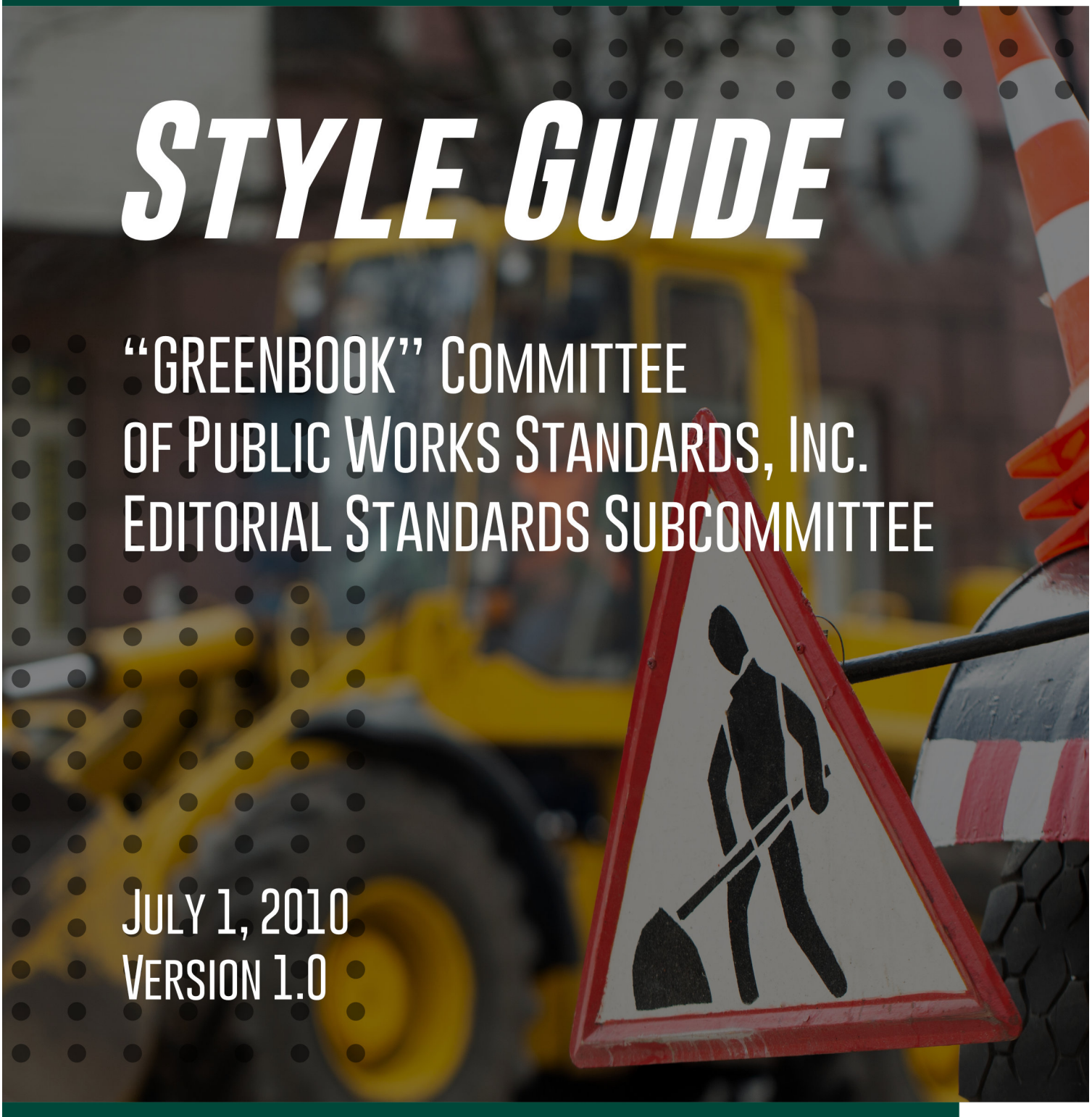
GREENBOOK Committee



STYLE GUIDE

"GREENBOOK" COMMITTEE OF PUBLIC WORKS STANDARDS, INC. EDITORIAL STANDARDS SUBCOMMITTEE

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I. PURPOSE

These guidelines are intended to assist in preparing specifications which conform to the format and structure of Standard Specifications for Public Works Construction ("GREENBOOK"). Following these guidelines will ensure consistency in format and structure when editing or adding contents to the GREENBOOK.

II. GENERAL CHARACTERISTICS OF SPECIFICATIONS

The Agency controls the specifications; as they are detailed statements by the Agency prescribing the work to be performed by the Contractor (i.e., "Work"). They are instructions to the Contractor for the Work to be performed, the conditions and restrictions on performance and execution of the Work, the required quality of the Work, and how the Work will be measured for payment. Specifications complement the Plans.

Specifications do not provide requirements for the contract administration and inspection activities to be performed by the Engineer. Support activities by the Engineer shall only be specified when the Contractor's activities, sequence of Work, or schedule could be affected.

> Example:
>
> The Agency will collect samples of the pulverized material in conformance with California Test 125. The Agency will perform a minimum of one gradation and one sand equivalent test per 500 cubic yards of material pulverized. The Contractor shall allow the Agency a minimum of 48 hours to complete each test and inform the Contractor of the results.

Well-written specifications are grammatically correct, easy, to understand, structured in a sequential manner, and do not contain ambiguities or conflicting requirements.

