

# **Society of Petroleum Engineers Style Guide**

## Foreword

The Society of Petroleum Engineers (SPE) produces print and electronic publications and marketing materials that are distributed to engineers and others in the oil and gas industry worldwide. Because SPE disseminates technical information for a worldwide readership, it is particularly important to avoid local terminology and to adhere as closely as possible to recognized and widely accepted modes of English expression. Clear writing is essential to enhance the comprehension of SPE publications by readers from a number of geographic areas, nationalities, and language backgrounds.

SPE's rules of style are intended to promote clarity, conciseness, accuracy, and consistency in the society's publications. Guidelines on customary abbreviations for engineering units; numbering of references, figures, tables, equations, and appendices; language usage; nomenclatures and references lists; and punctuation are included in this booklet. The following writing guides are also helpful.

Bernstein, Theodore. 1983. *The Careful Writer—A Modern Guide to English Usage*. New York City: Atheneum Publishers.

Strunk, William Jr. and White, E.B. 1979. *The Elements of Style*, third edition. New York City: MacMillan Publishing Co. Inc.

*The Chicago Manual of Style*, 15th edition. 2003. Chicago: U. of Chicago Press.

*Webster's Third New International Dictionary*. 2002. Springfield, Massachusetts: Merriam-Webster.

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# 1 TIPS FOR CLEARER WRITING

**Use active voice.** The use of active rather than passive voice produces clearer, more concise writing.

**Examples:**

*Passive voice:* An improved method was recommended by the authors.  
Results of the five experiments are shown in Fig. 2.

*Active voice:* The authors recommended an improved method.  
Fig. 2 shows results of the five experiments.

**Minimize the use of long, complex sentences.** Most technical writing experts recommend an average sentence length of approximately 25 words. A mix of long and short sentences and a varied sentence structure are most readable.

**Limit the use of abbreviations.** Limit use of abbreviations to those that are used often in the article. Do not abbreviate terms used only once. When an abbreviation is used, spell out the term at the first use and present the abbreviation in parentheses following it; then use only the abbreviation in the rest of the paper.

**Example:**

We analyzed X-ray computerized tomography (CT) saturation profiles of waterfloods, oilfloods, and miscible core floods.

Rules on the use of abbreviations and a list of common oil industry terms and their abbreviations appear in Sec. 4.

**Write concisely.** Avoid repeating information. Eliminate unnecessary words and flowery language. A short word often is preferable to a longer word or phrase with the same meaning.

**Examples:**

<u>Instead of</u>	<u>Use</u>
in order to	to
due to the fact that	because
utilize	use
for the purpose of	to
in reference to	about
employ	use

**Avoid jargon.** The specialized term used for an object, place, or method in your geographic area or discipline might not be common elsewhere. Use the commonly accepted name or English word rather than local industry jargon.

## 2 COMMON ERRORS IN USAGE/GRAMMAR

**ability, capacity**—**Ability** is the human power to do; **capacity** is the power to receive.

**about**—Do not use as a synonym for **approximately**; use that word instead.

**all of**—Except with pronouns, **of** is unneeded (e.g., “all the drill bits,” but “all of them”).

**allow, enable**—**Allow** means “to not prevent from happening”; **enable** means “to facilitate happening.”

**alternate, alternative**—**Alternate** means **one after the other**; **alternative** means **one or the other**.

**among, between**—Use **among** when referring to three or more and **between** when referring to two (“between Wells A and B”) or to reciprocal relationships shared by two or more (e.g., “unitization **between** the operators”).

**as**—Often imprecise when used as a subordinate conjunction indicating cause. Sometimes used to mean **while, when, because, or since**; choose the precise word.

**as to whether, whether or not**—**Whether** is usually sufficient.

**assure, ensure, insure**—**Assure** means to **encourage**; **ensure** means **to make certain**. **Insure** should be used when referring to underwriting a loss.

**based on**—The main noun in a sentence is “**based on**” the subordinate noun contained in the “based on” phrase.

Correct: “Based on poor results, our decision was to terminate the project.”

Incorrect: “Based on poor results, we decided to terminate the project.” “**On the basis of**” should replace “based on” here.

**below**—Do not use as a synonym for **less than**.

**commence, initiate**—Use **begin** or **start**.

**compare to, compare with**—**Compare to** implies resemblances between essentially different ideas or things; **compare with** implies contrasts between essentially similar ideas or things. Thus, waterflooding operations **compare to** gas lift operations; Well 1 production **compares with** that of Well 2.

**complement, compliment**—**Complement** means (1) fill up or make complete; (2) the quantity required to complete something (e.g., the personnel of a ship); or (3) one of two mutually completing parts. **Compliment** means **praise or respect**. **Complimentary** means without cost.

**comprise**—Means **to embrace** or **to include**. The whole **comprises** its parts. **Comprised of** is incorrect.

**connote, denote**—**Connote** is to imply; **denote** is to be explicit.

**currently, presently**—**Currently** means it is happening now. **Presently** means it will happen soon.

**data**—Takes a plural verb. **Datum** is singular.

**different from**—One thing **differs from** another; **different than** is grammatically incorrect. For example, “Life in the industry was different than he had expected it to be” should be rewritten as “Life in the industry was **different from** what he had expected it to be.”

**dilemma**—Does not mean “**a problem**” but implies a choice between two unattractive alternatives.

**domestic**—Use **US** to designate items of American origin.

**due to**—Use **through, because of, caused by, resulting from, owing to** if possible.

**due to the fact that**—use **because**.

**effect, affect**—**Effect** means **result** (noun) or **to bring about** (verb). **Affect** means **to influence**.

**employed**—Use **used** instead.

**etc.**—Means **and so forth** and should be used at the end of a list that **makes clear** exactly what kinds of other things are implied. Not correct when used at the end of a list introduced by “such as” or “for example.”

**fact**—**Actual fact** and **true fact** are redundant expressions. All facts are true and actual.

**farther, further**—Use **farther** when distance is implied, **further** when referring to time or quantity.

**graph**—A **graph** (noun) is a drawing that exhibits a relationship. Use **plotted** (verb) when you mean to locate points or figures on a graph.

**having**—It is better to use **with**.

**hopefully**—Means **with hope**. Incorrectly used in “Hopefully, we can leave tomorrow.” Correct use would be, “‘We should be able to leave tomorrow,’ he said hopefully.”

**if, whether**—**If** implies uncertainty, **whether** implies an alternative.

**imply, infer**—Something suggested or indicated is **implied**; something deduced from evidence is **inferred**. **A writer implies and a reader infers**.

**in order to**—Simply use **to**.

**input**—Often used incorrectly as a verb; **enter** is a verb, and **input** is a noun.

**irregardless**—Incorrect; use **regardless**.

**knot**—A **knot** is 1 nautical mile (6,076.1 ft or 1852 m) per hour. The expression **knots per hour** is redundant.

**less, fewer**—**Less** refers to quantity, **fewer** to number. (“We used **less** cement and **fewer** truckloads.”)

**located**—Use **positioned** instead where applicable and necessary; usually, however, just remove as redundant.

**majority, minority**—Use only when referring to numbers of things, not size.

**none**—Uses singular verb when meaning **no one** or **not one**.

**on line, online/off line, offline**—When something is started up, it is said to be brought **on line** (two words); when being turned off, it is said to be taken **off line** (again, two words). The exact verb can vary: put on line, set off line, etc.; the usage is often literal, referring to mechanical/electronic devices, but it also can be used metaphorically for any system or practice to be used or not. In nearly all other instances, **online** and **offline** are adjectives used as single words only.

**only**—**Only** goes next to the word it modifies. “The standard is based only on data from one source.” The same rule applies to **primarily, largely, principally, mainly, partly, and completely**.

**over**—Means **above** in a physical sense; do not use as a substitute for **more than** or **greater than**.

**presently**—See **currently**.

**principal, principle**—**Principal** (noun or adj.) means first or foremost. **Principle** (noun) means a basic truth or determined course of action.

**prior to**—use **before**.

**proved, proven**—**Proved** (verb) is the past tense of prove, meaning to establish truth or validity. **Proven** is used as an adjective that is used directly before a noun, meaning verified, as in “a proven talent.”

**seasons**—Seasons of the year are not capitalized except in this construction: “**Fall 1980**.”

**since**—Implies passage of time; use **because** when meaning “the reason for.”

**so as to**—Use **thereby**.

**subsequent to**—Use **after**.

**takes into account**—Use **accounts for**.

**that, which**—**That** is the defining or restrictive pronoun; **which** is the nondefining or nonrestrictive pronoun. “The automobile **that** is out of gas is in the driveway,” tells which automobile. “The automobile, **which** is out of gas, is in the driveway,” adds a fact about the only automobile in question.

**under way**—Two words.

**unique**—Means **without equal**. There can be no degrees of uniqueness. Thus, **almost unique, totally unique, partially unique**, etc., are incorrect.

**upscale**—Use **scale up** as the verb form.

**using, by using**—Generally substitute **by use of** (for **using**) or **with** (for **by using**).

**utilize**—Use is preferable.

**very**—In technical writing, often overused and imprecise: “The results are very significant.” To express how significant the results are, report the p-value.

**via**—Means **by way of** in a geographical sense, *not by means of*.

**where, which**—**Where** refers to physical location; **which** (generally preceded by a preposition) refers to other circumstances, such as condition. Depending on the sentence, the preposition may be different: at which, by which, in which, with which, etc. (Wrong: “There have been four studies where the results contradict these findings.” Right: “There have been four studies **in which** the results contradict these findings.”) By convention, “where” is used in mathematical expressions (Example: “Suppose that  $a = bq + r$ , where  $0 \leq r < b$ .”)

**whose, of which**—**Whose** refers to something owned/possessed by a person; **of which** refers to something “owned by” or pertaining to a thing, such as a physical property of it. (Wrong: “The experiment, whose results are widely accepted, has not been duplicated.” Right: “The experiment, the results **of which** are widely accepted, has not been duplicated.”)

### 3 SPELLING

#### 3.1 General

3.1.1 In the growing vocabulary of the industry, many verb/adverb or verb/preposition combinations are combined into one word. They should be written as two words when used as verbs.

workover well	to work over the well
at breakthrough	water will break through
buildup pressure	pressure can build up

3.1.2 Certain compounds formed by two nouns should be written as one word when combined to form an adjective.

casinghead gas	the casing head
oilfield problems	an oil field
oilwell tools	the oil well

3.1.3 When forming the plural of a non-English word, use the anglicized form if it is thoroughly accepted.

abscissas	darcies
focuses	formulas

However, a number of words take the Latin plural form.

analyses	indices	strata	data	appendices
vortices	media	radii	criteria	phenomena

#### 3.2 British/US Spellings

US spelling conventions are followed for SPE periodicals, books, and most other materials. An exception is made for meeting programs and proceedings. Paper titles for all SPE meeting programs and proceedings follow whichever English spelling convention the author(s) elect(s) to use. Programs and other promotional materials prepared for meetings organized by SPE offices in Dubai, London, and Kuala Lumpur (most meetings held in Europe, the Middle East, India, Africa, and the Asia Pacific region) follow British spelling conventions. SPE meetings organized from the SPE office in Dallas follow US spelling conventions. In both cases, each document should be consistent.

#### 3.3 Oil Industry Terms

Listed here are the preferred spellings of common terms in SPE literature (except as noted in Sec. 3.2).

