

# MASTER SPECIFICATIONS INSTRUCTIONS FOR USE

## PART 1 - GENERAL INSTRUCTIONS

### 1.1 SUMMARY

A. The Master Specifications are a compilation of individual sections of **baseline technical specifications** developed for the specific needs and requirements of the Orange County Sanitation District (OC SAN) Engineering Department. The purpose of the Master Specifications is to specify the most standard requirements with typical alternatives or variations to streamline the process of preparing project specific specifications. The Master Specifications include the majority of the Specifications sections needed for wastewater projects, but are not to be considered all inclusive.

B. The Master Specifications include the General Requirements (GRs) and 17 divisions of detailed technical specifications. These specifications shall be modified consistent with the project-specific requirements as specified below and as described in the OC SAN Design Guidelines, Chapter 01, Section "OC SAN Master Specifications". The Specifier(s) shall also modify the project specifications to correct errors, omissions and outdated requirements, if any, that may exist in the Master Specifications.

### 1.2 CONTENT EDITING

A. The GRs and detailed specifications cannot be used blindly. Specifier(s) shall read the GRs thoroughly to determine if the requirements are applicable to the Project. In order to assist the Specifier(s), requirements that need to be selected, edited or inserted by the Specifier(s) are **bracketed and bolded**. However, other parts of the Specifications section text may have to be edited as well, which is the Specifier's responsibility to determine.

### 1.3 RECOMMENDED METHOD OF USING THE MASTER SPECIFICATIONS

A. Start with the latest version of the Master Specifications rather than old project Specifications. (Check with the OC SAN Project Engineer to obtain the latest version). Become familiar with the "front-end documents" and read the General Requirements thoroughly.

B. Select the detailed Specifications sections needed for the Project from reviewing the table of contents (in the Master Specifications main folder or in the Contract Documents Table of Contents template) and obtain the latest copy of these sections.

C. Add any sections necessary to the design that are not contained in the Master Specifications. Mark-up the sections as design requirements are determined. Further modify the Specifications section to correct errors, omissions and outdated requirements, if any, that may exist.

D. Use the MS-Word Track Changes tool to make the subsequent submittal review by OC SAN staff more efficient. This is required by the OC SAN Design Guidelines Chapter 01.

E. Submit draft Specifications for each Project submittal as defined by the Scope of Work.

F. Before final submittal of the Contract Documents, check Specifications against Plans to avoid contradictions and omissions.

G. Edit the Contract Documents Table of Contents template to generate the Table of Contents required for the Project.

## PART 2 - GENERAL ORGANIZATION

### 2.1 CONTRACT DOCUMENTS

A. The Table of Contents lists all of the typical parts of the Contract Documents.

B. In addition to the GRs and technical specifications, the complete set of Contract Documents includes the following “front-end documents:”

1. Notice Inviting Bids
2. Instructions to Bidders
3. Special Instructions to Bidders
4. Information Available to Bidders
5. Bid Submittal Forms
6. Contract Agreement
7. General Conditions
8. Special Provisions

C. The OC SAN Contracts/Purchasing and Materials Management Department (Contracts Administration) is responsible for the “front-end documents” listed above. The OC SAN Project Engineer shall facilitate the assigned Contracts Administrator’s review of the detailed technical specifications and drawings.

### 2.2 GENERAL REQUIREMENTS VS. DIVISION 01 ADDITIONAL GENERAL REQUIREMENTS

A. The General Requirements (GRs) broadly state in principle, the administrative and procedural requirements which are sometimes specified in further detail in the technical specifications. The GRs contain some of the common topics necessary for a wastewater construction project, but do not contain requirements which are specific to individual projects. The Specifier(s) shall familiarize themselves with the General Requirements in order to insure that all of the procedural information necessary for the CONTRACTOR to execute the Work is included and no contradictory requirements exist. Modifying these requirements for individual projects will involve addressing project-specific needs as described in the NOTE below.