II.1 Method vs. Performance Specifications

"Methods" and "Performance" are the two basic types of construction specifications.

A. Methods specifications describe in detail the materials, workmanship, and processes the Contractor is to use during construction. Method specifications restrain Contractor innovation and obligate the Agency to accept the Work if the specified materials and processes are used.

B. Performance specifications describe the desired result or quality of the final product to be achieved. They specify performance requirements for materials, equipment, or completed construction. Performance specifications encourage Contractor innovation and allow the Agency to accept or reject the final product.

C. Examples:

Performance: The milled pavement shall be true to grade and cross section. When the straightedge specified in 302-5.6.2 is laid on the finished surface parallel to the centerline of

the roadway, the surface shall not vary from the edge of the straightedge more than 3/8 inch (10mm) at any point, except at intersections or at changes of grade.

Method: Initial rolling shall commence immediately following spread of screenings. The compaction of screenings shall be accomplished by a minimum of three self-propelled, pneumatic-tired rollers meeting the requirements of 302-5.6.1, except that tires shall be inflated to 100 psi (690 kPa) and the operating weight shall be 5,000 pounds (2300 kg) per tire. The rolling equipment shall maintain a distance of not more than 200 feet (60 m) behind the chip spreader on the first pass. The rollers shall operate at a maximum speed of 5 miles per hour (8 km/hr).

D. Method specifications shall not be intermingled with Performance specifications. Intermingling of Method and Performance requirements within the same section or subsection introduces the possibility of a conflict between the requirements.

E. The GREENBOOK is primarily a Method specification publication.

II.2 Tone

Traditionally, specifications are written in the indicative mood, either active or passive voice.

A. Active voice:

Example:

The Contractor **shall place** the aggregate to a depth of 6 inches and compact it to a density of 95 percent.

B. Passive voice:

Example:

Aggregate **shall be placed** to a depth of 6 inches and compacted to a density of 95 percent.

C. Imperative mood, active voice:

Several states including Caltrans have rewritten or are considering writing their standard specifications in the imperative mood, active voice. This style of writing replaces the lengthy "the Contractor shall" sentences with short sentences giving direct instructions.

Example:

Place the aggregate to a depth of 6 inches and **compact** it to a density of 95 percent.

D. GREENBOOK requirements:

1. GREENBOOK has not adopted the imperative mood style.
2. Use short simple sentences in the active voice wherever possible.

3. Use the imperative mood only if it is preceded by an introductory statement clarifying that the text makes a requirement on the Contractor.
4. In other words, if you MUST refer to the first or second person, be sure you define the meaning of the pronouns, and use them only as defined.

   Example:

   Magnesium chloride dust palliative shall be applied as follows:

   Scarify the top 2 inches of the existing road surface and wet with water to approximately 4 percent moisture content. Apply the magnesium chloride dust palliative in two applications of 0.25 gallon per square yard in each application. Allow to soak for 30 minutes after each application. Roll the surface with a pneumatic tire roller, as specified in the Contract. Do not permit traffic on the treated surface until approved.

II.3 Characteristics of Well-Written Specifications

A. Are clear, concise, and technically correct.

B. Free of ambiguous words or phrases that could lead to misinterpretation.

C. Contain technically correct terms, not slang or "field" words.

D. Do not contain conflicting requirements.

E. Do not repeat requirements stated elsewhere in the Contract Documents. It is risky to write general terms and conditions that are duplicated throughout the specifications. It may cause contradictions and is confusing to both Contractor and Engineer. If there is a dispute, courts usually side with the party who did not create the confusion in the first place.

F. Assign risks appropriately to the entities that have control over them.

G. Do not explain or provide reasons for a requirement.

H. State construction requirements sequentially and in a logical order.

I. Do not place requirements on the Agency. State when and what the Agency will do if the Contractor's activities may be affected.

J. Comply with Laws, Statutes, and Regulations but do not incorporate (unless required by law) or interpret them. The Contractor is required to comply with all laws whether referenced or not. . However, certain laws are required to be incorporated verbatim into the Contract Documents.

K. Do not offer choices without specifying a resolution. Otherwise the Engineer has no basis of rejection of one choice or the other.

L. Establish a basis of bidding without requiring the Contractor to make assumptions.

M. Establish a basis of acceptance or rejection, i.e., clearly convey what constitutes the Work being in conformance with the specifications versus what constitutes the Work not being in conformance with the specifications without ambiguity or subjectivity.

N. Contain sentences that are short and simple and easy to understand. Long and complicated sentences make it more difficult to keep the subject and verb in agreement.

O. Are consistent in both structure and contents. Frequent changes to specifications and differences in specifications from project to project and facility to facility lead to misinterpretation, inconsistent enforcement, higher bid prices, and Contractor claims.

P. Except in very unique or dangerous cases, do not limit the bidding to those contractors who have certain degree of experience with a particular type of work as this raises serious legal issues with fair public contracting laws and may lead to bid protests. Leave that to the Agency's discretion.

III. ORGANIZATION AND STRUCTURE OF THE GREENBOOK

The GREENBOOK follows the AASHTO format and is organized into numbered Parts, Sections, and Subsections. The current Parts are:

- Part 1 contains general conditions dealing with contracting procedures, general and legal responsibilities of the Contractor, prosecution of the Work, control of Work and materials, and general measurement and payment terms for the Work.
- Part 2 covers materials requirements. It does not cover measurement and payment.
- Part 3 covers construction methods, measurement, and payment.
- Part 4 covers alternate rock products, asphalt concrete, portland cement concrete, and untreated base material.
- Part 5 covers pipeline system rehabilitation including materials and construction methods.
- Part 6 covers modified asphalts, pavements and processes.

