

Guidelines for the Construction, Format, and Management of Monolingual Thesauri

Abstract: A thesaurus is a controlled vocabulary arranged in a known order and structured so that equivalence, homographic, hierarchical, and associative relationships among terms are displayed clearly and identified by standardized relationship indicators that are employed reciprocally. The primary purposes of a thesaurus are (a) to facilitate retrieval of documents and (b) to achieve consistency in the indexing of written or otherwise recorded documents and other items, mainly for postcoordinate information storage and retrieval systems. This standard provides guidelines for constructing monolingual thesauri: formulating the descriptors, establishing relationships among terms, and effectively presenting the information in print and on a screen. It also includes thesaurus maintenance procedures and recommended features of thesaurus management systems.

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Foreword

(This foreword is not part of the American National Standard Guidelines for the Construction, Format, and Management of Monolingual Thesauri, ANSI/NISO Z39.19 - 2003. It is included for information only.)

The first edition of this standard, published in 1974, was prepared by Subcommittee 25 on Thesaurus Rules and Conventions of American National Standards Committee Z39 on Standardization in the Field of Library Work, Documentation, and Related Publishing Practices (later known as Library and Information Sciences and Related Publishing Practices) [1]. The subcommittee drew heavily on standards of practice developed by the Engineers Joint Council, the Committee on Scientific and Technical Information of the Federal Council for Science and Technology, and UNESCO [2,3,4]. In 1980 ANSI published a revised edition of the thesaurus standard. In 1985, the National Information Standards Organization, the successor of American National Standards Committee Z39, balloted to reaffirm the standard. Two “no” votes led to a default ballot in 1987, which resulted in additional recommendations for revision.

In 1988 Standards Committee PP was appointed to draft a revised standard. The committee members, chosen for their expertise in both the theory and the practice of the development and use of thesauri in information systems, represented a wide range of subject interests (aerospace, business, medicine, social sciences, information science, and the arts).

The current revision borrows heavily from the corresponding international and British standards [5,6]. It differs substantially in structure and word-

ing from the 1980 American edition, but supports most of its recommendations. An important change is in the handling of the whole-part relationship, which is now treated as a special case of the hierarchical relationship rather than as an associative relationship.

Another notable change is the deletion of the word *use* from the title because this standard does not prescribe how thesauri are to be used. The phrase *monolingual thesauri* has been added to the title to distinguish this standard from a separate standard for multilingual thesauri [7].

This edition continues to emphasize the role of thesauri in information storage and retrieval systems, but recognizes their applicability to other fields, such as knowledge engineering. New sections deal with screen display and thesaurus management systems.

Unlike the previous edition, the revised standard does not take a monolithic approach to thesaurus structure and display, but instead points out the advantages and disadvantages of various formats. Many of these formats are illustrated in an appendix of supplementary figures.

Suggestions for improving of this standard are welcome. They should be sent to the National Information Standards Organization, P.O. Box 1056, Bethesda, MD 20827 (301) 975-2814.

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4. Guidelines for the Establishment and Development of Monolingual Scientific and Technical Thesauri for Information Retrieval. Paris: United Nations Educational, Scientific and Cultural Organization, July 1970.
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6. Guidelines for the Establishment and Development of Monolingual Thesauri. London: British Standards Institution, 1979. (BS 5723:1979). Superseded by: British Standard Guide to Establishment and Development of Monolingual Thesauri. (BS 5723:1987=ISO 2788-1986).
7. Documentation—Guidelines for the Establishment and Development of Multilingual Thesauri. Geneva: International Organization for Standardization, 1985. (ISO 5964-1985).

Abbreviations, Codes, and Conventions Used in this Standard

Abbreviations (Thesaurus Codes) and Relationship Indicators

BT	=	broader term
BTG	=	broader term (generic)
BTI	=	broader term (instance)
BTP	=	broader term (partitive)
GS	=	generic structure
HN	=	history note
NT	=	narrower term
NTG	=	narrower term (generic)
NTI	=	narrower term (instance)
NTP	=	narrower term (partitive)
RT	=	related term
SEE	=	equivalent to U (USE)
SN	=	scope note
TT	=	top term
U	=	use
UF	=	used for
UF+	=	used for . . . and . . .
USE+	=	use . . . and . . .
X	=	see from (equivalent to UF); reciprocal of <i>see</i>

Conventions:

Descriptors are in **boldface**.

Words discussed in the text are enclosed in 'single quotation marks'.

Underlined terms are defined in the glossary.

Guidelines for the Construction, Format, and Management of Monolingual Thesauri

1. Introduction

A thesaurus^{*}, for the purposes of this standard, is a controlled vocabulary of terms in natural language that are designed for postcoordination. The need to control the formation and use of terms stems mainly from two basic features of natural language, namely synonyms (different terms representing the same concept) and polysemes or homographs (terms with the same spelling representing different concepts). The controlled vocabulary is established by information specialists or lexicographers and is generally employed in indexing.

Indexing is the process by which subject terms or classification symbols are assigned to concepts dealt with in documents. It includes any system in which the selection and organization of indexing terms call for human intellectual decisions, regardless of whether computer assistance is also used to store and manipulate these terms or to identify documents to which certain terms or combinations of terms have been assigned. The effectiveness of indexing as a means for identifying and retrieving documents depends upon a well-constructed indexing language.

Research in the field of information science has shown that controlled vocabularies improve both precision and recall in searching. For example, they improve precision by defining the scope of terms; they increase recall by retrieving documents that employ different terms for the same concept. (Some of the manuals of thesaurus construction listed in Appendix E cite studies that have demonstrated these advantages of controlled vocabularies.)

Thesauri may be used in computer-assisted indexing, but this standard is primarily oriented toward thesauri employed for assignment indexing by humans (as opposed to derivative indexing by machines).

It is important to note, however, that thesauri are not limited to systems that apply vocabulary control at the indexing stage. Thesauri may also be helpful to the user searching unindexed, i.e., natural language, databases. The value of thesauri is currently recognized as well by researchers in knowledge engineering and hypertext. The many uses to which thesauri may be put are recognized in the standard, but not explicitly discussed.

1.1 Purpose and Structure

A thesaurus may be considered in terms of both its purpose and its structure.

1.1.1 Purpose

Four principal purposes are served by a thesaurus:

- a) *Translation*. To provide a means for translating the natural language of authors, indexers, and users into a controlled vocabulary used for indexing and retrieval.
- b) *Consistency*. To promote consistency in the assignment of index terms.
- c) *Indication of Relationships*. To indicate semantic relationships among terms.
- d) *Retrieval*. To serve as a searching aid in retrieval of documents.

1.1.2 Structure

A thesaurus displays through its structure the equivalence (synonymous), hierarchical, and associative relationships among terms. These relationships are defined in section 5. Print and screen display formats used to show these relationships are recommended in sections 6 and 7, respectively.

1.2 Vocabulary Control

Vocabulary control in a thesaurus is achieved through three principal means: (a) the delineation of the scope, or meaning, of descriptors (see section 3.2); (b) the linking of synonymous and nearly synonymous terms through the equivalence relationship (see section 5.2); and (c) the disambiguation of homographs (see section 3.2.1).

2. Scope of the Standard

This standard presents guidelines and conventions for the contents, display, methods of construction, and maintenance of a monolingual thesaurus. It also notes the recommended features of a thesaurus management system.

The standard deals with some aspects of term selection, in that it contains recommended procedures for vocabulary control, but it is particularly concerned with means for establishing and displaying certain kinds of relationships between terms.

This standard should be regarded as a set of recommendations based on preferred techniques

* Underlined terms are defined in the glossary.

and procedures. Optional procedures are, however, sometimes described, e.g., for the display of inter-term relationships in a thesaurus.

The conventions used in this standard to indicate the force of recommendations are: *shall* (required for meeting the standard), *should* (recommended), and *may* (optional).

2.1 Applications of the Standard

The standard assumes that thesauri will be applied mainly in postcoordinate information storage and retrieval systems. Guidelines for the development of lists of subheadings designed for precoordination with descriptors are therefore not included in this standard, but this does not preclude the use of thesauri in precoordinate indexing systems.

The standard also does not provide guidelines for human or computer-aided indexing based on thesauri. For indexing procedures and practices, see ANSI Z39.4.

2.2 Monolingual Thesauri

The recommendations contained in this standard relate specifically to *monolingual* thesauri, with particular reference to English. No consideration has been given to the special requirements of other languages, nor to those of multilingual thesauri in which terms are listed in parallel sequences showing conceptual equivalences in more than one language.

2.3 Types of Terms

This standard deals only with the formulation, organization, and display of terms that form a controlled subset of natural language. It does not suggest procedures for organizing and displaying headings consisting of mathematical and chemical formulas, nor for establishing proper names. (For information on these, refer to appropriate standards, such as *Anglo-American Cataloguing Rules*, 2nd ed. [AACR2].) Such headings may be included in thesauri, however, and relationships among them may be indicated through the devices presented in this standard.

3. Scope, Form, and Choice of Descriptors

This section deals with the principles of descriptor selection and the determination of the correct form. Literary warrant is the guiding principle for the selection of the preferred form of a descriptor. Section 3.2.1 treats the form of cross-references from nonpreferred terms to preferred terms. In this section, the phrase 'rather than' is used to contrast

preferred and nonpreferred terms. Where two synonyms are juxtaposed without indication of a preference, they are separated by a slash.

The development of an initial set of descriptors is dealt with in section 8.

3.1 Single-word vs. Multiword Descriptors

Each descriptor included in a thesaurus should represent a single concept (or unit of thought). A concept may be expressed by a single-word term or by a multiword term. Because of the difficulty of defining 'single concept' in the latter case, objective criteria for dealing with compound terms are provided in section 4.

3.2 Scope of Descriptors

The scope of descriptors is restricted to selected meanings within the domain of the thesaurus. Each descriptor should be formulated in such a way that it conveys the intended scope to any user of the thesaurus. Terms whose meanings overlap in general usage, and homographs, i.e., terms with identical spellings but different meanings, should be avoided as far as possible in the selection of descriptors. Literary warrant, i.e., the occurrence of terms in documents, and other criteria may, however, justify the use of such terms as descriptors. Section 3.2.1 deals with methods of disambiguating homographs. Section 3.2.2 explains the use of scope notes for terms whose meanings overlap.

3.2.1 Parenthetical Qualifiers

The use of homographic terms as descriptors requires clarification of their meaning through a qualifier ('gloss' in linguistic terminology). The qualifier, which is enclosed in parentheses, is part of the descriptor. The qualifier itself may be a descriptor, often a broader term than the one being qualified. It should be as brief as possible, ideally consisting of one word, but should not be a homograph. Qualifiers should be standardized within a given thesaurus to the extent possible, e.g., 'biology' and 'bioscience' should not both be used as qualifiers.

A qualifier is not a scope note; however, a qualified descriptor may have a scope note appended to it. For guidelines on scope notes, see section 3.2.2.

Qualifiers should also be added to entry terms when their meaning is ambiguous.

Examples:

cranes (birds)
cranes (lifting equipment)

mercury (metal)
Mercury (planet)
Mercury (Roman deity)

seals (animals)
seals (law)
seals (numismatics)

socialization (economics)
socialization (social psychology)

- a) A qualifier should be added to each homographic term, even when one is used in the primary sense of the domain and the second in a different sense. For example, **cranes (lifting equipment)** should be the descriptor in an engineering thesaurus that also includes **cranes (birds)**.
- b) A parenthetical qualifier should be appended to homographic terms even when a descriptor is used in only one of its meanings within a thesaurus, e.g., **shells (structures)** in an engineering thesaurus. This facilitates cross-database searching and mapping of descriptors in disparate domains.

Examples:

developing (photography)
organism (philosophy)
translation (genetics)

- c) Parenthetical qualifiers should not be used to represent compound concepts, e.g., ‘cookery (zucchini)’ or ‘pipes (plastic).’ ‘Plastic’ is used in the latter example to indicate a type of pipe rather than to disambiguate the word ‘pipe.’ Appropriate uses of qualifiers with the term ‘pipes’ would be: **pipes (musical instruments)** and **pipes (smoking implements)**. (See section 4 for guidelines on formulating compound descriptors.)
- d) Selection of a compound term as a descriptor is preferred to use of a parenthetical qualifier with a single-word term, if usage permits, i.e., if the compound occurs in natural language.

Examples:

phonograph records *rather than* records
(phonograph)
religious tolerance *rather than* tolerance
(religion)

Both of these compound terms are natural expressions that may be selected for thesauri in the fields of music and religion, respectively.

3.2.2 Scope Notes

A scope note is used to restrict or expand the application of a descriptor, to distinguish between descriptors that have overlapping meanings in natural language, or to provide other advice on term usage to either the indexer or the searcher. A scope note should state the chosen meaning of a

descriptor; it may also indicate other meanings that are recognized in natural language, but which have been deliberately excluded from the controlled vocabulary. A scope note, unlike a parenthetical qualifier, is not part of a descriptor. While qualifiers are generally added only to homographs, a scope note (SN) may be supplied for any descriptor.

Example:

illuminations

SN Includes both the ornamental decoration and the illustrations in manuscripts as well as in some early printed books, if done by hand.