##### A

a posteriori  
a priori  
aboveground (adj.)  
acknowledgment  
adviser  
afterflow  
afterproduction (adj.)  
alongside  
analog  
anti- (joined prefix)  
axisymmetric

##### B

backflow  
backflush  
backpressure (noun, adj.)  
backrake  
backup (noun, adj.)  
backwash  
ballout (noun)  
bandwidth  
-based (hyphenated suffix)  
baseline  
bean up (verb phrase)  
beanup (noun)  
bicenter  
bleedoff (noun)

blowdown  
blowout (noun, adj.)  
borehole  
bottomhole (adj.)  
bottomwater (noun, adj.)  
breakdown (noun, adj.)  
breakthrough  
brownfield (noun, adj.)  
bubblepoint (noun, adj.)  
build up (verb)  
buildup (noun, adj.)  
bullheading  
buoyant  
bypass  
byproduct

##### C

caprock  
carry-over (noun)  
Cartesian  
casinghead (adj.)  
catalog  
centerline  
changeover (noun, adj.)  
channeling  
chokeline (noun)  
Christmas tree  
clean out (verb)

cleanout (noun, adj.)  
clean up (verb)  
cleanup (noun, adj.)  
co- (joined prefix)  
coalbed  
coal gas (noun)  
coal-gas (adj.)  
coastline  
coauthor (noun only)  
cofferdam  
coiled tubing (noun)  
coiled-tubing (adj.)  
cokriging  
coreflood (noun, adj.)  
cost-effective  
counter- (joined prefix, except counter-ion)  
crossbed  
crossfault  
crossflow  
crosslink (noun, verb)  
crossplot  
cross section (noun)  
cross-sectional (adj.)  
crosswell (adj.)  
cutoff (noun, adj.)

## D

database  
de-aeration  
deep water (noun)  
deepwater (adj.)  
dewpoint (noun, adj.)  
disk (disc in zoology and botany)  
dogleg  
dot-com  
down- (joined prefix)  
drainhole  
drawdown  
drawworks  
drill bit (noun)  
drill-bit (adj.)  
drill collar  
drill-in fluid  
drill off (verb phrase)  
drilloff (noun, adj.)  
drillout (noun, adj.)  
drillpipe  
drillship  
drillsite  
drillstem  
drillstring  
-drive (joined suffix)

## E

e-business  
e-commerce  
edge water (noun)  
edgewater (adj.)  
electric line  
electrical submersible pump

electro- (joined prefix)  
eLibrary  
email  
endpoint  
engine room  
extra- (joined prefix in most uses)  
extranet

## F

fail-safe  
fallback (noun)  
falloff  
farm out (verb phrase)  
farmout (adj.)  
feedwater (noun)  
Fiberglas (trade name)  
fiberglass (generic term)  
fiber-optic (adj.)  
fieldwide (adj.)  
fill up (verb)  
fill-up (noun, adj.)  
filter cake (noun)  
filter-cake (adj.)  
fireflood  
fire tube (noun)  
fire-tube (adj.)  
firsthand  
five-spot (noun, adj.)  
flood front  
floodwater  
flowback (noun, adj.)  
flow chart  
flowline (noun, adj.)  
flow loop  
flowmeter  
flow rate  
-fold (joined suffix)  
follow-up (adj., noun)  
frac pack (noun)  
frac-pack (adj.)  
-free (hyphenated suffix)  
freestanding  
fresh water (noun)  
freshwater (adj., adv.)

## G

gamma ray log (no hyphen)  
gas cap  
gas field (noun)  
gasfield (adj.)  
gasflood  
gas lift (noun, adj.)  
gauge  
gray (not "grey")  
gridblock  
gridpoint  
groundtruthing  
groundwater (noun, adj.)  
guar  
guidepile



**H**

half-life (noun, adj.)  
 half-length  
 half-width  
 heavyweight  
 hindcast  
 hold down (verb)  
 holddown (noun)  
 hold up (verb)  
 holdup (noun, adj.)  
 hookload (noun)  
 hookup (noun, adj.)  
 hot-water (adj.)  
 huff 'n' puff

**I**

in situ (adv.)  
 in-situ (adj.)  
 infill  
 inter- (joined prefix)  
 Internet  
 intranet

**J**

jack up (verb)  
 jackup (adj.)  
 judgment

**K**

kerosene  
 keypunch  
 keyseat  
 kick off (verb phrase)  
 kickoff (noun)  
 knockout (noun, adj.)  
 knowledge base

**L**

laboratory (not “lab”)  
 leak off (verb)  
 leakoff (noun, adj.)  
 life cycle  
 liftoff (noun)  
 lightweight  
 line pipe  
 lock up (verb phrase)  
 lockup (noun)  
 log-normal  
 long-reach  
 long-standing

**M**

main-bore (adj.)  
 main bore (noun)  
 make up (verb)  
 makeup (noun, adj.)  
 man-hour  
 man-year  
 meter (not “metre”)

micro- (joined prefix)  
 mid- (joined prefix)  
 Mid-Continent (SPE section)  
 milled-tooth bit  
 mineback (noun)  
 mis-tie(s)  
 mixed-wet  
 modeled  
 modeling  
 moonpool  
 motherbore  
 mudcake  
 mudline  
 mud motor  
 mud-weight (adj.)  
 multi- (joined prefix)  
 multiphase flow

**N**

naphtha  
 net-pay  
 non- (joined prefix)

**O**

off-bottom  
 offline (adj.)  
 offset  
 offshore  
 off-take (noun)  
 oil field (noun)  
 oilfield (adj.)  
 oilflood  
 oil well (noun)  
 oilwell (adj.)  
 oil-wet  
 online (adj.) (see Sec. 2)  
 on-site (adj., adv.)  
 on-stream (adj.)  
 open flow  
 openhole (adj.)  
 outcrop  
 over- (joined prefix)

**P**

pack off (verb phrase)  
 packoff (noun)  
 padeye  
 particle-size distribution  
 pay out (verb)  
 payout (noun)  
 phase out (verb phrase)  
 phaseout (noun)  
 pick up (verb phrase)  
 pickup (noun, adj.)  
 pinchout (noun)  
 pinch out (verb phrase)  
 pipeline  
 plaster of Paris  
 plexiglass  
 plugback

Poisson's ratio  
poly- (joined prefix)  
pore-water fluid  
Portland cement  
post- (hyphenated prefix)  
pre- (joined prefix)  
preventative  
printout (noun)  
pro- (joined prefix)  
pseudo- (joined prefix)  
pseudosteady state (noun)  
pseudosteady-state (adj.)  
pulse-loading  
pumpdown  
pumphead  
pumpoff (adj.)

## Q

quasi- (joined prefix, except quasi-equilibrium)

## R

rate-pressure  
rathole  
re- (joined prefix)  
read out (verb phrase)  
readout (noun)  
real time (noun)  
real-time (adj.)  
rigsite  
roller-cone bit

## S

salt water (noun)  
saltwater (adj., adv.)  
sandface  
sandout  
sandpack  
sand screen  
scaleup (noun, adj.)  
screenout (noun, adj.)  
seabed, seafloor  
sealbore  
seastate (noun, adj.)  
seawater  
seismic (adj.)  
seismics (noun)  
self- (hyphenated prefix)  
semi- (joined prefix)  
setup (noun)  
shaly  
shoreline  
short-term  
shut down (verb phrase)  
shutdown (noun)  
shut in (verb)  
shut-in (noun, adj.)  
shut off (verb)  
shutoff (noun, adj.)  
sidetrack  
sidewall

slackoff  
slickline  
slickwater  
slimhole  
slimtube  
slug catcher  
space out  
splash plate  
standalone (adj.)  
standby (adj.)  
stand off (verb)  
standoff (noun, adj.)  
start up (verb)  
startup (noun, adj.)  
steady state (noun)  
steady-state (adj.)  
steam chest  
steamdrive (noun, adj.)  
steamflood  
step-out (adj.)  
stepout (noun)  
stepwise  
stick/slip  
stock tank (noun)  
stock-tank (adj.)  
stopcock  
straightedge  
straightline (adj.)  
streamtube  
sub- (joined prefix)  
sulfate  
sulfide  
sulfur  
super- (joined prefix)  
swage (not "swedge")  
sweepout (noun, adj.)

## T

tail pipe  
thin-section (noun in laboratory tests)  
throughput  
through-tubing (adj.)  
tieback (noun, adj.)  
tie line (noun)  
tie-line (in mathematics)  
timestep (noun)  
timetable  
tool face  
tool joint  
topdrive  
tophole (adj.)  
towout (noun, adj.)  
traveltime  
tricone  
trunkline  
tubinghead (adj.)  
twistoff  
type curve (noun)  
type-curve (adj.)

## U

ultra– (joined prefix)  
 ultradeepwater  
 un– (joined prefix)  
 under– (joined prefix)  
 under way  
 up– (joined prefix)  
 updip  
 uphole/upstream

## V

V-door  
 vendor  
 viscoelastic

## W

wash out (verb phrase)  
 washout (noun)  
 waste water (noun)  
 wastewater (adj.)  
 water cut (noun)  
 water-cut (adj.)  
 waterdrive  
 waterflood  
 waterfrac  
 water-wet

## Web

website  
 well-being  
 wellbore  
 wellblock  
 wellhead  
 wellpoint  
 wellsite  
 wellstream  
 well test  
 –wide (joined suffix)  
 wind field (noun)  
 windfield (adj.)  
 wind speed (noun)  
 wireline  
 –wise (joined suffix)  
 workforce  
 work group  
 work over (verb)  
 workover (noun, adj.)  
 work string  
 worldwide  
 World Wide Web

## X

X-ray

## 4 ABBREVIATIONS

### 4.1 General

- 4.1.1 Use abbreviations sparingly. Too many abbreviations will confuse the reader. Spell out the term at first use, place the abbreviation in parentheses after it, then use the abbreviation in the remainder of the manuscript.
- 4.1.2 The terms listed below that are capitalized when part of a company or organization name should be abbreviated in reference lists, bibliographies, and tabular material (tables of contents and other actual tables) and spelled out in headings and running text. The terms listed in **Appendix A (Company Abbreviations)** are generally omitted from a company or organization name, except in an exhibitors list.

#### Organization-Related Abbreviations

Administration	Admin.
Associates	Assocs.
Association	Assn.
Department	Dept.
District	Dist.
Division	Div.
Institute, Institution	Inst.
International	Intl.
Manufacturing	Mfg.
National	Natl.
Society	Soc.
University (Universidad, Université, Universität, etc.)	U.

#### Other Abbreviations

bachelor of arts	BA
bachelor of science	BS
doctor of philosophy	PhD
et al. (and others)	et al.
et cetera (and the rest)	etc.
exempli gratia (for example)	e.g.,
exploration and production	E&P
id est (that is)	i.e.,
master of arts	MA
master of science	MS
one-, two-, three-, four-dimensional	1D, 2D, 3D, 4D
research and development	R&D
versus	vs.

- 4.1.3 Academic and honorary degrees should be abbreviated without periods or spaces. Adding the word “degree” after the abbreviation is optional.

