



Style Guide

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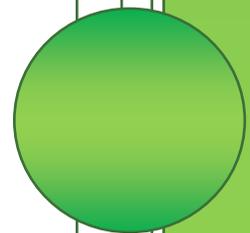


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I. PURPOSE

These guidelines are intended to assist in preparing specifications for work generally conforming to the Greenbook. Following these guidelines will ensure consistency and structure when revising and/or adding to sections of the Greenbook and preparing Special Provisions.

II. GENERAL CHARACTERISTICS OF SPECIFICATIONS

Specifications govern the Work to be performed by the Contractor, not the contract administration and inspection activities to be performed by the Engineer. They are instructions to the Contractor for the Work to be performed, the conditions and restrictions on performance and execution of the Work, the expected quality of the Work, and how the Work will be measured for payment. Support activities by the Engineer must only be specified when the Contractor's activities, sequence of Work, or schedule could be affected. Well-written specifications are essential to clarify the expectations of the Agency, can significantly affect the efficient construction of the project, and are a direct representation of the quality of the Contract Documents.

II.1 Method and Performance Specifications

Methods and Performance are the two basic types of construction specifications. 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. Performance specifications describe the desired result or quality of the final product to be achieved.

Performance specifications encourage Contractor innovation and allow the Agency to accept or reject the final product.

Method specifications must not be intermingled with Performance specifications. Intermingling of Method and Performance requirements within the same subsection introduces the possibility of a conflict between the two. Example:

Bituminous pavement shall be removed to clean and straight lines in accordance with the tolerances specified in these specifications. (*performance*)

Bituminous pavement shall be cut and removed by use of saw cutting, jackhammer, milling machine, wheel type pressure cutters, or drop hammer cutters. (*method*)

What if the required performance cannot be achieved by the required method? It will most likely lead to disputes.

II.2 Specifications 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:

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

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.

C. Imperative mood, active voice:

Example:

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

However, Greenbook has not adopted the imperative mood style. In Special Provisions, use short simple sentences in the active voice wherever possible. Use the imperative mood only if it is preceded by an introductory statement clarifying that the text makes a requirement on the Contractor. 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 that could lead to misinterpretation.

- C. Use technically correct terms, not slang or “field” words.
- D. Avoid 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 logical order.
- I. Do not put requirements on Agency unless activities affect Contractor.
- J. Comply with Laws, Statutes, and Regulations but do not repeat (unless necessary) or interpret them. Contracting laws already require the Contractor to be fully informed of, and comply with, all applicable laws and regulations. Including excerpts or references to these laws does not make them more enforceable.
- 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.

III. ORGANIZATION AND STRUCTURE OF THE GREENBOOK

The Greenbook follows the AASHTO format and is organized into numbered Parts, Sections, and Subsections.

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 the measurement and payment clauses.

Part 3 covers construction methods, measurement, and payment. The remaining parts contain specific material and construction details.

Each topic is organized into the following sections and order:

- 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. Include a purpose clause only when necessary. A purpose clause is a simple statement of intent that appears at the beginning of a subsection or subpart. The purpose clause is used to help the reader interpret the specifications. Use a purpose clause only when some of sections, due to their complex substance, are difficult to understand.
- B. Materials. This subsection either specifies the material requirements of the Work or refers to subsections in the materials details that contain those requirements.
- C. Construction Methods. This subsection specifies the required construction procedures or end results of the Work to be performed for the Section within the Standard Specifications. Specific construction details are specified in this subsection.
- D. Method of Measurement. This subsection describes the methods and the Sections by which the Work for the Section within the Standard Specifications will be measured for payment to the Contractor.
- E. Basis of Payment. This subsection establishes the pay items for Work accomplished for the Section within the Standard Specifications and, when necessary, explains what is included in the payment for those pay items beyond what is already covered by Part 1.

III.1 Sequence of Specifications

Once the outline has been established, arrange the provisions in a sequence the Work will be performed. Here are some suggestions to arrange the information in specifications:

- A. Place general provisions before specific provisions.
- B. Place permanent provisions before temporary provisions.
- C. Place administrative provisions such as submittals as the topic is discussed.

III.2 Sections and Subsections

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

- 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 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 in Figure 3.03 (A).

- E. Numbers in parentheses are also used to identify items in a list, regardless of the placement of the list within the subsection.