B. **Note:** The GRs shall NOT be altered in any way without written approval of the Engineering and Construction Division Manager. Changes or enhancements to the GRs shall be accomplished by creating / using sections in Division 01 “Additional General Requirements.” The language of the Additional General Requirements shall describe the modifications, if any, to the General Requirements and shall include a reference to the respective GR Article. E.g.: “This Specifications section replaces the GR section entitled “...” or “This Specifications section supplements the GR section entitled “...”. Division 01 should include the general requirements (common to all Specifications sections of the Project) that are not already within the General Requirements and those requiring further explanation. The Specifier(s) and the Project Manager / Project Engineer should determine the necessary Division 01 sections during the development of Design Submittal 2 (DS2). Do not duplicate the General Requirements. Do not include sections not specifically applicable to the Project.

C. If the modifications needed for the GRs are minor, the Design and Construction Division Manager may allow editing directly in the General Requirements document, instead of creating the respective Division 01 section(s). Correcting typographical errors directly in the GRs is also acceptable.

D. The resulting modified language in the GRs shall be emphasized by using bold-face text in both the Project Invitation for Bids Documents (Bid Set) and the conformed set of Contract Documents for construction. Striking out the original template text shall not be required.

**E. As described in the Order of Precedence of the Contract Agreement, each Division 01 Additional General Requirements section, being a detailed technical specifications section, will override the GRs in case of a conflict.**

## 2.3 DIVISIONS 02 THROUGH 17

A. The detailed Specifications, Divisions 02 through 17, are organized around a three-part outline format that provides a consistent organization for information in each Specifications section so that the reader knows where to find standard types of requirements throughout the document.

B. Each Part consists of Articles (the second level of the outline) identified by adding a sequential number to the Part ID, e.g.: Article 12 of Part 3 would be numbered 3.12. Any outline item below the article level is called "Paragraph" and is identified by a letter or number sequential within the respective article as can be seen in the Specifications section template file.

C. Part 1 – GENERAL defines the specific administrative and procedural requirements unique to this section. It covers references to codes, regulations, and standards; other related Work; site conditions; submittal requirements; definitions; quality assurance; and warranty requirements. In general, this part answers the question, "What are the procedures for accomplishing the Work of the section and what are the relationships with the other Work or requirements in the Project?" Refer to the Specifications section template file.

D. Part 2 – PRODUCTS describes, in detail, the description and quality of items that are required for incorporation into the Work under this section. Equipment and equipment components are described. This part answers the question, "What products are to be incorporated into the Project as part of this section?"

E. Part 3 – EXECUTION describes, in detail, preparatory actions and how the products are to be incorporated into the Work. Installation, calibration, testing and startup requirements are described. This answers the question, "What on-site actions are required and how are the products or Work to be incorporated into the Project."

2.4 FOOTERS

A. The footer at the bottom of each page shall be **bolded** and shall indicate the following:

1. On odd pages:

	<u>Left side</u>	<u>Right side</u>
<u>Line 0*</u>	Leave blank	Leave blank
<u>Line 1</u>	<b>{OC SAN Project Title***} or {OC SAN Contract Title****}</b> <i>(initials capitalized)</i>	<b>{SPECIFICATIONS SECTION TITLE*}</b> <i>(all upper case)</i>
<u>Line 2</u>	<b>{OC SAN Project No.***} or {OC SAN Contract No.****}</b> <i>(initials capitalized)</i>	<b>{SPECIFICATIONS SECTION TITLE cont'd}</b> <i>(if any; all upper case)</i>
<u>Line 3</u>	<b>{DOCUMENT SET**}</b>	<b>{Section Number}-{Page Number}</b>