The scope of descriptors is indicated additionally through the semantic relationships represented in the thesaurus (see section 5.2). Changes in the scope of descriptors should be recorded in **history notes** (see section 9.3).

3.2.2.1 Reciprocal Scope Notes

When reference is made to other descriptors in a scope note, a reciprocal scope note should generally be provided for each descriptor mentioned.

Examples:

dogtrots

SN Passages sharing a roof common with the rest of a building, connecting two parts of a log house of the American folk art tradition. Distinguished from **breezeways** by its folk architecture tradition and log house context and its common roof.

breezeways

SN Roofed passages connecting two parts of a house or a house and a garage; common after 1930. Distinct from **dogtrots**, which occur in folk architecture log houses.

Even where the scope of only one of the descriptors requires clarification, it is useful to note in the term record for the second descriptor that it has been cited in a scope note of a different descriptor, e.g.:

information science

X SN library science

The X indicates that there is a reference from the scope note of **library science** to **information science**. This reciprocal reference will ensure that when a change is made to one of the descriptors, or it is deleted, the effect on the other descriptor will be considered.

3.3 Types of Concept

The concepts represented by descriptors can be grouped into general types. The compiler of a thesaurus needs to be aware of these types,

because the type of concept may affect some of the procedures used in thesaurus construction; for example, the choice of singular or plural form (see section 3.5) and applying a test for the validity of a hierarchy (see section 5.3.1). The listed types are not exhaustive.

a) things and their physical parts

Examples:

birds
carburetors
microforms
mountains
oil paintings
teddy bears

b) materials

Examples:

adhesives
mustard gas
oxygen
paints
water

c) activities or processes

Examples:

acidification
miniature golf
painting
parenting
scuba diving
sewing

d) events or occurrences

Examples:

birthdays
civil wars
holidays
revolutions

e) properties or states of persons, things, materials, or actions

Examples:

consciousness
elasticity
personality
speed
texture

f) disciplines or subject fields

Examples:

anthropology
information science
organic chemistry
theology

g) units of measurement

Examples:

hertz
kilometers

3.3.1 Unique Entities

Unique entities, or “classes-of-one,” are usually expressed as proper nouns.

Examples:

Aristotle
Earth
Fourth of July
Library of Congress
Magna Carta
World Health Organization
Zimbabwe

3.4 Grammatical Forms of Descriptors

The following sections indicate the preferred grammatical forms of descriptors. Entry terms from nonpreferred grammatical forms may be provided.

3.4.1 Nouns and Noun Phrases

The grammatical form of a descriptor should be a noun or noun phrase. For an exception to this recommendation, see section 3.4.2.

Examples:

drawings
liver
space shuttles

3.4.1.1 Verbal Nouns

Verbs expressed as infinitives (without ‘to’) or participles should not be used alone as descriptors. Activities should be represented by nouns or gerunds.

Examples:

catalysis	<i>rather than</i>	catalyze
cooking	<i>rather than</i>	cook
freezing	<i>rather than</i>	frozen
reading	<i>rather than</i>	read
distillation	<i>rather than</i>	distill

3.4.1.2 Noun Phrases

Noun phrases are compound terms that may be established as descriptors if they represent a single concept (see section 4). Noun phrases occur in two forms: premodified, or adjectival; and postmodified, or prepositional.

3.4.1.2.1 Adjectival Noun Phrases

Adjectival noun phrases, which are generally premodified, are the preferred form.

Examples:

basal metabolism
cold fusion
historical drama
public television
rapid transit

3.4.1.2.2 Prepositional Noun Phrases

Prepositional noun phrases are generally postmodified. When possible, noun phrases should exclude prepositions; for example, use 'carbohydrate metabolism' rather than 'metabolism of carbohydrates,' and 'children's hospitals' rather than 'hospitals for children.'

Descriptors in the form of prepositional noun phrases should be restricted to concepts that cannot be expressed in any other way, or that have become idiomatic.

Examples:

accessories after the fact
burden of proof
cream of tartar
coats of arms
plaster of Paris
prisoners of war
sergeants-at-arms
strength of materials

3.4.2 Adjectives

Adjectives and adjectival phrases used alone may be established as descriptors in thesauri in the special circumstances considered below.

3.4.2.1 Limiting the Number of Compound Descriptors

As an alternative to the creation of multiple compound descriptors, adjectives may appear as separate descriptors when designed to be precoordinated in indexing or postcoordinated in searching. They should generally not be assigned as indexing terms in isolation. Given the possibility of false coordination in searching (e.g., the linking of an adjective with the wrong noun), adjectival descriptors should be used sparingly.

Examples:

<i>Adjectives used as descriptors</i>	<i>Precoordinated indexing terms</i>
airborne	airborne troops
mobile	mobile homes
offshore	offshore drilling
portable	portable heaters
prestressed	prestressed concrete

Certain noun phrases can be used to modify other nouns, e.g., 'high frequency' can modify the noun 'waves.' The guidelines for adjectives may be applied to such noun phrases.

3.4.2.2 Economy of Cross-references

Adjectives may be used alone in general cross-references to direct the user to or from a group of descriptors beginning with a corresponding noun,

e.g., "**cardiac** . . . *see also* the descriptors beginning with **heart**." An example of a reference in the opposite direction (noun to adjective) is: "**France** *see also* the descriptors beginning with **French** (French art, French language, French literature, French wines)."

This guideline applies especially when the adjective and the noun to which it is related differ widely in their derivation and spelling, for example, 'sea/marine,' 'ear/aural.' It works well in printed thesauri with a limited number of descriptors beginning with one of the terms, but explicit references from all compound forms (e.g., cardiac diseases **USE heart diseases**) may be necessary in thesauri displayed on a screen, or in printed tools in which the compound terms beginning with a particular adjective span several columns or pages, and the user may not notice the general reference.

3.4.3 Adverbs

Adverbs such as 'very' or 'highly' should not be used alone as descriptors. A phrase beginning with such an adverb may be accepted as a descriptor only when it has acquired a specialized meaning within a domain.

Examples:

very high frequency
very large scale integration
very low density lipoproteins

3.4.4 Initial Articles

The use of initial articles in descriptors should be avoided.

3.4.4.1 Deletion

Delete the initial article when the descriptor is clear without it. If not, use a parenthetical qualifier.

Examples:

arts	<i>rather than</i>	the arts
state	<i>rather than</i>	the state
(political entity)		

3.4.4.2 Retention

If the initial article is an integral part of a proper name, and should be searchable, it should be included in the descriptor in direct order. Otherwise, invert the article. Whether or not the initial article is included as an integral part of the name is dependent upon the language. In the following examples, English is the assumed language of the thesaurus.

Examples:

A Big Company [initialism: ABC]
Computer Place, The
El Niño
El Salvador
Los Angeles
Narrows, The

In cases where the article is included in direct order, a cross-reference from the element following the article should be provided, e.g., Salvador USE **El Salvador**.

3.5 Singular and Plural Forms

Terms can be divided into two categories: count nouns (see section 3.5.1) and noncount (mass) nouns (see section 3.5.2). The guidelines for singular and plural based on these categories apply to the formulation of both descriptors and entry terms.

3.5.1 Count Nouns

Count nouns are names of objects or concepts that are subject to the question 'How many?' but not 'How much?'. These should normally be expressed as plurals.

Examples:

books
chemical reactions
penguins
political parties
singers
vertebrates
windows

3.5.1.1 Exception to Plural Count Nouns

If in the domain of the thesaurus there is literary or user warrant for the expression of count nouns in the singular, establishment of descriptors in that form is acceptable. For example, in the field of biomedicine, the names of parts of the body are generally formulated in the singular.

Examples:

digestive system
ear
lung
nose
stomach

In a museum catalog, objects are typically treated as unique items, and descriptors are given in the singular.

Examples:

chair
oil painting
tapestry

3.5.2 Noncount (Mass) Nouns

Noncount nouns are names of materials or substances that are subject to the question 'How much?' but not 'How many?'. These should be expressed in the singular.

Examples:

copper
paint (but cf. **paints**, below)
snow
water

If the community of users served by a thesaurus regards a given substance or material as a class with more than one member, the class should be expressed in the plural.

Examples:

plastics (i.e., various types of plastic)
paints

3.5.2.1 Abstract Concepts

The names of abstract concepts, e.g., systems of belief, activities, emotions, properties, and disciplines, shall also be expressed in the singular. Some of these terms are subject to the question 'How much?'.

Examples:

beliefs	Judaism; Taoism
activities	digestion; distribution;
or processes	migration; welding,
	writing
emotions	anger; envy; love; pity
properties	conductivity; silence;
or states	worth;
disciplines	architecture; business;
	musicology; metallurgy

3.5.2.2 Unique Entities

The names of unique entities, whether concrete or abstract, shall be expressed in the singular.

Examples:

Shangri-La
Statue of Liberty

3.5.3 Coexistence of Singular and Plural Forms

Where the singular and plural forms of a term represent different concepts, separate descriptors for each should be entered in the thesaurus as appropriate. The distinction should be indicated by a qualifier.

Examples:

bridge (game)
bridges (dentistry)
bridges (structures)

damage (injury)
damages (law)

wood (material)
woods (forested areas)

3.6 Selection of Preferred Form

The authority for the form selected should be recorded in the term record (see section 8.5). The variant forms should be included as entry terms. The source(s) of variant forms may also be recorded.

3.6.1 Usage

Descriptors should reflect as much as possible the usage of people familiar with the domain of the thesaurus. Neutral rather than pejorative or objectionable terms should be selected, e.g., **developing nations** *rather than* underdeveloped countries. See also section 3.6.4.2.

3.6.1.1 Literary Warrant

Words and phrases drawn from the literature of the field should determine the formulation of descriptors. When two or more variants have literary warrant, the most frequently used term should be selected as the descriptor.

3.6.1.2 Published Authorities

Guidance in the selection of descriptors may be found in reference works of the domain, such as dictionaries, glossaries, encyclopedias, and authoritative treatises of the field.

3.6.1.3 Other Indexing Languages

Other thesauri, abstracting and indexing services, and subject heading lists may be useful as sources for selection of preferred forms.

3.6.1.4 Personal Authorities

Opinions of subject experts regarding the preferred form of descriptors may be sought.

3.6.2 Spelling

3.6.2.1 Literary Warrant

The most widely accepted spelling of words should be adopted. If variant spellings exist and are commonly recognized, each should be entered in the thesaurus, and a cross-reference should be made from the nonpreferred to the preferred form.

Examples:

Romania	<i>rather than</i>	Roumania
theater	<i>rather than</i>	theatre

3.6.2.2 Authorities

Spelling should follow the practice of well-established dictionaries or glossaries. If a choice between spellings is made for dialectal reasons (for example, between American and British English),

SCOPE, FORM, AND CHOICE OF DESCRIPTORS

the choice should be adhered to consistently throughout the thesaurus; exceptions may be made for proper names.

Examples:

catalogs	<i>rather than</i>	catalogues
color	<i>rather than</i>	colour
labor	<i>rather than</i>	labour
<i>but</i> Labour Party		

3.6.3 Abbreviations, Initialisms, and Acronyms

This section deals with the choice of full vs. abbreviated forms of descriptors. Capitalization is dealt with in section 3.7.1.

3.6.3.1 Preference for Abbreviation

Abbreviations and acronyms should be selected as descriptors only when they have become so well established that the full form of the term or proper name is rarely used. Cross-references should be made from the full forms.

Examples:

AIDS	<i>rather than</i>	acquired immune deficiency syndrome
(disease)		
DNA	<i>rather than</i>	deoxyribonucleic acid
lasers	<i>rather than</i>	light amplification by stimulated emission of radiation
UNESCO	<i>rather than</i>	United Nations Educational, Scientific, and Cultural Organization
VTOL	<i>rather than</i>	vertical takeoff and landing aircraft
aircraft		

3.6.3.2 Preference for Full Form

3.6.3.2.1 General Use

The full form of terms should be selected as descriptors when the abbreviated form is not widely used and generally understood. Cross-references should be made from the abbreviated forms.

Examples:

automated teller machines	<i>rather than</i>	ATMs
driving while intoxicated	<i>rather than</i>	DWI
prisoners of war	<i>rather than</i>	POWs

3.6.3.2.2 Ambiguity

Many acronyms and abbreviations stand for more than one word or phrase; the full form of the term should therefore be selected as the descriptor in preference to the abbreviated form, even when the abbreviation has only one value in

the domain of the thesaurus.

Examples:

artificial insemination *rather than* AI

artificial intelligence *rather than* AI

3.6.4 Neologisms, Slang, and Jargon

Neologisms, slang, and jargon terms often cover new concepts originating within a particular specialty, subculture, or social group. Such terms are generally not included in standard dictionaries. When no widely accepted alternative exists, the neologism, slang, or jargon term should be accepted as a descriptor.

Examples:

kludge

yuppies

3.6.4.1 Provisional Terms

A neologism, slang, or jargon term may be labeled provisional (see section 8.6.2), and may be elevated to full descriptor status as the term becomes accepted into the language.

