FHWA 2008). When listing the source in the References, spell out the name followed by the acronym in parentheses.

Example:

Federal Highway Administration (FHWA). 2008. "Travel Demand Management."

Unpublished Works

Do not include unpublished works in the references. Cite them in the text with the author's name, a description of the author, and the date of authorship in parentheses.

Example:

(Joe Jones, ADOT engineer, unpublished data, March 12, 2002).

Interviews

Do not include unpublished interviews (or other personal communications) in the references. Cite them in the text with the contact's working title, work unit, and agency name, and in parentheses give the type and date of communication. Do not use personal names.

Example:

An urban planner from FHWA's Arizona Division confirmed several reasons for the choice (telephone interview, March 12, 2002).

Cross Check

Make sure that each reference matches its citation(s) in-the text. Make sure that only works cited in the text are included in the references section.

Reference Listing Examples

The following source listings show examples of recommended styles. (Some examples come from Transportation Research Board's *Information for Authors* and from *The Chicago Manual of Style*.)

Note punctuation and use of initials and italics. Also note that the formatting for ADOT research reports uses the FHWA report number listed on the report's TRDP.

Book

Newland, D. E. 1988. *Random Vibrations: Spectral and Wavelet Analysis*. New York: John Wiley and Sons, Inc..

Chapter or section in a book

McGee, A. M. 2003. "Graduated Driver Licensing." In *Injury Prevention,* J. R. Millman (ed.). Chapel Hill: University of North Carolina Press.

Article in a periodical

Figueroa, Carlos F. and Amy Nagel. 2017. "Breaking Down Project Complexities." *Public Roads* 81(2): 10-13.

Transportation Research Board (TRB) publication

Dewan, Shameem A. and Roger E. Smith. 2003. "Creating Asset Management Reports from a Local Agency Pavement Management System." *Transportation Research Record: Journal of the Transportation Research Board* 1853*:* 13–20.

Government report

Von Quintus, H. L. and A. L. Simpson. 2002. *Documentation of the Backcalculation of Layer Parameters for LTPP Test Sections.* Publication FHWA-RD-01-113. Washington, D.C.: Federal Highway Administration.

Seekins, Tom, Alan Blatt, and Marie Flanigan. 2013. *Automatic Crash Notification Project: Assessing Montana's Motor Vehicle Crash and Related Injury Data Infrastructure*. FHWA/MT-13-005/6608. Helena: Montana Department of Transportation, Research Programs.

ADOT research report

Dodd, Norris L., Jeffrey W. Gagnon, Susan Boe, Amanda Manzo, and Raymond E. Schweinsburg. 2007. *Evaluation of Measures to Minimize Wildlife-Vehicle Collisions and Maintain Wildlife Permeability Across Highways: Arizona Route 260*. FHWA-AZ-07-540. Phoenix: Arizona Department of Transportation.

Permission to Use Published Materials

Using Copyrighted Materials

Copyrighted figures (including photographs and diagrams) and tables may not be used unless written permission of the copyright owner is obtained and provided to the Research Center. Prior use of copyrighted figures and tables in another publication does not necessarily constitute permission to use it in a specific Research Center publication. Citing the source of figures and tables is not a sufficient substitute for permission. Materials produced by public-sector agencies do not require permissions.

When conducting the research study, consultants are responsible for securing the appropriate copyright releases and including the release statement in the text; legal liability for failure to do this falls on them. Usage fees are the responsibility of the consultant. Include the original copy of copyright permissions with the draft file submitted to ADOT to maintain in the study file.

For overall copyright explanations and resources, see U.S. Copyright Office.

Using Materials That Are Not Copyrighted

Previously published or presented, but not copyrighted, figures and tables may be excerpted on a small scale without permission but must include proper citation. The Research Center reserves the right to determine when it is necessary to obtain permission.

Include the original copy of copyright permissions with the draft file submitted to the Research Center to maintain in the study file.