Sections are not hyphenated, e.g., Section 306. Subsections are hyphenated and may contain up to 3 decimal points. Each topic is in general organized into the following subsections and sequence:

A. *General.* This subsection consists of short, succinct statements summarizing the Work covered by this Section of the Standard Specification. It does not contain details, material or construction requirements, or explanations of measurement and payment. It includes a purpose clause only when necessary. A purpose clause is a simple statement of intent that appears at the beginning of a subsection. The purpose clause is used to help the reader interpret the specifications.

B. *Materials.* This subsection either specifies the material requirements of the Work or refers to subsections that contain those requirements.

C. *Construction Methods.* This subsection specifies the required construction procedures or end results of the Work to be performed. Construction methods are specified in ascending order

following the sequence of construction.

D. *Basis of Measurement.* This subsection describes the basis of measurement i.e., Cubic Yard, Ton, etc. for the Work to be performed under the respective Section or Subsection for payment.

E. *Basis of Payment.* This subsection establishes the pay items for the Work and, when necessary, describes what is included in the payment for those pay items beyond what is already covered by Part 1.

Do not include (C) through (D) if only specifying material requirements.

III.1 Sequence of Specifications

Once the outline has been established, arrange the provisions in a sequence the Work will be performed. In addition:

A. Place general provisions before specific provisions.
B. Include administrative provisions such as submittals as the topic is discussed.

III.2 Sections and Subsections

Different subsections, within the same section, that reflect similar or closely related subjects, shall have similar structures. Subsections shall be permitted to be subdivided for clarity, with each subdivision representing either a requirement or a part of a requirement.

A. Up to 3 levels of subdivisions are permitted, and any level may be permitted to contain a list.

B. The text of the GREENBOOK is organized into decimal subsections running consecutively through each Section where “x” and “x-x” are the Section and Subsection numbers.

C. Three decimal point rule: A maximum of 3 decimal points may be used.

D. Subsections are broken into smaller parts ordered by consecutive numerical or alphabetical characters and indented as shown below:

100-1	Text
100-1.1	Text
100-1.1.1	Text
100-1.1.1.1	Text
a)	Text
i)	Text

Numbers in parentheses are also used to identify items in a list, regardless of the placement of the list within the subsection. Each subsection should begin with a subsection entitled “General.” “General” subsections shall be the first paragraph in each subsection and provide an overall description of what is being specified in the subsection. Technical or unique requirements shall be addressed in specific subsections.

E. Cross references to material requirements specified in Part 2 shall be referenced in the “General” subsection.
F. Subsections after those specifying or cross referencing material requirements shall be presented in an orderly, systematic manner which generally follows the sequence of construction such that the topic is covered in an orderly, systematic manner.
G. A subsection covering measurement shall be included in all subsections which cover measurable Work such as base material, asphalt concrete pavement, etc.
H. A subsection covering payment shall be included at the end of all subsections which cover Work to be constructed. Payment for incidental Work or appurtenant Work shall also be addressed. Provisions shall be thorough, in particular for items to be paid for as a lump sum.
I. Do not include measurement and payment subsections in subsections which cover material requirements only.

III.3 Lists

Lists are a method of structuring features, characteristics, and requirements. If possible, use lists or tables to present requirements, rather than long text descriptions. Lists in any subdivision level shall be numbered, and listed items shall be single words, phrases, or sentences.

Whenever a list is composed it should be complete and easy to read, and that its elements should consist of parallel parts of speech.

A. Completeness

Generally speaking, the best policy for specification writers to follow is "If you don't specify it explicitly, then don't expect to get it." Adding generalized list elements, like "and others," "and the like," or the words "not limited to" will probably not get you something you haven't specified explicitly. Generalized list elements add little meaning to the text, and can often be ignored by readers. If you shall use generalized terms, use them alone and unaccompanied by specific items. By mentioning one thing explicitly, you may be excluding others. So often and for so many years this method of interpretation has been used that lawyers have a Latin name for it: *"Expressio unis est exclusio alterius,"* which means "to say one thing is to exclude the other." Sometimes generalized list elements are subject to interpretation according to another legal canon known as "*ejusdem generis*," which limits the unwritten elements to members of the same family. For example, the list "sands, gravels, crushed rocks, and other items" could be interpreted as not applying to cement, since cement is not an aggregate and all the listed components are.

B. Readability

When the elements of a list become numerous, the visual clutter of the text makes it difficult to read, and readers are therefore likely to miss one or more of the elements. This human-factor problem is easily solved by listing the elements vertically with subparagraph labels. For example:

Temperature-rise specifications shall apply to:

a) resistors,
b) capacitors,

c) inductors, and
d) transistors.

As a rule, indented lists are always preferred in technical documentation.

C. Parallelism

The elements of each list shall all be the same part of speech. For example, the following list is incorrect because "resuscitate" is a verb and all the other three elements are nouns. This list's elements shall have been all nouns:

Incorrect:

a) safety,
b) rowboats,
c) **resuscitate**, and
d) life preservers

Correct:

a) safety,
b) rowboats,
c) **resuscitation**, and
d) life preservers

IV. EDITING THE GREENBOOK

IV.1 Defined Terms

Defined terms are those terms defined in Subsection 1-2. Defined terms shall be capitalized and capitalized terms shall be defined. When a term that needs to be defined is used in a section or subsection it shall be defined there. If the term is used throughout several sections or subsections define it under Subsection 1-2.