PhD degree                      MS degree                      MBA

- 4.1.4 If you abbreviate names of societies and government agencies, use no periods or spaces.  
 SPE IADC SPWLA NPF
- 4.1.5 Use these and accepted abbreviations for other geographic subdivisions (states, provinces, etc.) only when accompanied by a specific locale when the location otherwise may be unclear.  
 UAE United Arab Emirates USA United States of America  
 UK United Kingdom EU European Union
- 4.1.6 Abbreviate units of measurement in the text only when used with numerical values (unless the abbreviation replaces a very long phrase, such as “several scf/D” for “several standard cubic feet per day”). A list of preferred abbreviations for engineering units appears in Sec. 4.3.10.  
 25 ft  $50 \times 10^3 \text{ ft}^3/\text{D}$   $10 \text{ dm}^3$   $3 \text{ cm}^3$
- 4.1.7 Use the same abbreviation for both singular and plural forms of measurements. (See also Sec. 7.4.5.)
- 4.1.8 Abbreviate such words as “article,” “volume,” and “section” in literary references within the text when the number is cited.  
 Chap. 1 Vol. 9 Art. 5 Sec. 3
- 4.1.9 Abbreviate and capitalize “equation,” “figure,” “reference,” and “column” when followed by a number or designating letter. Do not abbreviate “table,” “appendix” or “page.” Abbreviate “number” when it is part of the proper name of a well, but omit the word in other cases. Do not use # as an abbreviation for “number.”  
 Fig. 6 Eq. 5 Well 9 Col. A  
 No. 4 Table 10 Appendix C Page 57

## 4.2 Common Abbreviations

- 4.2.1 The following terms are often abbreviated in SPE literature. If used often in an article, they should be spelled out at first use (in the text, not counting use in the title), followed by the abbreviation in parentheses, and abbreviated throughout the rest of the article.

alternating current	AC	hydroxypropyl guar	HPG
barrel of oil equivalent	BOE	independent oil company	IOC
basic sediment and water	BS&W	inside diameter	ID
blowout preventer	BOP	interfacial tension	IFT
bottomhole assembly	BHA	kelly bushing	KB
bulletin board system	BBS	lease automatic custody transfer	LACT
capture unit	c.u.	liquefied natural gas	LNG
cathode ray tube	CRT	liquefied petroleum gas	LPG
central processing unit	CPU	local area network	LAN
cold water equivalent	CWE	measured depth	MD
computerized tomography	CT	measured depth from rotary table	MDRT
computer user group	CUG	measurement while drilling	MWD
direct current	DC	national oil company	NOC
enhanced oil recovery	EOR	nuclear magnetic resonance	NMR
equation of state	EOS	net present value	NPV
equivalent circulating density	ECD	oil-based mud	OBM
file transfer protocol	FTP	oil in place	OIP
formation volume factor	FVF	oil initially in place	OIIP
gas chromatography	GC	oil originally in place	OOIP
gas/oil contact	GOC	operating system	OS
Gulf of Mexico	GOM	original oil in place	OOIP
gas/oil ratio	GOR	outside diameter	OD
graphical user interface	GUI	pore volume	PV
health, safety, security, and environment	HSSE	porosity units	p.u.
high-pressure/high-temperature	HP/HT	pounds of proppant added	ppa
hydrocarbon pore volume	HCPV	pressure/volume/temperature	PVT
hydrolyzed polyacrylamide	HPAM	productivity index	PI
hydroxyethyl cellulose	HEC	rate of penetration	ROP
		residual oil saturation	ROS

root mean square	RMS	water alternating gas	WAG
scanning electron microscope	SEM	water-based mud	WBM
self-potential	SP	water/oil contact	WOC
shots per foot	spf	water/oil ratio	WOR
specific gravity	SG	weight on bit	WOB
total dissolved solids	TDS	wide area network	WAN
total depth	TD	World Wide Web	WWW
true vertical depth	TVD	X-ray diffraction	XRD
ultraviolet	UV		
uniform resource locator	URL		

4.2.2 With regard to acronyms, leave them all uppercase if they are “true” acronyms, in which each letter stands for an actual word. “False” acronyms are brought into downstyle (i.e., uppercase first letter only).

THUMS	(Texaco, Humble, Union, Mobil, Standard)
OPEC	(Organization of Petroleum Exporting Countries)
Arco	(Atlantic Richfield Company)

4.2.3 Many programming languages, some software applications, and a few other products have their names trademarked in all capital letters and are exceptions to the “true” acronyms rule; if the name is a trade name, capitalize the entire name—or the indicated portion of it—according to the trademarked style.

MS-DOS	Logo
BASIC	Pascal
COBOL	WordPerfect
FORTRAN	Macintosh OS
UNIX	dBASE for Windows
CHEARS	QuarkXPress
PIPESOFT-2	CorelDRAW

#### 4.3 Units

4.3.1 Do not add “s” to abbreviated forms of plural units of measure; use the same abbreviation for both singular and plural forms (e.g., 10 bbl, not 10 bbls).

Note: Add the “s” when the unit is spelled out (e.g., darcy/darcies, day/days, ton/tons, and mile/miles) or when it appears without a number (e.g., “The permeabilities of the samples varied widely.”).

4.3.2 Abbreviate units of measurement in the text only when used with numerical values (unless the abbreviation replaces a very long phrase, such as “several scf/D” for “several standard cubic feet per day”).

25 ft	$5 \times 10^3 \text{ ft}^3/\text{D}$	10 dm <sup>3</sup>	3 cm <sup>3</sup>
-------	---------------------------------------	--------------------	-------------------

Abbreviate such units in figures and tables.

4.3.3 For units of time, use the customary abbreviations “sec” (second), “min” (minute), “hr” (hour), and “yr” (year), and use the metric abbreviations “s” (second), “min” (minute), “h” (hour), “d” (day) (in metric units only; use “D” with nonmetric units), and “a” (year), **in combined units only**. Otherwise, spell out the term.

42 m/d, <i>but</i> 42 days	34 ft/D, <i>but</i> 34 days	12 cm/s, <i>but</i> 12 seconds
----------------------------	-----------------------------	--------------------------------

4.3.4 Use abbreviations instead of ciphers or symbols to represent customary units of measurement.

lbm or lbf, not #	in., not ″	ft, not ′
-------------------	------------	-----------

4.3.5 Use the degree sign (°) with angles, temperatures [except metric K (Kelvin)], and compass coordinates.

20° slope	65°F	2°W
-----------	------	-----

4.3.6 Use the slash (/) in place of “per” between two abbreviated units of measurement.

40 psi/ft	15 cm/s	40 lbm/ft
-----------	---------	-----------

[Exception: shots/ft is written thus at first use, followed by (spf) to indicate its abbreviated form in further uses.]

4.3.7 Use the hyphen (-) in customary units and the product dot (·) in metric units to indicate multiplication in combined units.

md-ft	md·m	B/D-psi	m <sup>3</sup> /d·kPa
-------	------	---------	-----------------------

4.3.8 Use lbm for pounds mass and lbf for pounds force.

4.3.9 Use cm<sup>3</sup>, not cc, for cubic centimeter.

4.3.10 The following are abbreviations for common oilfield units of measure. Consult the *SPE Metric Standard* for a complete listing of preferred SI units.

barrels of fluid per day	BFPD [m <sup>3</sup> /d fluid]	kilowatt hour	kW-hr [J]
barrels of liquid per day	BLPD [m <sup>3</sup> /d liquid]	kips per square inch	ksi [Pa]
barrels of oil per day	BOPD [m <sup>3</sup> /d oil]	mho per meter	Ω /m [S/m]
barrels of water per day	BWPD [m <sup>3</sup> /d water]	millidarcy	md
barrels per day	B/D [m <sup>3</sup> /d]	million electron volts	MeV [MJ]
barrels per minute	bbbl/min [m <sup>3</sup> /s]	million cubic feet	MMcf
billion cubic feet	Bcf [10 <sup>9</sup> m <sup>3</sup> ]	mils per year	mil/yr [ m/a]
billion cubic feet per day	Bcf/D [10 <sup>9</sup> m <sup>3</sup> /d]	ohm	Ω
cubic feet per barrel	ft <sup>3</sup> /bbl [m <sup>3</sup> /m <sup>3</sup> ]	pound per cubic foot	lbm/ft <sup>3</sup> [kg/m <sup>3</sup> ]
cubic feet per day	ft <sup>3</sup> /D [m <sup>3</sup> /d]	pound per gallon	lbm/gal [kg/m <sup>3</sup> ]
cubic feet per minute	ft <sup>3</sup> /min [m <sup>3</sup> /s]	reservoir barrel	res bbl [res m <sup>3</sup> ]
cubic feet per pound mass	ft <sup>3</sup> /lbm [m <sup>3</sup> /kg]	reservoir barrel per day	RB/D [res m <sup>3</sup> /d]
cubic feet per second	ft <sup>3</sup> /sec [m <sup>3</sup> /s]	square feet	ft <sup>2</sup> [m <sup>2</sup> ]
cubic yard	cu yd	square mile	sq mile [km <sup>2</sup> ]
darcy	(spell out)	standard cubic feet per barrel	scf/bbl
dead-weight ton	DWT [Mg]	standard cubic feet per day	scf/D [std m <sup>3</sup> /d]
feet per minute	ft/min [m/s]	standard cubic foot	scf [std m <sup>3</sup> ]
feet per second	ft/sec [m/s]	stock-tank barrel	STB [stock-tank m <sup>3</sup> ]
foot-pound	lb-ft or ft-lbf [J]	stock-tank barrels per day	STB/D [stock-tank m <sup>3</sup> /d]
gallons per minute	gal/min [m <sup>3</sup> /s]		
gallons per day	gal/D [m <sup>3</sup> /d]	stoke	St [m <sup>2</sup> /s]
gram	g	thousand cubic feet	Mcf
horsepower-hour	hp-hr [J]	trillion cubic feet	Tcf [10 <sup>12</sup> m <sup>3</sup> ]
inches per second	in./sec [cm/s]		
kilopond (1,000 lbf)	klbf [N]		

4.3.11 Abbreviations MM for million and M for thousand should be used ONLY with cubic feet to express gas volumes. Avoid the use of MM with such expressions as barrels of oil (MMBO) or barrel of oil equivalent (MMBOE); instead, spell out “million.”

#### 4.4 Chemicals

butane	C <sub>4</sub>	isobutane	<i>i</i> -C <sub>4</sub>
carbon dioxide	CO <sub>2</sub>	isopentane	<i>i</i> -C <sub>5</sub>
carbon monoxide	CO	methane	C <sub>1</sub>
ethane	C <sub>2</sub>	nitrogen oxides	NO <sub>x</sub>
heptane	C <sub>7</sub>	<i>n</i> -pentane	
hexane	C <sub>6</sub>	pentane	C <sub>5</sub>
hydrofluoric acid	HF	potassium chloride	KCl
hydrogen sulfide	H <sub>2</sub> S	propane	C <sub>3</sub>
hydrochloric acid	HCl	sodium chloride	NaCl

#### 4.5 Organizations

The following are abbreviations for some of the organizations that may be mentioned in SPE literature. When these organization names are used often in an article, they should be spelled out at first use, followed by the abbreviation in parentheses, and abbreviated throughout the rest of the article. Words like “Society” and “Institute” should always be abbreviated when included in reference lists, bibliographies, and tabular material (tables of contents and other actual tables) and should be spelled out in headings and running text (see Sec. 4.1.2).

American Petroleum Institute	API
American Institute of Mining, Metallurgical and Petroleum Engineers	AIME
American Association of Petroleum Geologists	AAPG
American Chemical Society	ACS
American Gas Association	AGA

American Geophysical Union	AGU
American Society for Testing and Materials	ASTM
American Society of Civil Engineers	ASCE
American Society of Mechanical Engineers	ASME
American Institute of Chemical Engineers	AIChE
Gas Technology Institute	GTI
International Association of Drilling Contractors	IADC
Iron and Steel Society	ISS
National Association of Corrosion Engineers	NACE
Petrotechnical Open Software Corporation	POSC
Society of Exploration Geophysicists	SEG
Society for Mining, Metallurgy, and Exploration	SME
Society of Professional Well Log Analysts	SPWLA
The Minerals, Metals, and Materials Society	TMS
US Department of Energy	US DOE

## 5 PUNCTUATION

### 5.1 Comma

- 5.1.1 Do not use commas in dates in the day/month/year format.  
 The project began on 5 June 1994.  
 If the day of the month is not given, do not use a comma to separate the month and the year.  
 Waterflooding began in April 1975.
- 5.1.2 In a series of three or more elements, use commas between each element and before the final conjunction.  
 ... papers by Rogers, Smith and Sloan, and Greenlee  
 ... the effects of viscosity, flow rate, and porosity
- 5.1.3 Use commas to set off states used with locations, but do not set off “II” and “III” and “Jr.” and “Sr.”  
 Jim Wilson Jr. arrived in Bakersfield, California, USA, last week.
- 5.1.4 Use a comma to separate two coordinate adjectives that modify the same noun; however, do not use the comma when the adjectives depend on what follows. The comma is needed when the adjectives are similar in meaning.  
 an efficient, simple, cheap way  
 a dark red dye  
 a dark red, commercial dye  
 Commas are used correctly if they logically can be replaced by “and.”
- 5.1.5 Set off parenthetical words or phrases with commas.  
 Of course, we decided to stay.  
 We should, nevertheless, leave soon.

### 5.2 Colon

- 5.2.1 Use a colon after a complete sentence to introduce a formal list, examples, equations, or an additional statement.
- 5.2.2 Do not insert a colon between a verb or preposition and its object(s).  
 The data were time, volume, and depth.
- 5.2.3 Use a colon to introduce a long, formal quotation.
- 5.2.4 Use a colon to express a ratio between numbers; use a slash (/) to express a ratio with words (e.g., area/volume ratio).