Maps

Consultants frequently submit maps created using Google Maps. Google Maps encourages use of their maps in publications as long as their embedded attribution is not obscured. Please follow the online guidance that Google gives for crediting their maps and data providers. For specific usage allowed by Google, refer to Google Products Guidelines. For correct attribution according to Google, refer to Google Attributions Guide.

The Research Center requires repeating the map image's embedded attribution and placing it below the figure caption. The text of the attribution must say the name "Google" and the relevant data provider(s), such as "Map data: Google, DigitalGlobe". Place the attribution immediately below the figure caption in Calibri 9-point font. When consultants alter copyrighted maps, a note in 9-point Calibri below the figure caption needs to state that the original map was changed by the author.

Releasing ADOT Study Information

Consultants who conduct research for ADOT must request and receive written permission from the Research Center before releasing any information associated with the study. "Release" means an action such as publishing, presenting at a conference, discussing with the news media, or posting on a website.

Study information includes any data and technical findings resulting from the research study, in addition to published final reports and technical memoranda, regardless of whether they have or have not been approved by ADOT.

Research Briefs

Purpose

The two-page research brief is designed to stand as a separate, easy-to-read summary of the research study with the main focus being on its major recommendations suggested for ADOT's possible use. The potential audience includes practitioners and transportation decision-makers, but also the less technically specialized members of the media and the public. The brief needs to hold the attention of the technical practitioners while also being clear to everyone else. After giving context for the purpose of the study, the research brief will cover the study's findings, recommendations, and potential implementation by ADOT.

Content

Length

The brief is approximately 500 words.

Text Only

The research brief's content is only text, which will be submitted as a Word file to the Research Center. Do not include the following:
- Footnotes
- Figures
- Tables
- Citations and reference lists (Do not include text that requires a citation.)
- Appendices or attachments of any kind

Style Guidelines

For capitalization, grammar, etc., use the guidance given later in this style guide.

How to Write the Brief

The research brief is written after the final report. Read the final report and the study's technical memos for key points ("takeaways"). Interview the ADOT PM and any key stakeholders that they indicate. Keep the writing simple, clear, and short. Organize the content around these four headings:

- Why We Did It (the reasons ADOT needed the research)
- What We Learned (the key findings and recommendations)
- How We Did It (brief description of methodology)
- How We'll Use It (how the research will improve ADOT processes or products)

When writing the brief, keep the following points in mind:
- When writing about the recommendations and potential implementation, do not use terms like "should" and "must" that may pose legal obligations.
- Use terms the public will understand, avoiding jargon and acronyms. The brief uses less technical terminology than the technical memos and the final report. If certain terms are absolutely essential, define them simply and clearly.
- Keep the tone matter of fact and professional but plainspoken. Avoid an academic tone.
- Use short sentences about 15 to 20 words long.
- Keep paragraphs compact. Separate different ideas into shorter sentences so that the main points are obvious and easily understood.
- Simplify language by deleting unnecessary prepositions, clichés, and insider jargon.
- Make key points directly and concisely. Avoid vague language and padded paragraphs.
- Keep numbers simple and readable by rounding them up.
- Use bullet points or numbered lists to express multiple ideas in a paragraph.
- Do not include the name of the ADOT PM or quote them in the brief. Quote only the key stakeholders who were interviewed and accurately attribute their quotes.

Grammar and Style for All Deliverables

Word Use

Acronyms, First Reference

Spell out what an acronym stands for at its first use in the TRDP abstract and the main text, then put the acronym in parentheses immediately following. Acronyms defined in the abstract must be defined again on the first use in the body of the report. Do not use an acronym when the term appears only once in the text (except in special cases, such as when the acronym is more widely known than the phrase it represents).

Example:
> A high-occupancy vehicle (HOV) may sometimes travel in a reserved lane.

Acronyms, Plural

To make a plural of an acronym, simply add an "s." An apostrophe is not used unless the acronym is possessive.

Examples:

- Plural: High-occupancy vehicles would be called HOVs.

- Possessive: The HOV's speed was excessive.