Example:

burnout

3.6.4.2 Cross-references from Slang Terms

A slang term that is an alternative to an existing and well-established term should be admitted as an entry term to the descriptor.

Example:

psychiatrists *rather than* shrinks
[descriptor] [cross-reference]

3.6.5 Common Names and Trade Names

3.6.5.1 Preference for Common Name

A product is frequently known by a widely recognized trade name. Where an equivalent common name exists, the common name should be used in preference to the trade name, because the generic name is the more accurate representation of the concept.

Example:

diazepam *rather than* Valium

Both common and trade names may be descriptors in thesauri that cover generic products as well as specific brands, with the latter treated as narrower terms (see section 5.3.1).

3.6.5.2 Trademarks

Because trademarks are recognized by law as proprietary, they should be identified as such in a thesaurus. The identification should be an integral part of the term. One of the following designations

may be used, as appropriate: (Trademark), (TM), (Reg), or (R).

Examples:

Current Contents (R)

Scotch Tape (TM)

3.6.5.3 Loss of Protected Status

A trademark may be used as a descriptor without qualification only when its legal protection has been lost.

Examples:

aspirin

escalator

thermos

3.6.6 Popular and Scientific Names

If a popular and a scientific name refers to the same concept, the form most likely to be sought by the users of the thesaurus should be chosen as the descriptor, and a cross-reference provided from the nonpreferred term. For example, **penguins** might be chosen as the descriptor in a nontechnical thesaurus, but the scientific equivalent, **Sphenisciformes**, may be selected for a zoological thesaurus.

3.6.7 Loanwords, Translations of Loanwords, and Foreign-Language Equivalents

3.6.7.1 Loanwords

Loanwords are terms borrowed from other languages that have become naturalized in the borrowing language. If such terms are well established, they should be admitted into the thesaurus. Diacritics should be included if required by the orthographic authorities for the borrowing language.

Examples:

coup d'état

gestalt

habeas corpus

pas de deux

weltanschauung

3.6.7.2 Translations of Loanwords

Occasionally a loanword and a commonly accepted translation coexist in the language of the thesaurus. The loanword should be preferred if it is more widely accepted in the domain of the thesaurus.

Example:

amicus curiae *rather than* friend of the court
[in a legal thesaurus]

If the translation becomes well established, however, it should be selected as the descriptor.

In all cases where a concept can be expressed by both a loanword and a translated equivalent, a cross-reference should be made from the nonpreferred term.

Examples:

braking radiation *rather than* bremsstrahlung
pen name *rather than* nom de plume

3.6.7.3 Foreign-Language Equivalents

Foreign-language terms, i.e., terms which have not become naturalized in the language of the thesaurus, should be linked to terms in the preferred language in cases where the foreign terms are likely to be sought by users. The language chosen for the descriptor should be that which the user would likely expect, with a cross-reference from the equivalent term in the other language. (For guidelines on multilingual thesauri, see ISO 5964.)

Example:

Shavuot / **Pentecost**
[Hebrew] *[English]*

3.6.8 Proper Names

Variant forms of proper names of persons, institutions, organizations, and places, as well as titles, if uncontrolled, create problems for searchers. Frequency of need for proper name access points generally determines which of the following practices is adopted.

Proper names of persons, institutions, organizations, places, and titles:

- may be controlled by inclusion in a thesaurus of subject (topical) descriptors;
- may be controlled through a separate name authority file;
- may be left uncontrolled.

In options b) or c), proper names may be assigned to documents as identifiers, differentiated from topical descriptors.

Different methods may be adopted for controlling various types of names. For example, geographic names may be included in a thesaurus of topical descriptors, and personal names established in an authority file.

Reasons for merging the files of name headings and topical descriptors are (a) that the borderline between them is not sharp, and (b) that it is often desirable to link a class with its instances hierarchically, e.g., **museums** and **Louvre** (see section 5.3.3).

When proper names are included in a thesaurus, the form of the name should be selected in accordance with a recognized code of cataloging practice, such as the *Anglo-American Cataloguing Rules*, 2nd ed.

3.6.8.1 Place Names

Names of countries and geographic regions frequently vary from language to language. Variant terms referring to the same place also occur within a single language community, for reasons such as the following:

- An official and a popular name are both in common use:

Example:

Netherlands / Holland

- Anglicized and vernacular forms coexist:

Examples:

Cambodia / Kampuchea

Israel / Yisrael

The form most familiar to the users of the thesaurus should be designated as the descriptor, and cross-references should be provided from the variants. Other things being equal, preference should be given to the official rather than the popular name. The short form of the official name should be preferred. Standard authorities, such as the publications of the U.S. Board on Geographic Names, should be consulted for the official forms.

Examples:

Arabian Peninsula *rather than* Arabia

Netherlands *rather than* Holland

Philippines *rather than* Republic of
the Philippines

3.7 Capitalization, Punctuation, and Non-alphabetic Characters

3.7.1 Capitalization

It is recommended that predominantly lowercase characters be used for descriptors in thesauri. (The display of descriptors in indexes is outside the scope of this standard.) Capitals should be used only for the initial letter(s) of proper names, tradenames, and for those components of taxonomic names, such as genus, which are conventionally capitalized; for all the letters of initialisms; or where featured in unusual positions in product or corporate names. Because lowercase letters may also occur in unusual positions in proper names, using a combination of capitals and lowercase letters in thesauri indicates to the user the correct orthography of a term in natural language and serves to distinguish common nouns from similar proper names.

Examples:

dBASE IV (Trademark)

DNA

information systems

Information Systems Corp.

NewsBank

3.7.2 Nonalphabetic Characters

To simplify filing and searching, the use of symbols and punctuation marks in descriptors and entry terms should be minimized. Established orthographic authorities determine when such characters are essential.

3.7.2.1 Parentheses

Parentheses should be used only to enclose qualifiers (see section 3.2.1) and trademark indicators (see section 3.6.5.2), or when they constitute part of a term.

Example:

benzo(a)pyrene

3.7.2.2 Hyphens

To obviate problems in filing and searching, hyphens should be avoided in thesauri whenever possible. Retain hyphens in topical terms only when dropping them would lead to ambiguity.

Examples:

high temperature testing

n-body problem

nonfiction

Hyphens should be retained where they occur as part of abbreviations, trademarks, chemical names, or proper nouns.

Examples:

MS-DOS

Newton-John, Olivia

p-benzoquinone

Saur, Karl-Otto

Stratford-upon-Avon

3.7.2.3 Apostrophes

3.7.2.3.1 Possessive Case

Apostrophes indicating the possessive case, whether in the singular or plural, must be retained. (For the choice of singular or plural descriptors, see section 3.5.) The singular form is most frequently found in eponyms. Standard orthographic authorities should be consulted for the position of the apostrophe in common nouns.

Examples:

singular

Boyle's law

Down's syndrome

Pascal's triangle

plural

artists' marks

workers' compensation

3.7.2.3.2 Proper Names

Apostrophes that are part of proper names must be retained.

Example: **O'Dwyer's tubes**

3.7.2.4 Diacritical Marks

Diacritical marks may be used if they are required for proper names or by the accepted standards of a discipline. (See section 3.6.7.1 for the use of diacritics in loanwords and section 3.7.3 for the use of diacritics in romanization.)

Examples:

El Niño

Guillain-Barré syndrome

Mössbauer effect

résumés

3.7.2.5 Other Symbols and Punctuation Marks

Symbols, such as the ampersand, and punctuation marks should be used only in trademarks and proper names because they create filing and searching problems.

Examples:

A & W Food Services

PL/C

3.7.3 Romanization

Commonly accepted spellings for terms or proper names from languages written in non-roman scripts, as found in authoritative reference sources, are preferable to systematic romanization, i.e., applying a table to convert the characters in a non-roman script into roman ones. A cross-reference should be provided from the systematic romanization to the established spelling.

Examples:

Chebyshev *rather than* Tchebyshev

polynomials *polynomials*

or Čebyšev polynomials

Koran *rather than* Qur'ān

When romanizing (transliterating or transcribing), the procedure described in a relevant standard or a nationally accepted library scheme should be followed as far as possible. (Library schemes used in the U.S. have been collected in *ALA-LC Romanization Tables*, 1991.) If a choice exists, a romanization system that uses few or no diacritical marks should be selected.

4. Compound Terms

4.1 General

Compound or multiword terms in natural language are considered lexemes, i.e., words bound together as lexical units. Dictionaries differ in their policies regarding the inclusion of various categories of compounds, and so they are not always authorities in this regard for thesaurus

designers. For this reason, guidelines on the handling of compound terms in thesauri have been developed.

To be acceptable as a descriptor, a compound term should express a single concept or unit of thought, capable of being arranged in a genus-species relationship within a hierarchy or tree structure. The compound phrase 'children and television,' for example, cannot be accommodated either in a strict genus-species hierarchy on 'children' or one on 'television,' while the compound term 'adopted children' represents a type of children, and the compound term 'educational television' represents a type of 'television.' (A compound phrase such as 'children and television' could be subordinated to a hierarchy on 'children and media,' but this would not represent a single genus-species relationship.)

4.1.1 Purpose of Guidelines on Compound Terms

The establishment of procedures for dealing consistently with compound terms is one of the most difficult areas in the fields of thesaurus construction and indexing. The guidelines below have the following purposes:

- to aid in achieving intra-indexer, inter-indexer, and inter-organizational consistency;
- to avoid overcomplexity of the indexing language;
- to achieve a thesaurus whose structure is based upon principles that are amenable to logical explanation;
- to enhance the ease and precision of searching.

4.1.2 Precoordination and Postcoordination

Descriptors should represent single concepts, expressed by a single word or by a multiword term. To express complex subjects, descriptors may be postcoordinated in search statements using Boolean or other operators, e.g., **liver AND anatomy**, or precoordinated into semantically linked, heading-subheading combinations, e.g., **liver—anatomy**.

4.1.3 Factors to Be Considered

The factors enumerated below may be considered in deciding which multiword terms should be split into separate descriptors and which should be retained in compound form. It should be emphasized that these procedures need not be applied rigidly. Administrative policies or system constraints may govern which of these practices is adopted by a given organization.

- Literary warrant.* A compound term may be employed so frequently within the literature of the domain covered by the thesaurus that splitting the term into its components would be unacceptable to users who consider it a lexeme.
- Regulating the number of terms in the thesaurus.* Compound terms increase the number of descriptors in a thesaurus.
- Printed versus computerized retrieval systems.* If a thesaurus is used for printed as well as electronic publications, the requirements of users of both formats should be taken into account. Printed indexes may require precoordinated headings for compound concepts, so that the number of entries per heading can readily be scanned by a searcher, whereas in computerized retrieval, access is often enhanced by the indexing of compound concepts through separate descriptors, which can subsequently be postcoordinated by the searcher. Rules may be developed for combining descriptors to form precoordinate indexing terms; while this practice reduces the size of a thesaurus, it should be kept in mind that the inclusion of compound descriptors may simplify the indexing process.
- Avoidance of false drops in retrieval.* Compound descriptors often obviate certain kinds of false drops (unwanted combinations of terms) in retrieval when the same words in a different sequence have a different meaning. For example, if the concept 'library science' is represented by the separate descriptors 'library' and 'science,' a search on this combination will also retrieve 'science library.'
- The nature of terminology in a given field.* This may call for special criteria to regulate the treatment of compound terms.

4.1.4 Elements of Compound Terms

Elements of a compound term are distinguished by their logical roles or functions, which are relevant to the criteria for determining whether a compound term should be split (see section 4.2). The majority of compound terms, including both pre- and postmodified noun phrases, can be analyzed into the following components:

- the focus (also known as the 'head noun'): the noun component that identifies the broader class of things or events to which the term as a whole refers.

Examples:

concrete	in the compound term	reinforced concrete
glass	in the compound term	stained glass

- b) the difference (also known as the ‘modifier’): the part of a compound term that refers to a characteristic, or logical difference, which narrows the denotation of the focus by specifying a subclass of the broader concept represented by the focus.

Examples:

reinforced, which specifies a subclass, i.e., a type, of concrete in **reinforced concrete**
stained, which specifies a subclass of glass in **stained glass**

4.2 Criteria for Establishing Compound Terms as Descriptors

Compound or multiword terms should be established as descriptors in the following circumstances:

- a) Splitting the parts would lead to ambiguity or a loss of meaning.

Examples:

plant food
rose windows

- b) One component of the term is not relevant to the scope of the thesaurus or is too vague to exist as an independent term.

Examples (nondistinctive element underlined):

composite drawings
first aid
stone cutters

- c) The modifier in the term has lost its original meaning, so the meaning of the compound term as a whole is not the sum of the meaning of its parts.

Examples:

deck chairs
trade winds

- d) The modifier suggests a resemblance, as in a metaphor, to an unrelated thing or event.

Examples:

butterfly valves
tree structures

- e) The term contains an adjective that does not define a subclass of the focus, and is not actually a member of that class at all.

Examples:

artificial limbs
paper flowers
rubber ducks
tin soldiers

- f) The term is a proper name, or includes proper nouns or proper adjectives.

Examples:

Freudian slips
Hudson’s Bay Company
United Nations

- g) The compound term has become so familiar in common use, or in the field covered by the thesaurus, that it is considered for practical purposes to represent a single concept.