### 5.3 Semicolon

- 5.3.1 Use the semicolon to separate clauses that are not linked by a conjunction and to separate long, involved coordinate clauses.  
 Drilling to such depths is rare; much of the technology is experimental and rapidly changing.

- 5.3.2 Use the semicolon to divide elements in a series when any of the elements contains commas.  
 Section officers are Jim Black, Chairperson; Susan Hall, Program Chairperson; and Bill Williams, Secretary.  
 2 people, 1 company: No comma before the “and.”  
 Joe Ford and Tom Gibson, Exxon Mobil Corporation  
 2 people, 2 companies: Comma before the “and.”  
 Joe Ford, Exxon Mobil Corporation, and Brad Smith, Schlumberger  
 3 people, 3 companies: Semicolons to separate, and semicolon before the “and.”  
 Joe Ford, Exxon Mobil Corporation; Brad Smith, Schlumberger; and Karen Moore, BP  
 X people, 2 companies: commas to separate, and comma before the “and.”  
 Joe Ford, Tom Gibson, and Steve Johnson, Exxon Mobil Corporation, and Karen Moore and Jan Foster, BP  
 X people, 3+ companies: semicolons to separate, and semicolon before the “and.”  
 Joe Ford and Tom Gibson, Exxon Mobil Corporation; Jan Foster, BP; Brad Smith, Schlumberger; and George White, Chris Jones, and Sandra Kennedy, Batman and Robin Consulting.
- 5.3.3 Organize material between semicolons around common elements.  
 Committee members are Jim Black, Chairperson, and Sam Smith, Secretary, Tonka Oil Company; Directors Al Jones, PDQ Drilling Company, and Max Wentworth, Sherman Associates; and Joe Johnson, Vice Chair, Texas Tools.
- 5.3.4 Use the semicolon before conjunctive adverbs such as “therefore,” “however,” “thus,” “moreover,” and “consequently.”  
 The first test failed; consequently, we ran another.  
 NOTE: “Whereas” should be preceded by a comma, never a semicolon.

## 5.4 Apostrophe

- 5.4.1 Apostrophes should be consistently typeset in curly form, not straight and vertical or slanted like an accent.
- 5.4.2 Use the possessive form for informal measures involving time, space, and quantity.  
 3 years’ experience                      a dime’s worth                      a yard’s length
- 5.4.3 Use the apostrophe alone to form the possessive of a plural noun ending in “s.” Use ’s to form the possessive of words not ending in “s.”  
 the mud’s weight                      the wells’ total production
- 5.4.4 **DO NOT** add ’s when forming the plural of figures, letters, years, abbreviations, etc.  
 the 1920s                      all As                      BHAs
- 5.4.5 The apostrophe replaces an omitted letter or letters in contractions.  
 didn’t                      shouldn’t                      huff ’n’ puff
- 5.4.6 Use ’s when forming the possessive of an abbreviated word.  
 Exxon Mobil Corporation’s well
- 5.4.7 When forming the possessive of compounds, the last part of the compound takes the possessive form.  
 the equation of state’s derivation
- 5.4.8 For words showing joint possession, only the last in the succession takes the possessive.  
 Smith and Jones’ paper
- 5.4.9 Individual possession is indicated by forming the possessive of each word in the group.  
 Smith’s, Johnson’s, and Jones’ papers

## 5.5 Parentheses

- 5.5.1 Use parentheses to set off phrases that start with i.e. or e.g.
- 5.5.2 Use parentheses to set off explanatory or incidental matter that is not part of the main thought of the sentence.  
 The time was right (despite some feelings to the contrary) to begin construction.



- 5.5.3 Use brackets [ ] around a parenthetical phrase already containing parentheses.  
The difference was small [compared with the earlier study (1976)].

## 5.6 Quotation Marks

- 5.6.1 Quotation marks should be consistently typeset in curly form (e.g., “like this”).
- 5.6.2 In general, use quotation marks to cite exact phraseology from another source, to set off titles when italics are not used, and to enclose a word or phrase being used in an unusual manner at its first use.
- 5.6.3 Use quotation marks at the opening of each paragraph and at the close of the final paragraph of a long quotation. If the quotation is to be set in contrasting type or to be indented from the rest of the copy, do not use the quotation marks.
- 5.6.4 Set commas and periods inside quotation marks. Other punctuation marks go inside the quotation marks only if they belong to the material quoted.
- 5.6.5 When defining or introducing a new term, use the quotation marks only at the first reference.

## 5.7 Dashes

- 5.7.1 There are several kinds of dashes, differing from one another according to length. The main ones are the en and em dashes. The en dash is half the length of an em dash and longer than a hyphen:  
Em dash: —            En dash: –            Hyphen: -  
**\*\*NOTE: The dash is NEVER surrounded by spaces.\*\***  
In titles, colons are preferred in place of em dashes.
- 5.7.2 The most commonly used dash is the em dash, which is used to denote a sudden break in thought that causes an abrupt change in sentence structure; a pair of em dashes often sets such an intrusive item apart from the sentence parenthetically.  
The Platonic world of the static and Hegelian world of process—how great the contrast!  
The chancellor—he had been awake half the night waiting in vain for a reply—came down to breakfast in an angry mood.  
An em dash also is inserted in the caption of a figure after its designation.  
Fig. 1—Cutaway drawing of a well.                      Table 1—Field Properties
- 5.7.3 The principal use of the en dash is to indicate continuing or inclusive numbers, such as in dates, times, or references.  
1968–72                      10 a.m.–5 p.m.                      0900–1300  
May–June 1967                      pp. 38–45                      0230–0500  
3–5 March 2002                      13 May 1965–9 June 1966
- 5.7.4 Do not mix the use of the en dash in this manner with words, such as “between/and” or “from/to,” in expressing a range.  
Use either “...from 1968 to 1972...” or “...1968–72...”  
NOT “from 1968–72...” or “...between 1968–72...”  
Use “...between 10 a.m. and 5 p.m. ....” or “...from 1000 to 1700....” or “...10 a.m.–5 p.m....” or “1300–1630”  
NOT “...from 10 a.m.–5 p.m.” or “...from 1400–1800...”
- 5.7.5 When the concluding date of an expression denoting a duration of time is in the unforeseeable future, the en dash is still used.  
North Texas area wells contributing information to the ongoing study include Crumley B-213 (1979–),  
McConnell C-124 (1979–1992), West B-246 (1979–), and Bruce A-317 (1979–1983).

## 5.8 Hyphenation

- 5.8.1 Do not use hyphens to express a range of figures. Instead, use the complete idiom except with dates, page numbers, and addresses.  
from 20 to 30%                      NOT from 20–30%

- 5.8.2 Hyphens normally are not needed after ordinary prefixes.
- |             |               |                 |                 |           |
|-------------|---------------|-----------------|-----------------|-----------|
| coeducation | hydroelectric | electrochemical | interconnection | semilog   |
| midwestern  | pseudosteady  | multiphase      | quasilegal      | updip     |
| nonlinear   | repressured   | subsea          | prestimulation  | ultradeep |
- However, use a hyphen after a prefix when a vowel is doubled (exceptions are cooperate, coordinate, isooctane, and microorganism).
- |          |             |                |
|----------|-------------|----------------|
| re-elect | pre-eminent | semi-insoluble |
|----------|-------------|----------------|
- Also, use a hyphen when the prefix precedes a proper name.
- |               |                 |
|---------------|-----------------|
| non-Newtonian | post-Ordovician |
|---------------|-----------------|
- Use a hyphen after any prefix if omitting it will convey the wrong meaning.
- |          |         |            |           |
|----------|---------|------------|-----------|
| re-cover | recover | re-treat   | retreat   |
| re-form  | reform  | co-operate | cooperate |
- 5.8.3 Hyphenate compound customary units of measurement.
- |         |       |
|---------|-------|
| acre-ft | md-ft |
|---------|-------|
- 5.8.4 Hyphenate expressions such as “*n*-pentane.” However, do not hyphenate ordinary chemical combinations used as modifiers or chemical names with prefixes.
- |                            |                    |
|----------------------------|--------------------|
| a sodium chloride solution | hydroxyacetic acid |
|----------------------------|--------------------|
- 5.8.5 Do not use a hyphen between words to take the place of “and” or “or.” Instead, use a slash.
- |                     |                    |                      |
|---------------------|--------------------|----------------------|
| oil/water interface | pressure/time plot | section/chapter news |
|---------------------|--------------------|----------------------|
- pressure/volume/temperature data  
*Exception: permeability-thickness product.*
- 5.8.6 Hyphenate the following terms.
- |                 |  |
|-----------------|--|
| president-elect | three-fourths (and other fractions that are spelled out) |
|-----------------|--|
- 5.8.7 Use hyphens to avoid ambiguity.
- |   |
|---|
| the lower-production interval (interval producing a lower production than other intervals)  |
| the lower production interval (interval of production that is physically lower than others) |
- or when two or more words in their combined sense modify a noun.
- |                           |                        |                    |                        |
|---------------------------|------------------------|--------------------|------------------------|
| 'round-the-clock watch    | all-time record        | in-situ combustion | five-spot flood        |
| oil-in-place calculations | gas-cap material       | stock-tank oil     | straight-line portions |
| restored-state cores      | trial-and-error method | 6-in. hole         | second-order equation  |
| clay-containing fluid     | rule-of-thumb method   | steady-state flow  | cross-sectional area   |
- Note that when such terms follow the word modified, they do not ordinarily require hyphens:
- |                         |                             |
|-------------------------|-----------------------------|
| the well is shut in     | combustion occurred in situ |
| barrels of oil in place | fluid containing clay       |
- When a unit of measurement comes before a noun, if it is preceded by an article, it should be hyphenated; if there is no article, there should be no hyphen.
- |                           |   |
|---------------------------|---|
| It is a 75-lbm drill bit. | It is set at 75 ft true vertical depth. |
|---------------------------|---|
- 5.8.8 Adjective phrases formed by an adverb and a verb usually are hyphenated:
- |                     |                         |
|---------------------|-------------------------|
| a slow-moving front | the quick-drying cement |
|---------------------|-------------------------|
- but not adverb/adjective combinations where the adverb ends in “-ly.”
- |                          |                       |
|--------------------------|-----------------------|
| regularly producing well | fully developed field |
|--------------------------|-----------------------|
- Some other combinations do not take hyphens.
- |                       |                    |           |
|-----------------------|--------------------|-----------|
| relative permeability | capillary pressure | gamma ray |
|-----------------------|--------------------|-----------|
- 5.8.9 Use the suspended (“floating”) hyphen for relating similar qualities.
- The pressure- and temperature-dependent characteristics must be established.
- 5.8.10 “Fold” is a joined suffix unless formed with a hyphenated number or numeral.
- |         |          |                  |
|---------|----------|------------------|
| twofold | 100-fold | Twenty-five-fold |
|---------|----------|------------------|

- 5.8.11 Hyphenate compound directions when they are used to form one direction. Use a slash to represent “to” in a direction.  
The wind blew from the north-northwest.  
The fault ran northwest/northeast.

- 5.8.12 Only break words and hyphenate them at the ends of the lines of right-margin-justified copy. Ragged-right-margin copy should not have word breaks.

## 5.9 Ampersands

Ampersands, which substitute for “and,” are not permitted in most instances. Exceptions include a few abbreviations (such as E&P, R&D, and BS&W), as well as preservation of the ampersand where it appears in trade names and publication titles. Avoid using ampersands in the titles of SPE meetings.

*SPE Reservoir Evaluation & Engineering*      *SPE Drilling & Completion*  
Health, Safety, Security, Environment & Social Responsibility discipline area

## 5.10 Web-Related Items

- 5.10.1 Most uses of the prefix “e” to denote computerized or electronic form are hyphenated and lowercase.  
e-business      e-commerce  
*Exception:* email
- 5.10.2 The e-prefix is not capitalized, even in a title or at the beginning of a sentence, unless it is part of copy that is already in all capital letters.  
A Closer Look at e-Commerce  
e-business is looking better all the time.  
WELCOME TO THE E-ZONE!
- 5.10.3 The e-prefix is not hyphenated in the use of a trademarked name with this as its style.  
eSPE  
eLibrary  
eUpdate
- 5.10.4 Web addresses are formatted in plain typeface, with no hyperlink (i.e., no underline or special color), and followed by a period if the Web address ends the sentence.  
You can find the site by searching for it at [www.webcrawler.com](http://www.webcrawler.com).