ADOT

This is the acronym to use when referring to the Arizona Department of Transportation on second reference. Do not use "Arizona DOT." The relevant pronoun when referring to ADOT is "it," not "they." When not using the acronym, refer to it as the department (lower case) or the agency. Do not use department to refer to work groups within ADOT. Those are divisions, offices, sections, or groups.

a.m., p.m.

When referring to a specific time, use a.m. or p.m., lower case and with periods.

Use of the Word "Data"

ADOT reports use the word "data" as plural and "datum" as singular.

Examples:

- The data show a significant trend.
- Researchers analyzed these data using several methods.
- The datum is an outlier and has been excluded from the graph.

department of transportation (DOT)

If referring to transportation agencies in general, use this term. Spell out on first reference in lower case and use the acronym on following usage. If making plural, add the "s" to the word "department." When using a relevant pronoun, refer to a single DOT as "it" rather than "they."

Prefixes

Most prefixes do not require a hyphen in current usage. Simply add the prefix unless there is a chance that the new word will be misunderstood. Answers to questions about hyphenation of a particular word can be found in lists of words under each prefix in a collegiate-level dictionary.

Always use hyphens with "quasi-," "self-,"and "ex-" (when it means "former").

Examples:

- semiopaque, transoceanic, semipermeable.
- ex-marine, quasi-intellectual, self-discovery.
- recover/re-cover, recreate/re-create, resent/re-sent (depending on the meaning).

Pronoun Use

Pronouns must agree in number and gender with the nouns they reference. Readers need to be able to identify clearly which noun the pronoun refers to (the antecedent). Usually that means that the antecedent is the last subject used before the pronoun.

Remember that pronouns must agree with the singular or plural nature of their antecedents. Singular groups (ADOT, division, team) require singular pronouns and modifiers (it, this—not they, their, or these).

To emphasize the collective nature of a noun, specify the population meant: ADOT officials (plural) rather than ADOT (singular), the committee members (plural) rather than the committee (singular).

Gender-Neutral Pronoun Use

When gender is not specified and usage calls for a singular pronoun, it is acceptable in modern usage to use "they" or "their."

When referring to ADOT or some other governmental entity, use "it."

States

In report text, spell out names of states. To abbreviate state names in references, tables, and figures, use the two-letter postal code. Do not use conventional abbreviations.

Examples:

- *In text:* Glendale, Arizona, is in the Valley of the Sun.
- *In references, tables, and figures:* New Orleans, LA.; Tempe, AZ; Baltimore, MD
- *Do not use:* The car is registered in San Diego, Calif., but it was bought in Minneapolis, Minn.

Trademarks

Try to avoid using names of trademarked products when referencing generic concepts (e.g., do not use "Excel" when "spreadsheet" is meant). When using trademarked or registered names, do not use the registered trademark (®) or trademark (™) symbol after the name. Trademarked or registered names are always capitalized.

United States, Abbreviating

Spell out "United States" when referring to the country as a noun. Abbreviate (without periods) when using as a modifier of some other term.

Exception: According to FHWA standards, use periods when referring to a roadway, like U.S. Route 60 (U.S. 60 upon second reference).

Examples:

- Spell out: The United States faces an overpopulation of deer.
- Abbreviate: The US standard allows that usage.

Years

When describing decades, simply add an s. If the "19" or "20" is not used, place an apostrophe before the year to take its place. As within contractions, the apostrophe indicates that information has been left out.

Example:
during the 1980s and '90s

Internet and Technology Terminology Guide

Handling Technology Terms

Some tech terms have become commonplace and no longer need to be capitalized (e.g., web, website). Tech terms that are brand names are capitalized and use trademark symbols when applicable (e.g., Excel, Macintosh). Brand names that begin with a lowercase letter (e.g., iPod, iPad) always use the lowercase first letter, even at the beginning of a sentence.

Some terms appear frequently in technical documents. The Research Center recommends the following usage. Please note spelling and hyphenation for these terms:

- Screenshot as one word.
- Drop-down menu uses the hyphen consistently.
- Email without a hyphen.

