

Center for Transportation Research

Style Guide

A Guide for Proofreaders and Editors of TxDOT Reports

Prepared by the editors of the

Center for Transportation Research
The University of Texas at Austin

Table of Contents

Introduction	5
Proofreading Checklist	7
Capitalization, Punctuation, Spelling, and Style.....	9
A to Z Style Guide	11
Appendix A: Pagination.....	51
Appendix B: Front Matter	53
Appendix C: Illustrations	67
Appendix D: Metrication.....	69
Appendix E: References	71
Appendix F: Word List.....	73
Appendix G: Acronym List.....	77

Introduction

Purpose of This Guide

This style guide provides the specific standards and accepted usage required to achieve consistency within a research document. It incorporates accepted principles of grammar and usage that ensure that reports are effective in communicating important research results to intended audiences. While issues of format (e.g., fonts, layout, and headings) will be left to individual authors, this guide can be used by editors/proofreaders needing to resolve particular issues regarding accepted usage. For example, the appendix provides frequently used acronyms and other abbreviations.

If a topic is not covered in the style guide, consult the following references in the order listed:

1. *The Chicago Manual of Style*, Thirteenth Edition (or later)
2. *Merriam-Webster's Collegiate Dictionary* (or any complete dictionary)
3. *The Civil Engineering Handbook* by W. F. Chen
4. *Dictionary of Science and Technology* by Larousse
5. *The New York Times Manual of Style and Usage* (Revised 1999)

Tools

This style guide contains specific tools to help proofreaders prepare reports. These tools include:

- Proofreading checklist
- A to Z style guide: An alphabetical listing of words and terms frequently used in transportation reports
- Word list: An alphabetical listing of words and terms frequently used by researchers preparing transportation reports
- Acronym list: A list of common transportation acronyms

Acknowledgement

CTR thanks Chris Pourteau and Michelle Walker of the Information and Technology Exchange Center (ITEC), Texas Transportation Institute, Texas A&M University System. Certain discussions and grammatical principles included in this style guide are borrowed directly from ITEC's comprehensive *Guide for Preparing, Editing, and Submitting TxDOT Technical Reports*.

Proofreading Checklist

Note: The following applies to research reports only. Project Summary Report formatting and organization will be addressed in another publication.

Organization

-
- DOT Form F 1700.7 (page i, a single page, no page number)
 - Front matter (page numbers centered, lowercase roman numerals positioned as footers, except on title page)
 - Title page (page iii after DOT Form [page i] and blank page [page ii])
 - Copyright (page iv)
 - Disclaimers (page v)
 - Acknowledgments (page v, names of TxDOT project director [PD] and project monitoring committee [PMC] members and their respective affiliations)
 - Products (page v) author must specify where products, if any, are located in the report
 - Table of Contents (page vii)
 - List of Figures (required by TxDOT)
 - List of Tables (required by TxDOT)
 - Chapters
 - Reference list
 - Appendices
-

Grammar and Usage

-
- Check spelling for correctness and consistency.
 - Check grammar (syntax) for correctness and consistency.
 - Check for agreement between subject and verb.
 - Check capitalization.
 - Check hyphenation.
 - Check punctuation for correctness and consistency.
 - Check abbreviations and acronyms for consistent spelling and punctuation.
 - Check for clear antecedents.
 - Check for proper insertion of serial comma.
 - Check to ensure that sentences don't shift in tense or person.
 - Check for appropriate word usage (keeping in mind the intended audience).
 - Annotate report with a marginal question mark (?) or the word "Rewrite" for vague or confusing language; specify what needs clarification and why i.e., query authors.
 - Check numbers in text for style (e.g., numerals or words).

Proofreading Checklist, Continued

Mechanical Details

- Check heading numbers for correctness and consistency.
- Check lists for parallel structure and punctuation.
- Check to ensure that equations are numbered and that the numbering is correct.
- Check use of italics, underlining, and quotation marks.
- Check references cited in text against the reference list (all references cited in text should be included in the References page, and all references in the References page should be cited in the text, unless the References are meant to serve as a comprehensive bibliography, in which case the Reference page is replaced with a “Bibliography” page).
- Check format of references cited in body text.
- Check for English units (with metric equivalents, if used, following in parentheses; if metrics used, English equivalents must be included following the metric units).
- Check cross-references to other chapters, sections, figures, and tables.
- Check figure/table numbers for correctness and consistency.
- Ensure that figure captions and table titles are distinguished adequately from text (by change in font or use of italics).
- Check for correct textual references to all figures and tables.
- Check to make sure that figures and tables immediately follow their first mention in the text.
- Check spacing before and after figures, tables, lists, and photos.

Note: In checking the items above, it is a good idea to make several passes through the report (i.e., first pass: grammar/formatting; second pass: heading and numbering; third pass: figure numbering; fourth pass: table numbering; fifth pass: equation numbering). These passes can be made for each chapter as it is completed or for the entire report. All passes following the initial pass will generally require only a quick flip through.

Capitalization, Punctuation, Spelling, and Style

Introduction

The alphabetical guidelines beginning on Page 11 should serve to answer many specific questions related to language usage. If you have other questions not addressed here, please direct them to the CTR Senior Editor.

Consistency and Correctness

Editors will mark consistency and correctness issues as necessary changes. Beyond the detailed requirements of these guidelines and those mandated by TxDOT, consistency of style and correctness of grammar will drive the editor's work in reviewing reports.

Example

If authors use the American spelling for "traveled," ensure that they don't adopt the British spelling "travelled" halfway through the report.

In this example, both spellings are technically correct. But using both implies carelessness to the reader.

Editing References

TxDOT mandates the use of *The Chicago Manual of Style* (13th edition or later) for questions regarding punctuation, mechanics, documentation, and other points not specified here. This manual can be purchased at most bookstores. Other reference sources include:

- *Merriam-Webster's Collegiate Dictionary* (10th edition or later) for spelling and word choice; and
- *TRB Guidelines* for citing references (TRB style for reference citation is an acceptable substitution for *Chicago's*).

What is style?

Style encompasses a number of elements, including a writer's voice, word choice, spelling, and tone. Consistency of style is as important as choosing the right style for the right purpose.

For example, *passive voice* helps maintain objective distance between a researcher and his or her research. It is most appropriate to use that style (or voice) when describing the methodology behind the research. However, passive voice can often seem verbose, awkward, and replete with jargon to a reader who isn't a specialist in that field of study. Thus, in the case of guidebooks, manuals, or other instructional materials—where the purpose is to tell someone, step by step, how to successfully complete a process—*active voice* is more appropriate.

Style can also refer to mechanical questions like the serial comma question. Is it "red, white and blue" or "red, white, and blue"?

In many cases—including the serial comma—there is no *right* answer. Like fashion, some mechanical issues go in and out of style. An example of this is evident between *The Chicago Manual of Style*, which specifically recommends the serial comma, and *The Associated Press Stylebook and Libel Manual*, which doesn't use it at all.

Stylistic issues are almost *never* presented as necessary changes when CTR edits reports. Exceptions include situations in which the reader's understanding will be compromised or situations in which the style is inconsistent throughout the report. Except in these cases, stylistic issues are usually left to the author's discretion.

A

A/An

Use “a” before words that begin with consonant sounds.

Use “an” before words that begin with vowel sounds.

When using these articles with abbreviations and acronyms, select the correct article based on how the abbreviation or acronym is to be read.

Abbreviations

No internal spaces in abbreviations except in the case of a person’s initials.

Use letter abbreviations (like “in.”) with measurements rather than quotation or prime marks.

Abbreviations of measurements should always be singular with no punctuation, except in the case of “in.” for the word “inch.”

Example

1.3 MPa, 16 ft, 36 lb, 75 mph

Use “a.m.” and “p.m.”

Remove the periods from the abbreviation for U.S. 183: US 183.

“Figure,” “Equation,” and “Reference” should be abbreviated (i.e., Fig, Eq, and Ref) with no punctuation when used in parentheses. However, “Figure” should always be written out when used in a caption.

To make an abbreviation plural, add only an “s.” If this creates a confusing abbreviation, add an apostrophe with the “s.” Add apostrophe also if the abbreviation is used as a possessive.

Examples

Ph.D.’s, xs and ys, M.A.’s, the three Rs, all SOSs

See the list in Appendix G for more abbreviations.

Acronyms

Acronyms are usually written with all caps and no internal periods. One exception to this general rule is “TxDOT” — with a lowercase x.

In general, acronyms are not capitalized when they are spelled out unless proper names are involved.

Examples

plasticity index (PI), equivalent single-axle load (ESAL), Federal Highway Administration (FHWA), United States of America (USA)

To make an acronym plural, add only an “s.” If this creates a confusing acronym, add an apostrophe with the “s.” Add apostrophe also if the acronym is used as a possessive.

Examples

RPU’s, ESAL’s, CPU’s, IOU’s, SOS’s, RWIS’s, VAMS’s

Continued on next page...

A, Continued

Acronyms (cont'd)

In CTR reports, acronym usage should allow each of the sections below to function as a stand-alone document. Write out the full term the first time it appears in the text. Include the acronym in parentheses. Thereafter, refer to the acronym only. Redefine the acronyms at the beginning of each of the following sections.

When an acronym appears in a title or heading, do not use the acronym; rather, write out the full term, no matter where the heading appears in the report.

Acronyms appearing in titles of works are not subject to the aforementioned rules concerning acronym usage in CTR reports and should be recorded exactly as they appear on the title of any given work. However, use appropriate acronyms in the other parts of the reference.

See Appendix G for a list of commonly used CTR and TxDOT acronyms.

Active Voice

Active voice attributes an action to a person or thing. Passive voice focuses on what was done rather than who did it.

Examples

Active: The researchers analyzed the data.

(This example says exactly who performed the action.)

Passive: The data was analyzed by the researcher.

(This example is less direct and has a weak structure. Sometimes “by the researcher” is left off completely, and the reader wonders who performed the analysis.)