## 5.11 Typeface

- 5.11.1 **Bold** typeface is used for such things as authors’ names in bylines and on first use in author biographies; section headings in articles; and first mention of figures and tables (see Sec. 8.3.5).  
Byline:  
**A.C. Clarke**, Monolith Communications, and **I. Asimov**, US Robotics.  
Author biographies:  
**Arthur C. Clarke** is the author of *2001: A Space Odyssey* and many other books. Clarke holds a PhD in astronomy from Oxford University and is credited with inventing the concept of the communications satellite. **Isaac Asimov** holds a PhD in biochemistry from Columbia University. Asimov is the author of more than 500 books, many about robots; he is even credited with having coined the word “robotics.”
- 5.11.2 In most situations, any punctuation accompanying a boldface citation is set in bold as well.  
Note trends shown in **Fig. 1**.  
When a figure is cited for the first time and happens to be in parentheses, both the figure number and the parentheses should be bold, along with any punctuation that immediately follows the parentheses (**Fig. 2**). If a figure is cited for the first time and is enclosed in parentheses along with additional text, then **ONLY** the figure designation should be bold, not the parentheses or any following punctuation (see data in **Fig. 3**).  
Bold the first reference to a portion of a multipartite figure (**Fig. 1a**), but leave subsequent references to other parts in normal type.
- 5.11.3 *Italic* typeface is used for such things as species names; all publication titles; and a number of mathematical elements (see Sec. 8.7.1).  
In Europe, the pike, *Esox lucius*, is valued for food as well as sport.

*SPE Journal* has many fine articles, but those in the *National Enquirer* are funnier.

- 5.11.4 Normal typeface is used for the majority of the print in a paper. In a passage of italic type, any terms that would be set off in italics in normal type are converted to normal type for contrast.

Wells, H.G. 1910. *Geological Absurdities in Journey to the Center of the Earth by Jules Verne*, 66–69. London: Gnome Press.

Also, certain technical terms are set in normal type, despite general rules that may apply to the contrary in some situations: M (for molar) and N (for normal), for example.

## 6 NAMES

### 6.1 People, Personal Titles, Degrees

- 6.1.1 When possible, write a person's name as that person writes it. Particularly observe preferences in the use of initials or given name, spelling of "Mc" and "Mac," and capitalization of prefixes such as "de," "da," "du," "le," "van," and "von." When personal preferences cannot be determined, use two or more initials or, if only one given name is available, spell out the first name and capitalize all prefixes except "von" and "de."

William L. Strong                      W.L. Strong  
William L. (Skipper) Strong        Skipper Strong

- 6.1.2 Do not use the titles Mr., Mrs., Ms., Miss, Prof., or Dr. Occasionally, cultural norms will dictate the use of an honorific.

- 6.1.3 Do not use commas to set off "II," "III," "Jr.," or "Sr." in names.

Jim Wilson Jr. arrived in Bakersfield, California, USA, last week.

- 6.1.4 When an author or speaker's nickname is used, it should be enclosed in parentheses.

W.T. (Bud) Parker

- 6.1.5 In running text, capitalize and spell out formal titles such as president, chairman, or vice president when they precede a name and "the" or "a" is not used. All titles appearing after the person's name should be lowercase. In program listings and headings, capitalize major words in titles, department names, etc.

The meetings will be hosted by President Jane Smith.

Meetings are hosted by the president of Acme, Jane Smith.

Giovanni Paccaloni, who served as 2005 SPE president, is being honored with an award.

Giovanni Paccaloni, 2005 SPE President

Please contact Maxwell Jones, vice president, finance.

- 6.1.6 Abbreviate academic and honorary degrees without periods or spaces. Use of the word "degree" is optional.

PhD                      MA                      LLB degree

- 6.1.7 Do not capitalize academic degrees when spelled out. Do not capitalize a field of study such as physics or petroleum engineering.

bachelor's degree                      BS in physics

- 6.1.8 Capitalize honorary membership titles and other SPE honors, awards, and distinctions.

SPE Distinguished Service Medal                      SPE Honorary Member

- 6.1.9 In reference lists and in technical program listings of papers and authors, use the author's initials instead of his/her given name and spell out his/her family name. Do not insert spaces between an author's initials.

M.B. Shelley                      G.B.L. Jones                      G. Elliot                      J.-P. Smith

- 6.1.10 Authors' names should be printed in bold in the author credits (byline) at first use, in regular type afterward.

- 6.1.11 Do not capitalize the names of devices, methods, theories, techniques, systems, or laws (except for proper names that are included).

Darcy's law                      Cartesian coordinates                      Muskat method  
Laplace transform                      pendant-drop method                      Stokes' law

## 6.2 Companies, Organizations

6.2.1 Capitalize names of regions, sections, chapters, committees, and other units of SPE when written in full. Do not capitalize the general term when used alone or in the plural form.

Permian Basin Section	the section
SPE Board of Directors	the board meeting

6.2.2 Capitalize names of companies, institutes, foundations, colleges, universities, associations, etc., but do not capitalize the general term when used alone or in the plural form except in cases covered under Sec. 6.2.4.

Faraday Society	society goals	25-Year Club members
-----------------	---------------	----------------------

6.2.3 Capitalize the official names of departments, districts, divisions, and similar major subdivisions of companies, organizations, or universities. Do not capitalize the general term when alone or plural.

Department of Petroleum Engineering	API Production Division
the Geosciences and Chemistry departments	the Monograph and Books committees

6.2.4 Capitalize all letters in company names only if they are true acronyms, each letter standing for a single word.

THUMS	Texaco, Humble, Union, Mobil, and Standard
Arco	Atlantic Richfield Company
Aramco	Saudi American Oil Company

6.2.5 Capitalize names of specific national and state legislative, executive, and judicial bodies.

US Supreme Court	UK Parliament
------------------	---------------

6.2.6 Capitalize official names of organizations but not general terms.

US Navy	the navy
---------	----------

6.2.7 Do not capitalize such words as national, federal, government, and state in nonspecific or incomplete references.

federal bureau	government agencies	state bureaus	Nigerian government
----------------	---------------------	---------------	---------------------

6.2.8 If you abbreviate names of societies and government agencies, use no periods or spaces.

SPE	NPF	AAPG	API	UKOOA	IATMI
-----	-----	------	-----	-------	-------

Note: Sec. 4.1.2 and **Appendix A** list common abbreviations in company names.

## 6.3 Geographic

6.3.1 Most names of cities should be followed by the state and country or the country in which they are located. The major oil industry centers and well-known cities listed here can be used alone.

Aberdeen	Denver	Rio de Janeiro
Amsterdam	Doha	Riyadh
Anchorage	Dubai	Rome
Athens	Hong Kong	San Francisco
Beijing	Houston	Shanghai
Berlin	Jakarta	Singapore
Bombay	Kuala Lumpur	Stavanger
Buenos Aires	London	Sydney
Cairo	Los Angeles	The Hague
Calcutta	Mexico City	Tokyo
Calgary	Moscow	Tulsa
Caracas	New Orleans	Washington, DC
Chicago	New York City	
Dallas	Paris	

6.3.2 When providing locations in the US that are not listed in Sec. 6.3.1, give the city, state (unabbreviated), USA. For locations outside the US and not listed in Sec. 6.3.1, give the city and the country. Once a location has been established in an article or a program, the city can be referred to without the state or country.

The 1997 SPE Annual Technical Conference and Exhibition will be in San Antonio, Texas, USA, on 5–8 October. See the Housing Request Form for information on accommodations in San Antonio.

- 6.3.3 Capitalize such words as river, ocean, valley, etc., and geographic locations when they represent worldwide accepted usage, real properties, or legal entities.
- |               |                |                |           |
|---------------|----------------|----------------|-----------|
| Pacific Ocean | Gulf of Mexico | Glasscock Unit | North Sea |
| Middle East   | Loire Valley   | Platform B     |           |
- 6.3.4 Do not capitalize terms that refer to a direction or general location.
- |  |                |                |
|--|----------------|----------------|
| west Texas   | eastern Europe | offshore Egypt |
| midcontinent area (BUT Mid-Continent Section of SPE) |                |                |
- 6.3.5 Do not capitalize geologic formations, such as belt, formation, zone, field, pay, basin, pool, reservoir, delta, sand, shale, and trend.
- |               |                |                  |                |
|---------------|----------------|------------------|----------------|
| Arbuckle zone | Cardium A pool | east Texas field | Delaware basin |
|---------------|----------------|------------------|----------------|
- Exceptions: Permian Basin and Overthrust Belt*
- 6.3.6 Capitalize geologic ages (e.g., “Mesozoic”), including leading adjectives (e.g., Upper Jurassic).
- 6.3.7 Use these and accepted abbreviations for other geographic subdivisions (states, provinces, etc.) only when accompanied by a specific locale when the location otherwise may be unclear.
- |     |                      |     |                          |
|-----|----------------------|-----|--------------------------|
| UAE | United Arab Emirates | USA | United States of America |
| UK  | United Kingdom       | EU  | European Union           |
- 6.3.8 Capitalize the word “the” in The Hague and The Netherlands, as well as other official names of institutions [e.g., The Woodlands Marriott Hotel]; for additional examples, refer to the *Chicago Manual of Style*.

## 6.4 Meeting Names

- 6.4.1 The official names of SPE meetings are listed in the SPE Long-Range Meetings Calendar. SPE meetings should be referred to by the name that appears in this document. Colons are preferred in place of em dashes in official meeting names.
- 6.4.2 Do not abbreviate any portion of the name of an SPE meeting. If using the full name is awkward because of its length, rewrite the sentence or use a generic term, such as “the conference.” The Offshore Technology Conference may be referred to as OTC, and the SPE Annual Technical Conference and Exhibition may be referred to as ATCE.
- 6.4.3 Capitalization of meeting names should follow capitalization rules for titles (see Sec. 8.1). Colons are preferred in place of em dashes in official meeting names.

## 7 NUMBERS

### 7.1 General

- 7.1.1 Large, rounded numbers should be written with the words “million” and “billion” or expressed in powers of 10 notation, with the number before the  $\times$  greater than 0 and less than 10. Spell out the preceding numerals if nine or less, except with sums of money or units of measurement (hours, days, years, and other units of time are considered units of measurement). Never use “billion,” “trillion,” etc., with SI metric units.
- |            |                       |                                      |               |
|------------|-----------------------|--------------------------------------|---------------|
| 40 million | six million consumers | $8 \times 10^6 \text{ m}^3/\text{d}$ | USD 4 million |
|------------|-----------------------|--------------------------------------|---------------|
- 7.1.2 Do not use commas in numbers in dates, pages, and addresses. Numbers of more than three digits used with customary (i.e., not SI metric) and nondimensional units use the comma.
- |             |                        |              |
|-------------|------------------------|--------------|
| 456,789 bbl | 2,956 ft               | October 1997 |
| Page 1171   | 1600 Pennsylvania Ave. |              |
- Do not use the comma with SI metric units. Use a space instead; four-digit numbers require no space.
- |                          |        |
|--------------------------|--------|
| 4 720 525 m <sup>3</sup> | 1525 m |
|--------------------------|--------|
- 7.1.3 Use the suspended hyphen when expressing a numerical series of dimensions.
- The 3-, 5-, and 7-in. wellbores ...
- A 25- to 50-lbm/bbl mud ... (Not “A 25–50-lbm/bbl mud ...”)



