

STATE OF OHIO
DEPARTMENT OF
TRANSPORTATION



SPECIFICATION
STYLE
MANUAL



COLUMBUS, OHIO



DECEMBER 19, 2011

**STATE OF OHIO
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SPECIFICATION STYLE MANUAL
December 19, 2011**

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1 INTRODUCTION

Specifications are exact detailed statements that describe mandatory requirements for materials and processes. The Construction and Material Specifications (C&MS) of the Ohio Department of Transportation (Department) describe the requirements for most aspects of building roads and bridges, and they are included in the contract for every construction project that the Department awards to a contractor. The C&MS is only one part of the contract, however. Because the C&MS is not specific to one project, it cannot completely describe all the requirements for a particular construction project. Therefore, the contract documents also include supplemental specifications, special provisions, and plans.

We intend this manual to help people who create or edit specifications for the Department, whether these be the C&MS, supplemental specifications, special provisions, or plan notes. Following the recommendations and guidelines in this manual will result in specifications that are: Concise, Clear, Complete, Correct, and Consistent.

For questions of style not addressed in this manual (such as some capitalization, forming compound words, punctuation, etc.) refer to the United States Government Printing Office Style Manual (available at <http://www.gpoaccess.gov/stylemanual/>).

Much of the material in this manual comes from the reference manual for the course “Principles of Writing Highway Construction Specifications,” NHI Course No. 134001.

The development and approval of the Departments’ specifications is governed by 27-005(P) Specification Development Policy, and 510-005(SP) Construction and Materials Specification Development Standard Procedure.

The information contained in the manual does not replace, supersede or otherwise modify any specification, plan or proposal provision, or other contract document or condition.

2 ORGANIZATION OF SPECIFICATIONS

2.01 Forms of Specifications. The Department uses many different forms of specifications for construction. First there is the Construction and Materials Specifications (C&MS) which is the standard specifications for all construction contracts. It consists of a bound manual divided into divisions and sections. The General Provisions, or Division 100, address the administrative aspects of the contract and establishes the rights, responsibilities and obligations of the Department and the Contractor. The other divisions in the C&MS address the technical aspects of the work and the materials.

The Department also uses supplemental specifications. These are standard specifications that go through a formal review and approval process, but are not included in the C&MS for one of the following reasons: 1) they are relatively new specifications that are frequently revised, 2) they are for work items that are not used very often, or 3) they revise or amend the C&MS. All supplemental specifications listed on the title page of the plans are included in the contract. One supplemental specification, SS 800, is always included in all contracts. The Department uses SS 800 to make changes to the C&MS in between printings of the bound manual. It

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contains all the revisions and additions to the C&MS since the last publication, and is commonly called the “boilerplate”. When the Department publishes a new version of the C&MS, all the revisions and additions from the latest version of SS 800 are rolled into the new publication.

A construction contract may also have project specific specifications that are in the form of plan notes or special provisions. Plan notes are notes written in the plans (the drawings on 11 × 17 inch or 22 × 34 inch paper) that modify or add to the construction requirements in the C&MS and supplemental specifications for that one particular project. Special provisions also modify or add to the construction requirements for one particular project, but they are printed on 8.5 × 11 inch paper and are separate from the plans. Plan notes and special provisions are generally written by the designer and are reviewed by the Department, but they are not subject to the same formal review and approval process as are the C&MS and supplemental specifications.

Finally, The Department uses supplements to describe standard procedures for sampling, testing, prequalification, or certification.

2.02 Order of Precedence. Because the C&MS and supplemental specifications are not project specific, sometimes the plan notes and special provisions must modify requirements in the C&MS and supplemental specifications. To accomplish this, there is an order of precedence for contract documents. C&MS 105.04 lists the contract documents in descending order of precedence as follows:

- A. Addenda
- B. Proposal and Special Provisions
- C. Plans (includes plan notes)
- D. Supplemental Specifications
- E. Standard Construction Drawings
- F. Standard Specifications (C&MS)

If there is a conflict or discrepancy between a plan note and a supplemental specification, the requirement in the plan note supersedes the requirement in the supplemental specification. This order of precedence is necessary so that the contract documents as a whole are appropriate for each and every construction project. The order of precedence also allows the Department to fix problems during the bidding process by issuing addenda. However, it also means that designers must write plan notes carefully, because a requirement in a plan note will override the standard specifications and supplemental specifications.

2.03 Parts of the Standard Specifications.

A. Division. The C&MS is divided by topic into the following divisions.

100	General Provisions
200	Earthwork
250	Pavement Repairs
300	Bases
400	Flexible Pavement
450	Rigid Pavement
500	Structures
600	Incidentals

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640	Pavement Marking
650	Roadsides
700	Material Details

B. Section (Item). Except for 100 General Provisions and 700 Material Details, the divisions contain sections that each describes a particular work item. For this reason, the sections are typically called “Items” (e.g. Item 304 Aggregate Base, and Item 642 Traffic Paint). The general provisions and material details are also further divided into sections, but they are not called “Items” since neither division addresses specific work items.

Sections are generally numbered consecutively within a division, but numerous exceptions exist. When sections are removed from the C&MS, subsequent sections are not usually renumbered, because doing so would change the item numbers for a particular work item and cause confusion. For example, Tack Coat remained Item 407 when the C&MS was reorganized in 2002 and Sections 404, 405, and 406 were eliminated.

The sections in 700 Material Details are used to group the material requirements for similar materials together. For example, all the different material requirements for concrete and clay pipe are within Section 706, and the requirements for different type of concrete or clay pipe are listed in the subsections within 706.

Sections are referenced in other specifications by number, and may be preceded with the term Item for clarity (for example: “For Item 448 mixes, the Department will perform acceptance sampling and testing according to 403.06 and 403.08”). The term “Item” normally refers to an entire section. The above cited example refers to C&MS Item 448 Asphalt Concrete.

Do not use section numbers 800 and above. These are reserved for supplemental specifications and supplements as follows:

800	Supplemental Specifications
900	Supplemental Material Specifications (similar to Division 700)
1000	Supplements

C. Subsection. Within a section, each specification contains subsections. Each subsection is numbered with the three digit section number followed by a decimal and a two (or sometimes three) digit number (e.g. 321.01, 321.02, 321.025, etc.). The subsection numbers are numbered consecutively within a section. However, if revising a section would cause many of the subsections to be renumbered, and this could cause incorrect references in other specification sections, then the subsection numbers do not have to be consecutive. For example, 703.15 was removed from the 2010 C&MS, but the subsequent subsections in 703 were not renumbered because many other sections in the C&MS and supplemental specifications refer to 703.16. Renumbering 703.16 to 703.15 in order to have consecutive subsections would have caused all the other sections to refer to the wrong specification section.