100-1	Text
100-1.1	Text
100-1.1.1	Text
a)	Text
(i).	Text

Figure 3.03 (A) Subsection Organization

- F. Each subsection should begin with a subsection entitled “General.” “General” subsections must begin with an overall description of what is being specified in the subsection in the first paragraph. The second and additional paragraphs may contain general requirements. Technical or unique requirements must be addressed in specific subsections.
- G. Subsections which cross reference material requirements in Part 2 or which contain material requirements must follow the “General” subsection.
- H. Subsections after those specifying or cross referencing material requirements must 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.
- I. A subsection covering measurement must be included in all subsections which cover measurable Work such as base material, asphalt concrete pavement, etc.
- J. A subsection covering payment must be included at the end of all subsections which cover Work to be constructed. Payment for incidental Work or appurtenant Work must also be addressed. Provisions must be thorough, in particular for items to be paid for as a lump sum.
- K. Do not include measurement and payment subsections in subsections which cover materials only addressed in Part 2. Refer to 2-6. Materials are never specified as “furnish only.” Materials are incorporated into the various items of the Work.

III.3 Lists

Lists are a method of structuring the items necessary to complete a rule e.g., features, characteristics, and requirements that must be consistent. 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 in the text of specifications, measures should be taken to make it complete and easy to read, and that its elements all consist of parallel parts of speech.

A. Completeness of lists

Generally speaking, the best policy for specification writers to follow is "If you don't mention a thing 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 mentioned explicitly. Generalized list elements add little meaning to the text, and can often be ignored by readers. If you must 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 of Lists

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 bullets or subparagraph labels and separated by blank lines. 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 in Lists

The elements of each list must 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 must have been all nouns:

Incorrect:

- e. safety,
- f. rowboats,
- g. **resuscitate**, and
- h. life preservers

Correct:

- i. safety,
- j. rowboats,
- k. **resuscitation**, and
- l. life preservers

IV. UPDATING THE GREENBOOK

IV.1 Defined Terms

Defined terms must be capitalized and capitalized terms must be defined. When a term that needs to be defined is used in a section or subsection it must be defined there. If the term is used throughout several sections or subsections define it under Subsection 1-2. Do not specify items of Work in the definition; as definitions are definitions and nothing more.

IV.2 Acronyms/Abbreviations

Acronyms are capitalized words like PVC and PCC, which are made from 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 some of the acronyms mean. 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.

The ways to avoid this problem are to avoid using acronyms, especially ones that are project-specific, and to put a glossary of acronyms in the document. Make the glossary easy to find, and 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 body of each article (e.g., Notice to Proceed (NTP)). Each subsequent use in the article shall be permitted to be the acronym or abbreviation only.

Abbreviations must conform to those specified in 1-3. Abbreviations must 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 suited for Plans where space is limited.

IV.3 Units of Measurement

Measures must conform to Section 1-4. For the units of measures 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 Unit - 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 need to include the other version.
- D. No decimals in metric units.
- E. Use mils; not decimals of an inch.
- F. Spell out inch and foot/feet.

IV.5 Symbols

Spell out the word percent in text, use symbol in tables.

IV.6 Subsection Nouns

Are plural – i.e. connectors, pull boxes

IV.7 Quantities

- A. Numbers over 999 use commas e.g., 1,200
- B. Always use digits – not words e.g., 500 Working Days, 120 feet (or 120' in tables)

IV.8 ASTM

Do not put a space between the letter and number when writing ASTM designations (e.g., ASTM D1856).

V. TERMINOLOGY AND PHRASE REFERENCES

The use of the phrase “as directed by the Engineer” must be **minimized**. Therefore, Work requirements must be clearly stated in the specifications in a logical order.

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. **Must** is ambiguous, since it may express a presumption instead of a requirement. For example: “The structure must have been designed per codes; after all, it withstood the ground shake.”

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, shall be not, and must”**, whose meanings are less clear, must not be used because these words present different levels of obligations. Use “shall” instead.
- C. The terms **“should, can, and could”** must 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”** must only be used where it recognizes a discretionary judgment on the part of an authority having jurisdiction.
- F. Specifications are instructions to the Contractor. Be very careful how "because" is used in specifications. 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 equipped 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 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.

V.2 Phrasing

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

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

- “... as shown on the Plans ...”
- “... as specified in the Special Provisions ...”
- “... shall conform to ...”
- “... conforming to ...”
- “...in accordance with...”