It is preferable to use active voice. See section on voice for more information.

Adverbs

Adverbs ending in “ly” that appear before adjectives are not hyphenated. The “ly” serves as the connector, making a hyphen redundant.

Example

Environmentally induced

Affect/Effect

Do not confuse the verb “affect” with the noun “effect.”

Examples

Changing the gradient affects the test results.

The effects of the water ingress were seen immediately.

all/all of

Either construction is acceptable, with “all of” required before a pronoun:

Examples

All of the data were analyzed.

All the data were analyzed.

Twelve individuals, all of whom were surveyed, participated in the project.

A, Continued

Among/Between	<p>“Between” should be used only when two persons, objects, or ideas are being discussed. Three or more items in a discussion require the use of “among.”</p> <p>Examples</p> <p>We chose the candidate from among 405 applicants.</p> <p>The contest was between two opponents.</p>
Ampersand (&)	<p>Do not use the ampersand symbol. Write out the word “and.”</p>
And/Or	<p>Avoid using “and/or” or similar constructions when writing. Use either “and” or “or” whichever is most appropriate.</p>
Antecedents	<p>Ensure that sentences have clear antecedents. For example, the word <i>this</i> should most often be used as a demonstrative adjective (with a noun following), rather than as an all-inclusive pronoun. Including the noun avoids confusion as to what is being referenced.</p> <p>Example</p> <p>This was unexpected. (No clear reference)</p> <p>This finding was unexpected. (Reference made clear)</p>
Appendices	<p>All highly detailed information should be included in an appendix rather than in the report. Consequently, some appendices may be more voluminous than the report itself. Authors should include in the appendices such material as the following:</p> <ul style="list-style-type: none"> • Manuals, guidelines, or specifications • Survey or questionnaire forms • Specific documentation and further discussion of research findings • Mathematical analyses • Computer program printouts (source codes) • Material that is supplemental to the research but which a reader may want to review
A Priori	<p>Do not italicize this adjective, which means “derived by reasoning from self-evident propositions.”</p> <p>Always include a space between the elements of the word, “a” and “priori.” Do not hyphenate.</p> <p>Example</p> <p>The findings are based on a priori assumptions.</p>

A, *Continued*

ASTM standards and specifications

American Society for Testing and Materials (ASTM) standards or specifications should include the standard/specification followed by its title in quotation marks.

Example

ASTM C1240, “Silica Fume for Use in Hydraulic-Cement Concrete Mortar”

Alternatively, authors can omit the title and identify the standard/specification by using only the designation (e.g., ASTM C1240).

Audience

Although the report will be read by other professionals in the transportation field, it should be clear enough for a lay audience, i.e., for someone who lacks specific knowledge of the field.

All rules of grammar and usage should be followed in an attempt to produce clear, concise writing.

Presently, the focus of much transportation research is on implementation—how to integrate research findings into practice. Thus, while academically toned reports have their place in the literature, most sponsors—including TxDOT—seek final documents whose language and presentation target those engineers in the field who will ultimately integrate the research innovations.

B

Because/Since

Use “since” specifically for contexts involving time. Do not use “since” to mean “because.”

Examples

We have waited since yesterday.

Because we were tired, we stopped to rest.

Between/Among

“Between” should be used only when two persons, objects, or ideas are being discussed. Three or more items in a discussion require the use of “among.”

Examples

We chose the candidate from among 405 applicants.

The contest was between two opponents.

Body Text

TxDOT has indicated that reports need not be formatted to a prescribed style. In terms of body text, however, the agency requires that margins should be at least 1 inch on all sides. Report text should use single spacing or space-and-a-half. Double-spaced text is not permitted.

Brackets

When parentheses occur inside parentheses, the interior parentheses become brackets.

If the material in the brackets encloses a stand-alone sentence, the period falls inside the brackets. If the material in the parentheses is part of a sentence, the period falls outside the brackets.

Example

The study cites heavy rainfall (see graphs by Stevens and Burke [1987] and White and Layo [1988]) as the cause for bridge failure.

Bullets/ Outline style

The Chicago Manual of Style prefers the use of numerals for lists, suggesting that the use of bullets (heavy dots) “may be considered cumbersome, especially in a scholarly work.” Nonetheless, in reports that make use of bullets, authors should adhere to those same rules that govern the use of numerals; that is, if the bulleted items are sentences, each item should begin with a capital letter and end with a period. If the items are syntactically part of a prior sentence, the items may begin lowercase and carry appropriate end punctuation. Whatever style is chosen should be adhered to consistently throughout the report. And whatever style is used, ensure that construction is parallel (see section on parallelism).

Example

In creating lists, authors should

- use bullets or numbers,
- begin each item with parallel wording, and
- use end punctuation if appropriate (i.e., if list items complete a sentence).

C

Capitalization

Use the examples in the following table as a guideline for capitalization.

Usage	Examples
Capitalize proper nouns and proper adjectives. For exceptions to this rule, see <i>CMS 7.6</i> .	Texas, Mr. Jones, Californian
In titles, figure captions, table titles, and the like, capitalize every word except articles, conjunction, and prepositions. This is referred to as "title case."	Travel Predictions and Models beyond the Year 2000
Capitalize TxDOT groups and offices.	Research Oversight Committee, Technical Advisory Panel, Design Division, Research Management Committee, Materials and Tests Division
Capitalize acronyms.	CRCP/PCC, CTR
Capitalize highway names.	IH-35, Interstate 35
Capitalize terms such as "avenue," "boulevard," "bridge," "park," "building," and "street" when these words are part of a formal name. Lowercase these terms when they stand alone or are used collectively after two or more proper names.	Congress Avenue, Lamar Bridge, Waterloo Park, Martin Luther King Boulevard, Burnet Road The roads and bridges were closed. Waterloo and Pease parks were open. The US 77 bridge was closed. (There are many US 77 bridges, so the usage here does not refer to a formal name of a bridge.)
Capitalize generic terms when used with a proper adjective. Capitalize these terms when also used generically and plurally with proper adjectives.	Travis County, San Antonio District, Colorado River Guadalupe and Red Rivers
Capitalize a direction with a state, city, or any other geographical region only if it is part of the proper name. It is preferred that regions familiarly accepted as proper names be capitalized. Simple directional modifiers should not be capitalized when they precede a proper name.	West Texas, West Virginia Gulf Coast, Panhandle, Midwest western U.S., southern Texas

Continued on next page...

C, Continued

Capitalization (cont'd)

Usage	Examples
Capitalize the words “step,” “rule,” “chapter,” “reference,” and similar words when they appear with a number.	Step 5, Rule 17, Reference 3, Chapter 23, Lane 1, Type B, Grade 5, Section 3.12
Capitalize the second word of a hyphenated compound, if used as a heading or title.	“Application of Full-Scale Accelerated Pavement Testing”
Do not capitalize position titles unless used before the person’s name.	project director, project coordinator, Project Director Jim Davis
Capitalize a program or research item only if it is an official proper name or title. If it is a generic product type, do not capitalize it.	Texas A&M Intelligent Transportation System (ITS) ground penetrating radar (GPR)
Do not capitalize “state” or “federal” unless you are quoting laws or bills that do so. If specifically referring to a political entity, “state” can be used uppercase with the name of the state:	the state of Texas, the federal government State of Texas

Case

The use of the word “case” in a sentence requires the idiomatic “in which” rather than “where.”

Example

This finding is confirmed by the case in which...

Colon

Colons appear outside quotation marks.

A colon is used at the end of an introductory sentence that precedes a list.

Example

Follow these guidelines when creating a list:

- Use bullets or numbers.
- Begin each item with parallel wording.
- End each item with some form of punctuation.

C, Continued

Comma

Use a comma to separate items in a series of three or more. Always put a comma before the word “and.” This is called the *serial comma*.

No commas are permitted in compound sentences — i.e., those having two different subjects and two different verbs. Also, no commas should be used to separate elements of a compound predicate.

Use a comma to separate two or more adjectives.

Use after an introductory phrase or clause.

Place commas *inside* quotation marks.

A comma should come before and after the name of a state that follows a city.

A comma should come before and after a year that follows a month and day (but there is *no* comma between a month and year only).

Examples

In this report, we cover faster, more efficient ways to test slopes and we include two special sections.

The September 1969 hurricane hit Galveston, Texas, especially hard.

Comparisons

To compare X *with* Y is to measure X in relation to Y. To compare X *to* Y is to assert that X is similar to Y. Most often, studies “compare X *with* Y.”

When using “than” or “as” in comparisons, always complete the clauses they introduce.

Examples

The stresses measured in the asphalt section were higher than in the rigid pavement section. (incomplete)

The stresses measured in the asphalt section were higher than *those measured* in the rigid pavement section. (complete)

Comprise/ compose/ include

Compose means to make up. Comprise means to be made up of, or to consist of. The parts compose the whole. The whole comprises the parts. It is understood that in either case, all parts are referenced. If only examples of the whole are referenced, authors should use “include.” This distinction is routinely overlooked and should be carefully reviewed.

Example

The database comprises a total of 137 sections.

The database includes several JCP sections.

Consists of Consists in

“Consists of” is used with nouns (The mix consists of various ingredients).

“Consists in” is used with verbs (The process consists in preparing various ingredients).

Consistency

There should be consistency throughout the report in terms of organization and presentation of the following elements: chapter titles, heading levels, figure and table captions, equations, names, dates, and specialized terms.

Contractions

Avoid contractions.

D

Dashes

There are two kinds of dashes: en dashes and em dashes. Do not confuse these dashes with hyphens.

hyphen (-) en dash (–) em dash (—)

A **hyphen** is smaller than either dash and is used primarily to divide words at the end of a line (hence the term “hyphenation”) and to connect compound adjectives.

Example

The low-quality movie was billed as a must-see spectacular.

An **en dash** is half the size of an em dash. It is frequently used to indicate a span of numbers.