Note capitalization with these terms:

- Macintosh; PC; personal computer.
- hypertext transfer protocol (HTTP); a transfer protocol; hypertext.
- Internet protocol (IP); the Internet; the net; an intranet.
- Open Source Initiative (the corporation); open-source platforms.
- World Wide Web Consortium; the World Wide Web; the web; a website; a web page.

The basic alphabet keys, as well as all named keys, are capitalized even if they are lowercased on a particular keyboard. Menu items and icon names are usually spelled and capitalized as in a particular application. Acronyms for file formats are rendered in full capitals. Notice that quotation marks are not necessary to designate menu items as long as they are capitalized:

- The function key F2 has no connection with the keys F and 2.
- The Option key on a Mac is similar to the Alt key on a typical PC.
- Choosing Cut from the Edit menu is an alternative to pressing Ctrl+X.
- Save the file as a PNG or a GIF, not as a .jpg.

URLs

Web addresses must be functional if feasible. If it is known that a particular web address is no longer valid, indicate that in parentheses following the link name.

In a printed work, if a uniform resource locator (URL) has to be broken at the end of a line, the break must be made:

- *After* a colon or a double slash (//).
- *Before* a single slash (/), a tilde (~), a period, a comma, a hyphen, an underline (_), a question mark, a number sign, or a percent symbol.
- *Before or after* an equals sign or an ampersand.

Never add a hyphen to a URL to denote a line break, and never allow a hyphen that is part of a URL to appear at the end of a line. Keep in mind that a manually broken link (by a space or soft return, for example) will no longer be functional.

Example:
http://www.azdot.gov/TPD/ATRC
/Research/emphasis_areas.asp

Capitalization

Captions and Titles

In titles, headings, figure and table captions, and the like, capitalize every word except articles (a, an, the), conjunctions (and, but, for, or, nor), and prepositions of four letters or less (to, of, in, with, etc.). When using hyphenated words, capitalize the major elements.

Examples:
- Hyphenated words: State-of-the-Art Bridge Design; Planning for Medium-Sized Communities
- Longer preposition: Travel Predictions and Models Beyond the Year 2000; Damage Observed Between Mileposts 60 and 65

References to Chapters, Figures, or Tables in Text

When referring in the text to a chapter, figure, or table, capitalized citations are required.

Example:
Chapter 1, Figure 6, Table 9

Names of Roadways

Titles of roadways must be written consistently throughout the document. Upon first reference, spell out the name: Interstate 10 (not Interstate Highway 10). The following are the ways to write titles of Interstates upon second reference:

- I-35
- I-35W and I-35E (no spaces)

Use "route" when naming roadways other than Interstates. Roadways and highways, such as state routes and U.S. routes, are formatted on second reference as [type of roadway] [space] [number] (notice that there are no hyphens, unlike the Interstates):

- State Route 114 (first reference), SR 114 (second reference).
- U.S. Route 281 (first reference), U.S. 281 (second reference). Notice that U.S. uses periods in this case, according to FHWA standards.
- State Loop 202 (first reference), Loop 202 (second reference).

portland cement

The word "portland" is lower case when referring to portland cement.

East, West, North, and South

Capitalize directions with a state, city, or any other geographical region only if it is part of a proper name. Regions familiarly accepted as proper names may be capitalized. Simple directional modifiers are not capitalized when they precede a proper name.

Examples:

North Carolina, West Texas or west Texas, Gulf Coast or gulf coast, Gulf of Mexico, Midwest, western United States, southern Louisiana

Position Titles

Do not capitalize a person's position title, such as project manager, director, etc. Capitalize position titles only if they come before the name and are official titles, such as President Tyler, Congressman Smith, Director Jones, etc.

Examples:

John Smith, research assistant; Tom Smith, director of the center

Programs or Research Items

Capitalize a program or research item (database, software, etc.) only if it is an official proper name or title. If it is a generic product type, do not capitalize it.

Examples:

- intelligent transportation systems (ITS), ground-penetrating radar (GPR), ADOT districts.
- Multimodal Planning Division, the Holbrook District.