Examples:

data processing
gross domestic product

4.3 Criteria for Determining when Compound Terms Should Be Split

4.3.1 Factors to Be Considered

It is more difficult to specify exact criteria for recognizing the kinds of compound terms that should be split into separate components, each of which is then entered as a noun or noun phrase in the thesaurus. The following recommendations are based upon general criteria, but they should not be regarded as mandatory instructions to be applied rigidly in all circumstances. As noted above, such decisions are often based on the nature of terminology in a given field, which may call for special treatment of compound terms, or on the necessity for controlling the size of the thesaurus.

4.3.2 Hierarchical Structure

The following recommendations are offered as a means of achieving consistent treatment of compound terms that should be split. They also ensure a correct hierarchical structure in which each term fits into a logical conceptual framework. Each of these recommendations is accompanied by a converse condition that can be used to identify classes of terms that can usually not be split without risk of ambiguity.

4.3.2.1 Focus and Difference

- a) A compound term should be split when its focus refers to a property or part, and its difference represents the whole or possessor of that property or part.

Examples:

aircraft engines = **aircraft** + **engines**
 hospital personnel = **hospitals** + **personnel**
 soil acidity = **soils** + **acidity**

- b) Conversely, a compound term should not be split when the focus term refers to a whole and the difference is a term for its part or property.

Examples:

acid soils
skilled personnel

4.3.2.2 Transitive Action

- a) A compound term should be split if it consists of a term representing a transitive action modified

by a term for the object on which the action is performed.

Examples:

office management = **offices** [object] + **management** [action]

textile printing = **textiles** [object] + **printing** [action]

- b) Conversely, a compound term should not be split when its component term for a thing or material is modified by a term for the action carried out upon it.

Examples:

cast steel (cast [action] + steel [object])

printed textiles (printed [action] + textiles [object])

4.3.2.3 Intransitive Action

- a) A compound term should be split if it consists of a term for an intransitive action modified by a term for the performer (agent) of the action.

Examples:

bird migration = **birds** [agent] + **migration** [action]

metal deterioration = **metal** [agent] + **deterioration** [action]

- b) Conversely, a compound term should not be split when the term for an object is modified by a term for the intransitive action in which the object is involved.

Example:

dancing shoes (dancing [action] + shoes [object])

4.4 Compound Descriptors vs. Node Labels

A compound descriptor should not be created solely for the reason that it forms a logical level in a hierarchy and would serve to group a set of narrower terms. For this purpose node labels should be used (see section 5.3.5).

4.5 Order of Words in Compound Terms

Noun phrases should be entered in a thesaurus in natural language order, i.e., direct order. For further guidance on the form of premodified and postmodified noun phrases, see section 3.4.1.2.

Examples:

birds of prey

oral surgery

secondary schools

4.5.1 Cross-references from Inversions

The inverted form of a noun phrase may be included as a cross-reference to the preferred term in natural language order.

Examples:

surgery, oral USE **oral surgery**

schools, secondary USE **secondary schools**

See also the discussion of permuted lists in section 6.1.1.

5. Relationships

5.1 General

5.1.1 Semantic Linking

One of the main differences between thesauri and other vocabulary lists is that thesauri display and clearly distinguish the basic semantic relationships that link the terms they contain by means of relationship indicators. Other types of term lists do not provide such relationship indicators, or do not provide them systematically. Ideally, a thesaurus should not include any orphan terms, descriptors that are not related to any other descriptors.

A variety of formats for displaying semantic relationships are described in section 6; this section is concerned with defining and illustrating the relationships themselves.

5.1.2 Kinds of Relationship

Relationships of three kinds should be included in thesauri:

- the equivalence relationship (see section 5.2);
- the hierarchical relationship (see section 5.3);
- the associative relationship (see section 5.4).

These relationships are illustrated in Figure 1, p.14.

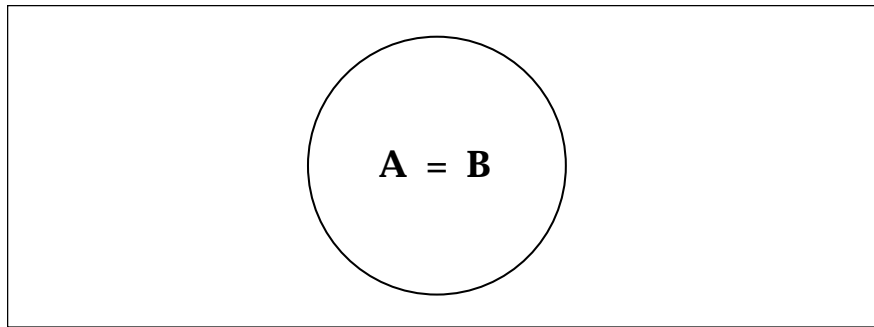
Each relationship possesses the property of reciprocity, i.e., every relationship indicated between term A and term B has a corresponding relationship from term B to term A.

The conventional abbreviations for relationship indicators are used in the examples below. Additional abbreviations for specialized purposes are found in the following sections. (A complete list of abbreviations used in this standard appears on page xii. Typographic aspects of relationship indicators are discussed in section 6.3.3.)

Relationship	Relationship Indicator	Abbreviation
Equivalence (Synonymy)	USE	none or U
	USED FOR	UF
Hierarchy	BROADER TERM	BT
	NARROWER TERM	NT
Association	RELATED TERM	RT

Figure 1. Semantic Relationships in a Thesaurus

The circles in the diagrams below represent the scope of the terms.

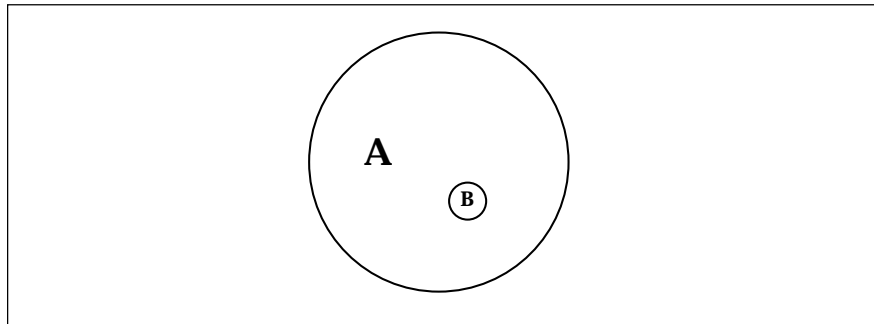


The diagram implies equivalent sets. Circle A and Circle B overlap.

Figure 1a. The equivalence relationship, e.g., teenagers USE adolescents.

(A)

(B)

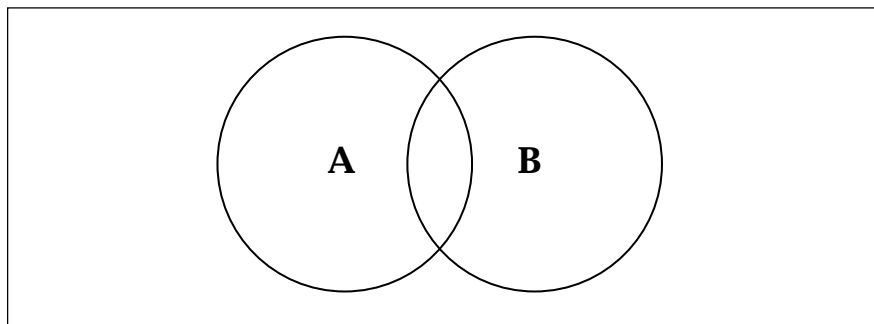


The diagram implies class inclusion.

Figure 1b. The hierarchical relationship, e.g., mammals NT cows.

(A)

(B)



The diagram implies semantic overlap, i.e., that there is an element of meaning common to both terms.

Figure 1c. The associative relationship, e.g., gold RT money.

(A)

(B)

The relationship indicators are binary (or paired) operators. Some indicators are symmetric, and some are asymmetric.

RT is symmetric:

if A RT B, then B RT A.

USE and UF are asymmetric:

if A USE B, then B UF A.

Similarly, for BT and NT:

if A BT B, then B NT A.

5.2 The Equivalence Relationship

5.2.1 General

When the same concept can be expressed by two or more terms, one of these is selected as the preferred term, i.e., the descriptor. The relationship between preferred and nonpreferred terms is an equivalence relationship in which each term is regarded as referring to the same concept. The descriptor in effect substitutes for other terms expressing equivalent or nearly equivalent concepts. A cross-reference to the descriptor should be made from any synonym or quasi-synonym that may function as an entry term for the user.

Reciprocity of the equivalence relationship is expressed by the following conventions:

U or USE,	which leads from a nonpreferred (entry) term to the descriptor, and
UF or USED FOR,	the reciprocal, which records entry terms leading to the descriptor.

Examples:

Aves USE **birds** outline USE **shape**
birds UF Aves **shape** UF outline

These relationship indicators are the equivalents of *see* and *x* (see from), respectively, in many traditional subject heading lists. This equivalence relationship covers three basic types of term:

- synonyms (see section 5.2.2);
- lexical variants (see section 5.2.3); and
- quasi-synonyms (see section 5.2.4).

5.2.2 Synonyms

Synonyms are terms whose meanings are regarded as the same or nearly the same in a wide range of contexts. True synonyms are rare in natural language. Although the terms may be interchangeable in many circumstances, usage may vary as a result of such factors as level of formality, professional vs. lay context, or

pejorative vs. neutral vs. complimentary connotation. The examples listed below are illustrative of the various classes of synonyms that may be encountered in practice. A slash is used to separate the synonyms, indicating that the preferred term has not been selected. (For this reason, the terms are not in boldface.)

a) terms of different linguistic origin

Examples:

cats / felines

freedom / liberty

sodium / natrium

sweat / perspiration

b) popular terms and scientific names

Examples:

aspirin / acetylsalicylic acid

gulls / Laridae

salt / sodium chloride

c) generic nouns and trade names

Examples:

petroleum jelly / Vaseline

photocopies / Xeroxes

refrigerators / Frigidaire

tissues / Kleenex

(See section 3.6.5.2 for the designation of trademarks.)

d) variant names for emergent concepts

Example:

hovercraft / air cushion vehicles

e) current or favored terms versus outdated or deprecated terms

Examples:

poliomyelitis / infantile paralysis

developing countries / underdeveloped countries

f) common nouns and slang or jargon terms

Examples:

helicopters / whirlybirds

psychiatrists / shrinks

g) dialectal variants

Examples:

elevators / lifts

subways / undergrounds

In these and other cases, preferred terms should be selected to serve the needs of the majority of users, bearing in mind the criteria enumerated in sections 3 and 4. For the sake of predictability, these criteria should be applied consistently throughout the thesaurus. If, for example, American spelling is preferred to British spelling, or scientific names are preferred to popular names, this decision should be noted in the introduction (see section 6.3.2) and should be applied consistently in the formulation of descriptors.

5.2.3 Lexical Variants

Lexical variants differ from synonyms in that synonyms are different terms for the same concept, while lexical variants are different word forms for the same expression. These forms may derive from spelling or grammatical variation or from abbreviated formats.

- a) lexical variants, including direct versus inverted order, orthographic variants, stem variants, and irregular plurals

Examples:

radar antennas / antennas, radar
Romania / Rumania / Roumania
ground water / ground-water / groundwater
online / on-line
pediatrics / paediatrics
mice / mouse

- b) full names and abbreviations

Examples:

International Federation for Documentation / FID
pi mesons / pions
polyvinyl chloride / PVC

5.2.4 Quasi-Synonyms

Quasi-synonyms are terms whose meanings are generally regarded as different, but which are treated as equivalents for the purposes of a thesaurus, e.g., 'REM sleep' and 'rapid eye movements.' The extent to which terms are treated as quasi-synonyms depends in large measure upon the domain covered by the thesaurus and its size.

Quasi-synonyms are frequently antonyms or represent points on a continuum:

Examples:

wetness / dryness
smoothness / roughness

An indexing agency may decide to designate either 'wetness' or 'dryness' as the preferred term on the understanding that the specialist studying one of these properties should be able to retrieve all information on the other.

As a general rule, terms should be treated as quasi-synonyms only in subject areas that are peripheral to the domain of the thesaurus. When concepts can be distinguished in the thesaurus domain with sufficient precision to justify their representation as separate terms in a thesaurus, they should be individually defined and retained as descriptors. If two concepts cannot be consistently and reliably differentiated from one another, however, a term for one concept should be selected as the descriptor and a USE reference made from the other.

5.2.4.1 Generic Posting

Generic posting is a technique in which the name of a class and the names of its members are treated as quasi-synonyms, with the broader class name functioning as the preferred term.

Examples:

waxes	plant waxes	
UF plant waxes		USE waxes
furniture		
UF beds	beds	USE furniture
UF chairs	chairs	USE furniture
UF desks	desks	USE furniture
UF tables	tables	USE furniture

If employed, this technique should be limited to the peripheral areas of a subject field, or used when the number of documents on the members of a class does not warrant its being split into subclasses. This practice places limits on the specificity of the thesaurus, and should be used with discretion. The narrower terms are useful entry terms.