An en dash can also be used to hyphenate an open compound or an already hyphenated compound.

Examples

Look on pages 123–38 for the answer. Then, refer to the time chart for 1962–76.

They took the New York–London flight.

An **em dash** is the length of two en dashes and is mostly used to indicate a parenthetical break in a sentence. The em dash is a *pause* device.

There should *not* be a space before and after the em dash.

Example

We went to the meeting— that is, we tried to go to the meeting— but we got lost at the airport.

Data/Datum

It is permissible to use the plural “data” as a singular noun. While “datum” is actually the singular form, this usage has grown stilted. However, authors may also use data as a plural noun (with such usage in agreement with the verb) as long as such usage is consistent. Proofers should ensure that the verb agrees with the noun as always.

Example

The data were (or was) collected in the field.

Decibel

Abbreviated “dB.”

In some instances, abbreviations like “dBA” or “dBB” may be used. These are also abbreviations associated with acoustical measurements, but they are distinctly different from “dB.”

D, Continued

Decimals

Use figures for all numbers that contain decimals. Note: If the figure is entirely a decimal, use a zero before the decimal point.

Examples

The region had 3.4 in. of rain.

The region had 0.8 in. of rain.

But compare: The gunman had a .22-caliber rifle

Deliverables

Deliverables refer to the products of a research project that are meant to document the research and to facilitate the implementation of research findings. These products can take the form of research reports, project summary reports, letter reports, field guides, videos, CD-ROMs, software/hardware, specifications, training modules, and equipment. Note that each deliverable must be specified and described in the "Deliverables Table" of the original project agreement (proposal); any changes (e.g., submission date) to the Deliverables Table require an official change to that table. Please refer to Chapter 7, "Project Deliverables and Progress Reports," of TxDOT's *Research and Technology Transfer Manual* for a full discussion of project deliverables.

Double Figures

Use lowercase letters to distinguish between multiple figures or tables in the same numerical grouping.

Example

For help with this concept, see Figures 2.17a and 2.17b.

Due To

Authors should not begin a sentence with "due to;" instead use "owing to," "because of," "as a result of," "through," or "by." Additionally, the phrase should not be used within a sentence unless it is a predicate adjective; that is, it is appropriate to use "due to" in a construction that uses a form of the verb "to be."

Example

The erosion is due to excessive rain.

We found that the incorrect test results were due to faulty equipment.

E

Effect/Affect	<p>Do not confuse the noun (or the verb) “effect” with the verb “affect.”</p> <p>Examples</p> <p>The effects (noun) of the water ingress were seen immediately.</p> <p>The researchers sought to effect (verb) changes in the system.</p> <p>Changing the gradient affects (verb) the test results.</p>
e.g.	<p>The unabbreviated term is “<i>exempli gratia</i>,” (think “example given”) or “for example.” Do not italicize.</p> <p>Always use a comma before and after this abbreviation.</p> <p>Example</p> <p>We want something with a lot of speed, e.g., a boat, a car, or a plane.</p>
Emphasis	<p>Use italics for emphasis.</p> <p>Do not use bold, underlining, quotation marks, exclamation points, or all caps for emphasis.</p> <p>Example</p> <p>Are you <i>sure</i> you want to delete that file?</p>
Ensure/Insure	<p>Use “insure” when referring to money or the insurance industry.</p>
English (Imperial) Units	<p>As of October 1998, TxDOT requires that all TxDOT reports that include measurements (e.g., area, length, volume, weight, force, and temperature) must use English (Imperial) units. If metric units are used, English equivalents must be included (in parentheses) immediately following the metric unit.</p> <p>Example</p> <p>A sharp increase in viscosity occurred in the top 6 mm (1/4 in.) of the surface of the asphalt, which was 35 °C (95 °F).</p>
et alia (et al.)	<p>A Latin term that means “and others.” This term is frequently used to indicate the presence of multiple authors on any particular work.</p> <p>Do not italicize this term.</p> <p>“Et alia” should be abbreviated as “et al.” When the term is abbreviated, only “alia” is shortened and, therefore, only “al.” should have a period. “Et” should not have a period.</p> <p>Example</p> <p>The testing was outdated almost immediately (Johnson et al. 1974).</p>

E, Continued

etc./et cetera

Avoid use of “etc.” if it is possible that the reader does not know all of the unnamed items in a series. Use of “etc.” most often signals lazy writing. When you do use “etc.,” do not italicize it.

Equations

All equations should be numbered in parentheses on the right side of the page unless they appear within a sentence. As with figures and tables, number equations consecutively within chapters (e.g., Eq 2.1 would be the first equation in Chapter 2).

All equations and variables should be set in italics.

F**Farther/Further**

Use “farther” with distance. Use “further” with time, amount, or other abstract matters.

Examples

How much farther is it to the test site?

We will pursue this topic further at our next meeting.

Fewer/Less

Use “less” when referring to a quantity or general amount. “Fewer” should be used when referring to a number of individual countable items.

Examples

There is less water in the river than before the drought.

There are fewer cookies left than vegetables.

G

Graphics Software

Microsoft Excel is the commonly used software for creating figures. Authors are encouraged to call the CTR Graphics Office if a different program is to be used.

For figures and tables, please see those respective sections, as well as the section entitled "Software."

In all cases, before leaving CTR, a student must make available to CTR a digital copy (computer disks) of all text, figures, and tables used in his or her report.

H

Headings

Headings help the reader to understand the organization of the report. They should be consistent in order and form.

There must be at least two of any heading level used under a higher level heading (i.e., if a subject does not break into at least two topics, leave as is).

Highway Designations

Do not hyphenate highway designations. The exception is IH-35 (though please note that the use of an “H” in IH-35 — a usage peculiar to central Texas — conflicts with the standard interstate designation used elsewhere, e.g., I-35, I-10).

Also, do not use periods or spaces with abbreviations in highway designations.

Examples

US 183, SH 21, FM 2222

Hyphenated Titles

Use initial caps for both words in a hyphenated term when the term is part of a title or heading.

Example

“An Automated Process-Control and Data-Acquisition System for the Texas Mobile Load Simulator”

Hyphenation

In general, TxDOT prefers closed compounds rather than the use of the hyphen with prefixes (e.g., nondestructive testing).

Use the examples in the following table as a guideline for hyphenation.

Usage	Examples
Do not hyphenate adverbs ending in “ly” that precede an adjective.	Environmentally induced
In general, do not use hyphens with prefixes unless the last letter of the prefix is the same as the first letter of the word.	Nondestructive, overdeveloped, misinformed, overpass post-tension, semi-independent, co-op
Hyphenate compounds with “well,” “ill,” “better,” “best,” “lesser,” and “little” when they precede the noun, unless there is a modifier.	well-known report very well known report the report is well known
Hyphenate unit modifiers	large-scale tests chloride-induced mix
Hyphenate compound numbers.	Ninety-two, thirty-four, sixty-one

Continued on next page

Hyphenation (cont'd)

Usage	Examples
<p>Hyphenate cardinal numbers when used with a unit of measure preceding a noun. If an adjective is added after the unit of measure, the adjective and unit are joined by a hyphen.</p> <p><i>BUT</i></p> <p>When numerals are used and the units are abbreviated — as is more frequently the case in research reports — hyphens are omitted even before a noun.</p>	<p>The ten-foot pole was too short. The two-year-old structure needed a three-meter-high wall.</p> <p>33 m distance 3 m high wall 3 ft high wall</p>
<p>Capitalize the second word of a hyphenated compound if part of a title or heading.</p>	<p>“Application of Full-Scale Accelerated Pavement Testing”</p>

Do not use hyphenation or other punctuation if it will confuse the meaning of a particular term that can be readily understood as it stands. In a majority of cases, usage without punctuation will be clear to technical readers.

Example

A five-span continuous segmental concrete curved box girder bridge

See Appendix F at the end of this style guide for a list of common CTR and TxDOT adjectival compounds.

For more extensive information, consult *The Chicago Manual of Style*.

/

i.e.	<p>This abbreviation stands for “id est,” which means “that is.”</p> <p>Do not italicize “i.e.” in normal text.</p> <p>Always write “i.e.” with periods and with no internal space.</p> <p>Authors should set off “i.e.” with commas when used in a sentence; it should <i>always</i> be <i>followed</i> by a comma.</p> <p>Example</p> <p>The materials were prepared, i.e., cleaned and dried.</p>
Implementation	<p>The Texas Legislature has mandated that TxDOT justify its research expenditures by demonstrating how the findings of its sponsored research are being implemented within the agency. In other words, TxDOT needs to show that the investment in research adds value to its operation and practices (by reducing costs, saving lives, streamlining operations, or extending the service life of materials) and that the citizens of Texas benefit from these investments. Accordingly, researchers must be aware of and must fully understand and describe how research findings of a particular project can be implemented. Project summary reports (“S” reports) serve as the primary implementation document.</p>
In situ	<p>When “in situ” is used as a noun, write it as two words. The adjective form is hyphenated. No italics are required.</p>
Insure	<p>Use “insure” when referring to money or to the insurance industry.</p>
Italics	<p>Use italics for the following:</p> <ul style="list-style-type: none"> • Emphasis • Technical terms that are new, especially at the point at which their definition is presented • Letters of the alphabet referred to as letters • Titles of books and scholarly journals • Equations and variables <p>Examples</p> <p>Are you <i>sure</i> you want to delete that file?</p> <p>In this report, we will cover advanced <i>white stopping</i> techniques.</p> <p>There is only one <i>l</i> in the word “modeling.”</p> <p>Consult <i>The Chicago Manual of Style</i> for questions about italics.</p> <p>In Equation 2.1, <i>x</i> and <i>y</i> are constant.</p>

J

Journals

Journal titles should be italicized in the reference list.

Titles of individual articles published or reprinted in journals should be enclosed in quotation marks.