Do not specify Work in the definition; as definitions are definitions and nothing more. For example:

Incorrect:

pH - Unit universally used to express the intensity of the acid or alkaline condition of a water sample. The pH of natural waters tends to range between 6 and 9, with neutral being 7. Extremes of pH can have deleterious effects on aquatic systems. The authorized non-storm water discharges shall meet the NELs and NALs for pH.

Correct:

pH - Unit universally used to express the intensity of the acid or alkaline condition of a water sample.

IV.2 Acronyms and Abbreviations

Acronyms are capitalized words like PVC and PCC, which are composed of the initial characters of

an often repeated phrase. But, in the case of PVC, they have become so widely used that they have been demoted to the status of ordinary English words.

Acronyms can make documents hard to read, since the readers often have to stop and refresh their memory of what the meaning is. When the document is only a page or two long, it's easy to scan backwards and find the places in the text where the acronyms are defined. In a hundred-paged document, it is not so easy.

Avoid using acronyms, especially ones that are project-specific. Put the acronyms in 1-3, "ABBREVIATIONS." Make sure each acronym is defined.

Acronyms and any abbreviations that are not in common use shall be spelled out with the abbreviation following in parentheses for the first use of the term in the subsection heading as the first choice or body of each subsection (e.g., Notice to Proceed (NTP)). Each subsequent use in the subsection shall be permitted to be the acronym or abbreviation only.

Abbreviations shall conform to those specified in 1-3. Abbreviations shall be added to 1-3 as appropriate. Abbreviations do not contain periods. Abbreviations contain only capitalized letters. Avoid abbreviations as much as possible. They are better suited for use on the Plans where space is limited.

IV.3 Units of Measurement

Units of measurements must conform to Subsection 1-4. Note the following:

A. Where the actual measured size of a product is not the same as the nominal size, trade size designators shall be used rather than dimensions. Trade practices shall be followed in all cases.
B. Dual Units - Use English Units First (metric units in parenthesis) unless the industry standard is metric.
C. If the measurement is for specialized tests or work that is done in only one unit, don't include the other unit.
D. Use mils; not decimals of an inch.
E. Spell out "inch" and "foot/feet" in the text.

IV.4 Subsection Nouns

Are plural – i.e. connectors, pull boxes

V. TERMINOLOGY AND PHRASE REFERENCES

V.1 Mandatory Rules, Permissive Rules, and Explanatory Information

A. When writing specifications, always state requirements in the future tense using the emphatic form ***shall***. Hence, the finished product SHALL be, SHALL produce, SHALL consume.... The weaker auxiliary verbs ***will***, ***should,*** and ***may*** do not express a requirement. ***May*** grants permission, and ***should*** states a preference.

One exception to the rule is when writing the requirements following SHALL. They shall be in present tense; do not write them in future tense.

Example:

Incorrect: No conductor shall be used in such a manner that its operating temperature **will exceed** that designated for the type of insulated conductor involved.

Correct: No conductor shall be used in such a manner that its operating temperature **exceeds** that designated for the type of insulated conductor involved.

B. ***"Shall, shall not,*** and ***shall not be"*** indicate mandatory Agency's requirements. Terms such as "***is to be,*** and ***shall be not,*** whose meanings are less clear, shall not be used because these words are conditional tense and present different levels of obligations, as well. Use "shall" instead. Do not write specifications in conditional tense.

C. The terms "***should, can,*** *and* ***could"*** shall be avoided as they may be understood differently by different parties.

D. ***"Shall be permitted*** and ***it shall be permissible"*** indicate allowed optional or alternate methods. (Note that these are still mandatory language and constitute rules.)

E. The term "***may"*** shall only be used where it recognizes a discretionary judgment on the part of the Engineer.

F. Specifications specify; they do not explain. Explaining may needlessly provide grounds for disputes. Furthermore, the word "because" may introduce both essential and nonessential subordinate clauses. Many readers and writers are not capable to distinguish between the two. Here's an example:

"The fasteners shall not be sandblasted because of corrosion."

Does the sentence mean "Corrosion shall not constitute a reason to sandblast the fasteners," or does it mean "The fasteners shall not be sandblasted since sandblasting them may cause corrosion"? Which did the writer intend? The way it is punctuated requires that we accept the first interpretation, regardless of the meaning intended by the writer. Do not use "because" or include any background information.

V.2 Phrasing

The phrases "approved by the Engineer" or "accepted by the Engineer" shall be avoided. These shall be used only when the Engineer will actually accept or approve a specific item or the Work. In such phrases, "approved" and "accepted" are synonymous; there is no difference in the responsibility taken by the Engineer.

A. Phrases that **may** be used:

- "… as shown on the Plans …"

- "… as specified in the Special Provisions …"
- "… shall conform to …"
- "… conforming to …"
- "…in accordance with…"
- "…as shown in the Table…"
- "…conforming to the requirements shown in Table…"

B. Phrases that **may not** be used:

- "… as directed by the Engineer… "
- "… as determined by the Engineer …"
- "… unless otherwise directed by the Engineer …"
- "… as allowed," "as appropriate, " "as indicated," "as required," and "as necessary…"

Reason: It is not fair or reasonable to expect the Bidder to know what the Engineer would be asking for after the award of the Contract.