"State," "City," and "Federal"

Do not capitalize "state," "city," or "federal" unless referring to the specific, official governmental entity.

Examples:
- The State of Arizona [governmental entirety] employs many workers, and the City of Phoenix purchases supplies.
- The geographic area covered by the state of Arizona [geographic reference] contains several cities, and the city of Phoenix is not far from the city of Mesa, Arizona.
- The program receives federal funding.
- The Federal Highway Administration distributes the funds.

District

Do not capitalize the word "district" unless it refers to a specific agency name.

Examples:
- Three ADOT districts use the technique.
- The Prescott District expects to implement it during fiscal year 2012.

Punctuation

Bulleted Lists

When a document lists complex material, it is helpful to pull the list out of the paragraph and separate it with bullets (•) for readability. Use bullets for any listing of three or more items and for listings of two items if they are longer than a line of text.

Use bulleted lists instead of numbered lists unless the items have a specific order or ranking. If using a numbered list, capitalize, indent, and punctuate it the same way as a bulleted list.

When creating bulleted and numbered lists:

- Use a phrase or sentence to introduce the list and end it with a colon (:).
- Ensure that the introductory sentence clearly identifies whether all items apply (use "and") or whether they stand independent (use "or"). Generally, items in the list will not contain any conjunction linking one item to another.
- For all bulleted lists, whether they are full sentences or phrases, capitalize the first word of each item—even for sub-bullet items.
- For all bulleted lists, if they are full sentences, end the item with a period (or, rarely, a question mark)—even for sub-bullet items. If the items are only phrases, do not end with a period or other form of punctuation.
- Use parallel grammatical construction within bulleted lists. For example, begin each item with a verb or a noun (depending on what is appropriate given the introductory phrase) or make each item a complete sentence. Do not mix complete sentences with phrases.
- Insert a blank line between a completed list and the next paragraph.
- Do not double space between items in a list.

Commas in a Series

When listing a series (three or more items) within text, use a serial comma (i.e., the comma before the "and"). Especially in technical writing, using the serial comma can make the difference between a clear sentence and an unclear one.

When elements within a series contain internal commas, use a semicolon to separate the elements; otherwise the series can be confusing.

Examples:

- The authors were Smith, Johnson, and Walker. (serial comma)
- The authors were Smith, chairman; Johnson, treasurer; and Walker, secretary.

Commas in Compound Sentences

A true compound sentence contains two full sentences joined by a conjunction. A sentence with compound elements generally contains one subject and two verb phrases. Use a comma to separate the parts of a compound sentence but no comma in a sentence with compound elements.

Examples:

- This report identifies some of the key policy questions, but local officials must determine answers at the grassroots level. (compound sentence)
- This report identifies some of the key policy questions regarding the study and sheds light on some of the possible answers. (compound elements)

Commas with a State or a Year

Use a comma before and after the name of a state that follows a city. A comma also comes before and after a year that follows a month and day (but there is no comma between a month and year only).

Examples:

- Flagstaff, Arizona, is the site of Northern Arizona University.
- January 10, 2009, is the date of the meeting.
- February 2010 will be dedicated to a literature search.

Hyphens in Modifying Phrases

Place a hyphen between words that serve as a modifying phrase. The purpose of the hyphen is to help clarify for the reader that both words modify the word that follows. In certain constructions, leaving the hyphen out can prove confusing. Industry usage overrides guideline style (e.g., portland cement concrete). Check for consistency in the use of phrases or words repeated within a report.

Examples:

- Figure 1 shows a cross section. The cross-section diameter is 1 inch.
- high-resolution photograph, 12-year period, 5-m span, 5-ft wall or 5-foot wall
- crumb-rubber mixture (but no hyphen in "crumb rubber" if used as a noun)

Hyphens in Modifying Phrases that End in "-ly"

If the modifying phrase contains -ly, do not use a hyphen.