K

Kip

This is an abbreviation for the English unit of weight called the “kilopound.” It is now acceptable to use “kips” (with an s) to form the plural. For metrication, a kip should be converted to Mg (megagram) or kN (kiloNewton) units.

L

Legends and Labels

A label indicates points of special interest on a graphic. Use the following guidelines when writing and formatting labels and legends for graphics:

- Use initial capital letters for label text.
- Do not use closing punctuation with the label.
- Avoid mixing fragments and complete sentences in the same graphic.

Less/Fewer

Use “less” when referring to a quantity or general amount. “Fewer” should be used when referring to a number of individual countable items.

Examples

There is less water in the river than before the drought.

There are fewer than a dozen tests remaining.

Lists

Lists that are enumerated or bulleted should be treated consistently throughout a report.

The Chicago Manual of Style prefers the use of numerals, especially if there is a need to refer to them by number or letter. If there is no need to reference the items later, then bullets are acceptable. Numerals used in lists are aligned on the period that follow them; lines following the first line of an item are set flush with the item text (i.e., hanging indent). No parentheses are necessary in enumerated lists (BUT: References to an item in an enumeration by letter or number only are enclosed in parentheses, whatever the style of the enumeration itself; if a category name [Item, Method, Step, etc.] is used along with the number, then no parentheses are necessary).

Whatever style is used, ensure that construction is parallel (see section on parallelism).

In terms of format, if the listed items are stand-alone sentences, each item should begin with a capital letter and end with a period. If the items are syntactically part of a prior sentence, the items may begin lowercase and carry appropriate end punctuation.

Examples

In creating lists, authors should

- use bullets or numbers,
- begin each item with parallel wording, and
- use end punctuation if appropriate (if list items complete a sentence).

In creating lists with numerals, authors should

1. omit parentheses around numbers,
2. begin each item with parallel wording, and
3. use end punctuation if appropriate (if list items complete a sentence).

From (1) , (2), and (3) above, it is apparent that ...

Items 1, 2, and 3 above show that ...

M

Measurements

As of October 1998, TxDOT requires that all TxDOT reports that include measurements (e.g., area, length, volume, weight, force, and temperature) must use English (Imperial) units. If metric units are used, English equivalents must be included (in parentheses) immediately following the metric units.

Separate units from numbers with a space.

Example

A sharp increase in viscosity occurred in the top 1/4 in. (6 mm) of the surface of the asphalt, which was 95 °F (35 °C).

N

No. Capitalize when used as part of an adjectival descriptor.
 If “no.” is used as an abbreviation for “number,” it must be followed by a period to distinguish the abbreviation (noun) from the word “no” (pronoun or adjective).
Example
 Use a No. 200 sieve size.

Number of “Number of” used as a subject may be singular or plural. Preceded by “a,” it is always plural; preceded by “the,” it is always singular. Such usage applies also to “series of.”
Example
 The limited number of projects built in Texas has exhibited good performance.
 A number of performance evaluations have been conducted.

Numbers Refer to the examples in the following table and *The Chicago Manual of Style* for detailed rules about numbers.

Usage	Example
Any number representing a measurement or value should be written as a numeral.	36 meters, 16.3 kilos, .02 psi (units of measure are abbreviated)
In all other cases, numbers one through ninety-nine should be written out.	We called the help desk thirty-six times. There were sixteen people waiting in line.
Numbers greater than ninety-nine should be written as numerals.	The test was run 2,545 times. Only 189 had positive results.
Use numerals when writing about time.	12 months, 45 minutes, 5 years, 32 seconds
Use numerals when referring to scale or factors.	1/3 scale model, a factor of 1:10, 5 times more productive
Use numerals to indicate percent in text. However, write out the number if it begins a sentence.	36%, 10 percent, Thirty-six percent responded to the survey.
Use numerals for parts of documents.	Step 3, Chapter 14, Row 8, Book 19, Volume 4, Section 3
Use commas between groups of three digits, counting from the right to punctuate numbers greater than 999.	2,122,676 1,502
Hyphenate compound numbers when they are spelled out.	Twenty-nine styles were used in this document.
Ordinal numbers: Spell out the first nine ordinal numbers; use numerals thereafter.	first, fifth, ninth, 15th, 32 nd (But: No ordinals in dates, e.g., May 5 th)

O

On

Authors should not use “on” when meaning “about.”

Example

The recent history about (not “on”) highway noise ...

On vs. upon

Almost all researchers base conclusions “on” or “upon” the findings of their tests. The use of the synonyms “upon” or “on” is an arbitrary choice made by the author. While “upon” is stronger and more formal, it has been falling into disuse, primarily because of its somewhat stilted sound in technical writing. Authors are therefore encouraged to use the word “on.” (Note that “up on” conveys both elevation and contact and should not be confused with “upon.”)

Only

To avoid confusion, place the word “only” immediately before the word it modifies.

Examples

Only the CTR team tested the section means that no one else did.

The CTR team tested only the section means that the team tested nothing else.

The CTR team only tested the section suggests that other things were not performed.

NOTE: Idiomatic usage requires some exceptions. *It can only get worse*, for example, is clearer than *It can get only worse*.

Over

Use to indicate direction. Do not use to mean “more than.”

Example

We drove over the bridge. The bridge was more than 6 miles long.

P

Parallelism

Parallelism refers to the use of the same grammatical construction or form for elements (words, phrases, ideas) that are used together in a sentence or a list.

Examples

The process involves selecting materials, find a site, and to hire some engineers. (This sentence does not use parallel wording: selecting, find, to hire.)

The process involves selecting materials, finding a site, and hiring some engineers. (This sentence *does* have parallelism with respect to the following words: selecting, finding, and hiring.)

Parallelism is especially helpful when a list is to be created:

- Buy the materials.
- Research the topic.
- Write the paper.
- Submit the final draft.

This list is parallel because all the bulleted items begin with present-tense imperative verbs.

Parentheses

Use parentheses sparingly.

“Parenthesis” is singular. “Parentheses” is plural.

Do not capitalize the first word inside the parentheses unless the parentheses contain a complete sentence.

Usually, a period is placed outside the close-parenthesis mark at the end of a sentence.

Ending punctuation should go inside the close-parenthesis mark if the punctuation pertains to the parenthetical statement (i.e., if what is contained inside the parenthesis is a complete sentence having both a subject and predicate).

Example

When you log on to the system (Do you remember the password?), open the new file (called “Draft”).

Passive Voice

Active voice attributes an action to a person or thing. Passive voice focuses on what was done rather than who did it.

Examples

Active: The researchers analyzed the data.

(This example says exactly who performed the action.)

Passive: The data was analyzed by the researcher.

(This example is less direct and has a weak structure. Sometimes “by the researcher” is left off completely, and the reader wonders who performed the analysis.)

It is preferable to use active voice. See section on voice for more information.

P, Continued

Percent (%)	<p>Authors should always use numerals with the word “percent.” Do not write out the numbers unless the percentage begins the sentence.</p> <p>NOTE: TxDOT accepts both symbol and word in text (i.e., one or the other). TxDOT prefers the symbol in graphics/tables and the word in text. Proofers should assess how authors use the term and then ensure that such usage is consistent throughout a report.</p> <p>Example</p> <p>The reading reveals a 62 percent drop in moisture. Thirty percent is a more reasonable drop for this time of year.</p>
Period	<p>Use one space after a period at the end of a sentence.</p> <p>Do not include a second period if an abbreviation with a period ends the sentence.</p> <p><i>Always</i> place periods inside quotation marks.</p>
per se	<p>This expression means “by, of, or in itself or oneself or themselves: as such: intrinsically.”</p> <p>Write as two words. Do not italicize.</p>
Photographs	<p>Authors should use only original photographs in a report (color, black-and-white, or digitally scanned images).</p> <p>Photocopies are not acceptable.</p> <p>The CTR report production office has established electronic publishing of reports (via PDF files) and it requires that authors furnish digital information only.</p>
Plurals	<p>Do not place “(s)” at the ends of words to make them plural. Use either the singular or plural form of the word□ whichever is correct.</p>
Prefixes	<p>Most words created by adding a prefix should be closed; they should not contain a hyphen between the prefix and the word.</p> <p>In general, do not use hyphens with prefixes unless the last letter of the prefix is the same as the first letter of the word: post-tension, semi-independent, co-op.</p> <p>Examples</p> <p>Nondestructive, antebellum, intermingle, overpass, semi-independent, subgrade, nonexistent, pretensioned, electrohydraulic, nonlinear, intraregional</p> <p>See the previous section on hyphenation, <i>The Chicago Manual of Style</i>, and Appendix F for more help with hyphenating prefixes.</p>

P, Continued

Principal/Principle

“Principle” functions as a noun only. It refers to a rule or basic truth.

Example

It’s the principle of the thing.

“Principal” can function as both a noun and an adjective. As a noun, “principal” denotes a person who is in a position of authority□ e.g., the chief. As an adjective, it denotes a thing of primary importance.

Example

The principal of the school gave testimony as the principal witness in the case against the thieves. Although they did not actually steal the money, they were convicted on principles.

Profilograph

Lowercase this term even with the manufacturer’s name: McCracken profilograph.

Q

Quotation Marks

Commas and periods appear inside quotation marks. Colons and semicolons go outside quotation marks. Question marks and exclamation points depend upon the usage.

Replace straight quotes with smart quotes and apostrophes.

Use quotation marks:

- When directly quoting material from another source.
- When directly quoting speech or dialogue.
- Around titles of magazine or journal articles.

Do not use quotation marks for emphasis. Use italics.

Do not use quotation marks for titles of books or journals. Use italics.

R

References

The reference list follows the last chapter of a report.

References are listed in the order they appear in the text and numbered on the list accordingly. Cite the reference's number when making a parenthetical notation in the text.

Always use the author's name followed by the reference cited in parentheses. Do not use the word "reference" or a variation of the reference citation as the subject of a sentence.

Do not cite references in table titles or figure captions.