2. On even pages:

	<u>Left side</u>	<u>Right side</u>
<u>Line 0*</u>	Leave blank	Leave blank
<u>Line 1</u>	<b>{SPECIFICATIONS SECTION TITLE*}</b> <i>(all upper case)</i>	<b>{OC SAN Project Title***}</b> or <b>{OC SAN Contract Title****}</b> <i>(initials capitalized)</i>
<u>Line 2</u>	<b>{SPECIFICATIONS SECTION TITLE cont'd}</b> <i>(if any; all upper case)</i>	<b>{OC SAN Project No.***} or {OC SAN Contract No.****}</b> <i>(initials capitalized)</i>
<u>Line 3</u>	<b>{Section Number}-{Page Number}</b>	<b>{DOCUMENT SET**}</b>

- \* One space above the first text line shall be left in each footer.
- \*\* Omit if this is a submittal set. Otherwise, indicate **BID SET, ADDENDUM NO. X, or CONFORMED** (all upper case) as applicable.
- \*\*\* For non-subdivided projects
- \*\*\*\* For subdivided projects

B. Footer Examples:

1. Shown for a non-subdivided project.

Example 1 - Submittal Set:  
(shown for odd pages only)

<b>Plant No. 2 Warehouse Improvements</b> <b>Project No. P2-65</b>	<b>DEMOLITION</b>  <b>02050-3</b>
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Example 2 - Bid Set:  
(shown for odd pages only)

<b>Plant No. 2 Warehouse Improvements</b> <b>Project No. P2-65</b> <b>BID SET</b>	<b>DEMOLITION</b>  <b>02050-3</b>
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Example 3 - Bid Addendum Set:  
(shown for odd pages only)

<b>Plant No. 2 Warehouse Improvements</b> <b>Project No. P2-65</b> <b>ADDENDUM NO. 2</b>	<b>DEMOLITION</b>  <b>02050-3</b>
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Example 4 - Conformed Set:

<b>Plant No. 2 Warehouse Improvements</b> <b>Project No. P2-65</b> <b>CONFORMED</b>	<b>DEMOLITION</b>  <b>02050-3</b>
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## 2.5 NOTES TO SPECIFIER (NTS)

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NTS: Explanatory notes to the Specifier are throughout the detailed sections of the Specifications and are separated from the rest of the text between two horizontal lines with the adjacent # \$ symbols. These notes should be removed before the final printing. Keyword search for “\$” or “#” or “NTS” will help find the Notes in the document.

\_\_\_\_\_ # \$

Newer sections may have notes as shown herein (boxed and shaded in green) formatted as **hidden text** by the “NTS” MS-Word style. By default, hidden “NTS” are not printed so they do not have to be deleted by Specifier. For clarity, this “NTS” was not formatted with hidden text.

## 2.6 CROSS-REFERENCES

A. Specifications refers to the body of project specifications (i.e., Part E) while section refers to a generic specification with the body of Specifications.

1. Example: “Other sections and divisions of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this Work.”

B. this section - refers to content within the current section.

1. See "Submittals" within *this section*.
2. The requirements of the following sections apply to the Work of *this section*.

C. Referencing Other Specifications Sections: Each reference added or revised in the body of the section shall also be added to Article "Related Work Specified Elsewhere" in Part 1 of the section. Use comma between the section number and title; do NOT use quotation marks for the title. The Specifier shall verify all cross-references to Specifications sections (numbers and titles). For example:

1. Track NETA acceptance testing required in *Section 16080, Electrical Testing*.
2. See *GR-30, Submittal Procedures*

D. References in the body shall be made to article titles rather than numbers that may change with subsequent specification editing. For example:

1. ... as described in article "*Submittals*"
2. See "*Submittals*" in this section.
3. See paragraph entitled "*Bookmark Organization*" later in this section for electronic file organization using bookmarks.

E. Be explicit when referring to other standards outside of the Specifications.

1. Aggregate base course shall be crushed aggregate base and conform to *SSPWC 200 2.2, Crushed Aggregate Base*.
2. Compaction shall be to 95% of maximum compaction in accordance with *ASTM D-1557* (ASTM title not needed if referenced in "Related Work Specified Elsewhere").