V.3 Prepositional Phrases

A sentence containing a series of prepositional phrases all in a row runs the risk of creating a syntactic ambiguity. An example is *"The O&M Manuals shall be prepared for use by the Agency forces."* Who was supposed to prepare the materials, the Contractor or the Agency forces?

V.4 Modifiers

A modifier works best when it is next to the word it modifies. If it is possible for a reader to attach one of the phrases to a different word than the one you intended, then you must restructure the sentence.

Example:

"The flange shall be fastened by nuts and bolts of stainless steel."

Which is stainless, both the nuts and the bolts, or just the bolts? The correct version reads as follows:

"The flange shall be fastened by stainless steel nuts and stainless steel bolts."

V.5 Additional Phrases to Avoid

A. "… and shall conform to the requirements of this Section/Subsection…"
B. "… conforming to the requirements in…"
C. "… at the Contractor's own expense…"
D. "… of the best quality, high quality, commercial quality, etc.…"
E. "… approval of the Engineer…"
F. "… acceptable to the Engineer…"
G. "… such as…"

H. "… at a minimum but not limited to…"
I. "… in a workmanlike manner…"
J. "… to the satisfaction of the Engineer…"

V.6 Sentence Structure

Keep sentences short and simple. Here's an editing tip that will help write clearer sentences: When you've written a sentence, read it back to yourself with all the modifiers and subordinate clauses deleted; read only a short subject, the main verb, and a short object. You'll be able to see when the sentence contains unnecessary terms or nonsense.

V.7 Paragraph Cross References

Paragraph cross-references cite other paragraphs within their own document. Such citations are highly prone to error. It is not unusual for a reviewer to find a reference either to the wrong paragraph, or to a paragraph that doesn't exist. Review cited cross references and verify that they are applicable and appropriate. Determine if additional provisions are necessary.

When cross references are used to avoid repeating a requirement, cross references shall include only the number of the subsection being referenced. The words "section," "subsection," and "paragraph" shall not be used.

Example:

"Such changes will be paid in accordance with 3-2."

Use simple direct language. Technical writing shall be dignified, but doesn't have to be pompous. Writing can be dignified when the language is simple, direct, and strong. To make your writing clearer, easier to read and more effective, use the simple word.

Examples:

DON'T SAY	SAY
initiate, commence	begin
make	Construct, fabricate, produce
terminate	end
utilize	use

DON'T SAY	SAY
substantial portion	large part
afforded an opportunity	allow
Inspector	Engineer
provided or stated	specified
Drawings	Plans
project or job	Work
more than	greater than

V.8 Avoid Word Pairs

Don't use word pairs if the words have the same effect or where the meaning of one included the other to avoid redundancy.

Examples: Word pairs to avoid:

any and all	each and every	means and includes
authorize and direct	full and complete	necessary and desirable
cease and desist	order and direct	

V.9 Avoid Use of Exceptions

If possible, state a rule or category directly rather than describing that rule or category by stating its exceptions. However, you may use an exception if it avoids a long and cumbersome list or elaborate description.

V.10 Contextual Ambiguity

Sometimes we find a sentence that has no ambiguous words and can be reasonably diagrammed in only one way, but still leaves its reader confused about its meaning.

Consider the sentence: “All surfaces... shall be painted white to increase reflectivity.”

Does it mean "paint all surfaces white"? Or does it mean "determine which surfaces have lower reflectivity than white paint, and then paint them white"? We know from the source that the writer really wanted all surfaces painted.

The infinitive phrase, "to increase reflectivity," was added to explain the Engineer's reason for the requirements. However, it gave the reader two ways to interpret the words. Do not explain!

The only way to avoid making errors of this type is by adjusting your point of view and playing "what-ifs" in your head when you read the text. The corrected version reads as follows:

> "All surfaces... shall be painted white."

V.11 Syntactic Ambiguities

This type of ambiguity occurs when there are two or more ways to read the structure of a sentence. Take, for example: "Flying aircraft may be hazardous."

Does it mean the act of flying may be hazardous? Perhaps it means that airplanes themselves may be hazardous. Maybe it means they're hazardous only when in flight. Regardless, it cannot be resolved from the content of the sentence since "flying" may act as a noun, an adjective, or a verb. Things your English professor called "misplaced and dangling modifiers" also cause syntactic ambiguities. In spoken English, ambiguities are resolved by raising the pitch of a word. The rise in pitch is called intonation. As a general rule, if you need to add intonation to a sentence to make the meaning clear, the sentence most likely has an ambiguity and shall be rewritten.

Other types of syntactic ambiguities happen when pronouns aren't clearly tied to a single noun phrase, in strings of prepositional phrases and in sentences with multiple conjunctions. Sometimes syntactic ambiguities can be resolved by punctuating the sentence correctly.

V.12 Ellipsis

When speaking in English, we often leave out a word or short phrase without interfering with the understanding of cooperative listeners. This practice is also permissible in casual written English. We say the missing words are "understood."

When reading specifications, however, nothing is understood. Readers are not necessarily cooperative, and may actually be looking for a way to rationalize failure on their part to deliver acceptable goods.

Examine your sentences for cases where words are "understood" and insert the missing words where they belong.

> Example: "The generator shall supply the processor with 10.5 amperes and the batteries 8.5 amperes."