Example

A University of Texas study (Ref 12) has demonstrated the efficiency of aggregate size in relation to long-term wear of pavements.

If several references are used, indicate the sources together in parentheses.

It is not really useful to reference more than three sources at one time. (The reader in all probability will not investigate all.) If there are many sources on a particular topic under discussion, list only one or two of the best or most comprehensive sources.

Example

Several studies (Refs 2, 3) have indicated similar results.

Also observe the following guidelines about the reference list:

- Do *not* list in the references any material not cited in the text.
- Do *not* use underlining. Use italics for book and journal titles.
- Do *not* reference tech memos (TxDOT does not allow).
- Do *not* reference any material that is not generally available to readers, including unpublished material, personal correspondence, telephone conversations, or interviews. Instead, cite these references in parentheses in the text.
- Do *not* repeat a reference in the "References" list.
- Do *not* use *ibid.*, *op. cit.*, or *loc. cit.* If you repeat a reference previously cited, repeat (in the text) the number first assigned to the reference.

Rio Grande

Do not refer to the "Rio Grande River." Doing so is redundant because "rio" is the Spanish word for "river."

S

Semicolons

Use a semicolon to join two independent clauses that are not joined by a conjunction.

Semicolons go outside quotation marks.

Use a semicolon in place of a serial comma when the items in the series are grammatically complex, or if they contain commas already.

Setup/Set Up

“Set up” is a verb. “Setup” is a noun.

Examples

I set up my new computer last night.

The page setup required large margins.

Sequence of Tense

In research reports — reports that serve to document research recently performed — the prime verb in a sentence is generally in the past tense. To ensure clarity, the other verbs in a sentence should relate logically to the tense of that governing verb, which helps the reader to understand the chronology. Consider, for example, the difference between *The researchers tested the section when the equipment arrived* and *The researchers had tested the section when the equipment arrived*.

Descriptions of events more distant in the past are generally reported in the past perfect tense. *The researchers indicated that they had been careful in the testing setup* means that the researchers were careful at some time before they indicated they were.

Future events are ordinarily reported using future tense. *The researchers will retest the section* means the researchers promise to test again. Present tense can also be used to describe future events — e.g., *The University opens next month*. Future events can also use the conditional tense. *The researchers said that they would retest the section* means that the researchers promised to retest at some point after they spoke.

Past events, statements, or findings reported in the literature can use present tense (called historical present) to make a statement clearer or more graphic.

Examples

The Declaration of Independence states that all men are created equal.

The 1981 report shows that many factors influence pavement performance.

Since/Because

Use “since” specifically for contexts involving time. Do not use “since” to mean “because.”

Examples

We have waited since yesterday.

Because we were tired, we stopped to rest.

S, *Continued*

Singular/Plural

Form the plurals of most common nouns by adding *s*: devices, sections, pavements. Consult a dictionary or *The New York Times Manual of Style and Usage* for other rules and usage. When a dictionary gives two different plurals for the same word, either may be used (consistently of course), although the first is usually preferred: memorandums, memoranda; appendixes, appendices; symposia, symposiums.

Form the plurals of most compound terms by adding *s* to the most important element: rights of way, passers-by.

Slash

Avoid constructions in text that use slashes (he/she, either/or, and/or). Select the most appropriate word or rewrite to avoid the usage.

Source Codes

If these are part of a report, prepare them as an appendix.

Spell Check

Authors are encouraged to run spell check before submitting their document.

Spelling errors can creep in during any revision process. Spell-check is one of the easiest things authors can do to ensure the quality of a document. A reader may miss some of the finer points of grammar, but a misspelled word is obvious to all who read the report.

Spelling

Many words have two spellings listed in the dictionary, the American spelling (preferred for TxDOT deliverables) and the British spelling.

Examples

traveled/travelled
acknowledgments/acknowledgements
judgment/judgements
focused/focussed
color/colour
toward/towards
defense/defence
naturalization/naturalisation

States

Spell out or use abbreviations for states. Do not use postal codes.

Examples

Bryan, Texas, is in the Brazos Valley. (Not "TX")
New Orleans, La., is located on the Mississippi River. (Not "LA")

S, Continued

Study

TxDOT prefers the use of “project” or “research.”

Style

Style encompasses a number of elements, including a writer’s voice, word choice, spelling, and tone. Consistency of style is as important as choosing the right style for the right purpose.

Style can also refer to mechanical questions like the serial comma question. Is it “red, white and blue” or “red, white, and blue”?

In many cases — including the serial comma — there is no *right* answer. Like fashion, some mechanical issues go in and out of style. An example of this is evident between *The Chicago Manual of Style*, which specifically recommends the serial comma, and *The Associated Press Stylebook and Libel Manual*, which doesn’t use it at all.

In most cases, if the author has done the opposite of what we recommend here, but has done it consistently throughout the report, then our editors will not mark these items as errors.

If, however, the researcher has been inconsistent in style, the editor will use these guidelines to standardize usage.

Such as

Usage of “such as” is appropriate, although some style guides (*NY Times*, e.g.) recommend that this stilted phrase be replaced with “like.” “Such as” sounds slightly better if a noun falls between the words (e.g., “such devices as...”).

T

Than/Then

Do not confuse “then” with “than.”

Examples

I’d rather go home than stay for the meeting.

Find a phone, and then we can go to lunch.

That/Which

Restrictive clauses begin with “that” and are necessary to the meaning of the sentence.

Restrictive clauses do not require commas.

Example

The report that is on the desk will become a best-seller.

“Which” is used with nonrestrictive clauses. These are phrases that are parenthetical and not necessary to the meaning of the sentence.

Nonrestrictive clauses require the use of commas.

Example

The report, which is on the desk, will become a best-seller.

The

Use “the” with abbreviations, but do not use it with acronyms (abbreviations that are coined as words). Proper acronyms, being surrogate words, don’t need articles. However, acronyms used as adjectives do need articles.

Examples

the FHWA, the CIA, the AFL-CIO, the IRS

NAFTA, TxDOT, AASHTO, radar

a NAFTA policy, the TxDOT standards

Always use “The” when referring to “The University of Texas.” The article “The” is part of the official, legal name of the institution.

In this situation, “the” should always be capitalized.

Example

Research performed through The University of Texas at Austin is released through CTR.

T, *Continued*

Time	<p>Use “a.m.” and “p.m.”</p> <p>Use numerals when writing about time.</p> <p>Example</p> <p>18 months, 45 minutes, 5 years, 32 seconds, 6 days, 867 hours</p>
Trademarks	<p>Avoid using trademarked names if possible.</p> <p>If a trademarked name is used, place the registered trademark (®) or trademark (™) symbol after the name on the first reference, and thereafter do not use the trademark symbol.</p> <p>Be sure to indicate who the trademark belongs to somewhere in the report, in fine print if necessary.</p>
TxDOT	<p>The acronym for the Texas Department of Transportation. Write out the full name of the agency the first time it is mentioned in text, followed by the acronym in parentheses; thereafter, the acronym alone may be used.</p> <p>Do not preface the acronym with “the” unless “TxDOT” is used as an adjective.</p> <p>Always lowercase the “x” in TxDOT.</p> <p>Example</p> <p>The TxDOT meeting will be held on Monday. TxDOT usually holds meetings for any policy changes.</p>

U

Underlining

Do not use underlining. Use italics for titles of books and journals.

Upon vs. on

Almost all researchers base conclusions “on” or “upon” the findings of their tests. The use of the synonyms “upon” or “on” is an arbitrary choice made by the author. While “upon” is stronger and more formal, it has been falling into disuse, primarily because of its somewhat stilted sound in technical writing. Authors are therefore encouraged to use the word “on.”

U.S.

Abbreviation for the United States.

Always write with periods, but no space.

When designating the name of a highway, do not use periods or spaces in “US,” as in “US 183.”

UT

Abbreviation for The University of Texas. The UT System has fifteen component institutions, including The University of Texas at El Paso (UTEP), The University of Texas at Arlington (UTA), The University of Texas at Austin (UT Austin), and others.

Prior to 1968, the flagship university (Austin) was referred to as “The University of Texas, Austin, Texas.” After 1968, the flagship university has been referred to as “The University of Texas at Austin.”

Always capitalize “T” in *The* University of Texas. The word “The” is part of the official legal name of both this system and each component institution.

V

Variables	Variables that are part of an equation should be italicized when they are referred to in the text of the report.
Versus	Do not use the “vs.” abbreviation. Write out the full word.
Viz.	An abbreviation for “videlicet,” which means “namely.” Use “namely” rather than “viz.”
Voice	<p>Active voice attributes an action to a person or thing. Passive voice focuses on what was done rather than who did it.</p> <p>Examples</p> <p>Active: The researchers analyzed the data. (This example says exactly who performed the action.)</p> <p>Passive: The data was analyzed by the researcher. (This example is less direct and has a weak structure. Sometimes “by the researcher” is left off completely, and the reader wonders who performed the analysis.)</p> <p>Active voice is important for the following reasons:</p> <ul style="list-style-type: none"> • TxDOT wants reports to be readily understandable, and research in the field of technical communications shows that the use of active, rather than passive, voice is much more effective in documents written for the practitioner. • Readers process and understand more quickly information written in active voice and active voice helps preserve objectivity and accuracy by clarifying who or what is performing the action.

W

Washington, D.C.

There should be no internal space in “D.C.”
Always include a comma after “Washington.”
Always include both periods in “D.C.”

Where

Authors should not use “where” in place of “in which.” “Where” denotes physical location in formal English.

Example

An example in which (not “where”) noise abatement action was taken ...

Whether

Use “whether” when an “or” situation is described or implied.
Do not use “whether or not.”

Which/That

“Which” is used with nonrestrictive clauses. These are phrases that are parenthetical and not necessary to the meaning of the sentence.

Nonrestrictive clauses require the use of commas.

Example

The report, which is on the desk, will become a best-seller.