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The specifications that describe a particular work item generally contain the following standard subsections.

- ___.01 Description
- ___.02 Materials
- ___.03 Construction
- ___.04 Method of Measurement
- ___.05 Basis of Payment

The actual subsection number for each of these may vary, and additional subsection headings can be used. Other common subsections are equipment and submittals. Also, instead of a subsection for construction, the specification may contain multiple subsections that describe the various construction steps.

1. Description. The subsection for “Description” always comes first. This subsection should provide a short, concise statement of the work required and describe any relationships to other work items that are necessary to perform the work. The subsection will start with “This work consists of ...”

Do not use phrases such as “in accordance with these specifications” or “in reasonably close conformance with the lines and grades”. These requirements are already stated in C&MS 105.03. Also avoid describing methods of construction, construction details, and procedures for measurement and payment. Those will be covered in other subsections.

2. Materials. This subsection will generally come second, and it identifies the materials required to complete the work. Specify the material requirements in detail for each material, or provide a cross-reference to material requirements in another part of the specifications. Use references to Division 700, AASHTO or ASTM material requirements, or other nationally recognized agencies whenever possible. Otherwise, establish required material properties and methods of testing for each material.

Use the verb “conform” for materials, instead of “obtain”, “meet”, or “comply”. The materials subsection will generally start with “Furnish materials conforming to ...”

3. Construction. This subsection describes the requirements to construct and accept the work. Quite often there will not be just one subsection for construction. Most of the time, there will be multiple subsections that describe each of the various construction steps in detail. The subsections may describe the required sequence of steps that the contractor must follow, the required end product, or a combination of the two. Clearly describe the number and type of testing required and what results are necessary for acceptance. Do not discuss how or what the Department will measure for payment, as this will be included in the subsection for Method of Measurement.

4. Method of Measurement. This subsection describes how the Department will measure the work for payment. It will usually start “The Department will measure ___ by the number of __, ...” Specify how to measure the quantity if it could be measured in different ways (e.g. in original location, in dump truck, in final position, etc.) Quantities are normally rounded up to the nearest whole unit, so if a different level of precision is necessary describe it in this subsection.

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Also discuss modification factors if appropriate, such as shrinkage or temperature factors. If the pay items for the work item are all lump sum, then this subsection is not necessary.

5. Basis of Payment. This subsection describes all the items for payment and identifies work that is incidental to other work items. However, only identify specific items that are incidental and do not make general statements similar to “all labor, equipment, and materials necessary to complete this work are incidental.” This concept is already covered by C&MS 109.03 which states “Payment of the Contract Price is full compensation for all resources necessary to complete the Contract Item and maintain the Work.” When identifying incidental items, use one of the following phrases:

Include the cost of ____ in the contract unit price for ____.
(Preferred)

The Department will consider the cost of ____ to be included in the contract unit price for ____.

The basis of payment subsection includes the text “The Department will pay for accepted quantities at the contract prices as follows:” and then lists all the pay items with their unit of measurement.

2.04 Supplemental Specifications. A supplemental specification should be written as a complete item of work, similar to an item of work in the C&MS. It follows the same organization of subsections as the standard specifications described above, with the addition of a designer note. Each supplemental specification must include a designer note that instructs the designer when the supplemental specification should be included in the plans and the steps required to incorporate it into the plans.

2.05 Supplements. Supplements describe standard procedures for sampling, laboratory test methods, prequalification or certification procedures. They generally do not describe work items, and do not describe measurement for payment. Consequently, supplements do not follow the same organization of subsections as described above.

2.06 Proposal Notes. Proposal notes are parts of the contract that are included in the proposal when appropriate for the project. Because they are in the proposal, they supersede any requirements in the plans, supplemental specifications, standard construction drawings, and C&MS. They sometimes will revise parts of the specifications, but usually add additional requirements to the contract. Like supplemental specifications, proposal notes should include a designer note that instructs whoever is assembling the proposal when the proposal note should be included in the contract.

3 WRITING STYLE

3.01 Active Voice – Imperative Mood. Use the active voice when writing specifications. The active voice is direct and concise, and it clearly defines who is performing an action. When appropriate, use the imperative mood to give direction to the contractor. The imperative mood omits the subject of the sentence. In the specifications, the subject of the sentence is understood to be the Contractor.

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Example of passive voice:

The submittal must be approved before beginning work.

Example of active voice and imperative mood:

Obtain the Engineer's approval before beginning work.

The imperative mood is not always appropriate. Use the indicative mood when describing existing conditions or something that is not giving direction to the Contractor.

Example of indicative mood:

Work that does not conform to the requirements of the Contract is defective.

The C&MS begins with the following text to explain the Department's intentions.

101.01 General. These Construction and Material Specifications are written to the Bidder before award of the Contract and to the Contractor after award of the Contract. The sentences that direct the Contractor to perform Work are written as commands. For example, a requirement to provide cold-weather protection would be expressed as, "Provide cold-weather protection for concrete," rather than "The Contractor shall provide cold-weather protection for concrete." In the imperative mood, the subject "the Bidder" or "the Contractor" is understood.

All requirements to be performed by others have been written in the active voice. Sentences written in the active voice identify the party responsible for performing the action. For example, "The Engineer will determine the density of the compacted material." Certain requirements of the Contractor may also be written in the active voice, rather than the active voice and imperative mood, if the sentence includes requirements for others in addition to the Contractor. For example, "After the Contractor provides initial written notice, the Engineer will revise the Contract as specified in 104.02."

Sentences that define terms, describe a product or desired result, or describe a condition that may exist are written in indicative mood. These types of sentences use verbs requiring no action. For example, "The characteristics of the soils actually encountered in the subgrade may affect the quality of the cement and depth of treatment necessary."

3.02 Concise Language. Use simple, non-technical language. Emulate spoken instructions. Avoid legal sounding language or terms with specific legal meanings.