B. Phrases that **must 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...”

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 Chains of Prepositional Phrases

When you write a sentence containing a series of prepositional phrases all in a row, you are running 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 right next to the word it modifies. Pay attention to which word each phrase modifies. By some stretch of your imagination, 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. Remember, readers may be very creative.

Here's an 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

- And shall conform to the requirements of this Section/Subsection
- Conforming to the requirements in
- At the Contractor’s own expense
- Of the best quality, high quality, commercial quality, etc.
- Approval of the Engineer
- Acceptable to the Engineer
- Such as
- At a minimum but not limited to
- In a workmanlike manner
- 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. Minimize the use of cross-references.

However, when cross references to other parts of Greenbook are necessary to avoid repeating a requirement they shall include only the number and the title of the rule 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 must 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
construct, fabricate	make
initiate, commence	begin
terminate	end
utilize	use
substantial portion	large part
afforded an opportunity	allow
furnish and install	provide
Inspector	Engineer

DON'T SAY	SAY
provided or stated	specified
Drawings	Plans
project or job	Work

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 must 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 must 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 must 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 must 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 must 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. Examples: "The Contractor shall remove any laitance" reads better as "The Contractor shall remove all laitance"; "Any source of borrow other than an available source will be known as a Contractor source" reads better as Sources of borrow other than an available source will be known as Contractor sources." 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"

Be careful with the word "capable." When you use "capable" to describe a piece of equipment, you're not specifying that the equipment be delivered ready to do the job. To do the job, it may need other equipment that is not furnished, or it may need to be modified.

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/In accordance"

- A. "Conform to" applies to materials specifications
- B. "In accordance" applies to procedures

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.

If you must use the word "critical," be sure that the sentence cannot be interpreted two or more ways by choosing different definitions.

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 because Contractors are not required to deliver things that are not specifically mentioned. This means that 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 concrete base**) to be placed on the grading plane is to be paid for by the ton . . ."*

*Correct: "If subbase or base material **other than asphalt concrete base** to be placed on the grading plane 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/Shown"

Referring to Plans and Specifications. In most cases, refer to "in the Contract". When it is necessary to refer specifically to Plans or Specifications use: "in the Specifications" or "on the Plans".

- A. Specified in the Specifications
- 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" must 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 must 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 12-inch pulley that is dynamically balanced."

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

VI.16 Vague Adjectives and Adverbs

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

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 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. SPECIAL PROVISIONS

VII.1 General

Write a Project Special Provision only if the subject has not been adequately covered in the Greenbook. In other words, prepare Special Provisions which supplement or amend the specifications in the Greenbook for each contract.

- A. When the words “as specified in the Special Provisions” appear in the Greenbook it means that the specifier must do something.
- B. Prepare Special Provisions in the same format and sequence as the Greenbook.
- C. Different standard specifications and specification formats (e.g., CSI and AASHTO) must be avoided or minimized within the same Contract Documents.
- D. Address Agency-specific requirements; in particular, in Part 1.
- E. Address the unique, work-specific requirements in particular, in the other Parts.
- F. Do not place requirements upon the "Agency" or the "Engineer." Specify what the Agency will do, when the Agency will do it, and what, if anything, the Contractor shall do before, during, or after.
- G. Specify what materials, if any, the "Agency" will furnish, where and when they may be picked up, etc.
- H. Ensure all Bid items, conditions, requirements, etc. are "biddable", i.e. sufficiently defined and described in the Contract Documents to where a Bidder can develop a Bid Unit Price.
- I. Write clear, enforceable requirements that will be interpreted the same way by both the Engineer and the Contractor.
- J. Do not put terms and conditions in the “construction notes” on the Plans. It is not uncommon to place terms and conditions on the Plans under various “Construction Notes” because they are perceived to be more accessible and visible. This is neither the appropriate use of the Plans nor Specifications. Here is why:
- Special Provisions and other contract terms and conditions are written documents to clarify expectations within the Contract and are not appropriate to place on the drawings.
 - Placing such items on the Plans creates a potential conflict within the Contract Documents that may not accurately convey the Engineers intentions due to the

Precedence of The Contract Documents.

- Having contract requirements in more than one place increases the maintenance effort necessary to create the Standard Specifications.

The purpose of the “Construction Notes” on the Plans is only to highlight or bring attention to unique or special aspects, construction details, or to cross reference the Special Provisions.