## 7.5 Whole Numbers

7.5.1 In general, spell out “zero” and whole numbers from one through nine; use figures for 10 or more.

one	two	three	10	101
first	second	third	10th	101st

7.5.2 Use figures if the number expresses a unit of measurement or ratio.

1%	6 km	3 in.	6 m	2:1	20°C
----	------	-------	-----	-----	------

7.5.3 Use figures for dates, street addresses, currency, and times of day.

USD 3	USD 0.27	2 p.m.	55 Park Avenue
-------	----------	--------	----------------

7.5.4 Use figures for numbers when grouping similar things if any of the numbers are greater than 10.

contains 4 to 16 pages	contains four to six pages
------------------------	----------------------------

7.5.5 In general, avoid Roman numerals. Use Arabic numbers to designate tables, figures, and equations.

7.5.6 Use only numerals in statistical and tabular material.

7.5.7 Spell out the first term to distinguish between two numbers that come together.

twenty-one 2-acre tracts	two 3-hour tests
--------------------------	------------------

7.5.8 Spell out numbers that begin a sentence. If the numbers are so large that the sentence becomes awkward, rewrite the sentence.

Ten wells are producers; 13 are dry holes.  
Four-inch pipe was set.

7.5.9 When using the number “1” or the word “one” in text can lead to confusion, the term “unity” may be substituted (e.g., “for mobility ratios other than unity”).

7.5.10 Use a capital “X” to indicate magnification: 500X.

## 7.6 Fractions

7.6.1 Spell out common fractions when they are used alone in the text. Use figures when the fraction is combined with a whole number or when it is used with a unit of measurement. Common fractions do not exist in the SI metric system; use decimal notation instead.

2¼ pages	½-in. tubing	3.25 kg	one-half the normal time
----------	--------------	---------	--------------------------

7.6.2 When writing decimal fractions, place a zero before the decimal point (0.5, not .5).

## 7.7 Currency

7.7.1 When expressing currencies, select the appropriate three-letter abbreviation from the list of ISO currency abbreviations (the list can be found at <http://www.iso.org/iso/en/prods-services/popstds/currencycodeslist.html>), and omit the currency symbol (\$, £, ¥). If currencies will be used often, such as on meeting registration forms, a statement at the top of the form noting the type of currency used (e.g., “Prices are in US dollars.”) is sufficient.

*Examples:*    USD 50.25            CAD 90.50            JPY 500  
                  GBP 50                    EUR 10.50

7.7.2 In text, drop unnecessary zeroes from currencies. For example, write “USD 10” rather than “USD 10.00.” Retain the two decimals in a column of currencies only if one or more of the prices listed requires them.

USD 55.50
50.00
35.25

## 7.8 Dimensions

7.8.1 The designations three-dimensional, four-dimensional, etc., are generally written as 3D, 4D, etc.



- 7.8.2 When physical dimensions are written out, they are expressed in numerals, and a multiplication symbol appears between the dimensions without any additional spacing. The unit is specified afterward normally.  
Each cell is  $84 \times 84 \times 5$  ft.

## 8 ELEMENTS OF TECHNICAL PAPERS

### 8.1 Titles and Headings

- 8.1.1 In titles and headings for books, articles, lectures, etc., capitalize nouns, pronouns, adverbs, and all other words of four or more letters. Also capitalize “no,” “nor,” “off,” “out,” “so,” and “up.” Capitalize words of fewer than four letters if they are a verb or part of or closely connected to a verb.

Held Up                      To Inject                      Can Be Produced

- 8.1.2 Capitalize both parts of a compound adjective.

Two-Phase                      In-Situ                      Full-Sized

- 8.1.3 Use a colon (preferred) or an em dash, rather than a comma, to set off part of the title; capitalize the first word after the em dash or colon, and then capitalize normally as for titles generally.

Corrosive Service: A Study in Economics  
Horizontal Drilling—New Horizons

### 8.2 Author and Company Names

- 8.2.1 Author names on technical papers should include the name of each author, followed by “, SPE,” if he/she is an SPE member, followed by his/her company affiliation.

J.B. Brown, SPE, Consolidated Flange; P.D. Smith, Smith Consulting; and Edward White, SPE, Worldwide Washers

- 8.2.2 If two or more authors have the same company affiliation, it should not be repeated after each name.

Edward White, SPE, P.D. Smith, and J.B. Brown, SPE, Consolidated Flange, and S.R. Lane, SPE, Worldwide Washers

- 8.2.3 When possible, write a person’s name as he/she writes it. Particularly observe the spelling of “Mc” and “Mac” and capitalization of prefixes such as “de,” “da,” “du,” “le,” “van,” and “von.” When personal preferences are not determinable, use two initials rather than the given name (or spell out the given name if you know only one), and capitalize all prefixes except “von” and “de.” Also, be aware that the order of names (family name, given name, etc.) is different in different cultures. The author’s preference should always be considered.

- 8.2.4 Do not use the titles Mr., Mrs., Ms., Miss, Prof., or Dr.; occasionally, cultural norms will dictate the use of an honorific.

### 8.3 Numbering Tables, Figures, and Equations

- 8.3.1 Use Arabic numbers to label tables and figures; number them in order cited consecutively through the text and within appendices. Within each appendix, use Arabic numbers and the same letter designation as that of the appendix (Eq. A-1, A-2, etc.; Eq. B-1, B-2, etc.) Label two-part equations as Eq. 1a and Eq. 1b, or Eq. A-3a and Eq. A-3b. Do not label them as Eq. 1 and Eq. 1a, or Eq. A-3 and Eq. A-3a.

- 8.3.2 Designate all illustrations and nontabular material by “Fig.” Do not use the words “chart,” “exhibit,” “graph,” or “photo” when naming a specific figure. When referring to distinct parts of a single figure, use lower-case letters: Fig. 2a, Fig. 2b, Fig. 2c, etc.

- 8.3.3 Label tables, figures, and equations accompanying a Discussion of a Paper Table D-1, Fig. D-1, Eq. D-1, etc. Those accompanying the Author’s Reply to a Discussion are labeled Table R-1, Fig. R-1, Eq. R-1, etc.

- 8.3.4 When citing two-part figures in text, use “Figs. 2a and 2b” rather than “Figs. 2a and b.”

- 8.3.5 The first time a figure or table is cited in the text, put it in boldface. All subsequent citations of that figure or table should be in regular typeface.  
 ...as shown in **Fig. 1**. Also note in Fig. 1 that the ...  
 However, if a previously mentioned figure is grouped with another being mentioned for the first time, it is set in bold again.  
 ...as indicated in **Fig. 1**. Further development is shown in **Figs. 1 through 4**.

## 8.4 Enumeration of Points

- 8.4.1 Avoid numbering items in a series of brief elements.  
 The measured liquid production was a result of external expansion, liquid expansion, and rock compaction.
- 8.4.2 If the points listed have multiple parts that need to be separated by commas, semicolons should be used to separate the points.
- 8.4.3 When points enumerated are more complex, use a colon after the introductory sentence, and separate the clauses by semicolons. For consistency, if one point is a complete clause, all should be.  
 The measured liquid production was a result of several factors: expansion of the system external to the core was caused by...; expansion of the liquid contained in the pore spaces of the rock normally occurred when...; actual decrease in pore space was caused by compaction within....
- 8.4.4 When points are enumerated in a bulleted list, introduce them with a sentence followed by a colon or period, or with a phrase without a colon or period. Bulleted lists always start with a capital letter. Whenever possible, bulleted lists should be all complete sentences ending in a period or all incomplete sentences with no period at the end of a phrase or sentence fragment.  
 The steps you can take to protect yourself from identity theft are as follows:
  - Destroy your private records and statements.
  - Secure your mail.
  - Safeguard your passwords.
 As president of the society, Smith will emphasize
  - Building support for young professionals
  - Recruiting mentors from core industries
  - Promoting sections to undergraduate students
- 8.4.5 Numbering points is necessary only when the point is referred to later in the article.  
 The method specified in Point 3 could be used.
- 8.4.6 The Conclusions section of a paper commonly presents the final points as a numbered list.

## 8.5 Equations

- 8.5.1 Equations are subject to the same rules of grammar as sentences. Maintain correct grammatical structure in sentences that contain, precede, or follow equations. A complete sentence introducing an equation can end in a period or colon.  
 In many cases, the relationship of motion,  

$$A = Bx + (c - D_2), \dots\dots\dots(3)$$
 can be expressed more simply.  
 Take special care to avoid confusion. For example, “When  $Ax = By$ ,  $C$  varies” is clearer when written as “When  $Ax = By$ , then  $C$  varies.”
- 8.5.2 The symbols for “equals” (=), “yields” ( $\rightarrow$ ), “reversibly yields” ( $\rightleftharpoons$ ), and other such signs act as verbs. Sentences containing these symbols must be grammatically correct.
- 8.5.3 Align subscripts and superscripts properly to avoid confusion about whether a symbol or number should be set on the line or as a subscript or superscript.
- 8.5.4 Letter symbols should conform with SPE standard nomenclature (see Sec. 8.7). Define them in a formal alphabetical nomenclature at the end of the paper.

- 8.5.5 When typing an equation on more than one line, break the equation at a complete term and start the next line with a sign.

$$A_1 = 2B_2 + C \cdot (DF - DG) \\ + 2B_1 \times F_2 \dots\dots\dots(2)$$

- 8.5.6 Use parenthetical pairs in the following order, proceeding from the inside of the equation outward: parentheses ( ), brackets [ ], and braces { }.

$$2\{[A(B + C/D) - E]2\} = 3F.$$

**8.6 Units**

Either SI metric or customary English units should be used consistently throughout the paper. Do not mix units by using metric units to measure one thing (pressure in kPa, for example) and English units to measure something else (pipe length in feet, for example).

**8.7 Symbols and Nomenclature**

The *SPE Letter and Computer Symbols Standard* provides more information on the use of symbols in SPE literature.

- 8.7.1 Letter symbols (including subscripts and superscripts) should be italicized in the text, equations, tables, and figures. Do not italicize numerals (including subscripts and superscripts), mathematical abbreviations (log, sin, cos, etc.), capital Greek letters, or chemical symbols. Do not italicize portions of letter symbols that are abbreviations (such as “max” for maximum) or that correspond to proper names (such as subscript Re in Reynolds number,  $N_{Re}$ ). For more details, please refer to the subscript definitions list in the *SPE Letter and Computer Symbols Standard*.

$$p_D \quad T_{max} \quad k_{rw}$$

- 8.7.2 Each symbol used in a paper should have a unique definition (i.e., the same symbol should not be used for two different things in the same paper or book chapter).

- 8.7.3 Symbols should consist of a one-letter kernel. Multiple-letter symbols (e.g., WOR for water/oil ratio or NPV for net present value) are not allowed. Subscripts and/or superscripts should be used to differentiate between symbols with the same one-letter kernel.

- 8.7.4 At the end of the paper or book, include an alphabetical Nomenclature of all symbols used. The list should include the letter symbol, an accurate and concise definition, the dimensions in which the quantity is measured, and the units of measure used in the paper.

$p$  = pressure, m/Lt<sup>2</sup>, psi

$\mu$  = viscosity, m/Lt, cp

Dimensions are mass (m), length (L), time (t), temperature (T), electrical charge (q), money (M), and amount (n). If dual units are used throughout the paper, the second set of units should appear in brackets.

$L$  = length, L, ft [m]

$\rho$  = density, m/L<sup>3</sup>, lbm/ft<sup>3</sup> [kg/m<sup>3</sup>]

- 8.7.5 Common SPE standard symbols are listed below.

$A$	= area	$q$	= production rate
$B$	= formation volume factor	$r$	= radius
$C$	= concentration	$S$	= saturation
$d$	= diameter	$t$	= time
$D$	= depth	$T$	= temperature
$h$	= thickness	$v$	= velocity
$J$	= productivity index	$V$	= volume
$k$	= permeability	$Z$	= elevation
$K$	= coefficient	$\mu$	= viscosity
$L$	= length	$\rho$	= density
$m$	= slope	$\phi$	= porosity
$N$	= dimensionless number		
$p$	= pressure		
$P_c$	= capillary pressure		

8.7.6 Organize items in the Nomenclature as follows: first, list Roman alphabetical terms, each presented with lowercase versions first; second, list Greek alphabetical terms, each presented with lowercase versions first. Within these sets, individual terms are alphabetized accordingly (e.g.,  $p$  precedes  $p_c$ , which precedes  $p_{eff}$ , which precedes  $P$ ; likewise,  $\Delta$  precedes  $\Delta p$  in the Greek section).