5.2.5 Cross-references to Elements of Compound Terms

A USE....AND (or USE+) reference may be made from a compound term to its components in cases where the term is split and both components must be used in indexing or searching.

Examples:

coal mining	USE coal AND (or+) mining
ferromagnetic films	USE ferromagnetic materials AND films

UF+ (USED FOR . . . AND . . .) is a code that may be used for the reciprocal of the reference from the compound term, as UF alone may suggest that one of the two components may be used alone in searching for the concept.

Example:

coal	UF+ coal mining
mining	UF+ coal mining

This type of cross-reference is illustrated in Figure A1.

5.3 The Hierarchical Relationship

This basic relationship is the primary feature that distinguishes a systematic thesaurus from an unstructured list of terms, such as a glossary. It is based on degrees or levels of superordination and subordination, where the superordinate descriptor represents a class or a whole, and subordinate descriptors refer to its members or parts. Reciprocity may be expressed by the following relationship indicators:

BT (Broader Term), a label for the superordinate descriptor

NT (Narrower Term), a label for the subordinate descriptor

Example:

mammals **vertebrates**
BT **vertebrates** NT **mammals**

In the flat format thesaurus (see section 6.2.1) BT and NT indicate one level broader and one level narrower, respectively. There are other types of alphabetical display that indicate multiple levels of hierarchy (see section 6.2.2).

Hierarchical relationships may also be indicated by systematic presentations such as tree structures (see section 6.2.3) or graphic displays (see section 6.2.4).

The hierarchical relationship covers three logically different and mutually exclusive situations:

- a) the generic relationship (see section 5.3.1);
- b) the whole-part relationship (see section 5.3.2);
- c) the instance relationship (see section 5.3.3).

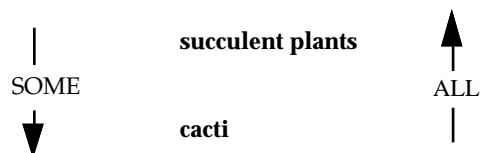
All these types of relationship may apply to a single descriptor, and special codes may be used to distinguish them. Each of the relationships leads to hierarchies that are amenable to a logical test (see below) through reference to the basic types of concept represented by the terms, for example, those listed in section 3.3. Every subordinate descriptor should refer to the same basic kind of concept as its superordinate descriptor, that is, both the broader and the narrower term should represent a thing, an action, a property, etc.

Example:

- a) **anatomy** (a discipline) and **central nervous system** (a body part that may be an object of study of that discipline) represent different kinds of concept; therefore, these terms cannot be related hierarchically;
- b) **central nervous system** and **brain** both represent body parts; these terms can therefore be related hierarchically.

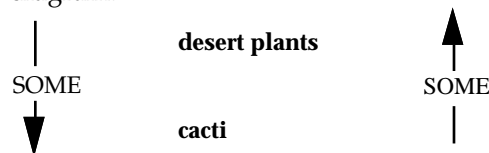
5.3.1 The Generic Relationship

This relationship identifies the link between a class and its members or species. A simple way to apply the test for validity described above is to formulate the statement "[narrower term] is a [broader term]." This relationship is also amenable to a logical 'all-and-some' test as shown in the following diagram:



The diagram indicates that some members of the class 'succulent plants' are known as 'cacti' and

that all 'cacti,' by definition and regardless of context, are 'succulent plants.' This test would usually ensure that a descriptor such as 'cacti' is not subordinated to a class such as 'desert plants,' since cacti are not desert plants by definition. This particular relational link can be represented by the following diagram:



The diagram illustrates that some members of the class 'desert plants' are known as 'cacti,' and that some, but not all, cacti are desert plants. These descriptors should therefore be assigned to different hierarchies in the thesaurus, and both descriptors should be assigned to the same document when indexing a work on "cacti as desert plants."

5.3.1.1 Codes for the Generic Relationship

The generic nature of a relationship may be identified by the BT/NT coding described above, or if more refined coding is desired for the various types of hierarchical relationship, by the following abbreviations:

BTG = Broader term (generic)

NTG = Narrower term (generic)

Example:

rats **rodents**
BTG **rodents** NTG **rats**

5.3.2 The Whole-Part Relationship

This relationship covers situations in which one concept is inherently included in another, regardless of context, so that the descriptors can be organized into logical hierarchies, with the whole treated as a broader term. This relationship can be applied to several types of term; the four types enumerated below are not intended to be exhaustive. In the following examples, parts are indicated through indentation.

- a) systems and organs of the body

Example:

nervous system
 central nervous system
 brain
 spinal cord

- b) geographic locations

Example:

Canada
 Ontario
 Ottawa
 Toronto

- c) disciplines or fields of discourse

Example:

science
biology
botany
zoology

- d) hierarchical organizational, corporate, social, or political structures

Examples:

countries
states/provinces
cities
armies
divisions (military)
battalions
regiments

5.3.2.1 Codes for the Whole-Part Relationship

The hierarchical whole-part relationship may be indicated specifically by the following abbreviations:

BTP = Broader term (partitive)

NTP = Narrower term (partitive)

Example:

central nervous system	nervous system
BTP nervous system	NTP central nervous system

5.3.2.2 Parts of Multiple Wholes

When a whole-part relationship is not exclusive to a pair of terms, i.e., the part can belong to multiple wholes, the name of the whole and its part(s) should be linked associatively rather than hierarchically in the thesaurus (see section 5.4). Carburetors, for example, are parts of machines other than cars. Therefore, 'cars' and 'carburetors' should not be linked in a whole-part relationship in a thesaurus. See section 4.3.2.1 for further guidance on this point.

5.3.3 The Instance Relationship

This relationship identifies the link between a general category of things or events, expressed by a common noun, and an individual instance of that category, often a proper name.

mountain regions	—class—	state capitals
Alps	—instances—	Albany
Himalayas		Trenton

In the first example, the **Alps** and the **Himalayas** are assigned to subordinate positions in a hierarchy, yet they are neither kinds nor parts of **mountain regions**, but represent specific examples or instances.

5.3.3.1 Codes for the Instance Relationship

The hierarchical instance relationship may be indicated specifically by the following abbreviations:

BTI = Broader term (instance)

NTI = Narrower term (instance)

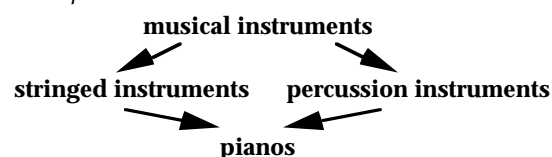
Example:

fairy tales	
NTI Cinderella	
	Rumpelstiltskin

5.3.4 Polyhierarchical Relationships

Some concepts belong, on logical grounds, to more than one category. They are then said to possess polyhierarchical relationships.

Example:



In this example, the term **pianos** is assigned to subordinate positions on the basis of its generic relationship to two broader terms, in other words, **pianos** would be an NT to both **stringed instruments** and **percussion instruments**.

In other cases, polyhierarchical links may be based upon whole-part relationships.

Example:



In some cases, polyhierarchical links can be based on logically different relationships.

Example:



In this example, the link between **bones** and **skull** is based upon the generic relationship (the skull is a kind of bone), whereas the link between **head** and **skull** is based on the hierarchical whole-part relationship (the skull is part of the head). These relationships may be represented as

skull	
BTG bones	
BTP head	

5.3.5 Node Labels in Hierarchies

When descriptors are arranged in hierarchies (such as tree structures) in a thesaurus (see section

6.2), node labels may be inserted into arrays to show the principles of division among a set of sibling terms (descriptors that share a broader term). Although their function is similar to that of BTs, *node labels are not descriptors*, and must not be used as indexing terms. They are often typographically distinguished from descriptors, e.g., through the use of italics and/or enclosure in angle brackets.

Example:

cars

by motive power

diesel cars

electric cars

by purpose

racing cars

sports cars

Additional examples of node labels are in Figure A8 and Appendix B. For the use of node labels in the associative relationship, see section 5.4.3.

5.4 The Associative Relationship

This relationship covers associations between descriptors that are neither equivalent nor hierarchical; yet the terms are semantically or conceptually associated to such an extent that the link between them should be made explicit in the thesaurus, on the grounds that it may suggest additional descriptors for use in indexing or retrieval. The relationship is symmetrical, and is generally indicated by the abbreviation RT (re-lated term). (Cf. section 5.4.4.)

Example:

cells

RT **cytology**

cytology

RT **cells**

The associative relationship is the most difficult one to define, yet it is important to make explicit the nature of the relationship between descriptors linked in this way and to avoid subjective judgments as much as possible; otherwise, RT references may be established inconsistently.

As a general guideline, whenever one term is used, the other should always be implied within the common frames of reference shared by the users of the thesaurus. Moreover, one of the terms is often a necessary component in any explanation or definition of the other; the term 'cells,' for example, forms a necessary part of the definition of 'cytology.'

Either of the following types of terms can be linked by the associative relationship:

- those belonging to the same hierarchy (see section 5.4.1);
- Those belonging to different hierarchies (see section 5.4.2).

5.4.1 Relationships Between Descriptors Belonging to the Same Hierarchy

5.4.1.1 Relationships Between Overlapping Sibling Terms

RT references are required for sibling terms with overlapping meanings, such as 'ships' and 'boats,' where each of the terms can be precisely defined (so they do not form an equivalence set), yet they are sometimes used loosely and almost interchangeably; the user interested in one should therefore be reminded of the other.

This link does not need to be made explicit in the systematic section of a thesaurus containing organized hierarchies (see section 6.2.3), since this method of display automatically brings such terms together. The link should be indicated, however, in an alphabetical thesaurus, and in the alphabetic section of a hierarchical thesaurus.

Example:

boats

BT **vehicles**

RT **ships**

ships

BT **vehicles**

RT **boats**

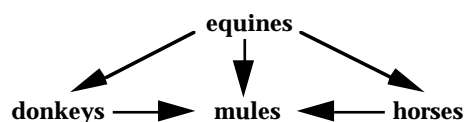
5.4.1.2 Relationships Between Mutually Exclusive Sibling Terms

It is not necessary to interrelate all sibling terms. For example, there is no need to associate terms such as 'roses' and 'daffodils,' which share the broader term 'flowers,' because the meaning of the terms does not overlap, i.e., they are mutually exclusive.

5.4.1.3 Derivational Relationships

Concepts linked by a familial or derivational relationship (i.e., one of the concepts is derived from the other) also require RT references. This guideline applies to the relationship between such terms as 'parents' and 'children' or to the relationship of 'mules' to 'donkeys' and 'horses.' In the graphic display that follows, **donkeys**, **horses**, and **mules** are all subclasses of **equines**. In the alphabetic display, RT references are provided between **mules** and **donkeys** as well as **mules** and **horses**. **Horses** and **donkeys** are not linked by RTs because they do not share a derivational relationship.

Example (Graphic display):



Example (Alphabetic display):

donkeys	horses
BT equines	BT equines
RT mules	RT mules
equines	mules
NT donkeys	BT equines
NT horses	RT donkeys
NT mules	RT horses

5.4.2 Relationships Between Descriptors Belonging to Different Hierarchies

It is possible to establish many grounds for associating descriptors belonging to different hierarchies. Related term references are often made between etymologically related descriptors, i.e., that contain the same root, but which do not represent the same kind of thing. The following are some representative examples of typical relational situations. For guidance on coding the precise nature of a relationship, see section 5.4.4.

- a) Disciplines or fields of study and the objects or phenomena studied, or the discipline's practitioners

Examples:

mathematics	mathematicians
RT mathematicians	RT mathematicians
neurology	nervous system
RT nervous system	RT neurology
botany	plants
RT plants	RT botany

- b) Operations or processes and their agents or instruments

Examples:

temperature control	thermostats
RT thermostats	RT temperature control
hunters	hunting
RT hunting	RT hunters

- c) Objects or processes and their counteragents

Examples:

plants	herbicides
RT herbicides	RT plants
inflammation	anti-inflammatory agents
RT anti-inflammatory agents	RT inflammation

- d) Actions and their products

Examples:

weaving	cloth
RT cloth	RT weaving
lacrimation	tears
RT tears	RT lacrimation

- e) Actions and their targets

Examples:

harvesting	crops
RT crops	RT harvesting
binding	books
RT books	RT binding

- f) Objects or substances and their unique properties

Examples:

poisons	toxicity
RT toxicity	RT poisons
liquids	surface tension
RT surface tension	RT liquids

- g) Concepts linked by causal dependence

Examples:

death	bereavement
RT bereavement	RT death
infections	pathogens
RT pathogens	RT infections

- h) Concepts and their units or mechanisms of measurement

Examples:

electric current	amperes
RT amperes	RT electric current
temperature	thermometers
RT thermometers	RT temperature

- i) Phrases in which the noun is not a true broader term (see section 4.2e). For example, a 'rubber duck' is not a 'duck.'

Examples:

ducks	rubber ducks
RT rubber ducks	RT ducks
fishes	fossil fishes
RT fossil fishes	RT fishes

5.4.3 Node Labels for Related Terms

In order to bring closely related concepts together in the alphabetical array under a given descriptor, related terms may be divided into categories that do not form part of a logical hierarchy. These related terms should then be identified by a node label.