Restrictive clauses begin with “that” and are necessary to the meaning of the sentence.

Restrictive clauses do not require commas.

Example

The report that is on the desk will become a best-seller.

X

Xerox	Xerox is a trademark for a photocopying process. Do not use the word as a verb or as a generic term for a photocopy.
x-axis	When describing the contents of the x-axis in the text, authors should use italics for “x.”
X-ray	Lower case “r,” but in headlines use X-Ray.

Y

y-axis

When describing the contents of the y-axis in the text, authors should use italics for “y.”

Years

When describing decades, simply add an “s.”

If the “19” is not used, place an apostrophe before the year to take its place. As with contractions, the apostrophe indicates that information has been left out.

Examples

In the 1880s, highway travel did not exist.

During the ‘80s and ‘90s, highway travel hit an all-time high.

Z

Zero (0)

If used as a unit of measure, use the numeral.

Appendix A: Pagination

Introduction	Each section of the document, including the front matter, should be arranged and paginated correctly. Every page of the report should be assigned a page number, whether that page number is printed or not.
Doubled-Sided	<p>Reports are ultimately published double-sided and should be paginated accordingly.</p> <p>All reports turned in to CTR should be copied single-sided only, but please check to make sure that, when the report is copied double-sided, the pages fall where they are supposed to.</p>
Page Numbering	<p>All page numbers are ideally centered at the bottom of the page. Headers and footers that incorporate mirrored page numbers are allowed but are not preferred. Some pages — such as the DOT Form and author’s title page — have unprinted page numbers, but are counted in pagination.</p> <p>Front Matter</p> <p>Front matter should be numbered in lowercase Roman numerals: i, ii, iii. The DOT Form is treated as an unnumbered page i; thus the front matter (title page, disclaimers, table of contents) begins on page iii.</p> <p>Body of the Text</p> <p>The body of the text should be numbered with Arabic numerals: 1, 2, 3, 4. It should begin with page 1. Number the report consecutively throughout the entire report, including appendices. Alternatively, reports may also be numbered internally to each chapter; 1-1, 1-2, 1-3.</p>
Figure and Table Numbering	<p>Figures and Tables</p> <p>Figures and tables should be numbered in accordance with their sequence in a particular chapter. Thus the first figure of Chapter 5 is Figure 5.1.</p>
Odd Page Numbers	All odd page numbers should be on the right-hand or front (recto) pages, and all even numbers should be on the left-hand or back (verso) pages.
Beginning Chapters or Major Sections	<p>New chapters and major sections (Refs and appendices) must begin on recto (odd) pages. Insert a blank page, if necessary, to force the new chapter onto a recto page.</p> <p>For example, if the previous chapter ended on page 5, have a blank page for page 6, and start the new chapter on page 7.</p>

Appendix A: *Pagination, Continued*

Beginning Appendices

The first page of an appendix must begin on a recto (odd) page. Insert a blank page, if necessary, to force the new appendix onto a recto page.

There are two ways to paginate the appendix:

Heading

The appendix may simply have an appendix heading at the top of the page (e.g., “Appendix A: Survey Results”), followed by the beginning of the appendix proper on the same page.

Cover Page

The appendix may also begin with a cover page. If a cover page is used, the title should be centered in the middle of the page and a printed page number should be included. This cover page should appear as a recto page. Skip the next page (blank verso) and begin the appendix information on the next recto page. There is no need to repeat the heading at the top of this page.

Pagination Guide

Front matter should be paginated according to the following example.

Sections may be more than one page; paginate accordingly, making sure that those sections marked with an asterisk fall on an odd page number.

Section	Number Shown	Number Not Shown
Technical Report Documentation Page*		i
Blank page		ii
Author’s Title Page*		iii
Blank page	iv	
Implementation Recommendations* (required for project summary reports only)	v	
Disclaimers*	v	
Acknowledgments	v	
Table of Contents*	vii	
List of Figures (optional)	ix	
List of Tables (optional)	xi	
Chapter 1*	1	
Chapter 2*	13	
Chapter 3*	27	
References*	75	
Appendix Title Page*	77	
Blank page	78	
Appendix Body* (begin appendix material)	79	

Appendix B: Front Matter

Front Matter Defined

Front matter includes all sections that are numbered with lowercase Roman numerals, such as the table of contents and disclaimers. The front matter should be carefully paginated and should include all sections required by the sponsoring agency.

Technical Report Documentation Page (TRDP) or DOT Form

The author must complete the DOT Form for the National Technical Information Service (NTIS). It is a requirement for most CTR reports.

The DOT Form

- Is the first page of the report
- Has an unprinted page number (i)
- Has a blank verso page (ii) following it

See a sample DOT Form on Page 55.

Reports for other sponsors may require the DOT Form to be filled out differently.

Author's Title Page

The author's title page

- Follows the DOT Form
- Is page iii (unprinted)
- Has a blank verso page following it as page iv.

There is an example of the author's title page following the DOT Form on Page 57. Much of the information on the author's title page is the same as that on the DOT Form. The two should be cross-checked to ensure that they contain *exactly* the same information, specifically author's names, the report title and number, and the date.

The text on the title page should be centered as shown in the example on Page 57.

Implementation Recommendations Disclaimers

This section is required for project summary reports (PSRs) only.

The disclaimer page

- Follows the author's title page
- Is page v (printed)

The author can combine disclaimers (author's, patent, and engineering) under the one Disclaimer heading. See TxDOT's Research Manual for details on the wording of those disclaimers.

Most disclaimers read as follows:

The contents of this report reflect the view of the author(s), who is (are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view of policies of [*if sponsored by FHWA*: the Federal Highway Administration and/or] the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation. [*If the report contains engineering recommendations, the following is necessary*: Not intended for construction, budding, or permit purposes. The engineer in charge of the project was Joe Smith, P.E. #12345.]

Appendix B: Front Matter, Continued

Acknowledgments and Products

The Acknowledgments and Products

- Is required
- Follows the Disclaimers
- Is included on page v (printed)

The author must credit the project director and members of the project monitoring committee and the state and federal sponsor if applicable. Any products contained in the report must be listed.

Table of Contents (TOC)

The TOC

- Follows the Acknowledgments
- Begins on page vii (printed)

List all first- and second-level headings with their corresponding page numbers. Third- and fourth-level headings may be listed if desired. Also list all appendices and other back matter.

If a chapter or section title is more than one line long, break it where it is logical, and do not let it get within three leader dots of the page number.

Use indentation consistently to show section subordination and coordination.

The TOC should begin with the first section that follows it. Do not list the TOC itself or any front matter preceding it.

The author should cross-check the page numbers and headings in the TOC with the page numbers and headings in the text. Proofreaders should do this as well.

All leader dots should be aligned. This is most easily accomplished by setting up leader tabs.

Sample Front Matter Pages

PRELIMINARY REVIEW COPY

Technical Report Documentation Page

1. Report No. 0-1234-1		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Report Title Here in Title Case				5. Report Date January 2010	
				6. Performing Organization Code	
7. Author(s) Firstname Lastname, Firstname Lastname, and Firstname Lastname				8. Performing Organization Report No. 0-1234-1	
9. Performing Organization Name and Address Center for Transportation Research The University of Texas at Austin 3208 Red River, Suite 200 Austin, TX 78705-2650				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. 0-1234	
12. Sponsoring Agency Name and Address Texas Department of Transportation Research and Technology Implementation Office P.O. Box 5080 Austin, TX 78763-5080				13. Type of Report and Period Covered Research Report, Project Summary Report, or Product	
				14. Sponsoring Agency Code	
15. Supplementary Notes Project conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration, and the Texas Department of Transportation.					
16. Abstract Abstract here.					
17. Key Words Keywords here.			18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.		
19. Security Classif. (of report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of pages 23	
				22. Price	



Report Title Goes Here in Title Case

Author Name
Author Name
Author Name
Author Name

CTR Research Report:
Report Date:
Research Project:
Research Project Title

Insert Report Number (ex. 0-1234-1)
Insert Report Date
Insert Project Number (ex.0-1234)
Insert Project Title

Center for Transportation Research
The University of Texas at Austin
3208 Red River
Austin, TX 78705

www.utexas.edu/research/ctr

Copyright (c) < YEAR 2010
Center for Transportation Research
The University of Texas at Austin

All rights reserved
Printed in the United States of America

Disclaimers

Author's Disclaimer: The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the Federal Highway Administration or the Texas Department of Transportation (TxDOT). This report does not constitute a standard, specification, or regulation.

Patent Disclaimer: There was no invention or discovery conceived or first actually reduced to practice in the course of or under this contract, including any art, method, process, machine manufacture, design or composition of matter, or any new useful improvement thereof, or any variety of plant, which is or may be patentable under the patent laws of the United States of America or any foreign country.

< Authors: Please include the following "Notice" if the report includes references to specific manufacturers or trade names. >

Notice: The United States Government and the State of Texas do not endorse products or manufacturers. If trade or manufacturers' names appear herein, it is solely because they are considered essential to the object of this report.

Engineering Disclaimer

NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Project Engineer: < Project Engineer's name goes here >
Professional Engineer License State and Number: < Texas No. ##### >
P. E. Designation: < "Research Supervisor" >

Acknowledgments

< Type Acknowledgments here.

For example: "The authors express appreciation to..."

Acknowledgments should include: the TxDOT Project Director, members of the Project Monitoring Committee and their locations [TxDOT district / division / office, or other], and any others instrumental to the project. >

Products

If this report contains any products, please use this space to indicate the name of the product(s) and where it (or they) can be found in the report. If the report contains no products, you may delete this section.