Example:
a thermally induced reaction

Em Dashes

Em dashes (also denoted by 1/m) are used to separate thoughts—and insert information—within sentences. Though often represented by two hyphens (--), the proper symbol is the em dash. To create this symbol in Word 2010, type CTRL+ALT+Num-. (To create an en dash, type CTRL+Num.)

Spacing after Periods

Use only a single space after a closing period or other closing punctuation.

Parentheses and Periods

When parentheses or brackets enclose a stand-alone sentence, the period falls inside the parentheses. (This sentence is an example.) If the material in the parentheses is part of a sentence, the period falls outside the parentheses (like this).

When a secondary set of parentheses occur inside parentheses (as here (i.e., the text being read now)), the interior parentheses should be changed to brackets [like this].

Punctuation and Quotation Marks

Commas and periods always go inside quotation marks. Semicolons and colons normally go outside quotation marks. Question marks and exclamation points depend on use.

Examples:

- The article, "How to Grow Red Tomatoes," was replaced by "How to Grow Yellow Onions"; we finally settled on "How to Encourage Gardening."
- Did you read "The Tell-Tale Heart"?
- He asked, "Where are you going?"

Titles in Italics Versus Quotation Marks

Generally, when referring to documents in text, the titles of long works (e.g., books, journals) are in italics, and the titles of short works (e.g., chapters, journal articles) are in quotation marks. The titles of works that are not published (e.g., course titles) are usually set in quotation marks.

Examples:

- Place the following types of works in italics: reports, books, manuals, journals, proceedings, newspapers, and dissertations.
- Place the following types of works in quotation marks: articles, book chapters or sections, papers, pamphlets, courses, seminars, classes, and projects.

Spelling

American Versus British Spellings

Use conventional American spelling for Research Center reports.

Examples of American/British spellings:

American Spelling	British Spelling
traveled	travelled
acknowledgment	acknowledgement
judgment	judgement
focused	focussed
color	colour
toward	towards
backward	backwards
defense	defence
naturalization	naturalisation
a historical	an historical

Spell Check

Using a spell check tool is helpful, but cannot ensure correct spelling. Carefully re-read the text for words that are spelled correctly but that are misused.

Numbers

When to Spell Out Numbers

The rules prescribed here differ from those in *Chicago* and better meet the needs of technical reports. Within a sentence, according to these rules, spelling out and using numerals may be combined.

Spell out:

- Numbers between one and nine (e.g., eight cars)
- Rankings, or ordinals, of first through ninth (e.g., the ninth car)
- A number that begins a sentence (e.g. Eighty-seven percent of the people surveyed liked the idea.)

Use a numeral for:

- Numbers 10 and greater (e.g., 10 trucks)
- Rankings, or ordinals, of 10 and greater (e.g., the 10th truck, 21st century)*
- Percent (e.g., 5 percent)
- Notations with measurements (e.g., 5 m, 2 ft)
- Time when used as data (e.g., 5 seconds)
        *Do not superscript ordinal numerals (e.g., 17th).

According to these rules, the following example is correct.

Example:

Researchers counted five cars and 10 trucks.

Commas with Numerals

Use commas to separate digits into groups of three when the number is greater than four digits. When a number in text is four digits, it does not have a comma (although commas might be needed in tables and figures for alignment). Dollar amounts of four digits or more may use or omit a comma.

In tabular columns that show both four-digit and five-digit or greater numbers, use commas as needed for clarity, alignment, and appearance.

Examples:

- 100,000 and 1000.
- $1000 or $1,000.

Decimals, Not Fractions

Where reasonable, use decimals instead of fractions. Place a zero before the decimal point for quantities less than one. Industry usage in some instances (e.g., references to equipment or tools) may require use of fractions. If using fractions, use a consistent form throughout (1/4 or ¼).