A "shall supply" has been left out, and it is not clear whether the understood phrase belongs before or after "the batteries." The resulting statement is ambiguous. Here is the corrected version:

> Example: "The generator shall supply the processor with 10.5 amperes and shall supply the batteries with 8.5 amperes."

V.13 Pronoun References

The words "it," "they," "them," and "their" are hazardous. When a pronoun is preceded by more than one noun phrase, people may argue over which noun phrase the pronoun refers to. Consider

the following example taken from a scope of Work.

> "Prior to accepting Work or documentation developed by Subcontractors, the Contractor shall evaluate **them** for completeness, technical adequacy, and compliance with Owner contract requirements."

What is to be evaluated? Does "them" refer to the products or the Subcontractors? Note that pronouns often refer to nouns in preceding sentences. Check a few sentences to the left of each pronoun for nouns that the pronoun may refer to.

V.14 Gender Specificity

Avoid words like "man," "he," "him," and "his," which might indicate that you haven't considered that the person involved might be a woman. Instead, use "person," "they," "them," and "their," and refer to people by their currently correct job titles like "project manager."

DON'T SAY	SAY
Crewman	Crew member
Draftsman	Drafter
Fireman	Firefighter
Flagman	Flagger
Foreman	Supervisor
Man-hours	Hours Worked or Person Hours
Manpower	Personnel, Workforce

Avoid the gender-specific pronoun when the antecedent could be male or female.

Example:

Incorrect: The Contractor shall be responsible for his Subcontractors' work.

Correct: The Contractor shall be responsible for the Subcontractors' work.

V.15 Multiple Conjunctions

When you write sentences with two or more conjunctions, you risk producing an ambiguity. For example, *"The flange shall be fastened by gluing and clamping or riveting."*

This could mean "**gluing and clamping** or riveting" or it could mean "gluing and **clamping or riveting**." Unfortunately, English does not provide us with a means of declaring the order of application of its logical operators. The burden of resolving the confusion of precedence is placed on the writer, who shall find a different way of expressing the idea without ambiguity. In the above case try: *"The flange shall be fastened either by gluing and clamping or by riveting."*

V.16 Repeat Phrases

A very basic rule in writing specifications is to say things once. In updating or adding specifications special attention shall be given to Part 1 which covers the terms and conditions of the Contract. Therefore, there is no need for repeating those terms in the other parts. For example, avoid repeating that the Contractor shall comply with the applicable laws. That requirement has already been covered by 7-13, “LAWS TO BE OBSERVED.” Another common example will be to repeat the requirement that has been covered by 2-6, “WORK TO BE DONE.” It is already stated there that the Contractor shall furnish all materials, equipment, tools, labor, and incidentals necessary to complete the Work.

VI. WORD CHOICES

VI.1 “and/or”

Avoid the use of awkward phrases such as “and/or” and “him/her.” Do not use "and/or": alternatives are: "a, b, or both" and "a, b, c, or a combination thereof". Sometimes "a, b, or c" Works just as well.

VI.2 "Any"

"Any" is an ambiguous word that can mean: all, a selected alternative, every, a specific one, etc. Writers may intend “any” to denote "plurality" and readers may interpret it to denote "oneness." Also, when "any" is used to describe the selection of items from a set, it is the **reader** who selects, not the writer. Which items or how many of a particular item the readers select depends upon their point of view.

Avoid using the word "any", especially where it can be inferred that the Contractor chooses an alternative.

A good way of testing is to substitute "any old" for "any." If the meaning changes, the sentence needs to be rewritten.

"ANY OR ALL" means readers may choose any item(s) (they choose which and how many) OR all of them, whichever they prefer. If you have used this phrase, you probably meant "each," "every," or "each and every," which is a phrase of emphasis often used by lawyers. "Each," "every" or "all" nearly always does the job perfectly well on its own.

Often the word "any" may be simply deleted without affecting the intended meaning of the text.

VI.3 “As a Minimum" and "Not Limited To"

These phrases serve no purpose other than to give the specification writer a false sense of security. Don't use them in specifications. You must clearly spell out all requirements in full. If you don't know what is required, how do you expect the Contractor know?

In a case of a low bid, no reasonable person can expect to get more than the absolute minimum required by the contract. What sense does it make then, to say "We'd like more, but we're only paying for..."?

VI.4 “Capable"

“Capable” refers to performance requirements. When you use "capable" to describe a piece of equipment, you're referring to the performance requirements e.g. “capable of withstanding winds up to 35 Miles/Hr.”

VI.5 Coined Words

While it's acceptable to coin words e.g., “densification” when you're writing literature, or even when you're writing memos and reports, it's not acceptable in engineering specifications because the meaning is elusive. Therefore, use “compaction” instead of “densification.”

VI.6 “Conform to” vs. “In accordance with”

A. “Conform to” applies to materials or method specifications
B. “In accordance with” applies to procedural specifications

VI.7 “Critical"

The word "critical" is very often used by engineers. It is likely to cause trouble because it is both vague and ambiguous. Here are a few of its definitions:

- Prone to criticize,
- Relating to a turning point,
- Uncertain, and
- Able to sustain a chain reaction.

Do not use the word “critical.”

VI.8 "etc."

The abbreviation "etc." is short for "et cetera," which is Latin for "and others" or "and the rest." Its use is inappropriate in specifications. You must take the time to figure out everything you need to specify, and then spell it out completely.