Example:

books
RT
<operations>
binding
printing

In this example, *operations* functions as a node label.

For the use of node labels to indicate principles of division for logical hierarchies, see section 5.3.5.

5.4.4 Specifying Types of Related Term References

In certain thesauri, it may be considered desir-

able to refine related term references in order to make the nature of the relationships explicit. Codes for such relationship indicators and their reciprocals may be developed locally. (See, for example, Figure A22.) These local codes should be clearly explained and illustrated in the introduction (see section 6.3.2) or documentation (see section 7.4) to the published or machine-readable thesaurus.

6. Print Display

The three basic types of format in a printed thesaurus are: (a) alphabetical, showing all the immediate relationships of each term; (b) permuted or rotated, giving access to every word in each descriptor and entry term; and (c) hierarchical, showing a display of all levels of hierarchies. Various versions of each format are illustrated by sample pages from thesauri in Appendix A.

A major principle in the design of the format of a printed thesaurus is the minimization of double lookup, i.e., the need to consult more than one sequence.

The most commonly used methods of presenting equivalence relationships and term hierarchies are described and evaluated in sections 6.1 and 6.2, respectively. A discussion of general format considerations follows in section 6.3.

6.1 The Equivalence Relationship

USE references from nonpreferred terms should be incorporated into the main alphabetical listing of a thesaurus rather than being relegated to an auxiliary “access vocabulary” or separate list of entry terms.

6.1.1 Inverted USE References and Permuted Lists

Some thesauri include an auxiliary permuted or rotated list in KWIC or KWOC format that gives access to every word in descriptors and USE references (see Figures A2 and A3). The permuted list should not be used as a substitute for the inclusion of useful inversions as USE references in the main alphabetical list.

For example, it is conceivable that in a thesaurus in the domain of library and information science, a user will search the term ‘automation, library.’ If the preferred term is **library automation**, a USE reference is essential. A reference from the inverted form of the term **information science** is, in contrast, not essential and would, moreover, be misleading as it might be interpreted as ‘science information.’ An automatically generated permuted display will, however, display the term **information science** under **science** as well as under **information**.

6.1.2 Inverted USE References and Hierarchical Display

The choice of format for the display of hierarchical relationships (see section 6.2) affects decisions on the necessity for USE references. For example, if narrower terms are included in the alphabetic display in a case such as

libraries

NT **academic libraries**

public libraries

special libraries

the following USE references may be unnecessary:

libraries, academic

libraries, public

libraries, special

If, however, **academic libraries** has the NTs **college libraries** and **university libraries**, in the flat format (see section 6.2.1), these would not be visible under **libraries**; therefore, USE references from inversions of all the compound terms should be made. Moreover, where a descriptor has numerous BTs, NTs, and RTs, an inverted USE reference may be easier to find than the desired narrow term.

If hierarchical information is given only by a tree structure (see section 6.2.3), USE references from inversions would be desirable within the main alphabetic sequence of the thesaurus.

6.1.3 Juxtaposition of Terms

Juxtaposition of terms also plays a role in the creation of USE references for a printed thesaurus. For example, an entry term that would immediately precede or follow the descriptor to which it leads may be suppressed. (This guideline would not apply to thesauri for databases searched by computer — see section 7.3.1.) Some singular and plural forms of terms may be widely separated in a printed alphabetic list, however, and a USE reference from one to the other would then be warranted, even if the policy regarding preference for singular or plural is stated in the introduction to the thesaurus (see section 6.3.2). In the following example, several terms occur between the singular and plural forms of ‘cat,’ and so a reference from one to the other is desirable, especially because the singular form is the first word of a compound descriptor.

Example:

cat USE **cats**

cat fleas

catalogs

catharsis

cats

The addition of descriptors that file between the position of a potential entry term and its corresponding descriptor, or the interfiling of descriptors with uncontrolled terms in an index may create a need for additional USE references.

Similar considerations apply to the establishment of related term references in a printed thesaurus.

Most printed thesauri are produced from machine-readable files that also generate a screen display. Because a screen displays less information than a printed page, a more generous entry vocabulary is required on a screen than on a page. The reader's eye takes in the larger panorama of the printed page, and it is easier to locate descriptors that are variants of the search term. A possible approach is to include all potentially useful references in the machine-readable file and suppress unnecessary ones in the printed product (see section 7.3.1).

6.2 Hierarchical Relationships

The hierarchy of descriptors may be displayed in a variety of ways. This section explains the advantages and disadvantages of the most commonly used formats for displaying hierarchical relationships among descriptors in print. Indentation should be used as a visual cue for hierarchical levels in all the formats.

6.2.1 Conventional Flat Thesaurus Structure

The most commonly used thesaurus format arranges all descriptors in alphabetical order and gives for each some or all of the following: scope notes, used for (UF) references, terms that are one level broader (BT), terms that are one level narrower (NT), and related terms (RT). This is the recommended order of relationships. Narrower terms are generally arranged alphabetically, but node labels may be used to group both narrower and related terms in categories (see section 5.3.5 and Appendix B).

Indentation should be used as an additional visual cue for narrower terms.

Example:

vertebrates

NT **mammals**
reptiles

An example of the flat format is found in the ERIC thesaurus (see Figure A4).

6.2.2 Multilevel Hierarchy Within Alphabetic Display

This type of display format saves the time of

the thesaurus user in that the broadest and most specific descriptors relating to the sought term are immediately identified, whereas in the flat format, the user must proceed one step at a time, going from descriptor to descriptor, to examine the full hierarchy. In both formats described in the following sections, the sibling terms of the sought descriptor can only be identified by going to the broader term. Because the hierarchy is repeated over and over again in these formats, they are far more space-consuming than the flat format and hence less desirable for a printed thesaurus. If the hierarchies are not very deep, e.g., only three or four levels, the extra space occupied may not be excessive.

6.2.2.1 Multilevel Broader and Narrower Terms

This format differs from the flat format in that it gives *all* levels of broader and narrower terms within the alphabetic display. It employs special notation such as BT1, BT2 (one level broader, two levels broader) and NT1, NT2 (one level narrower, two levels narrower). A model for this format is the *International Energy Subject Thesaurus* (see Figure A5).

6.2.2.2 Generic Structure

Multiple levels of hierarchy may be indicated without BT/NT notation, by using the abbreviation GS (generic structure) with indentation and punctuation marks such as period and colon as cues to the levels of hierarchy. A model for the latter system is found in the *NASA Thesaurus* (see Figure A6).

6.2.3 Tree Structure

In this format, each descriptor is assigned a classification notation or line number, and this leads the user from the alphabetic display to the full hierarchical display (sometimes called 'systematic display' or 'classified display') in a separate sequence. *Medical Subject Headings* (MeSH) serves as a model for the format featuring classification notation (see Figure A7). The *Art and Architecture Thesaurus* provides a model of a hierarchical display with line numbers (see Figure A8), although the system also employs classification notation.

There is no redundancy in this method of thesaurus display, and it is economical of space. The panorama of the complete hierarchy is a distinct advantage to the user.

Another advantage of the tree structure is that the complete array of classes and subclasses serves as a check on the logical consistency of the

hierarchies. In the flat format or generic structure, hierarchical relationships may be built from the bottom up; in a tree structure, they are often built from the top down.

The power of a tree structure may be fully exploited in online searching (see section 7.3.3). It is, however, possible for a computer to build a complete hierarchy from a thesaurus employing a flat format or generic structure.

6.2.3.1 Notation

If a hierarchical classification scheme is applied to a tree structure, its notation must be carefully developed so that it will be hospitable to interpolation at any level. Computer-generated or humanly-assigned line numbers may be easily revised when descriptors are added, but the notation is not expressive, i.e., it does not reflect the levels of hierarchy.

Pure notation, consisting of either letters or numbers, has a smaller base than mixed or alphanumeric notation and is therefore less hospitable to new descriptors. Mixed notation may, however, create problems for novice users, who may have difficulty locating the codes. This suggests an advantage of the generic structure: all levels of broader and narrower terms are displayed to the user within the alphabetic list, and no second lookup is required. Sibling terms are not displayed in the generic structure, however, while they are an important feature of the tree structure.

6.2.4 Graphic Displays

Graphic displays are logically equivalent to a tree structure, but may not have a notation (see Figure A9). They are difficult to produce and maintain, as well as being wasteful of space. A simple graphic display may make it easier to take in the relationships of a descriptor at a glance. If too many related terms and levels of hierarchy are included, however, the display becomes difficult to comprehend.

6.2.5 The Top Term Structure

In this format, the alphabetic display includes all the relationships found in the flat format, with the addition of a relationship indicator for the top term (TT) of the hierarchy. The latter is equivalent to the broadest term in a generic structure. The top term leads the user to a separate sequence of the thesaurus in which top terms are arranged alphabetically, with each top term followed by all its narrower terms, arranged hierarchically on various levels.

Since it does not include a classification notation, a top term structure does not provide guidance to the location of a descriptor within the array under its top term. The *Inspec Thesaurus* provides a model for this format (see Figures A10 and A11).

This format is more economical in terms of space than the generic structure, but like the tree structure, requires a second lookup.

6.2.6 Two-Way Hierarchical Structure

This is generally appended to a flat format thesaurus. Each descriptor is an access point, and all levels of broader and narrower terms are displayed, generally without notation and with indentation as a cue to hierarchy. A model of this is found in the ERIC thesaurus (see Figure A12). This format is logically equivalent to the generic structure, i.e., in a single display one can view all of the broader and narrower terms of a descriptor. In combination with the flat format, the two-way hierarchical structure requires more space than the top term structure.

6.2.7 Broad Categories

The alphabetic arrays of some thesauri include numbers that identify the broad category to which each descriptor belongs. The notation for the category may be searchable online or used for purposes of selective dissemination of information. Such thesauri generally feature a separate section that displays the descriptors for each numbered category or subcategory in an alphabetic sequence, undifferentiated in terms of hierarchical levels. An example of such category numbers may be found in the TEST thesaurus (see Figure A13).

6.3 General Format Considerations

6.3.1 Components of a Printed Thesaurus

Given the variety of displays available, it is not possible to stipulate a standard form of layout for a printed thesaurus. Minimally, every thesaurus should include an alphabetic display.

Every published thesaurus should include a title page, a table of contents identifying all the sections, and an introduction (see section 6.3.2).

6.3.2 Introduction

All printed thesauri should contain a comprehensive introduction that clearly states

- a) the purpose of the thesaurus;
- b) the scope, i.e., the subject field(s) covered, with core and fringe areas separately identified;
- c) the meaning of all conventions, abbreviations, and

- any punctuation marks used in nonstandard ways;
- d) the rules and authorities adopted in selecting the preferred forms of descriptors, and in establishing their relationships;
 - e) whether the thesaurus complies with a national or international standard for thesaurus construction;
 - f) the filing rules employed, citing an appropriate national standard when used;
 - g) the total number of terms, with separate totals for descriptors and entry terms (the number of descriptors indicates the size of the indexing/searching vocabulary; the ratio of entry terms to descriptors indicates the accessibility of the thesaurus to end-users);
 - h) the date on which the computer file for the thesaurus was put into final form before printing, which may be the date of the last update;
 - i) a statement on the updating policy, and the name and address of the responsible organization to which comments and suggestions should be sent.

6.3.3 Typography

Descriptors, nonpreferred terms, relationship indicators, and textual notes should be typographically distinguished. Suggested typographic specifications are: lightface or *italics* for nonpreferred terms, all capitals for relationship indicators such as USE, and **boldface** for descriptors.

Example:

teenagers USE **adolescents**

6.3.4 Capitals / Lowercase Letters

The thesaurus should serve as an orthographic authority in addition to noting preferred terminology. A combination of capitals and lowercase letters should therefore be used in thesaurus terms. Topical descriptors and entry terms should be in lowercase; proper names should be capitalized as in standard usage. Initialisms are generally all uppercase; acronyms may have an initial capital followed by lowercase letters.

6.3.5 Filing

This section provides general rules for the filing of alphabetic characters and numerals in thesauri. Guidance on specific filing problems may be found in *ALA Filing Rules* (1980), *Library of Congress Filing Rules* (1980), and *British Standard Alphabetical Arrangement and the Filing Order of Numerals and Symbols* (BS 1749:1985). These filing codes are, however, not compatible with each other in certain details, and only one of them should be chosen as an authority.

6.3.5.1 Alphabetic Characters

Terms consisting of letters should preferably be filed word-by-word rather than letter-by-letter. In word-by-word filing, a space is significant; this filing principle is called “nothing before something.” It juxtaposes terms that begin with the same word.

Examples:

Word-by-word filing

gas USE **gases**

gas coolants

gas welding

gases

gaskets

Letter-by-letter filing

gas USE **gases**

gas coolants

gases

gaskets

gas welding

Another advantage of word-by-word filing is that the space is a significant character in computer programs that may be used to sort terms and to print the thesaurus.

A disadvantage of word-by-word filing is that it separates agglutinated compounds from those consisting of two words, e.g., ‘folk song, folk tune, folklore, folktale.’ USE references from the variant spellings may compensate for this problem.