Table of Contents

1. Introduction 1	
1.1 Introduction beginning	1
1.2 Previous Work	1
1.2.1 Work Description subhead.....	1
1.2.2 Work Description subhead.....	1
1.2.3 Work Description subhead.....	2
1.3 Introduction continues.....	2
1.4 For more information about sources	2
2. Previous Work	3
2.1 Work in USA	3
2.2 Work in Australia.....	3
2.3 Work in Europe.....	3
2.3.1 European work in detail.....	3
Details One	4
2.4 Work in India.....	4
References	7
Appendix A	9

List of Figures

Figure 2.1	Work in India.....	4
Figure 2.2	Work in Australia	5
Figure A.1	Figure of US	9
Figure A.2	Work in Texas	10

List of Tables

Table 2.1	Table of Mexico	4
Table 2.2	Table of Russia.....	4
Table A.1	Table of Australia.....	9
Table A.2	Table of India	9

Appendix C: Illustrations

Requirements	<p>Illustrations□ figures, tables, photographs, and color inserts□ should be clear and legible. See TxDOT’s Research Manual for specific requirements.</p> <p>All figures, tables, and equations should be referenced in the text. See TxDOT’s Research Manual for information on using copyrighted material.</p>
Placement	<p>Cited figures, tables, and equations should always fall on the same page where they are mentioned or on the closest following page. They should never be placed before their first in-text reference.</p>
Margins	<p>Margins should be set at 1 inch, with a slighter greater inside margin (1.25 in.). Anything less may cause information to be cut off when the report is bound.</p>
Font Size	<p>The illustration should have type no smaller than 7 points, and the font used should be consistent throughout the report.</p>
Page Numbers	<p>Place page number on pages with illustrations.</p> <p>Page numbers should be portrait orientation rather than landscape, even on illustrations that are landscaped on the page. This is often difficult to do in a word-processing program, so this is preferred rather than mandatory. Please see the user’s manual or help system of your word processing program to determine how to format page numbers.</p>
Orientation	<p>Sometimes it is necessary to place the illustration in landscape style, rather than portrait style, on the page. In these cases, make sure when you turn the printed book clockwise 90°, the illustration is right-side up. See the illustration below for an example.</p> <div data-bbox="568 1377 912 1610" data-label="Image"> </div>
Sources	<p>If figures, tables, or appendices are taken from another source, they should be properly documented. See TxDOT’s Research Manual for more information.</p>

Appendix C: Illustrations, Continued

Figure Defined	Figures are any graphic representation not in text form.
Quality	Generally, only clear, dark original line art is acceptable. If originals are not available, CTR provides services to re-create the figure.
Numbering	Illustrations should be numbered consecutively within chapters using Arabic numerals in a dual system; i.e., Figure 3.2 would be the second figure in Chapter 3. Authors may use either periods or hyphens (Figure 3-2), as long as one or the other is used consistently.
Captions	Figure captions are required and should be placed under the figure. Break the caption into two or more lines when appropriate. Captions should be distinguished from the text by a difference of typeface and/or font.
Continuation	When a figure continues for two or more pages, note the continuation with “continued” following the figure caption on each page.
Table Defined	Tables are any graphic representation in columnar text form.
Numbering Tables	Tables should be numbered consecutively within chapters using Arabic numerals in a dual system; i.e., Table 3.2 would be the second table in Chapter 3. Authors may use either periods or hyphens (Table 3-2), as long as one or the other is used consistently.
Table Titles	Table titles are required and should be placed above the table. Break the title into two or more lines when appropriate. Table titles should be distinguished from the text by a difference of typeface and/or font.
Units in Tables	Place repeated units of measure or degree in the column headings. Do not repeat these units in each row or column.
Continuing Tables	When a table continues for two or more pages, note the continuation (i.e., with “continued” following the table caption) on each page.
Photographs	Photographs are considered figures in reports and should be numbered and captioned as such.
Quality of Photographs	Black-and-white photographs — either scanned and embedded in the document or furnished as originals — are preferred. Color photographs, unless their color is absolutely necessary and/or the author has written approval from the PD to reproduce in color, will be reproduced as black-and-white photos. Sometimes color photographs do not display well when reproduced in black and white, so it is most desirable to reproduce these photos from black-and-white originals.

Appendix D: Metrication

Requirement

In a letter dated October 7, 1998, TxDOT/CSTR outlined the current policy regarding metric and English units in TxDOT research reports. The current policy is as follows:

“All printed and film reports must use English units. If metric units are used, English units must be included immediately following the metric units.”

This text supersedes the metric provision as stated in the RTTM.

According to the October 7, 1998 letter, “if significant effort has been spent metricizing a report already under development with no English notation, or if the research is tied to a metric construction project, the English units may be withheld.”

Figures

How best to show dual notations in figures is left up to the author. However, it is recommended that English units be used in the figure itself and that metric equivalents be given as part of a legend or footnote to the figure.

Source

The following standards are taken from the *TxDOT Metrication Guide*.

Symbols

The following are some metric units and their symbols:

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

Prefixes

Do not use the prefixes “deci-,” “centi-,” or “deca-.”

Numerals with Symbols

Use the numeral and metric symbol in text, tables, and figures.

Example

a width of 12 mm (*not* 12 millimeters or twelve mm)

Place a space between the numeral and the unit of measure.

Example

5 kg (*not* 5kg)

Do not place a period after the metric or English symbol unless it is at the end of a sentence. The exception is “in.” which should always have a period at the end.

Example

The weight is 5 kg. The weight should increase to 6 kg after the testing.

Do not add “s” to any unit of measure or symbol to make it plural.

Example

The cargo weighed 10 kg. The beaker held 5.6 mL of fluid.

Appendix D: Metrication, Continued

Spell Out Unit	<p>Spell out the metric or English measurement when it is <i>not</i> used with a numeral.</p> <p>Example</p> <p>The distance is given in meters.</p>
Commas	<hr/> <p>In most numbers of 1,000 or more, use commas to separate digits into groups of three, counting from the right.</p> <p>Example</p> <p>10,000 1,256 1,863,899</p> <p>Exceptions to this rule include years, page numbers, and addresses.</p>
Celsius	<hr/> <p>Place a space between the numeral and the degree (°) Celsius or Fahrenheit.</p> <p>Example</p> <p>The temperature is 31 °C.</p>
Decimals versus Fractions	<hr/> <p>Always use decimals, <i>not fractions</i>, to express number. Place a zero before the decimal point.</p> <p>Example</p> <p>The reading was 0.75 (<i>not</i> $\frac{3}{4}$ or one-quarter) of the original measurement.</p>

Appendix E: References

References Defined

As a general rule, whenever a writer quotes, paraphrases, or refers to information or ideas (which do not fall into the category of “common knowledge”) from another publication or source other than himself/herself, the writer should credit the source in a footnote, bibliographic reference, or statement in the text.

Actual use of copyrighted material is covered in TxDOT’s Research Manual.

Formatting References in Text

Text citations are the most common way to credit sources. For TxDOT reports, any citation system is acceptable, as long as the system is consistently used throughout a report. Thus, authors can use “Ref” (with the word and the number in parentheses at the end of sentence and before the end punctuation) or the standard author and date (in parentheses at the end of the sentence and before the end punctuation).

Examples

This technology was first studied in the 1960s (Ref 1). Subsequent research refined the technology (Refs 2, 3, 4).

or

This technology was first studied in the 1960s (Weinberg 1960). Subsequent research refined the technology (Foley 1975; Keller 1980).

Reference List

All sources referenced should be listed in a single section called “References” after the main text of the report but before any appendices (and on a recto page). Please note that “References” can be labeled “Bibliography” (though bibliographies are usually not numbered but are arranged alphabetically according to authors’ last names). An author using the author/date text citation may use the unnumbered bibliographic form.

Which Sources to List

Only those sources cited in the text should be listed.

Unpublished Works

Do not include unpublished works and telephone conversations in the References or Bibliography. These may be cited in the text with a description of the author (or interviewee) and a date of authorship (or when the interview occurred) in parentheses.

Cross-Check

Make sure that each reference in the Reference list is matched to its correct in-text citation. Make sure that only works cited in the text are included in the References.

Appendix E: References, Continued

Order	If the author uses the “Ref-plus-number” system, the first reference should be “Ref 1,” with each subsequent reference numbered sequentially. The author information on the “References” page would then correspond with the numbers, irrespective of alphabetical order. Author/date citations are not numbered and must only correspond to an author’s alphabetically ordered entry in the bibliography.
Repeated References	<p>In the “Ref-plus-number” system, authors should not enter a new number for a source already cited. Authors simply use the same reference number initially assigned to the source when it first appeared.</p> <p>Thus, if Wagner is cited as (Ref 1) on the first page, he will be cited as (Ref 1) again if referred to on the last page, as long as it is exactly the same source by Wagner that is cited. Other sources by the same author should be assigned a unique reference number that is used consistently throughout the report.</p>
Using Copyrighted Material	<p>See TxDOT’s Research Manual for detailed information on using copyrighted information.</p> <p>NO copyrighted material, except that which falls under the “fair use” clause and is academically documented (see <i>CMS</i>, 14th ed., pp. 144–154), may be incorporated into a report unless the written permission of the copyright owner has been obtained.</p>
Proprietary Information	Proprietary information <i>should not</i> be used because this may restrict availability of reports.

Appendix F: Word List

AASHO Road Test, n.	downstation, adj.
acknowledgments, n.	durometer, n.
a.m., abbr.	drier, adj.
as-needed, adj.	earthen, adj.
at-grade, adj.	Ethernet, n.
Atterberg limits, n.	Edwards Aquifer Recharge Zone, n.
backcalculated, v.	falling weight deflectometer, n.
Beaumont clay, n.	field of view, n.
Beaumont formation, n.	field-test, v.
buffalo grass, n.	field test, n.
buildup, n.	field trip, n.
built-in, adj.	finite-element method, n.
Cape Seal, n.	five-span, adj.
centerline, n.	flowchart, n.
centroid, n.	flyover, n.
channelization, n.	formwork, n.
clayey, adj.	freestanding, adj.
controlling, adj.	full-consumption, adj.
cost-beneficial, adj.	full-scale, adj.
cost-effective, adj.	gauge, n., v.
cost-effectiveness, n.	geogrid, n.
cps (characters per second), abbr.	groundwater, n.
cross-country, adj., n.	Gulf Coast, n.
cross section, n.	ha (hectare), abbr.
cross-sectional, adj.	hard copy, n.
data set, n.	hardwired, v., adj.
database, n.	high-performance, adj.
dB (decibel), abbr.	high-stress, adj.
decision maker, n.	hypotheses, n. pl.
decision making, n.	hypothesis, n. sing.
decision-making, adj.	ID (identification), abbr.
deice, v.	in-place, adj.
dew point, n.	in situ, adj., adv.
	Internet, n.
	intranet, n.