Example:

0.25 (not 1/4 or ¼ or .25)

Measurements, Symbols, and Equations

American Versus Metric Units

The PI must give measurements in the system that was used to take them. If measurements are taken using Systeme Internationale (SI) units, the measurements must be followed in parentheses by their equivalent customary American units. Round metric values to the same number of digits as were in the American number (11 miles at 1.609 km/mi equals 17.699 km, which rounds to 18 km). Convert mixed American units (feet and inches, pounds and ounces) to the smaller unit before converting to metric rounding (10 feet, 3 inches, = 123 inches; 123 inches x 25.4 mm = 3124.2 mm; round to 3124 mm).

Common Unit Abbreviations

The following are some units and their abbreviations.
Metric Units

- liter   L
- meter   m
- millimeter   mm
- hectare   ha
- kilogram   kg
- newton   N
- kilopascal   kPa

Do not use the prefixes deci- or deca-.

American Units

The following are some American units and their abbreviations to use:

- inch   inch or inches (do not abbreviate)
- foot   ft
- yard   yd
- mile   mi
- ounce   oz
- pound   lb
- ton   ton
- quart   qt
- gallon   gal
- barrel   bbl

Do not use plural forms such as lbs.

Numerals with Unit Symbols and Abbreviations

Use numerals with English and metric abbreviations and symbols in text, tables, and figures.

Example:
    a width of 12 mm (not 12 millimeters)

Space:

Place a space between the numeral and the unit. Leave a space between the degree symbol and the temperature system abbreviation.

Examples:

- 5 kg (not 5kg)
- 5 ft
- 5° F

Period:

Do not place a period after the measurement abbreviation unless it is at the end of a sentence.

Example:

5 kg (not 5 kg.); but a punctuating period may appear following a metric unit at the end of a sentence, "The weight is 5 kg."

Plurals:

Do not add an "s" to symbols or abbreviations. If measurement units are spelled out rather than abbreviated, the plural form may be used.

Examples:

- 10 kg not 10 kgs
- 5 ft
- 6 yd not 6 yds

Adjectival phrase:

Use a hyphen between the numeral and the unit abbreviation when in an adjectival phrase.

Examples:

- a 5-m wall
- a 5-ft wall

When to Spell Out Units

Spell out metric or English units when not used with a numeral. Use unit abbreviations in figures and tables. In text, be consistent in using numerals with abbreviations.

Examples:

- The amount is given in meters.
- The project studied a 5-mile pavement section.

Percent

Write out "percent" in text and use a numeral with it, even for numbers less than 10. In a figure or table, use the percent sign with no space between (or include percent designation in the column heading).

Examples:

- The increase was 5 percent.
- 10% (in a table or figure)

Slope

Express slope in nondimensional ratios with the vertical component shown first and then the horizontal (V:H). Compare the same units (meters to meters, etc.). For example, base tapers previously shown as 8:1 will now be shown as 1:8.

Time

If units of time (seconds, hours, etc.) are specific measurements, then use a numeral with them and abbreviate. If they are more general, spell out the unit.

If using a numeral, abbreviations (with no periods) may be used for units of time:

- sec (not s)
- min (do not then abbreviate minimum as min.)
- hr
- yr

Examples:

- The study ran for two years.
- Researchers examined data at 2 -sec intervals.

Temperature

When expressing temperature using a degree symbol, use the degree symbol next to the number and leave a space between the symbol and the measurement abbreviation: (10° C)

Symbols

Use the proper symbols to denote functions in equations, text, and illustrations. This includes the multiplication sign (*) and the minus sign (−). When creating equations, also refer to the Complying with Section 508 chapter.

Remember to verify the accuracy of any symbols used in the report when the manuscript is reviewed at the various publication stages.

Example:

5x * 10r = 35yz

Equation Numbering

ADOT guidelines require that equations be numbered consecutively throughout the document (e.g., Eq. 1, Eq. 2). When creating equations, also refer to the Complying with Section 508 chapter.

Equation Placement

Place the equation on a separate line, using line space to separate it from the paragraph. Indent or center each equation.

Place the equation number in parentheses flush with the right margin on the last line of the equation elements.