VI.9 Parentheses

Use parentheses for:

a) Law citation references
b) Abbreviations

Do not add parentheses for information that is essential to the specification. For example, do not use parentheses in the following sentence:

*Incorrect: “If subbase or base material **(other than asphalt treated base)** is to be paid for by the ton . . .”*

*Correct: “If subbase or base material **other than asphalt treated base** is to be paid for by the ton . . .”*

VI.10 “Perform/Construct”

A. “Perform” applies to procedures or methods.

B. “Construct” for items to be constructed.

VI.11 “Shall” and “Will”

Correct usage of "shall" and "will" in specifications is extremely important, and is a frequent source of errors found in drafts. Use the word “shall” only for requirements of the Contractor. Use the word “will” only for decisions or actions of the Engineer.

VI.12 Slash Mark "/"

The dictionary states this about the Slash Mark "/" (i.e., virgule): "an oblique stroke (/) used between two words to show that the appropriate one may be chosen to complete the sense of the text." Keep in mind that it will be the Contractor who gets to decide which word is proper. Note also that the dictionary tells the Contractor to choose just one, not both.

When we write A/B, we usually mean "either A or B" or "either A or B or both" or "both A and B" or "number of A's divided by number of B's." The writer’s intention may not be clear to the reader.

In many cases, substituting a hyphen for the slash will fix the problem. For example, we see "instructor/operator" in training device specifications where "instructor-operator" would be clearer.

In most cases you'll have to write "A or B or both," or whatever you really meant.

VI.13 “Specified in” and “Shown on”

When it is necessary to refer specifically to Plans or Specifications use:

A. Specified in the Specifications (used when referring to where something is specified)

B. Shown on the Plans

VI.14 "Up to"

"Up to" is a particularly troublesome phrase in specifications. It can be interpreted three ways, depending on one's point of view.

- It may mean "all numbers from the specified minimum to the specified number." This is what engineers usually intend when they write "up to."
- It may mean "a single number between the specified minimum and the specified maximum, but not more." This is the way the Contractor's attorney is likely to interpret your specifications.
- In vendors' specifications, it often means "sometimes as great as, but not necessarily." They're hoping you'll think they intended "all numbers from the specified minimum to the specified number," and buy their product without testing it.

Avoid confusion. Write "no less than" or "from ___ to ___." Never write "up to." Be wary when

you read "up to" in a vendor's specification.

VI.15 "Which" and "That"

If you've used "which" to introduce a relative clause, and you want the clause to be an essential part of a requirement, use "that" instead of "which."

"Which" may introduce either an essential or a nonessential clause. In the case of nonessential clauses, "which" shall be preceded by a comma. Many writers fail to provide the necessary comma, and consequently, there are often disputes over whether or not a particular "which" clause was intended to be essential or nonessential.

Clauses introduced by "that" are always essential to the meaning of the sentence, and are not preceded by a comma unless the comma serves another purpose. To avoid confusion, avoid using "which" whenever "that" would fit.

You may use ", which" to introduce a relative clause stating a fact that is not essential to the meaning of the sentence, but such cases shall not occur often in specifications. Specifications specify; they do not explain. When "which" is used, its preceding comma is the only indicator of whether the writer intended the clause to be essential or nonessential. Avoid using "which" whenever possible. Otherwise, a comma, or lack thereof, is all you may need.

Here's a sentence with a nonessential relative clause introduced by "which":

> “The compressor shall be driven by a 12-inch pulley, which is dynamically balanced.”

In this specific case, the pulley is not required to be dynamically balanced. The clause ", which is dynamically balanced" merely states the writer's opinion that 12-inch pulleys are dynamically balanced. Changing ", which" to "that" yields a sentence clearly requiring that the pulley be dynamically balanced:

> “The compressor shall be driven by a dynamically balanced 12-inch pulley.”

The clause ", which shall be dynamically balanced" would clearly state the requirement also.

VI.16 Vague Adjectives and Adverbs

The words used in specifications have a great deal of influence on the finished product. You are directing the Work of a large number of people. Individuals may have differing opinions of what the product shall be. If you use words that allow a broad range of interpretation, you may be in for an unpleasant surprise when it's time for inspection.

Because they will be interpreted however the reader sees fit, words such as those listed below, unless accompanied by additional details, may actually be meaningless in the context of specifications. Sometimes standardization brings meaning to them. For example, a large egg shall be within certain limits of size or US Department of Agriculture regulations say it can't be called "large." On the other hand, the size of a large ice cream cone may differ from vendor to vendor.

Listed below are some vague adjectives and adverbs that have been found in draft specifications. Contractors cannot guess what is required at the time of Bid. There are many, many more of them in the English language. Vague words:

about
acceptable
accurate
adequate
adjacent
adjustable
affordable
applicable
appreciable
appropriate(ly)
approximate(ly)
available
average
avoid(ed)
better
can
care
careful(ly)
consider(ed)(ation)
could
deep
dependable
desirable
easy(ily)
economical
efficient
equivalent(ly)
essential
exactly
excessive
familiar
feasible
few
firmly
frequent(ly)
generally
good
high
immediately
improper
instant
insufficient
known
legible(y)
less
lightly
likely
low
major
many
may
maybe
might
most(ly)
near(ly)
neat
neat(ly)
necessary
normal
normal(ly)
note
optimum
other
periodic(ally)
pleasing
possible
practicable
practical(ly)
practices
prefer(red)
proper
proper(ly)
quality
quick
ready(ily)
reasonable(y)
recognized
relevant
reputable
safe(ly)(ty)
satisfactory
secure(ly)
several
significant
similar
simple
should
smooth
stable
substantial(ly)
sufficient(ly)
suitable
temporary
timely
typical
usual(ly)
variable
various

wide
Workmanlike
Worse

The terms contained here shall be reviewed in context, and, if the resulting requirement is unenforceable or vague, the term shall not be used.