6.3.5.2 Numerals

Some operating systems file numerals at the beginning of the alphabet and some at the end. Either position is acceptable, provided that the filing position of numerals is explained in the introduction to the thesaurus.

Applying the principles of ascending order and word-by-word filing to numerals, a computer will file 19 before 2, and 2001 before 30. A special sort routine is required to get the computer to file on arithmetical value, e.g., 1, 1.5, 10, 151, 1000. Special sorting instructions must be inserted by humans if numbers are to be ignored, e.g., in chemical terms, or filed as spelled out, e.g., **21** [twenty-one] **gun salute**.

6.3.5.3 Non-Alphanumeric Characters

Punctuation marks should generally be ignored in filing entry terms and descriptors. In the following example, the comma in the inverted USE reference is ignored:

cat breeds

cat, Siamese

USE **Siamese cats**

catalogs

Parentheses within terms should be ignored in filing, e.g., *benzo(a)pyrene* should be treated as if it were spelled ‘benzoapyrene.’

Parentheses around qualifiers require special treatment. It is desirable for the user to see homo-

graphic terms juxtaposed to assist in the selection of the desired term. Ignoring the parentheses around qualifiers would lead to the dispersal of homographic terms among compound terms. The desired sequence is illustrated in the following example:

Earth (planet)
 earth (soil) USE **soil**
earth science

6.3.6 Running Heads

Whenever a printed thesaurus includes multiple sequences, e.g., an alphabetic list, a rotated list, and a hierarchical display, each page should feature a running head to identify the sequence. Running heads are useful even if the sequences are in separate volumes.

6.4 Multiple Versions of Printed Thesauri

Thesauri may be produced in various editions: a basic list of terms, references, and relationships designed for the end-user or occasional searcher, and a more complete version designed for the indexer and the expert searcher, which may include detailed scope notes, indexing instructions, information on term history, and postings data.

A model for multiple print formats may be found in the two editions of *Medical Subject Headings*: MeSH as found in *Index Medicus* (also known as “Black and White” MeSH), which is designed for end-users, and the *Annotated Alphabetic List*, which is designed for indexers and searchers (see Figures A14 and A15).

7. Screen Display

7.1 User Categories

The design of screen displays should take into account the needs of each anticipated class of user:

- a) *thesaurus maintainers* who have expertise in indexing and thesaurus construction, and are likely to be experts in the subject domain of the thesaurus. They must have access to all views of a thesaurus and complete information about each term, with the ability to edit and manipulate term records, cross-references, classification notation, and hierarchies. They require “housekeeping” displays not needed by end-users of a thesaurus. (See section 10 for specifications of thesaurus management software.)
- b) *expert searchers and indexers* who have expertise in indexing, online information retrieval,

use of thesauri, or all of these. Indexers are likely to have expertise in the subject domain of the thesaurus; expert searchers may or may not have such expertise. These sophisticated users require the ability to search and view cross-references, definitions, and notes for descriptors as well as various levels of the classification or hierarchies. Postings data are especially important for searchers (see section 7.3.1). Sophisticated thesaurus displays and terminology are appropriate for these users.

- c) *end-users* who are not likely to be experienced in the jargon and complexities of online information retrieval, but who can be expected to have expertise in the subject field, and to understand its terminology. Abbreviations should be avoided, or explained in a window or at the bottom of the screen on which they appear. The types of displays available to expert searchers can be useful to end-users as well, when designed with their needs in mind. End-users may benefit from on-screen instructions in addition to any printed documentation that may exist. It is important to take the needs of each anticipated class of user into account in designing screen displays.

7.2 Factors to Be Considered

A thesaurus is generally used in the context of an information storage and retrieval system, and the choice of screen display formats will depend upon the domain, the searching behavior of users in that domain, and the overall design of the information system of which the thesaurus is a component.

Viewing information on a screen differs from viewing printed information: with a screen, it is harder to browse and remember one’s context; the screen is more difficult and tiring to view than printed media; and the available screen “page” size can make it difficult to grasp information that is perfectly comprehensible in printed form.

A great deal of research has been done and is ongoing concerning user search behavior and cognitive learning styles in the context of interactive search systems, library catalogs, videotex, and hypermedia. In addition to existing standards in computer-human interaction, working groups are producing draft standards for user interfaces, screen layouts, menus, windows, and other interface formats. These standards should be applied rigorously to all user interface designs. See Appendix C for sources of standards and

references to authoritative texts on interface design.

7.3 Types of Display

The following types of display are recommended for consideration (see also section 6). The selection will depend on the requirements of a given system and its users.

7.3.1 Alphabetical Listing

When a user enters a search term—whether it is a descriptor, entry term, or term not in the thesaurus—the system should display an alphabetical sequence of terms preceding and following the search term. This list should contain both descriptors and entry terms with USE references to descriptors.

Spelling variations, common misspellings, and common typographical errors should be stored as USE references in the machine-readable thesaurus to enhance retrieval, but need not be displayed to users (see section 10.2).

Thesauri linked to databases may also display the number of postings for assigned descriptors. The postings data in a thesaurus display should not include free-text occurrences of single-word descriptors.

7.3.2 Permuted Displays

Rotated or permuted listings (e.g., KWIC and KWOC displays) of multiword terms are useful to all classes of users (see Figures A16 and A17).

7.3.3 Hierarchies and Classifications

It should be possible to display a hierarchy at various levels. For example, if the hierarchy of a full thesaurus has five levels, it should be possible to display an outline of the first three levels. Indentation or other cues to the hierarchy are essential.

Users should be able to broaden or narrow their searches by selecting descriptors at various levels in the hierarchy, and to add some or all broader or narrower terms for a descriptor. For example, beginning with the descriptor **vertebrates**, the user may request that the search be expanded to include all of its narrower terms—at one or more levels—or only **mammals** and, optionally, its narrower terms. A tree structure with notation facilitates such search expansion, although the same effect may be achieved with other structures. Alternatively, the system could assign to each descriptor in a hierarchical display a line number, which the user may refer to (rather

than rekeying terms) in expanding a search. Highlighting is another option to obviate rekeying.

Node labels in hierarchies, which are not to be used in indexing or searching, should be distinguished from descriptors, e.g., by placing them in angle brackets. Node labels may also be assigned line numbers.

7.3.4 Term Detail

A user should be able to choose a term from any listing and see an expanded view of the detail for that term, either fully or in part. Users should have the option of calling up a descriptor's history, scope note, or definition, as well as all term relationships—equivalence, hierarchical, and associative—plus any specialized relationships created for the thesaurus. These relationships should be appropriately labeled, avoiding abbreviations in the case of end-user displays (see Figure A18). Windowing techniques may be employed effectively in term-detail screens.

7.3.5 Graphic Displays

Research has shown that graphic displays may communicate relationships among concepts more effectively than linear displays to some users. Graphic displays of thesauri should be considered, taking into account the domain and search habits of users. (Cf. section 6.2.4.)

7.4 Documentation

For publicly available databases, thorough descriptions of the thesaurus and its use should be available in the database documentation. The basic information sheets provided by database vendors should explain the structure of the thesaurus and the commands for searching it. Thesaurus software packages should provide clearly written, well-organized and indexed documentation for thesaurus maintainers, as well as for indexers and searchers where the thesaurus is part of a complete information retrieval package.

7.5 Relation of Thesaurus Character Set to Search Commands

Nonalphabetic characters used in a machine-readable thesaurus should not conflict with special characters used in search commands. For example, parentheses used in qualifiers should not be interpreted as nesting indicators in a search statement. If the potential for ambiguity exists, a different character should be substituted, e.g., square brackets may enclose qualifiers.

8. Thesaurus Construction

8.1 Avoidance of Duplicate Work

The compiler should ascertain, through reference to one of the clearinghouses listed in Appendix D, whether an existing thesaurus covers the same or an overlapping domain of knowledge. Complete duplication of subject coverage is rare, but access to one or more thesauri in related fields can frequently serve as a useful starting point. For example, a thesaurus developer in the field of malpractice law should begin by consulting existing thesauri in medicine and law, which will surely contain many of the terms and relationships required for the more specialized, interdisciplinary thesaurus.

8.2 Determination of Structure and Display Format

If possible, the form of the thesaurus (e.g., flat, generic structure, hierarchical display, or graphic display) should be decided before terms are collected and considered as candidates for inclusion. As demonstrated in section 6, the display format of the thesaurus affects the types of cross-references and relationship indicators that are provided. For example, if a tree structure with classification notation is adopted, the thesaurus may not include BT/NT references. The format should therefore be selected before relationships among terms are constructed. (Although it is possible to convert one thesaurus display format to another, one must begin with consistent coding of relationships in a single system.)

8.3 Methods

Three initial approaches to thesaurus construction are recommended.

8.3.1 The Committee Approach

Experts in the subject domain of the thesaurus draw up a list of the key terms in the field and indicate the relationships among them, with assistance from experts in thesaurus design.

8.3.2 The Empirical Approach

a) *The deductive method.* Terms are extracted from documents (by humans or computers; see section 8.4 for a discussion of machine assistance), optionally during a preliminary stage of indexing, but no attempt is made to control the vocabulary, nor to determine relationships between terms, until a sufficient number of terms has been collected. All terms are then reviewed by a

group of experts, preferably consisting of both information and subject specialists. They should first identify terms that represent the broadest classes, and then allocate remaining terms to these classes on the basis of their logical relationships, so that the hierarchies tend to be established on a broader-to-narrower basis. Vocabulary control should be applied at the stage where hierarchies are established, following the principles described in sections 3 and 4.

b) *The inductive method.* New terms are selected for potential inclusion in the thesaurus as they are encountered in documents. Vocabulary control is applied from the outset. Each term, as it is admitted, is designated as a member of one or more broader classes that are constructed on an ad hoc basis at an early stage. The thesaurus is therefore established on a narrower-to-broader term basis. Thesaurus construction is regarded from the outset as a continuous operation. Assistance from subject experts is strongly recommended; these experts may serve as members of a formal editorial board or committee.

8.3.3 Combination of Methods

In practice, more than one of these approaches is likely to be employed at one stage or another during the construction of a thesaurus. For example, hierarchies of terms that were first established inductively may later be examined from a deductive viewpoint. Both techniques are essentially empirical, and it should be accepted from the outset that some decisions regarding the terms and their interrelationships that were made during the early stages of compilation may have to be revised as further experience is gained.

The compilers should check terms and hierarchies frequently to ensure consistent application of principles in such procedures as the construction of inter-term relationships and the splitting of compound terms.

8.4 Machine Assistance

It is assumed throughout this standard that thesaurus construction calls for intellectual decisions. Machine assistance can be employed, however, for term identification tasks such as the following:

a) *Identification of candidate terms.* Candidate terms may be identified automatically from machine-readable text, e.g., titles and/or abstracts. The number of potential terms should be reduced by use of a stop list (a list of function words—articles, conjunctions, and prepositions such as ‘a,’ ‘and,’ and ‘for’—plus other words considered to be of

no value for retrieval). Remaining terms should be matched against those already recorded in the thesaurus. Unrecorded terms may be considered as candidates for inclusion.

- b) *Registering frequency of descriptor assignment.* In computerized indexing systems, the frequency with which a descriptor has been used in indexing can be registered automatically. Descriptors with exceptionally high or low scores can be considered as candidates for modification or deletion.
- c) *Recording terms in user queries.* Terms found in user queries that do not match one or more descriptors or entry terms may also be considered for inclusion, especially when a given term occurs in multiple queries. To ensure privacy, users should not be identified.

8.5 Term Records

An individual record should be created for every descriptor, and optionally for every entry term, as soon as it is admitted into a thesaurus. Records for entry terms may include source notes as well as the date of admission into the thesaurus. For descriptors, the record may contain any or all of the following elements:

- descriptor;
- source(s) consulted for descriptors and entry terms. This field is especially important for neologisms or unfamiliar terms; it may include citations to published sources or the names of personal authorities consulted;
- scope note;
- synonyms, i.e., Used For references;
- nondisplayable variations, e.g., common spelling errors (see section 10.2);
- broader terms;
- narrower terms;
- related terms;
- locally established relationships (see, for example, Figure A22);
- category or classification number;
- history note (generally coded HN), including minimally the date added, as well as the record of changes, if any (see section 9.3). If appropriate, the history note may include the date discontinued, the term that succeeded the descriptor, and/or the term that preceded it.

An example of a term record is in Figure A18.

Section 10.10 discusses field definition in thesaurus management systems.

8.6 Term Verification

Before a descriptor is admitted into a thesaurus, it should be validated according to the rules in section 3 concerning scope, form, and choice of descriptors. The compiler should also review relationships between each new descriptor and other descriptors in the hierarchy to which it is assigned. The following types of authority within the subject domain should be checked before candidate terms are accepted for inclusion:

- a) technical dictionaries, glossaries, scholarly monographs, reference texts, and encyclopedias;
- b) existing thesauri;
- c) classification schemes.

In problematic cases, expert advice should be sought on the selection of a descriptor from variant forms of terms.

8.6.1 Candidate Terms

Candidate terms are proposed descriptors that have not gone through all acceptance procedures. These terms should be marked by a special symbol or phrase in the term record. As soon as a candidate term is approved as a descriptor, the symbol or phrase should be deleted.