## 8.8 References

8.8.1 Cite references in the text by placing the author's last name and the year of publication in parentheses; then, include an alphabetical listing of the references at the end of the paper. [Note: This is a change from SPE's previous reference style, which required references to be numbered in the order in which they were cited.] If the text cites more than one reference from the same author in the same year, add "a," "b," etc. to distinguish between the references. References included in the same set of parentheses should be separated by semicolons.

Smith (1990) provides a detailed explanation of this method.

The method is analyzed in several studies (Smith 1990; Jones and Smith 1992; Smith et al. 2004).

Kabir et al. (2004a, 2004b) showed that...

8.8.2 When preparing the reference list, be sure to include complete information. List names of all authors if fewer than six; if a reference has more than six authors, list the first three authors' names plus et al. The et al. form is permissible in the text only when referring to three or more authors of a single paper.

8.8.3 The general information to be included in the reference listing is author's(s') last name(s), first and middle initials; title of the paper or book; edition (where applicable); name of publication or publisher; city of publication; date or year of publication or presentation; volume number; and inclusive page numbers. For journal articles, include issue number in addition to the page numbers. For papers published in SPE journals, include the SPE-assigned paper number at the end of the reference (e.g., "SPE-12345-PA"). If there is a DOI link available for the reference, insert it at the end of the reference in the following format: "DOI: 10.1002/aic.690471121."

8.8.4 Omit the reference entirely if the bibliographical information is so vague that the reader could not locate the document referred to. "Personal communication" and unpublished reports are not acceptable references. If essential to the text, use footnotes to acknowledge such informal sources.

8.8.5 Use the following formats for references to recommended practices, standards, and specifications.

In text:                    *API Bull. SI, Policy and Procedures for Standardization of Oilfield Equipment and Materials,*  
                                   *NACE Standard TM-01-77*  
                                   *API Spec. 5CT*

In Reference List:      *Spec. 2F, Specification for Mooring Chain*, third edition. 1981. Washington, DC: API.  
                                   *RP7G, Recommended Practice for ...*, 11th edition. 1989. Washington, DC: API.

8.8.6 A more abbreviated form of publications and organizations is allowed in references. Abbreviations for organizations listed in Sec. 4.5 can be used in reference citations without being spelled out at first use. Following are other abbreviations used in references:

Bulletin	<i>Bull.</i>
<i>Chemical Engineering Progress</i>	<i>Chem. Eng. Prog.</i>
<i>Drilling and Production Practice</i>	<i>Drill. &amp; Prod. Prac.</i>
Journal	<i>J.</i>
<i>Journal of Canadian Petroleum Technology</i>	<i>J. Cdn. Pet. Tech.</i>
<i>Journal of Petroleum Technology</i>	<i>JPT</i>
<i>Oil &amp; Gas Journal</i>	<i>Oil &amp; Gas J.</i>
<i>Petroleum Engineer International</i>	<i>Pet. Eng. Intl.</i>
<i>Proceedings</i>	<i>Proc.</i>
Recommended Practice	<i>RP</i>
<i>SPE Advanced Technology Series</i>	Do not abbreviate
<i>SPE Computer Applications</i>	<i>SPECA</i>
<i>SPE Drilling &amp; Completion</i>	<i>SPEDC</i>
<i>SPE Drilling Engineering</i>	<i>SPEDE</i>
<i>SPE Formation Evaluation</i>	<i>SPEFE</i>
<i>SPE Journal</i>	<i>SPEJ</i>

<i>SPE Production &amp; Facilities</i>	<i>SPEPF</i>
<i>SPE Production &amp; Operations</i>	<i>SPEPO</i>
<i>SPE Production Engineering</i>	<i>SPEPE</i>
<i>SPE Projects, Facilities &amp; Construction</i>	<i>SPEPFC</i>
<i>SPE Reservoir Engineering</i>	<i>SPERE</i>
<i>SPE Reservoir Evaluation &amp; Engineering Transactions</i>	<i>SPEREE Trans.</i>

8.8.7 All months and states should be spelled out.

8.8.8 Examples.

*Article in an SPE Magazine*

Cinar, Y. and Orr, F.M. Jr. 2005. Measurement of Three-Phase Relative Permeability With IFT Variation. *SPEREE* **8** (1): 33–43. SPE-89419-PA.

*Article in SPE Magazine, Also Published in Transactions*

Harris, P.C. and Reidenbach, V.G. 1987. High-Temperature Rheological Study of Foam Fracturing Fluids. *JPT* **39** (5): 613–619; *Trans.*, AIME, **283**. SPE-13177-PA.

*Article in a Non-SPE Magazine*

Jornel, A.G. 2002. Combining Knowledge From Diverse Sources: An Alternative to Traditional Data Independence Hypotheses. *Mathematical Geology* **34** (5): 573–596.

*Article Without Author Attributed*

Doubling of Reserves Seen Possible. *Oil & Gas J.* (31 May 1976) 22–25.

*Book With Editor Attributed*

Pirson, S.J. ed. 1958. *Oil Reservoir Engineering*, 56–58. New York City: McGraw-Hill Book Co.

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*SPE Reprint Series Titles*

Chambers, M.R. ed. 2002. *Multilateral Wells*. Reprint Series, SPE, Richardson, Texas **53**: 15–21.

### *SPE Transactions Papers*

If a paper published by SPE appears in an annual *Transactions* volume, that information should appear in the reference. References to *Transactions* papers published before 1961 (the first year *SPE Journal* was published) may include that information only. *Transactions* papers published from 1961 through 1979 and from 1986 through 1995 should carry a dual reference, that of the magazine as well as the *Transactions* volume. All papers published from 1980 through 1985 are included in *Transactions*, and only the magazine reference is necessary. Note that 1995 was the last year in which *Transactions* volumes were published.

Tracy, G.W. Simplified Form of Material Balance Equation. 1955. *Trans.*, AIME **204**: 243–255.

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### *Unpublished Paper Presented at a Meeting*

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NOTE: Each fall, the Society holds its official annual meeting. The proper name for all such meetings through 1974 is “Annual Meeting” (e.g., “the 1972 SPE Annual Meeting”). Beginning with the 1975 annual meeting, the proper name changed to “Annual Technical Conference and Exhibition” (e.g., “the 1975 SPE Annual Technical Conference and Exhibition”).

### *Unpublished Results and Personal Communications*

Use as footnote only. Do not include a numbered reference in reference list.

\*Personal communication with J. Doe. 2006. Dallas: Exxon Mobil Corp.

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Johnson, B. 1990. Reservoir Management. Paper SPE 36514 available from SPE, Richardson, Texas.

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### *User Guides*

Author. Year. *Title*, page number(s) cited. City, state, country: Publisher.

## **8.9 Footnotes**

- 8.9.1 Use footnotes only as a last resort. Whenever possible, incorporate such material into the text using parentheses. Very small type used for footnotes makes it particularly difficult to read equations.
- 8.9.2 If footnotes are unavoidable, keep them as brief as possible and place them at the bottom of the column in which the reference to them appears. Use an asterisk (\*) for the first, double asterisk (\*\*) for the second, dagger (†) for the third, double dagger (‡) for the fourth, and (§) for the fifth footnote to each text column.

## **8.10 Conversion Factors**

- 8.10.1 If dual units are provided for all units used in an article, paper, or book (including those in figures and tables), no conversion factor table is needed.
- 8.10.2 Use customary or SI units consistently. If only one system of units is used (customary or metric), then a conversion factor table must be included at the end of the article, paper, or book. The table should include conversion factors for all units used, including those used in figures and tables.

### *Sample Conversion Table*

#### **SI Metric Conversion Factors**

bbl	× 1.589 873	E–01 = m <sup>3</sup>
ft	× 3.048*	E–01 = m
hp	× 7.460 43	E–01 = kW

\*Conversion factor is exact.

- 8.10.3 The list below includes SI metric conversion factors for common engineering units. *The SI Metric System of Units and SPE Metric Standard*, the society’s official standard, is available at [www.spe.org](http://www.spe.org).

acre	× 4.046 856	E – 01 = ha
acre	× 4.046873	E + 03 = m <sup>2</sup>
acre-ft	× 1.233 489	E + 03 = m <sup>3</sup>
ampere-hr	× 3.6*	E + 03 = C
Å	× 1.0*	E – 01 = nm

°API	141.5/(131.5+°API)	= g/cm <sup>3</sup>
atm	× 1.013 250*	E + 05 = Pa
bar	× 1.0*	E + 05 = Pa
bbl	× 1.589 873	E - 01 = m <sup>3</sup>
Btu	× 1.055 056	E + 00 = kJ
Ci	× 3.7*	E + 10 = Bq
cp	× 1.0*	E - 03 = Pa·s
cycles/sec	× 1.0*	E + 00 = Hz
dyne	× 1.0*	E - 02 = mN
eV	× 1.602 19	E - 19 = J
ft	× 3.048*	E - 01 = m
ft <sup>2</sup>	× 9.290 304*	E - 02 = m <sup>2</sup>
ft <sup>3</sup>	× 2.831 685	E - 02 = m <sup>3</sup>
°F	(°F - 32)/1.8	= °C
°F	(°F + 459.67)/1.8	= K
gal	× 3.785 412	E - 03 = m <sup>3</sup>
hp	× 7.460 43	E - 01 = kW
hp-hr	× 2.684 520	E + 00 = MJ
in.	× 2.54*	E + 00 = cm
in. <sup>2</sup>	× 6.451 6*	E + 00 = cm <sup>2</sup>
in. <sup>3</sup>	× 1.638 706	E + 01 = cm <sup>3</sup>
kip	× 4.448 222	E + 03 = N
knot	× 5.144 444	E - 01 = m/s
ksi	× 6.894 757	E + 03 = kPa
kW-hr	× 3.6*	E + 00 = J
lbf	× 4.448 222	E + 00 = N
lbm	× 4.535 924	E - 01 = kg
mL	× 1.0*	E + 00 = cm <sup>3</sup>
mho	× 1.0*	E + 00 = S
mile	× 1.609 344*	E + 00 = km
oz	× 2.957 353	E + 01 = cm <sup>3</sup>
psi	× 6.894 757	E + 00 = kPa
psi <sup>2</sup>	× 4.753 8	E + 01 = kPa <sup>2</sup>
sq mile	× 2.589 988	E + 00 = km <sup>2</sup>
stokes	× 1.0*	E - 04 = m <sup>2</sup> /s
ton	× 9.071 847	E - 01 = Mg
ton, metric	× 1.0*	E + 00 = Mg
tonf	× 8.896 444	E + 03 = N
tonne	× 1.0*	E + 00 = Mg

\*Conversion factor is exact.

8.10.4 The following units apply in both the customary system and SI metrics and do not require conversion.

<u>Unit</u>	<u>Abbreviation</u>	<u>Unit</u>	<u>Abbreviation</u>
ampere	A	parts per million	ppm
capture unit	c.u.	porosity unit	p.u.
cubic centimeters	cm <sup>3</sup>	revolutions per minute	rev/min
frequency	Hz	shots per foot	spf
gram	g	volt	V
liter	L	volume percent	vol%
micron (micrometer)	µm	watt	W
millidarcy	md	weight percent	wt%

## 8.11 Figures

8.11.1 Number all figures in the body of the paper in the order of their citation.

- 8.11.2 Figures should be numbered with Arabic, not Roman, numerals in the order in which they are cited. Related figures or figure sections may be labeled with a shared numeral and consecutive lowercase letters (e.g., Figs. 1a through 1d).
- 8.11.3 Figures should be the smallest size possible without loss of clarity, preferably designed to occupy either a single column or the full width of the page.
- 8.11.4 Use 8-point Helvetica Bold for axis titles and 8-point Helvetica for body copy inside figures (if any). Capitalize axis titles; within the figure, capitalize only the first word and any proper nouns used within phrases.
- 8.11.5 Axis titles indicate quantity and unit, separated by a comma (not parentheses), with the unit abbreviated where appropriate.
- |             |                          |
|-------------|--------------------------|
| Time, years | <b>NOT</b> Time (years)  |
| Depth, m    | <b>NOT</b> Depth, meters |
- 8.11.6 Punctuate figure captions like sentences, and capitalize only the first word. If an acronym that has not already been defined in the text appears in a figure, it should be defined in the caption at its first use. Avoid using unfamiliar abbreviations in figures.