VI.17 Additional Requirements for Word Choices

A. Avoid legalese like "hereinafter," "hereinbefore," "herewith," and "wherein." They do not make the text more authoritative.
B. Do not use "said" and "same" as an article.
C. Avoid using superfluous words like articles "a" and "an" or "the" everywhere. But, if they enhance the readability, do it.
D. The use of "all" is usually redundant. Consider avoiding it.
E. Avoid the use of "Contractor" as much as possible. It is unnecessary because the subject of the specifications is Contractor.
F. Do not use "furnish and install" because GREENBOOK Part 1, Subsection 2-6, Work to be Done" already covers Work and what goes into it like labor, materials, equipment, and other things. If needed, define "Provide" to mean "Furnish & Install."
G. Construct sentences so that the misplaced or missing punctuation does not change the meaning or cause confusion. The best way to deal with this is to use short sentences. The more a sentence deviates from this structure, the harder the sentence is to understand. Long, run-on sentences are a basic weakness in legal documents. Legal documents often contain conditions which result in complex sentences with many clauses. The more complex the sentence, the greater the possibility for difficulty in determining the intended meaning of the sentence.

VII. MISCELLANEOUS FORMAT PROTOCOLS

Other protocols for grammar, syntax, and format shall be as in Table VII (A).

Table VIII (A)

ITEM	IN TEXT	IN TABLES	IN LISTS
Agency Forms	Use just the form number: Form 463	Use just the form number: Form 463	Use just the form number: Form 463
Areas	Use words: square foot, square yard	May use abbreviation: ft^2, yd^2.	Use words

ITEM	IN TEXT	IN TABLES	IN LISTS
ASTM	Do not put a space between the letter and number when writing ASTM designations (e.g., ASTM D1856).	Do not put a space between the letter and number when writing ASTM designations (e.g., ASTM D1856).	Do not put a space between the letter and number when writing ASTM designations (e.g., ASTM D1856).
Densities/rates	Use words: pounds per cubic yard, gallons per square yard	May use abbreviations: pcf, gal/yd^2.	Use words
Dimensions	Use words: foot, yard, inches	May use abbreviation (ft., yd.) or symbol (', ")	Use words
Dual Sections, e.g. sieve sizes	SAE first with SI in parentheses: 1 inch (25 mm)	SAE first with SI in parentheses: 1 inch (25 mm)	SAE first with SI in parentheses: 1 inch (25 mm)
Large numbers & money	Do not reiterate in Parentheses such as $80,000 – not "$80,000 (eighty thousand dollars)"	Do not reiterate in Parentheses: $80,000 – **not** $80,000 (eighty thousand dollars)	Do not reiterate in Parentheses: $80,000 – not $80,000 (eighty thousand dollars)
Numbers	For counts use digits such as 3 feet, 4 posts, 6 to 12 hours. Numbers over 999 use commas e.g., 1,200	Use digits	Use digits
Ordinal Numbers	Use words such as first, fifth, twentieth	Use symbols: 1st, 5th, 20th	Use words: first, fifth, twentieth
Other Forms	Identify the originating organization: FHWA Form 1273	Identify the originating organization: FHWA Form 1273	Identify the originating organization: FHWA Form 1273
Percentages	Use word: 12 percent, 25 percent	Use symbol: 12 %, 25%	Use word: 12 percent, 25 percent

ITEM	IN TEXT	IN TABLES	IN LISTS
Ranges	Use "to": 180 to 190 °F, 6 to 12 inches	Use "-": 180 - 190 °F, 6 - 12"	Use "to": 180 to 190 °F, 6 to 12 inches
Ratios	Use colon: 1:1, 1½:1	Use colon: 1:1, 1½:1	Use colon: 1:1, 1½:1
Us sieve sizes	Use words: 2 inch, ½ inch, No. 30, No. 100	Use symbols: 2", ½", #30, #100	Use symbols: 2", ½", #30, #100
SI sieve sizes	Use symbols: 19.0 mm, 300 µm	Use symbols: 19.0 mm, 300 µm	Use symbols: 19.0 mm, 300 µm
Temperature	Use symbol: °F	Use symbol: °F	Use symbol: °F
Volumes	Use words: cubic yard, cubic feet, gallons	May use abbreviation: yd^3, ft^3, gal.	Use words
Units of Measurement: Pounds of mass	pounds	lb	lb
Units of Measurement: Mass per volume	pounds per cubic yard	lb/CY	lb/CY

VIII. REFERENCES

This document is an edited compilation of the best management practices recommended by the following excellent references:

1. Colorado DOT Guidelines For Construction Specifications
2. Guide to Specification Writing For U.S. Government Engineers, by John Oriel, NAVAIR TSD
3. Contracts & Specifications for Public Works Projects, by Edward R. Fisk and Julius C.
4. Construction Specifications Writing: Principles and Procedures, by Harold J. Rosen and John Regener
5. National Electrical Code (NEC) Style Manual
6. Drafting Legal Documents from Federal Register
   http://www.archives.gov/federal-register/write/legaldocs/index.html
7. Specification Style Guide for 1999 and 2006 Specifications from Caltrans