A. Use **the**, **that**, or **those**, as appropriate, to replace **such** or **said**.

Example: *Replace* cost of any **such** specialty items
 With cost of **those** specialty items

Example: *Replace* restore **said** portion of the work
 With restore **that** portion of the work

B. Use **below** or **above**, as appropriate, to replace **herein** or **hereafter**.

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C. Eliminate redundant modifiers or multiple modifiers that are not obviously different. Use all-inclusive modifiers.

Example: *Replace* extremely severe weather
 With severe weather

Example: *Replace* as may be necessary
 With as necessary

D. Use the verb **will** instead of **shall** for work performed by the Department or Engineer.

E. Avoid using the word **nor**.

Examples:

Do not apply bituminous material when the atmospheric temperature is 10 °C (50 °F) and rising ~~nor~~ or when the temperature has been below 5 °C (40 °F) in the preceding 24 hours, except when applying seal coat on shoulders.

Place 305 mm (1 foot) length markings not less than 300 mm (11 15/16 inches) ~~nor~~ and not more than 310 mm (12 1/8 inches) from center to center.

3.03 Abbreviations, Acronyms and Symbols

A. Definitions. Abbreviations, acronyms, and symbols are shortened forms of longer words, names, or expressions. Each differs from the others in formation and usage.

1. Abbreviations in the strictest sense are shortened forms of a single word or phrase, usually followed by a period and often including lower case letters. Examples are Dr., etc., and chap. With the exception of a.m., p.m., etc., and No. (for number), do not use abbreviations of this form.
2. Initialisms are abbreviations formed from the first letters of a string of words or an organizational name. The letters in an initialism are read or pronounced separately rather than together as a single word. Examples are PVC, IEEE, and FHWA. Do not use periods in an initialism.
3. Acronyms are abbreviations, often initialisms, that can be pronounced as a word. Examples are ODOT and OSHA. Do not use periods in an acronym.
4. Symbols are free-standing signs, letters, or characters with unique agreed-on meanings. Symbols are not abbreviations and should not be punctuated or treated as such. Use a space before and after a symbol; symbols are not preceded by a hyphen or followed by a period. Examples: lb (for pound), kg (kilogram), m³ (cubic meter).

B. Rules for Acronyms and Abbreviations

1. Be consistent. The shortened forms used most often in ODOT's Standard Specifications are listed in C&MS 101.02, "Abbreviations." For the proper form of abbreviations not listed in the C&MS, consult chapters 9 and 10, "Abbreviations

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and Letter Symbols” and “Signs and Symbols,” in the *United States Government Printing Office Style Manual* (at <http://www.gpoaccess.gov/stylemanual/>).

2. Before introducing a shortened form not listed in C&MS 101.02, write out the complete name or meaning at the first usage, followed immediately with the shortened form in parentheses. When introducing a word-string of common nouns and adjectives set in lower-case letters that will later be used in a shortened form, maintain the lower-case letters in the full words and type the short form in capital letters. *Example:* “When horizontal elliptical reinforced concrete pipe (HERCP) is specified ...” “Install the HERCP so that ...”
3. Do not introduce a shortened form unless you will use it again in the same item or specification (e.g., WZRPM within Item 614, “Maintaining Traffic”). When a previously introduced short form is reused in a new item or specification, write out the complete name or meaning at the first usage in the new section, then follow with the short form in parentheses.
4. Initialisms, acronyms, and abbreviations that are pronounced as if they begin with a vowel are preceded by an. If the short form begins as if it were pronounced with a consonant, use a. *Examples:* an AASHTO requirement; an SAE specification (because the letter s is pronounced es), a PSC document.

C. Use measurement symbols properly. Standards for the use of SI (metric) symbols and symbols for units of U.S. customary measure appear in the *United States Government Printing Office Style Manual* (at <http://www.gpoaccess.gov/stylemanual/>).

1. Do not place a period after the symbol unless dictated by placement at the end of a sentence. Measurement symbols are not abbreviations.
2. Do not add an *s* to form a plural. The symbol remains the same whether the quantity is one or many. *Examples:* 1 kg, 2 kg (*not* 2 kgs); 1 ft, 2 ft; 24 h (*not* 24 hrs).
3. Type a space between the quantity and the symbol. *Examples:* 1 kg, 2 ft, 25 °C.
4. Precede only with numerals, never words. *Example:* 2 ft; *not* two ft. However, there are three feet in one yard.
5. Do not use symbols without accompanying numerals, except in tables. That is, never leave a symbol “naked.” *Example:* Measurement is by the cubic yard; *not* Measurement is by the yd³.
6. Do not mix symbols and names in the same expression. *Example:* m/s *or* meters per second; *not* meters/second or meters/s.
7. Print symbols and quantities in normal, upright (Roman) type regardless of surrounding text. *Example:* 2 ft, *not* 2 ft.
8. Do not use alternate symbols for a unit of measurement when the symbol for the unit is shown in the table below. *Examples:* 2 ft, *not* 2'; 6 in, *not* 6"; 5 g, *not* 5 gm (for grams)
9. Do not use symbols or abbreviations for ton and metric ton.
10. Be aware of the proper use of the English unit terms MGal (thousand gallons, not million gallons), and MBF (thousand board feet).

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TABLE 3.03-1 SYMBOLS FOR UNITS OF MEASURE

Inch-Pound Units (U.S. Customary System)		Quantity or measurement	SI (International System) Units (Metric System)	
Symbol	Unit Name		Unit name	Symbol
mil	mil (0.001 inch)	Length	micrometer	µm
in	inch		millimeter	mm
ft	foot		meter	m
yd	yard		kilometer	km
mi	mile			
in ²	square inch	Area	square millimeter	mm ²
ft ²	square foot		square meter	m ²
yd ²	square yard		square kilometer	km ²
mi ²	square mile		hectare	ha
ac	acre			
fl oz	fluid ounce	Volume		
gal	gallon		milliliter	mL
in ³	cubic inch		liter	L
ft ³	cubic foot		cubic meter	m ³
yd ³	cubic yard			
oz	ounce	Mass (Weight)	gram	g
lb	pound		kilogram	kg
ton	ton, short (2000 lb)		metric ton (1000 kg)	metric ton
°F	degree Fahrenheit	Temperature	degree Celsius	°C
s	second	Time	second	s
min	minute		minute	min
h	hour		hour	h
d	day		day	d
mph	miles per hour		Speed	kilometers per hour
psi, lb/in ²	pounds per square inch	Pressure	pascal	Pa
psf, lb/ft ²	pounds per square foot		kilopascal	kPa
			megapascal	MPa
W	watt	Power, Energy, and Electrical	Watt	W
kW	kilowatt		kilowatt	kW
A	ampere		ampere	A
V	volt		Volt	V
Ω	ohm		Ohm	Ω
Hz	hertz		Hertz	Hz
J	joule		Joule	J
lm	lumen		Lumen	lm
hp	horsepower			
lbf	pound-force	Force	newton	N
kip	1000 pounds-force		kilonewton	kN
gpm	gallons per minute	Flow	liters per second	L/s

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Always provide measurements in both U.S. customary units and SI (metric) units. Give the U.S. customary unit first, followed by the metric equivalent in parentheses. Use the conversion factors in C&MS Table 109.02-1 to convert between systems of measurement. Round the converted unit as appropriate, with a similar number of significant digits as the original units.