Example:
Eq. 1 explains my hypothesis:

$$a + b = c \hspace{15cm} \text{(Eq. 1)}$$

Creation of Equations

When creating equations, refer to the Complying with Section 508 chapter. If the report uses mathematical symbols, use the equation editor to ensure their accurate reproduction. This creates a unit that appears during PDF conversion as a graphic, but still allows revision to the source file as needed.

If embedding mathematical symbols in text as font characters, the best choice is to use the normal text or symbol character set in Word. Do not use other character sets, because they do not convert reliably to PDF.

Equation Symbol Identification

Identify symbols after their first use to aid the reader. This identification usually appears in a "where" list. Be consistent throughout the document whether using a list to identify symbols or using paragraph form. Also be consistent in introducing the list (colon or not, etc.). If in paragraph form, use the semicolon (;) to separate each item in the list.

Example:

$$y = mx + b \hspace{15cm} \text{(Eq. 1)}$$

Where y = the y value (ordinate)
                x = the x value (abscissa)
                m = slope
                b = y-intercept

Writing Tips

Always write clearly and professionally, whether producing a technical memo or a final report.

- Eliminate jargon or buzzwords. If industry terms are appropriate, make sure that their meaning is clear for the average reader and define on first use if necessary.
- Be plain-spoken but businesslike. Avoid using colloquialisms, field shorthand terms, or conversational language.
- Use generic, third-person references like "the team" rather than personal names or first-person references. Write in passive voice if necessary.
- Delete references to internal processes. Do not mention procurement documents, technical advisory committee (TAC) directives, project manager decisions, or other internal workings of a study. Write a deliverable to capture the work performed and its results.

All written deliverables can benefit from well-organized sentences and concise, direct language that replaces wordy phrases with fewer words. To give some guidance, the Research Center reprints, with permission, this online excerpt from *Daily Writing Tips*, "10 Techniques for More Precise Writing."

- ***Avoid Vague Nouns***

  Phrases that are formed around general nouns such as *aspect*, *degree*, and *situation* clutter sentences.
  Before: "She is an expert in the area of international relations."
  After: "She is an expert in international relations."

- ***Use Words, Not Their Definitions***

  Replace explanatory phrases with a single word that encapsulates that explanation.
  Before: "The crops also needed to be marketable so that families would be able to sell any yields that exceeded what they personally required."
  After: "The crops also needed to be marketable so that families would be able to sell any surplus."

- ***Avoid Noun Strings***

  Reorganize sentences to eliminate series of nouns used as adjectives.
  Before: "The lack of a secure transfer may hamper computer security incident response efforts."
  After: "The lack of a secure transfer may hamper responses to computer-security incidents."

GRAMMAR AND STYLE

- ***Convert Nouns to Verbs***

  When a sentence includes a noun ending in –*tion*, change the noun to a verb to simplify the sentence.
  Before: "They will collaborate in the creation of new guidelines."
  After: "They will collaborate to create new guidelines."

- ***Reduce Verb Phrases to Simple Verbs***

  Identify the verb buried in a verb phrase and omit the rest of the phrase.
  Before: "The results are suggestive of the fact that tampering has occurred."
  After: "The results suggest that tampering has occurred."

- ***Replace Complex Words with Simple Ones***

  Choose simpler synonyms for multisyllabic words.
  Before: "The department will disseminate the forms soon."
  After: "The department will pass out the forms soon."

- ***Avoid Expletives***

  Don't start sentences with *There is*, *There are*, or *It is*.
  Before: "There are many factors in the product's failure."
  After: "Many factors contributed to the product's failure."

- ***Eliminate Prepositional Phrases***

  Use possessives to eliminate phrases starting with the preposition *of*.
  Before: "The decision of the committee is final."
  After: "The committee's decision is final."

- ***Reduce Wordy Phrases to Single Words***

  Replace phrases that signal a transition with simple conjunctions, verbs, or other linking words.
  Before: "Due to the fact that the project is behind schedule, today's meeting has been postponed."
  After: "Because the project is behind schedule, today's meeting has been postponed."

  —Source: *Daily Writing Tips*, www.dailywritingtips.com