## 2.7 CONTRACTOR QUALIFICATIONS AND QUALITY ASSURANCE

A. All CONTRACTOR qualification provisions within each Specifications section shall be grouped in Article entitled "Quality Assurance" under the item entitled "Qualifications". The CONTRACTOR "Qualifications" item shall address not only the qualifications of the CONTRACTOR as a firm and its personnel, but also the qualifications of the Subcontractors, test laboratories, Suppliers, manufacturers, installers, and their personnel and representatives. Examples of the qualifications include the following: skills, professional registrations and certifications, years of experience, the number of successfully completed projects, type and duration of the training received, distance from the Project site to a specified CONTRACTOR's location, etc.

B. Coordinate with the related General Requirements common to all Specifications sections of the Project as addressed in Section 01400, Quality Assurance and Quality Control, if included in the Project.

C. All other quality assurance provisions within the section shall be grouped in Article entitled "Quality Assurance" under the item entitled "General".

D. It's the Specifier's responsibility to notify the OC SAN Project Manager and Contracts Administrator regarding the "Qualifications" provisions in the Bid Submittal Forms under BF-4.

## 2.8 PRODUCTS, MANUFACTURERS, SOLE-SOURCING, “OR EQUAL”

A. Due to the rapidly changing market conditions, product and/or manufacturer names listed in the Specifications may already be outdated. It is the Specifier’s responsibility to review and update all and each of the products and/or manufacturers listed in the Specifications. **California Public Contract Code (PCC) requires all equal products manufactured in the State of California be listed and followed by the words "or equal".**

B. VERIFY / CONFIRM WITH THE OC SAN PROJECT MANAGER WHETHER OC SAN REQUIRES A SOLE-SOURCE SOLUTION IN CERTAIN SPECIFICATIONS SECTIONS.

C. Specifier shall pay additional attention to each instance where only one product and/or manufacturer is listed in the Specifications. In each such case, Specifier shall EITHER add “or equal” verbiage, OR - where a sole-source solution is required - notify the OC SAN Project Manager that the sole-source justification forms must be filled out and approved in accordance with OC SAN procedures.

## 2.9 WARRANTY AND GUARANTY

A. All warranty provisions within each Specifications section shall be grouped in Part 1 under Article entitled “Warranty.” It’s the Specifier’s responsibility to notify the OC SAN Project Manager and Contracts Administrator regarding these provisions.

B. Coordinate with the related general requirements common to all Specifications sections of the Project.

C. Note the difference between “warranty” and “guaranty” as described in the “Word Usage” paragraph below.

## 2.10 SPARE PARTS

A. As stated in Design Guidelines Appendix A, section entitled “Spare Parts List”, in accordance with OC SAN standing policy, Project Specifications shall require CONTRACTOR to furnish spare/replacement part lists, but not the parts themselves.

## PART 3 - STYLISTIC TIPS

### 3.1 GRAMMAR MATTERS

A. The Specifier(s) shall adhere to the following stylistic rules for the text used in the Specifications sections. For all other rules on style, grammar and usage, refer to the latest edition of The Chicago Manual of Style Online (requires paid user account) or the Gregg Reference Manual (not online) or online at:

1. [http://www.chicagomanualofstyle.org/16/ch05/ch05\\_toc.html](http://www.chicagomanualofstyle.org/16/ch05/ch05_toc.html)
2. <http://www.grammarbook.com/>

### 3.2 CAPITALIZATION

A. Refer to the General Conditions (GC-1) for the defined terms. The defined terms shall be used consistently throughout the Contract Documents.

ac or dc (see “Engineering Terms and Units of Measurements” below)

As-Builts, As-Built Drawings (Do NOT capitalize if in a generic sentence like “an as-built copy of...”)