Examples:

2.5 ft (0.75 m) 200 psi (1380 kPa)

D. When using mathematical and other signs and symbols:

1. Type a space before and after the sign or symbol. *Example:* $2 \times 2 \times 1$ in.

Exceptions:

Do not use a space after μ (a 75 μm sieve) and \$.

Do not use a space before the angular degree symbol (180°), the squared or cubed symbols (yd^2 , m^3) and the percent symbol (25%).

2. If the symbol is shown in the column for “Tables only” do not use the symbol in text. Instead, use the meaning of the symbol as words in the text.

Example:

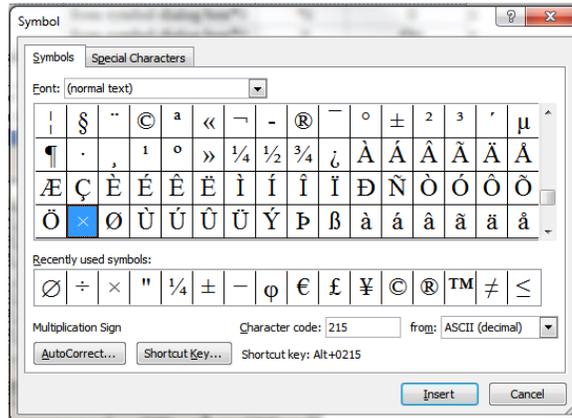
Fasten reinforcing bars securely except where the spacing is **less than** 1 ft (300 mm). (*not* the spacing is < 1 ft).

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TABLE 3.03-2 OTHER SYMBOLS

Symbol	Meaning	Insert using...	Shortcut key	Use symbol in...	
				Tables only	Text and tables
+	plus	keyboard	--	+	
-	minus	keyboard	--	-	
±	plus or minus	symbol dialog box*	Alt+0177		±
=	equal to	keyboard	--	=	
<	less than	keyboard	--	<	
≤	less than or equal to	symbol dialog box*	2264,Alt+X		
>	greater than	keyboard	--	>	
≥	greater than or equal to	symbol dialog box*	2265,Alt+X		
×	multiplied by; dimensional indicator	symbol dialog box*	Alt+0215		×
÷	divided by	symbol dialog box*	Alt+0247	÷	
²	squared (superscript 2)	symbol dialog box*	Alt+0178		²
³	cubed (superscript 3)	symbol dialog box*	Alt+0179		³
∅	diameter	symbol dialog box*	Alt+0216	∅	
/	per	keyboard	--	/	
%	percent	keyboard	--	%	
μ	10 ⁻⁶ (“micro”)	symbol dialog box*	Alt+0181		μ
°	degree	symbol dialog box*	Alt+0176	°	
Ω	ohm	symbol dialog box*	(none)		Ω
:	ratio; proportionality	keyboard	--		:
\$	U.S. dollar	keyboard	--		\$

* To insert symbols not shown on the keyboard, select “Insert” from the ribbon menu, then choose “Symbol.” If the symbol you want is not shown, click on “More Symbols...” and the dialog box shown below should appear. Some of the symbols can also be inserted using a shortcut key. Press and hold the “Alt” key while typing the four digit number shown on the number keypad, then release the “Alt” key and the symbol should appear at the cursor location. For the ≤ and ≥ symbols, type the four digit number and then press the “Alt” key and the “X” key at the same time. The four digit number should be replaced with the symbol.



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3.04 Numbers

A. General. Use numerals (not words) for all numbers as a general rule. However, there are a number of conditions and exceptions to this, such as the following:

1. Use words for numbers at the beginning of a sentence. If a number greater than ten appears at the beginning of a sentence, reorder the sentence if possible. *Example:* Thirty minutes before installation, begin preparing the material. *or:* Begin preparing the material 30 minutes before installation.
2. Use numerals for precise measurements. *Example:* Cut each board 2 ft long.
3. Use words for quantities or values of ten and below that are not critical, precise, or of paramount importance in the context. *Examples:* Fabricate from not more than two pieces of sheet steel. Furnish six sets of drawings.
4. When quantity and size are expressed together, use numerals for the size and words for the quantity. *Examples:* three 1 1/2-inch (38 mm) holes; twenty-two 50-pound (25 kg) weights.
5. Be consistent. With series of numbers in the same context, treat similarly all numbers that refer to the same category of things. *Examples:* Hold the vibrator 5 to 15 seconds. Thirty minutes before starting, and again sixty minutes later, ...

For all numbers with four digits or less, do not use commas or spaces. For numbers with more than four digits, use commas to separate the number into groups of three digits.

Examples: 3400 ft 1000 lb/in² 25,000 lb 10,000,000

B. Ranges. Do not use a dash (-) to indicate a range. Use either the words “from” and “to” or the words “between” and “and” in the text to indicate a range of values (in tables use only the word “to”). Provide the unit symbol after the second numeric value, unless the units are different. To indicate a range from which the endpoints are excluded, use the words “between, but not including,” and “and.”

Examples:
from 10 to 14 in from 25 to 30 °C
from 6 in to 4 ft between 110 and 125 VAC

C. Fractions, decimals, and percentages. Do not use fractions with metric values. Fractions are used only with conventional units of measure. When specifying a fraction, do not use the fraction characters ($\frac{1}{2}$, $\frac{1}{4}$, or $\frac{3}{4}$). Use standard typed fractions, for example: **1/2**, **1/3**, **5/6**, Take care when typing fractions, because Microsoft Word will automatically convert fractions to fraction characters. If a fraction is used with whole numbers, such as **1 1/3**, type one space between the whole number and the fraction.