## 8.12 Tables

- 8.12.1 Number all tables in the body of the paper in the order of their citation.
- 8.12.2 Tables should be numbered with Arabic, not Roman, numerals in the order they are cited in the paper.
- 8.12.3 Tables should be the smallest size possible without loss of clarity. Table headings and column headings should be as concise as possible.
- 8.12.4 Column alignment should be obtained with either tabs or spaces, not a mixture of both.
- 8.12.5 If possible, tables should be designed to occupy a single column or the full width of the page. Care should be taken to avoid any arrangement that unduly increases the depth of a table.
- 8.12.6 Use 8-point Helvetica Bold, centered, for table heads and 8-point Helvetica for body copy in tables.

## 8.13 Checklist of Items

All technical papers will have at least some of the following elements after the body of the paper, in this order.

- Nomenclature (if needed)
- Acknowledgments (if any)
- References
- Appendix (if included)
- Conversion Factors
- Author Biographies



## APPENDIX A—Company Abbreviations

*Note: Do not include these abbreviations in headlines or running text.*

A.B.	Aktiebolag (Finland, Sweden)
A.G.	Aktiengesellschaft (Austria, Germany, Switzerland)
A/L	Andelslag (Norway)
A/S	Aksjeselskap (Denmark, Norway)
Bpk.	Beperk (South Africa)
B.V.	Besloten Vennootschap met beperkte, Anasprakelijkheid (The Netherlands)
CRL	Compañía de Responsabilidad Limitada (Spain)
C.A.	Compañía Anónima (Venezuela)
Cia.	Companhia/Companía (Brazil, Portugal, Spain, Latin America)
Cie.	Compagnie (Belgium, France, Luxembourg)
C.V.	Commanditaire Vennootschap (The Netherlands)
Edms. Bpk.	Eiendoms Beperk (South Africa)
Ets.	Etablissements(s) (Belgium, France, Luxembourg)
Ges.	Gesellschaft (Austria, Germany, Switzerland)
GmbH	Gesellschaft mit Beschränkter Haftung (Austria, Germany, Switzerland)
H.B.	Handelsbolag (Sweden)
Inc.	Incorporated (US)
I/S	Interessentselskab (Denmark, Norway)
K.B.	Kommanditbolag (Sweden)
K.G.	Kommanditgesellschaft (Austria, Germany, Switzerland)
K.K.	Kabushiki Kaisha (Japan)
K/S	Kommandittselsap (Denmark, Norway)
LLC	Limited Liability Company (Middle East)
Ltd.	Limited (Ireland, Pakistan, South Africa, UK, US, Zimbabwe)
Ltda.	Limitada (Brazil, Portugal, Spain)
Ltee.	Limitee (Canada)
mbH	mit beschränkter Haftung (Austria, Germany, Switzerland)
Mij.	Maatschappij (The Netherlands)
N.L.	No Liability (Australia)
NPL	No Personal Liability (Canada)
N.V.	Naamloze Vennootschap (Belgium, The Netherlands)
Oy.	Osakeyhtiö (Finland)
plc	Public Limited Company (UK)
P.T.	Perusahaan Terbatas (Indonesia, often appears before company name)
Pte.	Private (Singapore)
Pty.	Proprietary (Australia, South Africa)
Pvt.	Private (India, Zimbabwe)
S.A.	Société Anonyme (Belgium, France, Luxembourg, Switzerland) Sociedad Anónima (Spain, Spanish Latin America)
SAI	Sociedad Anónima Inversiones (Spanish Latin America)
SAC	Sociedad Anónima Comercial (Spanish Latin America)
SARL	Sociedad Anónima de Responsabilidad Limitada (Brazil, Portugal) Société Anonyme à Responsabilité Limitée (Belgium, France, Luxembourg)
Sdn. Bhd.	Sendirian Berhad (Malaysia)
S.L.	Sociedad Limitada (Spain, Portugal, Latin America)
Soc. Cve.	Société Coopérative (Belgium)
SpA	Società per Azioni (Italy)
SRL	Società a Responsabilità Limitata (Italy)
S.V.	Samenwerkende Vennootschap (Belgium)

## APPENDIX B—Greek Alphabet

A	$\alpha$	Alpha
B	$\beta$	Beta
Γ	$\gamma$	Gamma
Δ	$\delta$	Delta
E	$\varepsilon$	Epsilon
Z	$\zeta$	Zeta
H	$\eta$	Eta
Θ	$\theta$	Theta
I	$\iota$	Iota
K	$\kappa$	Kappa
Λ	$\lambda$	Lambda
M	$\mu$	Mu
N	$\nu$	Nu
Ξ	$\xi$	Xi
O	$o$	Omicron
Π	$\pi$	Pi
P	$\rho$	Rho
Σ	$\sigma$	Sigma
T	$\tau$	Tau
Y	$\upsilon$	Upsilon
Φ	$\phi$	Phi
X	$\chi$	Chi
Ψ	$\psi$	Psi
Ω	$\omega$	Omega

## APPENDIX C—Math Signs and Operators

$e$ , exp	exponential function	$\rightarrow$	vector
+	plus	$\therefore$	therefore
!	minus	$\because$	because
$\pm$	plus or minus	:	is to; divided by
$\times$	multiplied by	$\therefore$	as; equals
$\div$	divided by		geometrical proportion
=	equal to	$\infty$	varies as
$\neq$	not equal to	$\doteq$	approaches a limit
$\approx$	nearly equal to	$\infty$	infinity
$\cong$	congruent with	$\int$	integral
$\equiv$	identical with	d	differential
$\not\equiv$	not identical with	$\partial$	partial differential
$\Leftrightarrow$	equivalent to	$\sum$	summation of
$>$	greater than	!	factorial product
$\nlessgtr$	not greater than	$\pi$	pi (math constant = 3.1416)
$<$	less than	$\varepsilon$	epsilon (math constant = 2.7183)
$\nlessgtr$	not less than	$^{\circ}$	degree ( <b>DO NOT</b> substitute a superscript letter O or number zero)
$\leq$	greater than or equal to	'	minute; prime
$\geq$	less than or equal to	"	second
$\sim$	difference between	$\sphericalangle$	angle
$\sqrt{\quad}$	square root	$\nabla$	del (gradient operator)
$\sqrt[3]{\quad}$	cube root	$\Delta$	delta (difference operator)
$\sqrt[n]{\quad}$	$n$ th root	$\in$	set identifier
erf	error function		
erfc	error function, complementary		

## APPENDIX D—Common Proofreading Marks

Proofreader's Mark	Definition
	Delete, remove, take out
^	Caret; insert at this point
#	Add space, as between words, letters, or lines
	Transpose: sign encompasses the affected words, letters, or characters, and "tr" is placed in margin
Stet	Restore or leave as printed; usually used to erase an incorrect proofreading mark
] [	Move to right or left
≡	Add hyphen
—	Add dash
V <sup>3</sup>	Set as superscript
V <sub>4</sub>	Set as subscript
wf	Wrong font: used when character or word is wrong type size or style
	Set in boldface type
	Set in italic type face
w	Lower-case letter
W	Capitalize letter
¶ L	Begin new paragraph
	Spell out or abbreviate

APPENDIX E—Sample Figures

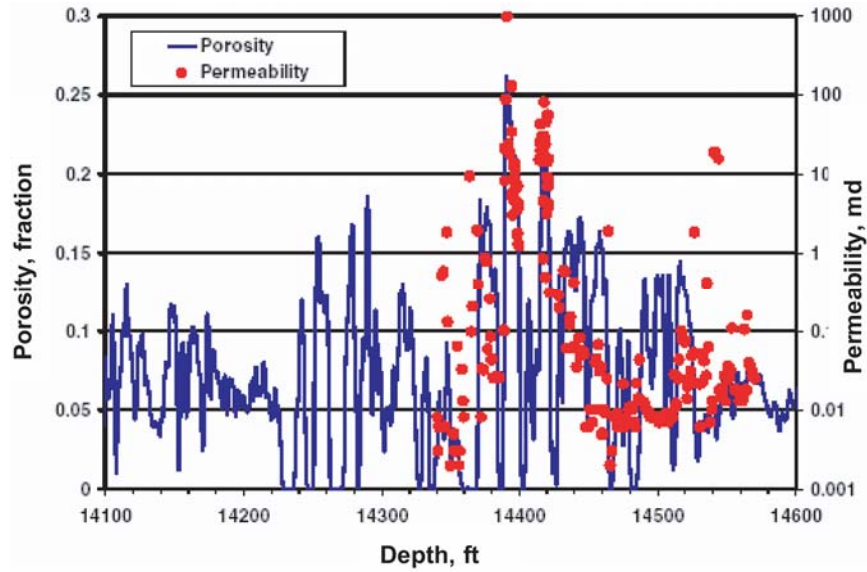


Fig. 1—Core permeability (circle) and density-log porosity as a function of depth for one of the wells drilled through the Jauf formation (Al-Qahtani and Buhidma 2001). This shows the variability in both properties over a rather small depth interval.

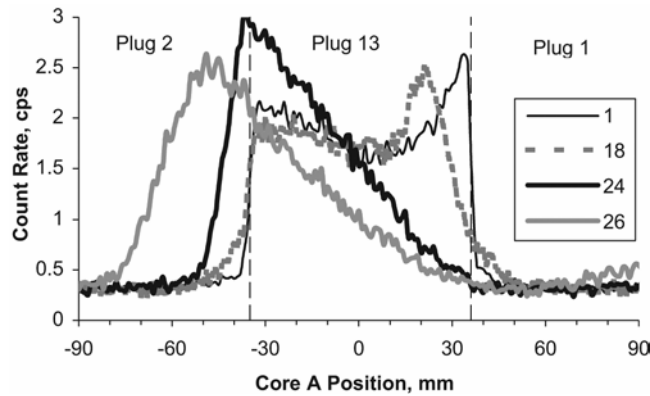


Fig. 5—Composite Core A: consequences of the contact between injection water and connate water for Measurements 1, 18, 24, and 26. Diffusion is against the flow direction.

## APPENDIX F—Sample Tables

Model Name	Model Description	No. of Flow Simulations	Initial Error	Matched Error	Validation Error
A1	T11, hard cond. data, no seismic	27	132	83	91
A2	T11, hard cond. data, no seismic	14	141	91	112
A3	T11, no hard cond. data, no seismic	39	133	79	97
B1	T12, hard cond. data, seismic	26	154	98	116
B2	T12, hard cond. data, seismic	32	146	97	102
B3	T12, hard cond. data, no seismic	10	140	99	96
<b>Averages:</b>		25	141	91	102

Component	Composition (mole fraction)	$P_c$ (bar)	$T_c$ (K)	Acentric Factor	Molecular Weight (g/mol)	$BIC_{C_1-x}$
CO <sub>2</sub>	0.03229	72.80	304.20	0.225	44.01	0.150
C <sub>1</sub>	0.62253	46.00	190.60	0.008	16.04	0.000
C <sub>2</sub>	0.09644	48.83	305.40	0.098	30.07	0.000
C <sub>3</sub> –C <sub>4</sub>	0.09080	40.90	387.49	0.162	49.70	0.000
C <sub>5</sub> –C <sub>6</sub>	0.03436	32.30	478.50	0.263	77.24	0.000
C <sub>7</sub> –C <sub>10</sub>	0.05979	24.52	568.20	0.703	110.89	0.000
C <sub>11</sub> –C <sub>14</sub>	0.02450	18.00	658.12	0.748	167.60	0.040
C <sub>15</sub> –C <sub>20</sub>	0.02085	13.00	723.00	0.778	237.67	0.050
C <sub>21</sub> –C <sub>29</sub>	0.01288	12.57	771.03	1.135	334.25	0.090
C <sub>30+</sub>	0.00556	8.00	860.39	1.750	550.00	0.160