Beneficial Occupancy (initials capitalized)

Bid, Bidder (initials capitalized)

Change Order (initials capitalized)

city, City (see the term in the “Word Usage” paragraph elsewhere herein)

CONSULTANT (See the term in the “Word Usage” paragraph elsewhere herein)

CONSULTANT’s (see “AAA’s” in the “Apostrophe, ...” paragraph elsewhere herein)

Construction Schedule (initials capitalized)

Contract (initial capitalized when referring to this Contract)

Contract Documents (initials capitalized)

Contract Completion (initials capitalized)

Contract Duration, Contract Milestone (initials capitalized)

Contract Unit Price, Contract Unit Price` (initials capitalized)

Contract Drawings (do NOT use. See the term in the “Word Usage” paragraph elsewhere herein)

CONTRACTOR (all capitalized when in reference to CONTRACTOR hired for the Project, not specialty contractor like I&C Contractor)

CONTRACTOR’s (see “AAA’s” in the “Apostrophe, ...” paragraph elsewhere herein)

Contract Specifications (do NOT use. See the term in the “Word Usage” paragraph elsewhere herein)

cubic [meter, yard, etc.] (see “Engineering, Notation, Terms and Units of Measurements” below)

Detailed Specifications (do NOT use. See the term in the “Word Usage” paragraph elsewhere herein)

Designer (see “CONSULTANT” in the “Word Usage” paragraph elsewhere herein)

DISTRICT (do NOT use. See the term in the “Word Usage” paragraph elsewhere herein)

Drawings (see the term in the “Word Usage” paragraph elsewhere herein)

ENGINEER vs. Engineer vs. engineer (See the terms “ENGINEER”, “Engineer” and “engineer” in the “Word Usage” paragraph elsewhere herein)

ENGINEER’s (see “AAA’s” in the “Apostrophe, ...” paragraph elsewhere herein)

Final Acceptance (initials capitalized)

Final Completion (initials capitalized)

General Requirements (initials capitalized)

General Conditions (initials capitalized)

INSPECTOR (also see the term in the “Word Usage” paragraph elsewhere herein)

L, liter (see “Engineering, Notation, Terms and Units of Measurements” below)

kVA, kA, kW, kHz (see “Engineering, Notation, Terms and Units of Measurements” below)

MVA, MW, MHz (see “Engineering, Notation, Terms and Units of Measurements” below)



mV, mA, mW (see “Engineering, Notation, Terms and Units of Measurements” below)

m, meter (see “Engineering, Notation, Terms and Units of Measurements” below)

micron (see “Engineering, Notation, Terms and Units of Measurements” below)

micrometer (see “Engineering, Notation, Terms and Units of Measurements” below)

mil (see “Engineering, Notation, Terms and Units of Measurements” below)

Notice to Proceed (initials capitalized)

OC SAN (also see the term in the “Word Usage” paragraph elsewhere herein)

or equal (do NOT capitalize when listing manufacturers or products)

OWNER (do NOT use. See the term in the “Word Usage” paragraph elsewhere herein)

Owner’s Manual (initials capitalized)

Plans (see the term in the “Word Usage” paragraph elsewhere herein)

Portland cement (capitalize only the first initial)

Project (see the term in the “Word Usage” paragraph elsewhere herein)

Record Drawings (initials capitalized)

Section (when referring to a specific Project Specifications section, use the word only when followed by the Project Specifications section number and title capitalize the initial, e.g.: Section 15100; however, the preferred way is as in the following example: “Section 15000, Piping General”)

Schedule of Prices (initials capitalized)

Special Provisions (initials capitalized)

Special Inspector (also see the term in the “Word Usage” paragraph elsewhere herein)

Specification, Specifications (see the term in the “Word Usage” paragraph elsewhere herein)

section (when referring to within the Project Specifications section, like “...elsewhere in this section”)

square [meter, yard, etc.] (see “Engineering, Notation, Terms and Units of Measurements” below)

Subconsultant (initial capitalized)

Subcontractor (initial capitalized)

Supplier (initial capitalized)

Work (initial capitalized when referring to work for this Contract)