Use words for simple fractions that do not describe a measurement or a precise quantity, that stand alone, or that come before the words “of a” or “of an.” Use a hyphen to connect the numerator and denominator.

Examples:
Overlap by at least **one-half** the width of the previous pass.

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If the stream crossing fills more than **one-third** the width of the stream, then use pipes to allow the movement of aquatic life.

Use decimals in all metric expressions. *Example:* 0.5 kg

Use numbers on both sides of a decimal point. That is, never leave a decimal point “naked.”

Examples: 1.5, 0.5 and 0.375 (*not* .375)

Use the word “percent” in the text after the number for a percentage. Use the percent symbol (%) only in tables.

Example: Compact to 98 percent of maximum dry density.

D. Hyphens and Unit Modifiers. When a number and word (usually a unit name) work together to describe something else (usually an object or material, like a pipe, bolt, or board), they are acting as a single word, or adjective, called a *unit modifier*. Use a hyphen between the number and the word. Use the word to describe the unit, not the unit symbol in unit modifiers.

When the context requires both U.S. customary and SI (metric) measurements, use the full name of the U.S. customary unit, placing a hyphen between the numerical value and the unit name, then write the metric unit in parentheses immediately afterward (using numerals and metric symbols only) before any additional adjectives are used.

Examples:

Flame- or saw-cut two, 4 1/2-foot (1.4 m) long test samples.

Install a 400-watt, 120-volt, bar-type electric heating unit in all controller cabinets.

Construct the cabinet from 0.125-inch (3 mm) thick aluminum.

a 6-inch (150 mm) layer, *but* a layer 6 in (150 mm) deep

a 1-pound (454 g) sample, *but* a sample of 1 lb (454 g)

a 1/2-inch (13 mm) pipe three 2 1/2-inch (63 mm) pipes

a ten-day notice a 3/4-inch (19 mm) diameter shank

an 8-pin, jones-type socket a 2-inch (50 mm) hose

E. Money. Use numerals for monetary amounts. Do not leave a space between the dollar sign (\$) and the number. For all dollar values of \$10,000 and over, use commas. For all dollar values under \$10,000, do not use commas (*Example:* \$8500). For all dollar amounts under \$100, use decimals to represent cents (*Example:* \$5.00).

F. Time and Date. Use numbers for clock times and keep zeros when describing times “on the hour” (*Example:* 11:00 a.m. – not eleven o’clock and not 11 a.m.). Use the standard 12-hour system, with the time followed by either a.m. or p.m. However, use the words “noon” or “midnight” to indicate 12:00 p.m. and 12:00 a.m. (*Example:* Do not apply sealer between noon and midnight.)

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Write out the full names of months and numbers for the day and year. Do not use ordinals (1st, 2nd, 3rd, ...) in dates.

Examples:

June 1, 2001 (*not* 6/1/2001)
October 1 and March 15 (*not* October 1st and March 15th)

3.05 Phrases and Terms for Consistency

A. Phrases - The following are guidelines for the use of words or phrases commonly used (or not used) in writing Department specifications.

1. **unless otherwise specified** - This phrase and words similar should not be used unless there is a specific reference or requirement. If there is a specific reference or requirement, cite it.

2. Use **as specified in** instead of **as described in**, **as designated in**, **as indicated in**, or **pursuant to**, etc. to reference specification provisions.

3. When referencing a section or other document, such as the Plans or working drawings, use consistent words or phrases. We recommend using **as shown/indicated on the Plans/working drawings** or **as specified in 109.05** or **as specified in the Contract Documents**.

4. The term “**working drawing**” is a generic term that includes all contractor prepared and submitted drawings. The term is generally only used in the section 100 of the C&MS. In other sections of the specifications, use a more descriptive term, such as shop drawings, erection plans, falsework plans, installation plans, etc.

5. Do not use phrases, such as **in conformity with requirements shown on the plans or indicated in the specifications**. These requirements are already provided in 105.03.

6. If the Plans, the Specifications, Special Provisions, applicable Sections, the Contract, or other parts of the Contract are referenced in combination with one another in the same sentence, change the multiple references to “the **Contract Documents**”.

Example:	<i>Replace</i>	as specified on the Plans or Special Provisions
	<i>With</i>	as specified in the Contract Documents
Example:	<i>Replace</i>	according to the Plans and the Contract
	<i>With</i>	according to the Contract Documents

7. **approve** versus **accept** – In a document with legal consequences, such as specifications, approve and accept have a difference in meaning. To “accept” is to recognize an obligation to pay, as in “The Department will pay for accepted quantities.” In contrast, to “approve” is to confirm agreement with or to indicate satisfaction with a situation or circumstance. If the Engineer is doing the approving, the Contractor shall **obtain the Engineer’s approval**.

Example:

Obtain the landowner’s and the Engineer’s written approval
written approval before using any pits as a pond.

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8. **require** - If the Engineer is doing the requiring, draft the sentence in the imperative mood by having the Contractor do what is required.

Example: *Replace* Footed rollers are required to compact the material.
 With Use footed rollers to compact the material.

Exceptions: the Engineer **will not** require
 the Engineer **may (not)** require
 if required

Examples:

The Engineer will not require the Contractor to set additional stakes to locate a utility line that is not included as a pay item in the Contract.

The Engineer may require additional tare weight measurements at any time.

9. **conforming to/according to** - Furnish/provide materials/equipment **conforming to** certain standards (AASHTO or Section) or directions (the manufacturer's recommendations). Perform work **according to** certain standards (AASHTO or Section) or directions (the manufacturer's recommendations).

Examples: **Conform to** state agency requirements regarding
 Provide materials **conforming to**
 Use materials **according to**
 Drill holes **according to**

10. **option** - When something is as an option to the Contractor, use **the Contractor may**. For the most part, the word **option** is never used.

Example:

The Contractor may use a heated enclosure or building.

11. **expense** - When the sentence is in active voice-imperative mood, use **at no expense to the Department**. Since the subject is understood, do not use possessive forms of the *Contractor*.

Example:

In case of damage to the existing structure, repair or replace the structure **at no expense to the Department**.

12. **permit** - If the Contractor **shall be permitted to** do something, then **the Engineer will allow**. In many cases, write the sentences in active voice-imperative mood.

Example:

The Department will not allow aerosol spray application of paints containing zinc dust.