- K. State the correct pay items. The name of the pay item must be consistent throughout the Plans, Specifications, and Bid schedule.
- L. Make sure that Special Provisions do not duplicate or conflict with other parts of the Plans and Specifications. Say it once!
- M. Specify a requirement; don’t make a suggestion or give an explanation.
- N. "DELETE" or "SUBSTITUTE" entire paragraphs or entire sentences as necessary. For example, modify by using phrases like: “ADD the following:”, “DELETE in its entirety and SUBSTITUTE the following:”
- O. Study documents included by reference to make sure all provisions apply.

VII.2 Format and Style

- A. The revised or added specification text must be organized under each applicable heading according to the conventions used in the Greenbook and must conform to the conventions used in the Greenbook.
- B. Use the terms "Section" and "Subsection" properly. Section = number only (i.e. 301). Subsection = number + hyphen + number, or number + hyphen + number(s) + decimal point(s) (i.e. 301-2, 301-2.2 or 302-5.2.3).
- C. Three decimal point rule: The Greenbook format uses a maximum of three decimal points. Follow this rule when preparing Special Provisions.
- D. Use the following headings, or a variation thereof, for the appropriate type of special provision (note: x-x represents the section number).
- E. Section titles are capitalized for section numbers without decimal point.

Examples: **2-5 PLANS AND SPECIFICATIONS.**

2-5.1 General.

- F. Begin a special provision that revises one or more subsections with the following heading:

- SECTION x-x.** REVISE as follows:
- Subsection x-x.1.** DELETE in its entirety and SUBSTITUTE with the following:
- Subsection x-x.1.** In the _th paragraph, DELETE the _th sentence and SUBSTITUTE with the following:
- Subsection x-x.1.** DELETE the _th paragraph in its entirety.
- Subsection x-x.1.** In the _th paragraph, DELETE the _th sentence.
- Subsection x-x.1.** REVISE the term from " _____ " to " _____."

- G. When appropriate, follow each heading with the added or revised text. Include related changes to separate Sections in a single special provision.

ADD:

SECTION x-x.

Subsection x-x.1. Add the following:

Follow this with the text of the new Section. Organize the text into the five main parts: Description, Materials, Construction Methods, Measurement, and Payment.

SECTION x-1. REVISE to include the following:

VII.3 Liquidated Damages, Penalties, and Incentives

Do not use specifications that assess penalties to the Contractor. The only deductions that can be made from monies due the Contractor are:

- A. Liquidated damages based on additional engineering and administrative costs to the Agency.
- B. Incentives/disincentives based on either the quality of the Work or incurred facility user costs.
- C. Price adjustments based on the quality of the Work.

In each case, the deduction amount included in the specification must be accurately calculated and documented in the project file. Remediation specified for non-specification Work must not be harsh or punitive, but must accurately represent the actual loss of value to the Agency or the users of the facility.

VII.4 Warranties

Warranty provisions for specific construction products or features are allowed subject to advance approval by the funding source. For example, unless approved federal funds cannot be used for warranties that extend beyond standard manufacturers' warranties. When an extended warranty is used without FHWA approval, a non-federal aid pay item must be created for the cost of the warranty.

VII.5 Proprietary Items

A proprietary (brand name) product must be specified with the phrase "or approved equal." If possible, at least three brand-name products and the phrase "or approved equal" are required to be listed.

VII.6 Appendices

Appendices shall contain references, examples, calculations, tables, and similar material. Appendices shall have titles and shall be designated by capital letters.

VII.7 Pay Items

Each Work breakdown item must have a measurement and a payment clause. Specify the basis of payment for work for which there is no specific Bid item if not specified in the Greenbook.

- A. The specifications establish the pay items under which the Agency will pay the Contractor for Work completed. Items of Work that are readily identifiable and measurable must not be made subsidiary to other items, but must be paid for under separate pay items.
- B. Use the appropriate unit of measurement. Use of lump sum pay items must be minimized in particular items which are readily measured. Pay items with subsidiary items and lump sum pay items are difficult for Contractors to bid and difficult for the Engineer to administer during construction, especially in cases of changed conditions or changed quantities.
- C. Payment for Work under Time and Materials (T&M) must be minimized. T&M Work involves additional paperwork and often has a higher cost than if the Work had been paid for under a bid or negotiated item.
- D. Bid items must be based on a specific type of work or construction operation (which generally correlates to one subsection of the Greenbook).
- E. Include Bid items for types of work, specialized construction operations or requirements to bring to the Contractor's attention, as appropriate.
- F. Use Greenbook subsection headings as the basis of Bid item descriptions as appropriate.