### 3.3 APOSTROPHE, HYPHENATION, PUNCTUATION

AAAA’s (in possessives: do NOT capitalize the “s” even if the whole noun is capitalized)

backplate (do NOT hyphenate)

busway (do NOT hyphenate)

dampproofing (do NOT hyphenate - as done in ASTM standards; standards and dictionaries vary)

drawout (do NOT hyphenate)  
ductbank (do NOT hyphenate)  
firestop (do NOT hyphenate)  
flush-mount, flush-mounted (hyphenated)  
handhole (do NOT hyphenate)  
manhole (do NOT hyphenate)  
multiconductor [cable] (do NOT hyphenate; compare with "single-conductor")  
multipole (do NOT hyphenate)  
off-site (hyphenated)  
on-site (hyphenated)  
overcurrent (do NOT hyphenate)  
overload (do NOT hyphenate)  
overvoltage (do NOT hyphenate)  
padlockable (do NOT hyphenate)  
pull box (do NOT hyphenate, two words)  
punchlist (do NOT hyphenate)  
single-conductor [cable] (hyphenate; compare with "multiconductor")  
undervoltage (do NOT hyphenate)  
wall-mount, wall-mounted (hyphenated)  
waterproofing (do NOT hyphenate)  
waterstop (do NOT hyphenate)  
wireway (do NOT hyphenate)

### 3.4 WORD USAGE

accepted / acceptance (does NOT amount to approval; only implies that the submittal or Work product *appears* to conform to the Contract Documents; responsibility for or ownership of the submittal or Work product remains with the CONTRACTOR; compare with "approved / approval" below). Manufacturers and laboratories approve. ENGINEER accepts.

approved / approval (implies that responsibility for or ownership of the submittal or Work product transfers to the approving entity; compare with "accepted / acceptance" above). Manufacturers and laboratories approve. ENGINEER accepts.

as per (replace with "per")

caulk (do not use "calk")

city vs. City (do NOT use; when referring to a municipal agency, use, instead, the full title of the respective agency with initials capitalized; when referring to OC SAN, use the term "OC SAN". However, "city" can be used in a general sentence, e.g.: "Do not obstruct city traffic")

CONSULTANT (all capitalized; use only when referring to consultant as a party to a contract and/or when referring to the consultant's property; otherwise see "ENGINEER" below)

consultant engineer (do NOT use. See "CONSULTANT" above)

Contract Drawings (do NOT use. See "Drawings" below)

Contract Specifications (do NOT use. See "Specifications" below)

degree Celsius, degrees Celsius

degree centigrade, degrees centigrade (do NOT use: obsolete; see "degree Celsius")

Detailed Specifications (do NOT use. See "Specifications" below)

Designer (limited usage: see "ENGINEER" below)

DISTRICT (do NOT use. See "OC SAN" below)

Drawings (initial capitalized when referring to plans or drawings of this Project)

ENGINEER (all capitalized when referring to the functions of the OC SAN Director of Engineering or designee such as OC SAN staff, Consultant or others, i.e., when directing the CONTRACTOR regarding engineering aspects of the Project. E.g.: "subject to acceptance by ENGINEER"; On rare occasions, when differentiating between OC SAN staff tasks and design consultant tasks is critical, the specification text can use "CONSULTANT" consistent with the defined term "CONSULTANT" in the General Conditions; compare with word usage of "OC SAN", "engineer", and "Engineer" below)

Engineer (initial capitalized when used as part of a discipline license title, e.g.: "Civil Engineer licensed in the State of California"; compare with word usage of "ENGINEER" above and "engineer" below)

engineer (not capitalized when used in a generic context NOT referring to ENGINEER or Engineer, e.g.: "manufacturer's field engineer"; compare with word usage of "ENGINEER" and "Engineer" above)

gauge (for measurements; do not use "gage")

guaranty (a separate contract by a third party who assumes responsibility in case the principle contracting party fails to perform; compare with "warranty" below)

INSPECTOR (do not use unless a special case; Consider using "ENGINEER", instead; if used, all capitalized; refer to the definitions in General Conditions)