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The Engineer will allow inserts or adapters.

13. **be responsible** - Use consistent text as shown in the following examples.

Examples:

The Contractor **is** (is not) **responsible** for ...

The Department **is** (is not) **responsible** for ...

The Department will in no way relieve the Contractor of **the responsibility** for ...

Sometimes the Contractor responsibility clause is replaced by the imperative mood.

Employ a Registered Engineer that **is responsible** to supervise the construction staking party and correct any errors or inaccuracies resulting from the operations of the construction staking party at no additional expense to the Department.

14. **insure/assure/ensure** – In specifications, the correct word is usually **ensure** which means to make sure or certain. Insure refers to financial protection provided by an insurance company. Assure is used in the sense that a person gives reassurance to another person or sets the mind at rest (e.g. He assured the king of his loyalty). Where appropriate, use the word **ensure** (ensure is usually either followed by **that** or preceded by **to**).

Examples:

Exercise special care and attention at all transverse construction joints **to ensure** continuity of the pavement at the proper crown, thickness, grade, and alignment.

Ensure that the equipment does not harm the roadway.

Insure the Department against liability.

15. Do not use phrases pertaining to **skilled or experienced workers**. This requirement is already stated in the C&MS 108.05.

Example:

Immediately after each application of cover material, broom the surface ~~using skilled or experienced workers~~ to ensure a uniform distribution of cover material and a smooth surface.

16. **take ownership** - Use this verb form when something previously was specified to **become the property of ...**

Example:

If the Engineer determines the pipe is unusable, **take ownership of** the pipe, and dispose of or recycle it according to 202.02.

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17. **and/or** – This construction is awkward and confusing. You can often use “and” or “or” instead of “and/or” Otherwise, write “red, blue, or both” when possible instead of “red and/or blue.”

Examples:

Replace Obtain Laboratory written approval for use of unusually large, old RAP stockpiles of unknown content **and/or** age.

With Obtain Laboratory written approval for use of unusually large, old RAP stockpiles of unknown content **or** age.

Replace Clearly identify each item for which additional compensation **and/or** time is requested.

With Clearly identify each item for which additional compensation, time, **or both** is requested.

18. **that** versus **which** – “That” and “which” are often used as if they are interchangeable. They are not. “That” is properly used to introduce information or a phrase that is essential to the meaning of a sentence (a restrictive clause). “Which” introduces information that is not essential to the meaning of a sentence (a nonrestrictive clause). If you can remove the phrase that begins with “that” or “which” and the meaning of the sentence is essentially the same, then the correct word is “which.” If the meaning of the sentence is significantly different without the phrase, then the correct word is “that.” Use commas to separate nonrestrictive clauses, which begin with “which”, from the rest of the sentence. Additionally, use “who” instead of “that” or “which” when the restrictive clause refers to a person. When using “who” use commas to separate nonrestrictive clauses from the rest of the sentence.

Examples:

Cooperate with the Engineer in protecting and preserving monuments, cornerstones and boundary survey markers **that** are affected by the Work.

Place the curb with a hand-operated or self-propelled machine consisting of a hopper and power-driven screw, **which** forces the material through an extrusion tube.

B. Terms. Follow the recommendations below to promote the consistent use of terms.

Replace	With
#	No. or number (in most cases)
%	percent (except in tables)
&	and (in most cases)
'	foot/feet (except use “ft” in tables)
"	inch/inches (except use “in” in tables)
° (symbol only)	degree (for an angle measurement, except in tables)
40° F (0° C)	40 °F (0 °C)
batch mixing	batch-mixing (as appropriate)
cross section	cross-section

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drum mix	drum-mix (as appropriate)
Federal-aid	Federal-Aid
guard rail	guardrail
in lieu of	instead of
in order to	to
in the event of	if
a minimum of	at least
as may be necessary	as necessary
practicable	practical (where appropriate)
pre-cast	precast
pre-construction	preconstruction
prior to	before
right(s) of way	Right(s)-of-Way
straight edge (tool)	straightedge
subsidiary	incidental (where appropriate)
templet	template
through the use of	by
utilize	use
weigh box	load box
weigh ticket/slip	load ticket
weight bucket	load bucket
work site	worksite

The following words or phrases should appear as shown.

air-cooled
air-entraining admixtures
air-entrained cement
centerline (when referring to a line that divides into two equal parts)
center line (when referring to a pavement marking)
edge line
high early strength
nonreflective
nonshrink
retroreflective
re-erect(ed)
water-reducing admixtures
water-reducing and set-retarding admixtures

3.06 Capitalization. Use lower case letters as much as possible. Too many capital letters creates an untidy appearance and reduces the effectiveness of using capital letters for emphasis.

Capitalize the following defined terms that appear in C&MS 101.03 for easier recognition:

Contract (when referencing *this* Contract)
Contract Documents
Contractor (when referencing *the* Contractor)
Department (when referencing the *Ohio Department of Transportation*)

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Engineer (when referencing *the* Engineer)
Extra Work (when referencing the defined term)
Laboratory
Proposal
Registered Engineer
Registered Surveyor
Right-of-Way
Special Provisions
Specifications (when referencing the C&MS, the supplemental specifications,
and special provisions)
Work

The following defined words and phrases should not begin with a capital letter:

fabricator
inspector
plans
shop drawings
subcontractor
workday
working drawings

Capitalize pay item titles in the subsections for Method of Measurement and Basis of Payment. Do not capitalize pay item titles in other subsections.

3.07 Series. In series of three or more elements, use commas to separate the elements. Use a comma before the conjunction (“and” or “or”) that joins the last two elements. However, if the elements in the series are phrases that already include conjunctions or commas, then use semicolons to separate the elements.

Examples:

Use vibration control and monitoring if blasting near buildings, structures, or utilities that may be subject to damage from blast induced ground vibrations.

This work consists of removing existing asphalt concrete, brick, portland cement concrete, or aggregate pavement courses; shaping and compacting the exposed material; and placing new asphalt concrete pavement or aggregate and asphalt concrete pavement courses.

Place conditional phrases to make it clear which item in a series the condition applies to.

A. Use **If requested by the Engineer; provide the date, time, and location** to make it clear that the condition applies to all three items.

B. Use **Provide the date; time; and, if requested by the Engineer, the location** to make it clear that the condition only applies to the location.