VII.8 Bold or Underlined Text

Bold characters may be used in the body of the text to emphasize or draw attention to a particular requirement. Underlining is not used in the Greenbook and must not be used in Special Provisions especially for Section titles.

Text must be bold in the following: section headings, subsection numbers, subsection titles, and table headings.

VII.9 Definitions

Defined terms must be capitalized and capitalized terms must be defined. The general uses for capitalization is to capitalize what you intend to define. For example, Agreement, Contractor, Notice to Proceed, etc. If it is not defined, do not capitalize it.

- A. Definitions shall be in alphabetical order and shall not contain the term that is being defined.
- B. Definitions shall not contain requirements or recommendations.
- C. Definitions must conform to those specified in 1-2.
- D. Defined terms, when used as defined, are capitalized, e.g., the "Engineer", the "Plans."
- E. Add definitions to 1-2 as appropriate as part of a change.
- F. If a term with a specific meaning is used repetitively, it must be added to 1-2 as a definition.
- G. Terms must be defined only in 1-2 unless used in one instance.
- H. Define all terms that can be subject to more than one interpretation.

VII.10 Titles

The title, capitalized and centered at the top of the page, must identify the part and section of the Greenbook being revised and the subject of the revision. Example:

**PART 2
CONSTRUCTION MATERIALS
SECTION 200- ROCK MATERIALS**

VII.11 Revised or Added Specification Text

Special provisions revising any of the Part 2 and beyond must be written so that the revised or added specification text is incorporated into the appropriate subsections under one or more of the five main parts. New main parts must not be established except in the rare instance of adding an item for design to be performed by the Contractor.

The organization used for the Greenbook must be followed for the added or revised text of Project Special Provisions. The part of the subsection being revised must be identified and the new or revised text must be made to fit that part. The text or breakdown character must be indented only if it enhances the readability and the presentation of the related materials.

VII.12 Specifying Materials

- A. When specifying materials proceed from the general to the specific.
- B. When specifying multiple materials start with the specifications that pertain to all of the materials and then include the specifications that pertain to each material.

VIII. MISC. FORMAT PROTOCOLS

Other protocols for grammar, syntax, and format that must be applied to Special Provisions appear in Table VII (A).

Table VIII (A)

ITEM	IN TEXT	IN TABLES	IN LISTS
Numbers	For counts use digits such as 3 feet, 4 posts, 6 to 12 hours.	Use digits	Use digits
Ordinal Numbers	Use words such as first, fifth, twentieth	Use symbols: 1 st , 5 th , 20 th	Use words: first, fifth, twentieth
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)
Dimensions	Use words: foot, yard, inches	May use abbreviation (ft., yd.) or symbol (' , ")	Use words
Areas	Use words: square foot, square yard	May use abbreviation: sq. ft., sq. yd.	Use words
Volumes	Use words: cubic yard, cubic feet, gallons	May use abbreviation: cu. yds. cu. ft., gal.	Use words
Densities/rates	Use words: pounds per cubic yard, gallons per square yard	May use abbreviations: lbs./cu. yd., gal./sq. yd.	Use words
Temperature	Use symbol: °F	Use symbol: °F	Use symbol: °F
Ranges	Use "to" not "-": 180 to 190 °F, 6 to 12 inches	Use "to" or "-": 180 - 190 °F, 6 to 12"	Use "to" not "-": 180 to 190 °F, 6 to 12 inches
SI sieve sizes	Use symbols: 19.0 mm, 300 µm	Use symbols: 19.0 mm, 300 µm	Use symbols: 19.0 mm, 300 µm

ITEM	IN TEXT	IN TABLES	IN LISTS
SAE sieve sizes	Use words: 2 inch, ½ inch, No. 30, No. 100	Use symbols: 2", ½", #30, #100	Use symbols: 2", ½", #30, #100
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)
Agency Forms	Use just the form No.: Form 463	Use just the form No.: Form 463	Use just the form No.: Form 463
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
Ratios	Use colon: 1:1, 1½:1	Use colon: 1:1, 1½:1	Use colon: 1:1, 1½:1

IX. REFERENCES AND CITED WORKS

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 and Specifications for Public Works Projects: A Specifications Style, 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