Master Specifications (do NOT confuse with Standard Specifications of the "Greenbook")

micron (see "Engineering, Notation, Terms and Units of Measurements" below)

micrometer (see "Engineering, Notation, Terms and Units of Measurements" below)

must (do NOT use. See "shall" and "will" below)

OC SAN (use instead of DISTRICT or OWNER; use only when referring to OC SAN property ownership rights, warranty rights, Contract cost, or location, e.g.: "Return salvaged equipment to OC SAN" or "Manufacturer's representative shall be located 10 miles from OC SAN" or "no additional cost to OC SAN"; compare with word usage of "ENGINEER" above; Also, see "ENGINEER" above regarding rare occasions when differentiating between OC SAN staff tasks and design consultant tasks is critical)

OC SAN Representative (do NOT use. See "ENGINEER" above)

OC SAN Specialist (do NOT use. See "ENGINEER" above)

OWNER (do NOT use. See “OC SAN” above)

Plans (initial capitalized when referring to plans or drawings of this Project)

Project (use only to refer to the entire scope of Work covered by this Contract; initial capitalized)

resident engineer (do NOT use. See “ENGINEER” above)

shall (always use when describing the CONTRACTOR’s responsibility, e.g.; “CONTRACTOR shall ...”; Compare with “must” above and “will” below)

Special Inspector (initials capitalized. Use only as applicable and defined by California Building Code Chapter 17. Otherwise, refer to the terms ENGINEER and INSPECTOR elsewhere herein)

Specifications (initial capitalized when referring to Contract specifications, not manufacturer’s)

Standard Drawings (refers to OC SAN’s typical details; Do NOT confuse with “Drawings”)

Standard Specifications (refers to “Greenbook” Specs for Public Works; Do NOT confuse with OC SAN Master Specifications)

use (attempt to avoid using this verb: instead, if possible, use “provide”)

utilize (attempt to avoid using this verb: instead, if possible, use “provide”)

will (use only when describing activities that are NOT the CONTRACTOR’s responsibility. e.g.; “ENGINEER will ...”; Compare with “must” and “shall” above)

warranty (assurance by the principal contracting party that it will assume stipulated responsibility for the completed portions of the Project; compare with “guaranty” above; thus, a manufacturer warrants its material, while the construction CONTRACTOR provides a guaranty for those same materials and a warranty for its own workmanship in installing them)

### 3.5 ENGINEERING NOTATION, TERMS, AND UNITS OF MEASUREMENT (GRAMMAR / CAPITALIZATION / HYPHENATION / PLURAL REQUIREMENTS)

7 days, 24 hours

1/2 (avoid using small fonts for fractions as in “½”)

1 ft 1/2 in (be explicit with fractional units, avoid dimensions like “1-1/2 ft”)

0.25 (do NOT skip the zero before the decimal point)

ac or dc (alternating and direct currents; no capitalization)

cubic [meter, yard, etc.] (spell it out; do NOT use notations with superscripts unless unavoidable)

degree Celsius, degrees Celsius

degree centigrade, degrees centigrade (do NOT use: obsolete; see “degree Celsius”)

50 degrees F (do NOT use “°” symbol)

foot (do NOT use the ‘ sign unless unavoidable)

inch (do NOT use the “ sign unless unavoidable)

kilo[unit] as unit symbols: kVA, kA, kW, kHz, (BUT: see “kvar” below as an exception)

kcmil = 1000 circular mils (measures cross sectional area; per NEC: do NOT capitalize)

kvar (this is an exception to the rules – per IEEE Power Engineering Society, Publication Guide, Jan 2001)

L, liter (capitalize the unit symbol or spell out as “liter” to avoid confusion with “1”)