Appendix F: Word List, Continued

job site, n.	ongoing, adj.
judgment, n.	on-line, adj. or adv.
keyword, n.	on-site, adj., adv.
kip (kilopound), abbr.	open-mindedness, n.
kN (kilonewton), abbr.	out-of-print, adj.
kPa (kilopascal), abbr.	pcplph (passenger cars per lane per hour), abbr.
kph, (kilometers per hour), abbr.	percent, n.
ksi (kilograms per square inch), abbr.	Ph.D. diss., n.
laptop, n.	pickup, n.
level of service (LOS), n.	plasticity index, n.
life cycle, n.	p.m., abbr.
life-cycle, adj.	policymaker, n.
lightweight, adj.	polymer-modified, adj.
limewater, n.	portland cement, n.
line of sight, n.	post-tensioning, n.
line-of-sight, adj.	precast, adj.
liquid limit, n.	predominant, adj.
log on, v.	predominate, v.
logging on, n.	prestress, adj., v.
long-term, adj.	pretension, n.
macrocracking, n.	Project 0-1314 (uppercase "P"), n.
mainlane, n.	psi (pounds per square inch) abbr.
Master's thesis, n.	punchout, n.
menus, n. pl.	raster, n.
MHz (megahertz), abbr.	read-only, adj.
microcomputer, n.	real time, n.
microcracking, n.	real-time, adj.
microsurfacing, n.	re-evaluation, n.
mL (milliliter), abbr.	right-of-way, n., adj.
mobile home, n.	rights-of-way, pl.
modeled, v.	riprap, n.
modeling, v., adj.	runoff, n.
Mohr-Coulomb, adj.	salt water, n.
MPa (MegaPascals), abbr.	saltwater, adj.
multiline, adj.	sawcut, n.
no-passing, adj.	seawater, n.
northbound, adj.	
off-line, adj. or adv. (or	
one-of-a-kind, adj.	

Appendix F: Word List, Continued

settleable, adj.	trip-makers, n.
settleability, n.	true-color, adj.
set up, v.	T-test, n.
setup, n.	turn-movement, adj.
sheet flow, n.	two-dimensional, adj.
shock wave, n.	U-beam, n.
short-term, adj.	underdrain, n.
siliceous, adj.	unreinforced, adj.
slurry, n., v.	upstation, adj.
southbound, adj.	user-friendly, adj.
speed-change, adj.	user-selected, adj.
state-of-the-art, adj.	user-specified, adj.
state of the art, n.	vehicle miles traveled, n.
step-by-step, adj.	versus, prep.
stormwater, n.	vph, abbr.
Superpave system, n.	water bath, n.
three-dimensional, adj.	waveform, n.
through lane, n.	wavelength, n.
throughput, n.	w/c ratio, (water-cement ratio), abbr.
thruway, n.	weather station, n.
time-consuming, adj.	Web, n.
time frame, n.	Web page, n.
time line, n.	Web site, n.
tire-rubber, adj.	wheelpath, n.
tongue and groove, n.	white topping, n.
trade off, v.	windshield, n.
trade-off, n.	workstation, n.
traveled, v.	World Wide Web, n.
traveling, v., adj.	worst-case, adj.

Word List — New entries

Appendix G: Acronyms

Acronym	Full Term
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
AC	asphalt concrete
ACI	American Concrete Institute
ADT	average daily traffic
AHS	automated highway system
AI	aging index
AID	automatic incident detection
AIDA	AUTOSCOPE Incident Detection Algorithm
AOA	angle of arrival
APT	accelerated pavement testing
ARD	apparent relative density
ARIMA	autoregressive integrated moving average
ART	Adaptive Resonance Theory
ASTM	American Society for Testing and Materials
ATIS	advanced traveler information system
ATMS	advanced traffic management systems
BMP	best management practice
BOD	biological oxygen demand
BRD	bulk relative density
CCTV	closed-circuit TV
CD	consolidated-drained
CFR	Code of Federal Regulation
CMHB	coarse matrix high binder
CMRG	Construction Materials Research Group
COD	chemical oxygen demand
CPU	central processing unit

Appendix G: Acronyms, Continued

CRA	Cooperative Research Agreement
CRCP	continuously reinforced concrete pavement
CRP	Cooperative Research Project
CSTR	Construction Division/Research and Technology Transfer Section (TxDOT office formerly known as RTT)
CTR	Center for Transportation Research
CRWR	Center for Research in Water Resources
CU	consolidated-undrained
CVISN	Commercial Vehicle Information Systems Network
DELOS	detector logic with smoothing
DES	Design Division, Pavements Section (TxDOT)
DGAC	dense-graded asphaltic concrete
DHV	design hourly volume
DR	detection rate
EMC	event mean concentration
EPA	Environmental Protection Agency
ERSG	electronic resistance strain gauge
ESAL	equivalent single-axle load
EUAC	equivalent uniform annual cost
EWG	expert working group
FAR	false alarm rate
FCC	Federal Communications Commission
FFT	fast Fourier transform
FHWA	Federal Highway Administration
FPS	flexible pavement system
FRP	fiber-reinforced polymer
FTA	Federal Transit Administration
FWD	falling weight deflectometer
FY	fiscal year
GEM	granular emulsion mix

Appendix G: Acronyms, Continued

GGBFS	ground granulated blast furnace slag
GIS	geographic information system
GPR	ground-penetrating radar
GPS	global positioning system
HDM	highway design and standards model
HMAC	hot mix asphalt concrete
HMT	hazardous materials trap
HPC	high performance concrete
HSC	high strength concrete
ICC	Intelligent Curing Concrete
IH	interstate highway
ISAT	initial surface absorption test
ISIS	interactive sound information system
ISSA	International Slurry Surfacing Association
ITI	Intelligent Transportation Infrastructure
ITS	intelligent transportation system
JCP	jointed concrete pavement
JRCP	jointed reinforced concrete pavement
JMF	job mix formula
LAN	local area network
LCC	life-cycle cost
LCCA	life-cycle cost analysis
LCD	liquid crystal display
LCRA	Lower Colorado River Authority
LED	light-emitting diode
LEF	load equivalency factor
LER	load equivalency ratio
LLER	log of load equivalency ratio
LL	liquid limit
LS	limestone

Appendix G: Acronyms, Continued

LTAP	Local Technical Assistance Program
LTPP	long-term pavement performance
LVDT	linear variable displacement transducer
LWT	loaded-wheel test
MAP	motorist assistance program
MDD	multidepth deflectometer maximum dry density
MLF	multilayer feed-forward
MLS	Texas mobile load simulator
MMLS	model mobile load simulator
M_R	resilient modulus
MSE	mechanically stabilized earth
MTS	Materials Testing System
NAFTA	North American Free Trade Agreement
NCHRP	National Cooperative Highway Research Program
NCRP	Nordic Cooperative Research Project
NHI	National Highway Institute
NHTSA	National Highway Traffic Safety Administration
NMSA	nominal maximum size of aggregate
NPDES	National Pollutant Discharge Elimination System
NPW	net present worth
NRC	noise reduction coefficient
NWS	National Weather Service
OECD	Organization for Economic Cooperation and Development
OGAC	open-graded asphaltic concrete
OGAB	open-graded asphalt base
OGBC	open-graded base course
OMC	optimum moisture content
OPC	ordinary portland cement

Appendix G: Acronyms, Continued

OR	oxidation ratio
PATH	Partners for Advanced Transit and Highways
PCC	portland cement concrete
PCI	pavement condition index Prestressed Concrete Institute
PD	project director
PI	plasticity index
PIH	Pan American Institute of Highways
PMS	pavement management system
PP	police patrolling
PPP	point-to-point
PSI	present serviceability index
PTZ	pan, tilt, zoom
PVC	vertical point of curvature
PVT	vertical point of tangency
RAP	recycled asphalt pavement
RFP	request for proposal
RH	relative humidity
RPS	rigid pavement system
RPU	remote processing unit
RRIC	Roadway Research Implementation Center
RSD	relative solid density
R&T	Research and Technology
RTT	Research and Technology Transfer Office (see CSTR)
RWIS	Road Weather Information System
SASW	Spectral analysis of surface waves
SCI	service curvature index
SEE	standard error of estimate
SDHPT	State Department of Highways and Public Transportation (now TxDOT)

Appendix G: Acronyms, Continued

SHRP	Strategic Highway Research Program
SMA	stone mastic asphalt stone matrix asphalt
SN	structural number
SP&R	State Planning and Research
SRG	siliceous river gravel
TCRP	Transit Cooperative Research Program
TDOA	time difference of arrival
TDR	time domain reflectometry
TKN	total Kjeldahl nitrogen
TL	transmission loss
TMC	temperature-matched cure traffic management center
TNM	traffic noise model
TNRCC	Texas Natural Resource Conservation Commission
TOC	total organic carbon table of contents
TP	total phosphorus
TRA	Tire and Rim Association
TRIS	Transportation Research Information Service
TRRL	Transport and Road Research Laboratory
TSS	total suspended solid
TTD	time-to-detect
TTI	Texas Transportation Institute
TxDOT	Texas Department of Transportation
TxMLS	Texas Mobile Load Simulator
UCS	Unified Classification System
USDOT	United States Department of Transportation
USGS	United States Geological Survey