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Convert important or complicated series to itemized lists. Capitalize the beginning of each item; even when the item is a word, phrase, or sentence fragment. If an **and** situation applies, end each item with a period. If an **or** situation applies, end the items with a comma or semicolon. The second to last item should have an **or** following the punctuation and the last item should end with a period. Use introductory phrases that identify whether one, more than one, or all items apply.

3.08 References. When referring to another part of the same specification document, use only the section or subsection number. When referring to a part of a supplemental specification or supplement from a different specification document, use the appropriate term (“supplemental specification” or “supplement”) before the number.

Example: C&MS section 508 refers to 501.05 as follows.
Submit falsework plans for cast-in-place concrete slab
superstructures according to 501.05.

Example: C&MS section 441 refers to Supplement 1041 as follows.
Provide testing facilities at the plant site conforming to
Supplement 1041.

When referring to specific numbered paragraphs within a subsection, append each level of numbering after the subsection number, separated by decimals (periods). *Examples:* 107.11.A 608.03.B 451.17.A.1

Do not include titles after section references. This also pertains to other national standards such as AASHTO and ASTM standards. When referring to industry standards (AASHTO, ASTM, AWS, Federal Specifications, etc.), check the content of the standard and remove any duplicate requirements from the specifications that are already in the referenced industry standard. Only include a publication date if necessary to distinguish between different versions.

Use AASHTO standards over equivalent ASTM standards when possible.

4 FORMATTING

4.01 Styles and Templates. All specifications must be written using Microsoft Word 2007 or later. For formatting the specification text, use “styles” in Word instead of using tabs, bolding, and blank lines manually (for tutorials on using styles in Word, go to the Microsoft website: office.microsoft.com). The Department has created custom styles for the specifications that will apply the correct formatting. This manual uses the custom styles and you can use it as an example.

When revising existing specifications, the custom styles are available in the specification Word document. When creating new supplemental specifications, use the specification document template file, which contains the custom specification styles.

In general, do not insert blank lines between paragraphs. The custom specification styles will format the correct amount of space between paragraphs. However, you will need to add blank lines after tables and itemized lists. Use the style called *blank line* for this purpose.

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Do not insert page breaks into the specification document or insert additional blank lines to move text from page to page. To keep relevant text together and prevent it from breaking across two pages, format the paragraph to keep it with the next paragraph, keep all the lines of a paragraph together, or both. You can adjust this type of formatting by formatting a paragraph, clicking on the *Line and Page Breaks* tab, and then checking the boxes next to *Keep with next* and *Keep lines together*. Doing this will ensure that future revisions will not create awkward page breaks.

The following example shows some of the different custom specification styles and where to use them.

Example:

SECTION

000.01 Section Paragraph List

000.02 Section Paragraph List

000.03 Section Paragraph List

[blank line]

000.01 Subsection Title. This entire paragraph is styled with *Subsection Paragraph*. However, the beginning of the paragraph is styled with *Subsection Title* to create the bold text. By using the style *Subsection Title*, the subsection paragraph list at the beginning of the specification section can be automatically generated by inserting a table of contents.

Additional subsection paragraphs are also styled with *Subsection Paragraph*.

The rest of the manual will describe the remaining custom specification styles.

4.02 Numbering. When creating numbered paragraphs or lists within a subsection, use the following outline numbering format for the different levels of information.

A, B, C, D

1, 2, 3, 4

a, b, c, d

(1), (2), (3), (4)

(a), (b), (c), (d)

Only use as many sublevels as necessary to organize and convey the specification requirements. Do not use automatically numbered lists. Manually number the paragraphs and lists so that the text does not automatically renumber with the addition or deletion of text (see 2.03.B above for further explanation).

The following example shows the different styles to use with numbered paragraphs. Each level has two styles associated with it. The first style is for the first paragraph that contains the outline number. The second style for each level is for the second and additional paragraphs within that outline level.

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Example:

A. First level [*style = 1 Indent 1 Paragraph*]

Second paragraph under first level [*style = 1 Indent 2 Paragraph*]

1. Second level [*style=2 Indent 1 Paragraph*]

Second paragraph under second level [*style=2 Indent 2 Paragraph*]

a. [*style=3 Indent 1 Paragraph*]

Second paragraph under third level [*style=2 Indent 3 Paragraph*]

(1) [*style=4 Indent 1 Paragraph*]

Second paragraph under fourth level [*style=2 Indent 4 Paragraph*]

(a) [*style=5 Indent 1 Paragraph*]

Second paragraph under fifth level [*style=2 Indent 5 Paragraph*]

There are also five other styles that are intended for lists of short items less than one line long. These are *1 Indent List*, *2 Indent List*, *3 Indent List*, *4 Indent List*, and *5 Indent List*. Use *1 Indent List* for short lists within the first level, *2 Indent List* for short lists within the second level, and so forth.

Example:

C. Furnish the data recorded for each shot before the next blast and include the following:

1. Identification of instrument used. [*style = 1 Indent List*]
2. Name of approved observer and interpreter.
3. Distance and direction of recording station from blast area.
4. Type of ground at recording station and material on which the instrument is sitting.

[*style = blank line*]

4.03 Material List. Two custom styles are used in the materials subsection. These two styles are *Material List* and *Material List Note*. When the listing references for the material requirements in a list, use these two styles as shown below. Use a tab after the material description to generate the dotted leader to the section reference. The style will automatically right align the section reference for the material.

Use the *Subsection Paragraph* style or the indented paragraph styles for the other paragraphs in the materials subsection. Please note that a material list note is seldom used.

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Example of material list:

Concrete, Class S, HP 3 or HP 4*	499	<i>[style=Material List]</i>
Epoxy coated reinforcing steel	509.02, 709.00	
Preformed joint filler	705.03	
Joint Sealer.....	705.04 or 705.11	

* Use the same class of concrete used in the bridge superstructure that the approach slab is attached to. If the superstructure concrete class for the bridge is not identified in the plans, use Class S. *[style = Material List Note]*

4.04 Pay Items. Two custom styles are used in the basis of payment subsection. These two styles are *Pay Item/Pay Unit Title* and *Pay Item/Pay Unit*. Use these two custom styles to format the list of pay items as shown below. Use tabs between the item number, the unit, and the pay item description.