MCM (do NOT use; this American Wire Gauge unit has been replaced with and is equal to “kcmil”)

mega[unit] as unit symbols: MVA, MW, MHz

micron (do NOT use: obsolete term; use “micrometer”)

micrometer (spell it out; do NOT use its  $\mu\text{m}$  symbol: the software may NOT print it correctly)

milli[unit] as unit symbols: mV, mA, mW

mil = one thousandth of an inch (do not confuse with millimeters)

mm (advisable to spell it out as “millimeter” to preclude confusion with “mil”)

psi (use it as a singular or spell it out as in “10 pounds per inch”)

square [meter, yard, etc.] (spell it out; do NOT use notations with superscripts unless unavoidable)

+/- (do NOT use; spell out as in “plus or minus 10 percent”)

$\pm$  [the underlined plus sign] (do NOT use; spell out as in “plus or minus 10 percent”)

% (do NOT use; spell out as in “10 percent”)

### 3.6 UNIT USAGE RULES - PHRASE PATTERNS AS A QUICK REFERENCE

A. Using units as symbols (i.e., not spelt out):

B. Using units as English words (i.e., spelt out):

C. Examples:

The motor rating shall be 12 kV. The bar width shall be 5 in. Metal sheets shall be 25 lb per ply. The cell shall be 5 mm long.	do NOT use plural; SI capitalization per rules; a space before it
The motor shall have a 12 kilovolt ac rating. The bar shall have a 5 inch width.	use English grammar: no hyphen, no plural; do NOT capitalize regardless of SI
Bars shall be 5 inches x 1/4 inch x 1 inch. Bars shall be 5 inches wide. The motor draws 2 kiloamperes of current. Provide 5 inches of clearance. The clearance shall be 5 inches.	use English grammar: plural as needed; do NOT capitalize regardless of SI

The clearance shall be 3/5 inch.	
Metal sheets shall be 25 pounds per ply.	

### 3.7 UNIT USAGE RULES - DETAILED EXPLANATION

A. Adhere to the general rules adopted by the National Institute of Standards and Technology's Guide Special Publication 811 located at this internet address:

1. <http://physics.nist.gov/Pubs/SP811/contents.full.html>.

B. The National Institute of Standards and Technology's Guide allows to treat units of measurement in 2 opposite ways: either as a *unit symbol* or as a *unit name/word*:

C. When the unit is used as a unit symbol, e.g.: "The motor rating shall be 12 kV":

1. See NIST Guide, 6.1.2, 6.1.3, 6.2, 7.2, 7.6
2. Never spell it out (e.g.: "V", not "volt")
3. Never use unit's plural (e.g.: "m" for meter, not "ms")
4. Always capitalize the initial of the unit symbol if derived from a person's name (e.g.: "V", not "v"); Otherwise, don't capitalize (e.g.: "m" for meter).
5. Exceptions:
  - a. capital L for liter in the US usage
  - b. (per IEEE) kvar for reactive power
6. Always leave space between the numeric value and unit symbol (e.g.: "5 A", not "5A")
7. For SI prefixes (kilo, mega, etc.) attached to units, use the prefix capitalization as set by SI (e.g.: "M" for mega" vs. "m" for "milli"), which may happen to be different from the capitalization of the unit symbol itself (e.g.: mW, MW, km, kVA).

D. When the unit is used as an ordinary English word, e.g.: "The motor shall have a 12 kilovolt rating" or "The motor draws 2 kiloamperes of current":

1. See NIST Guide, 7.6, 9.1, 9.2.
2. Spell it out (e.g.: "kilovolt, not "kV")
3. Use hyphen with units where required by the English language rules. For example, if the measurements are compound adjectives describing nouns then use the hyphen. When numbers are not used as compound adjectives preceding nouns, don't use a hyphen (e.g.: "the motor has a 12 kilovolt rating", "the 12-kilovolt motor is undersized").
4. Use the plural if need be (e.g.: "kiloamperes")
5. Do NOT capitalize unit's initial regardless of person's name or SI prefixes (e.g., "megavolt" in mid-sentence or "Megavolt" in the beginning of a sentence, BUT: not "megaVolt", not "MegaVolt")

3.8 ATTACHEMENTS (FROM OTHER SOURCES)

A. Voice and Mood in Specifications

B. Word Usage