Example of pay items:

Item	Unit	Description <i>[style = Pay Item/Pay Unit Title]</i>
421	Square Yard (Square Meter)	Microsurfacing, Leveling Course <i>[style = Pay Item/Pay Unit]</i>
421	Ton (Metric Ton)	Microsurfacing, Rut Fill Course

[style = blank line]

4.05 Tables. Number a table with the subsection number of the text where it is located followed by a dash and then the number 1 for the first table, 2 for the second table, etc. (for example TABLE 104.02-1 for the first table in subsection 104.02 and TABLE 104.02-2 for the second table in subsection 104.02). Using this numbering scheme will minimize having to revise table numbers as new tables are added. After the number, place the title of the table.

Place the table title, including the number above each table and format it with the style *Table Titles*. This style formats the font so that the text is all caps and centers the title on the page. Format all text in the table with the style *Table Text*. This style left aligns all the table text, but change the format in the columns to center-aligned or right-aligned as appropriate to present the data. Use column headings at the top of each column of data, and bold the column headings.

Make sure the table alignment is set to center so that it is horizontally centered on the page. Adjust the cell widths to eliminate any wrapping of text in the cells as much as possible, thereby minimizing the height of the table. Apply a top and bottom border to the table and a bottom border to the row that contains the column headings.

As a general rule, include U.S. customary units and metric units in the same table, with the metric units in parentheses. However, sometimes it is better to present the data in two tables, one with U.S. customary units and one with metric units. In this case, number the metric table with the same number as the U.S. customary table but include a “M” suffix (for example TABLE 614.11-1M).

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Example of a table:

TABLE 4.06-1 EXAMPLE TABLE

Left Aligned	Centered	Centered
The percent and dollar amount are:	100% ^[1]	\$1234
	90%	\$560
	0%	\$78,910 ^[2]

[1] Place special considerations, extra information, or notes in tables below the table using the style *Table Text Note*. Number the notes starting at one and place in brackets.

[2] Reference notes with a superscript in the table following the last letter or number in the cell.

[style = blank line]

4.06 Equations. Format equations with the style *Equation Text*. Follow the equation with a descriptive list of the variables used in the equation. Format the descriptive list with the style *Equation list*. Note that the *Equation Text* style will format the entire equation in the Arial font. However, in the descriptive list, you will have to manually change the font of the variables to Arial. Use tabs as shown below in the descriptive list so that the variables and equal signs are aligned properly.

Equation *[Style = Equation Text]*

Where: *[Style = Equation list]*

(tab) VAR = (tab) description of variable *[Style = Equation list]*

(The font for VAR must be changed to Arial.)

If the equation involves complex fractions or requires special symbols, you may use the equation editor in Word to create the equation. However, formatting the equation with the correct fonts is difficult with the equation editor, and the equation editor is different for different versions of Microsoft Word. Consequently, we recommend not using the equation editor if possible. Instead, use a table and border lines to create complex fractions (see the second example).

Example of equations:

$$\text{HOER} = [\text{RAF} \times \text{ARA} \times (\text{R} / 176)] + \text{HOC} \quad \textit{[Style = Equation Text]}$$

Where: *[Style = Equation list]*

HOER = hourly owned equipment rate *[Style = Equation list]*

RAF = regional adjustment factor shown in the Blue Book

ARA = age rate adjustment factor shown in the Blue Book

R = current Blue Book monthly rate

HOC = estimated hourly operating cost shown in the Blue Book

[style = blank line]

t (in inches) =	<table border="1" style="border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;">R</td> </tr> <tr> <td style="padding: 2px 10px;">900,00</td> </tr> </table>	R	900,00
R			
900,00			

Where: *[Style = Equation list]*

R = Ultimate bearing value in pounds as shown on the plans.

[Style = Equation list]

[style = blank line]

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4.07 Boilerplate Revisions. To revise or add to the C&MS between printings, we use Supplemental Specification 800. This supplemental specification is commonly called the “boilerplate” because it is included on every construction contract. To include revisions in the boilerplate, first identify the subsection reference where you are making the change. Then identify the page number in the printed version where the existing text is located, and finally describe the change. Here are some examples.

Example of boilerplate:

203.02,

On page 93, **Add** the word “siltstone” to the definition of rock in 203.02.O.

On page 93, **Delete** the word “siltstone” from the definition of shale in 203.02.P.

On page 94, **Delete** the words “or durable siltstone” from 203.03.D.

401.16,

On page 180, Section 401.16 Compaction, **Replace** the sixth paragraph with the following:

For surface courses using a polymer modified asphalt binder give a copy of the JMF approval letter containing the design compaction temperature to the Engineer before any mix is placed. Unless otherwise specified ensure that the mix temperature immediately before rolling is not less than 290 °F (145 °C) if placing hot mix asphalt, and not less than 250 °F (121 °C) if placing warm mix asphalt according to 402.09. Do not compact polymer asphalt concrete surface courses with pneumatic tire rollers.

Where the revisions are relatively short and simple, use the first example above (203.02). Where the revisions are more extensive, consider rewriting the entire paragraph and replacing the one in the book, similar to the second example above (401.16).

4.08 Supplemental Specifications, Supplements, and Special Provisions. Supplemental specifications, supplements, and special provisions should follow the formatting recommendations above as much as possible. The one obvious exception is the numbering format for special provisions. Because the special provision does not have a section or item number associated with it, number the subsections of a special provision with sequential single (or double) digit numbers. The rest of the numbering scheme can follow the recommendations above.

Example of a special provision:

SPECIAL PROVISION
CROSSHOLE SONIC LOGGING (CSL) TESTING FOR DRILLED SHAFTS
CNT-RT-SEC (PID XXXX)

June 2006

- 1 **Description**
- 2 **Materials**
- 3 **NDT Consultant**
- 4 **Installation of Access Tubes**

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- 5 Test Procedure
- 6 Test Report
- 7 Evaluation of Test Results
- 8 Coring of Drilled Shaft Concrete
- 9 Grouting Tubes and Holes
- 10 Method of Measurement
- 11 Basis of Payment

1 Description. This work consists of ...

4.09 Proposal Notes. Proposal notes will start with the proposal number preceded by the letters PN, followed by the date of the latest revision, and then the title of the proposal note. The format of proposal notes will vary, but they should be written in active voice, imperative mood.

Example of a proposal note:

PN 108 – 1/16/2009 – DISPUTE REVIEW BOARD PROCESS

The Department's Dispute Review Board Process is based upon the partnering approach to construction administration and must be followed by the Contractor in order to resolve disputes ... (etc.)