In an online system in which the thesaurus is linked to a single database, candidate terms are generally not displayed to users; in thesauri that are not linked in this way, candidate terms may be displayed.

8.6.2 Provisional Terms

Where no published authority exists, descriptors for new concepts may be labeled provisional. Provisional terms are checked periodically to determine whether there is literary warrant for establishing them as descriptors. When provisional terms are upgraded to descriptors, the label "provisional" is removed.

8.7 Level of Specificity

The addition of highly specific descriptors is usually restricted to the core area of the subject field covered by a thesaurus, because the proliferation of such descriptors in fringe areas is likely to lead to a thesaurus that is difficult to manage (see section 5.2.4.1). Although the cost of computer storage of a very large thesaurus may be insignificant, the human cost of establishing relationships among numerous descriptors at the periphery of the domain is high.

In an organization that deals with documents covering more than one domain of knowledge, it may be necessary to develop a number of specialized thesauri, each linked to, and compatible with,

a general thesaurus that has a lower level of specificity, produced by the same organization. A model for this may be found in the *Macrothesaurus* of the United Nations. (See also section 10.12.2.)

8.8 Unassigned Descriptors

When hierarchies are being established in a thesaurus, descriptors that have not yet been used in indexing are frequently admitted into the thesaurus on the grounds that they are necessary to complete a hierarchy (for example, as broader terms), and that they have potential value as indexing terms in their own right, where the thesaurus is linked to a particular database. These descriptors should be marked by a special symbol in the hierarchical display and in the term record, or by a phrase such as “not yet used.” (The phrase would not be necessary in cases where all thesaurus displays and term records indicate the number of postings.) As soon as the descriptor is used in indexing, the symbol or phrase should be deleted.

8.9 Announcement and Deposit of Published Thesauri

8.9.1 Notification of Intent

When an organization has decided to compile and publish a new thesaurus, it should submit a notice of intent to an appropriate professional journal, to minimize the possibility of two organizations simultaneously developing thesauri in the same domain.

8.9.2 Pilot Thesaurus

A new thesaurus should be tested by means of a series of trial runs prior to publication in printed or electronic form. A pilot version should be distributed to a select group of users, and suggestions for changes of terms and their relationships should be considered by the editors. The review of established thesauri is treated in section 9.1.

8.9.3 Deposit with a Clearinghouse

A copy of the first and any subsequent edition of a printed thesaurus or a printout of a thesaurus maintained only in electronic form should be deposited with the appropriate clearinghouse (see Appendix D).

9. Thesaurus Maintenance

This section suggests procedures for adding, modifying, and deleting terms. The term record should note the date of each change and identify the individual responsible for it.

9.1 Updating the Vocabulary

Thesauri are reflections of language, and they are therefore dynamic instruments. Policies and procedures should be established for periodic review of terminology, establishment of new descriptors, and replacement of obsolete descriptors, especially in fields where the terminology changes rapidly. Thesaurus editors should update the thesaurus at intervals that will be determined by the frequency and volume of changes made, and by the method of distribution. Printed revisions will necessarily be produced less frequently than revisions to a computerized system, in which updates can be accessible more quickly than is possible with print — instantaneously in some systems.

9.1.1 Addition of Descriptors

Whenever an appropriate descriptor or combination of descriptors cannot be found in a thesaurus, the indexer or searcher should nominate a new descriptor as a candidate term (see section 8.6.1). The nomination, including an adequate definition of the term, may be submitted electronically, possibly via an on-screen form, or by means of a printed form. A sample form is in Figure A19. New terms and those nominated for reconsideration should be reviewed by the editor of the thesaurus, and preferably by an editorial board that functions in the same manner as the group responsible for the original edition. The following decisions should be made for each term:

- a) Should this term be added to the thesaurus, or is it already covered by an existing descriptor or combination of descriptors? If it is covered, should an additional USE reference be added?
- b) Are scope notes or other notes needed? (See section 3.2.2.)
- c) If the term is to be added, what is the correct form, considering syntax, number, and spelling? (See section 3.)
- d) How should the new term be interrelated with existing descriptors on a hierarchical and related-term basis? (See section 5.)

9.1.2 Modification of Existing Descriptors

Indexers and searchers should also be able to propose modifications to existing descriptors or their relationships, explaining the rationale and supplying supporting documentation for the proposed changes. Like candidate term nominations, such proposals may be communicated electronically or via printed forms. (Figure A19, Thesaurus Term Review Form, accommodates both candidate terms and modifications to existing descriptors.)

Such proposed changes should be considered by the thesaurus editor and board, using the criteria for descriptor selection in sections 3 and 4. If a descriptor is modified, the date of the change should be recorded in the history note (see section 8.5), and a USE reference should be made from the old form to the new form.

If the thesaurus is used in an indexing system, the date on which an old descriptor was last assigned should be included in the history note. If the relationships are modified, a record of the old ones should be maintained in the history note as well.

9.1.3 Deletion of Terms

Overused descriptors and descriptors that have been assigned very infrequently in indexing should be considered candidates for modification or deletion, as both kinds of term are generally ineffective in retrieval. In some cases, an overused descriptor can be replaced by two or more descriptors of greater specificity, or these can be added to it as narrower terms.

9.2 Vocabulary Updates and Database Records

Whenever a descriptor is modified or deleted from a thesaurus, the impact of the change on the ability to search previously indexed database records must be considered, unless the modified or deleted descriptor has never been assigned. The problem of searching modified or deleted descriptors can be handled in several ways. The choice of method depends upon the size of the database, available human and financial resources, the nature and number of changes to be made, and whether automated procedures exist.

- a) A deleted or modified descriptor may be retained in the thesaurus for retrieval purposes only. It should be marked, e.g., "for retrieval purposes only," and the date of its change in status should be recorded in the history note and displayed to users. If it is superseded by a newer descriptor, a cross-reference to the new descriptor should be provided. The superseded descriptor should also be listed in the history note of the newer descriptor, with the dates for which the former is valid.
- b) One-for-one descriptor changes, where one term simply replaces another, can be implemented in the database automatically if resources permit. In very large systems, the cost of such file maintenance may be prohibitive. The history note in the term record then serves as a guide for retrospective searching.

- c) More complicated term changes require human intervention, e.g., where two or more specific descriptors are added to replace a more general term or become narrower terms to it.

Deleting a descriptor in the database without replacing it with another descriptor may, over time, seriously reduce access to documents if no replacement indexing is carried out. If it is discovered, however, that a descriptor has been established and assigned in error, once the descriptor has been deleted from database records, its record may be deleted from the thesaurus as well.

9.3 History of Changes

Each descriptor requires a history note recording its date of entry (see section 8.5). The note should also track the history of modifications (see section 9.1.2), recording previous forms with reasons for the change. Where obsolete descriptors are retained in the thesaurus but are not assigned in indexing, the date of replacement and reasons for it should be given. Where terms are deleted completely, it may be desirable to maintain a separate file of deleted descriptors, retaining a record of their scope and history in order to track such decisions in case a term from this group is later reconsidered.

Examples of history notes of various types and with varying degrees of detail are found in the figures in Appendix A:

- Figure A1: The Code DA notes date of entry into the thesaurus.
- Figure A4: The entry:
Action Programs (Community) (1966 1980)
USE COMMUNITY ACTION
indicates the dates for which the former descriptor was valid.
- Figure A5 illustrates the opposite pattern in the last entry:
FEDERAL REGION III
(Prior to June 1982 this concept was indexed to CENTRAL REGION.)
- Figure A14 documents a change in an entry term:
FERTILIZATION IN VITRO
Apr 79; TEST-TUBE FERTILIZATION
was TEST TUBE BABIES
see FERTILIZATION IN VITRO Apr-Dec 1979
X TEST-TUBE FERTILIZATION
- Figure A14 also provides an example of the record of a change in status of a descriptor:
FERULA
was see under PLANTS, TOXIC 1986-90
This history note means that, for the years

indicated, the descriptor was not authorized for use in the printed index, only in the online database. The *see under* reference led the indexer or searcher to a broader descriptor that was authorized for use in the print index.

10. Thesaurus Management Systems

Because thesauri are generally used in the context of information storage and retrieval systems, the design or choice of a thesaurus management system is necessarily dependent on and should be an integral part of the overall design of the information system of which it is a component.

Maintainers of thesauri should have access to systems that can deal with the special needs of a thesaurus. It should not be necessary to adapt the thesaurus to an inadequate system. The system should be flexible enough to allow thesaurus managers to take advantage of emerging technologies.

The following are general recommendations for features of thesaurus management software to be used by thesaurus maintainers. See also the recommendations in section 7 regarding screen display for users.

10.1 Typography and Sorting

The system should allow printing or screen display in both capitals and lowercase letters, and it should be able to handle any special characters required by the subject field or language of the thesaurus. (See section 3.7, Capitalization, Punctuation, and Nonalphabetic Characters.) The sort sequence should treat the capital and lowercase versions of a letter as equivalent and should comply with the filing guidelines presented for printed thesauri in section 6.3.5.

10.2 Term Records and Display Format

At minimum, term records (see section 8.5) should contain the data and specify the relationships recommended in this standard; but an individual thesaurus may require additional data, such as term weights for retrieval, special relationships, or codes from standards such as the USMARC Authority Format. The system should be capable of handling hierarchical thesaurus displays, where required.

The system should also be able to distinguish between the nonpreferred terms (USE references) that should be displayed to thesaurus users and those that should not be displayed (e.g., close spelling variations and common typographical errors entered to enhance computerized retrieval).

10.3 System Constraints

There should be no limits on the number of characters in a term, the number of levels in a hierarchy, or the number of relationships (broader, narrower, associative, or equivalence) that can be established for a given descriptor.

10.4 Searching

Thesaurus maintainers, indexers, and intermediaries should be able to search for and retrieve complete or truncated terms, including nonpreferred terms. System sensitivity to capitals and lowercase letters may lead to retrieval failure; a search term in capitals should therefore match a lowercase descriptor or entry term and vice versa.

Browsing displays should be available and should include hierarchical, alphabetical, and (optionally) KWIC or KWOC displays. (The need for the last type of display may be obviated by a text-word search capability.) From any of these displays, it should be possible to view a term in the context of its relationships as well as a complete term record.

Another desirable feature, particularly in large systems, is to allow for retrieval of descriptors and entry terms on the basis of quantitative characteristics, such as the number of characters or words in a term. Such data are useful for the determination of requirements for field length in term records, for the calculation of system capacity, as well as for projections of growth of the thesaurus.

10.5 Editing

Maintainers should be able to create and edit terms and to navigate editing screens easily using templates or prompts. When new relationships are being entered, or old ones deleted, the existing relationships should be visible on the screen. It should be possible to edit a descriptor's position in a hierarchy, and to simultaneously display multiple hierarchies for a descriptor where these exist.

Editing capabilities should include standard word processing features, i.e., the ability to add, modify, and delete characters, words, and lines without rekeying an entire field, and to navigate easily backward and forward between fields and relationship types.

A sample menu from a thesaurus management system is shown in Figure A20.

10.6 Error Checking

The system must be able to detect duplicate terms, whether entry terms or descriptors. Duplicates detected by the system should be

displayed to the thesaurus editor, who will judge whether they are true duplicates or homographs requiring qualification. The system must be able to identify duplicates with typographic variations (capitals and lowercase letters) for qualification, e.g., **mercury** (metal) and **Mercury** (planet). It should be able to check for inappropriate coding and content, as well as errors in term relationships and inconsistencies in the modification or deletion of terms, as described in the following sections.

10.7 Cross-References

When cross-reference links are created between terms, the system should:

a) check for the existence of a term chosen as a broader, narrower, related, or USE term, and check for the validity of references, so that:

- no cross-references are made to nonexistent terms;
- the only type of reference that leads from a nonpreferred to a preferred term is a USE reference. Nonpreferred terms have no BT, NT, or RT references;
- a term is not related to itself;
- no conflicting references are made for the same descriptor pairs (e.g., both a BT/NT and RT/RT reference);
- duplicate cross-references are eliminated.

b) create reciprocal references for BT/NT (or BTG/NTG and BTP/NTP), RT/RT, and USE/UF pairs. If the reciprocal descriptor for a BT, NT, or RT reference does not exist, the system should inquire whether a new descriptor should be created, but should not create it automatically. However, if the reciprocal term of a UF reference does not exist, the system may create that term. See section 5.1.2 for logical formulations of the relationships.

Examples:

editor creates	passenger cars
	UF cars
system creates	cars
	USE passenger cars
editor creates	motor vehicles
	NT passenger cars
system creates	passenger cars
	BT motor vehicles

c) maintain these references reciprocally, so that when a term is modified or deleted, the references to it are changed accordingly in the records for all the terms related to it. For example, if the

editor changes **passenger cars** to **automobiles** in the above example, the system should make the same change throughout the thesaurus, e.g., **motor vehicles** NT **automobiles**.

d) When a thesaurus is integrated with a hypermedia system, the appropriate standards for checking and maintaining hypermedia links apply.

10.8 Term Deletion

When a term is deleted, the system should first display the term and then prompt for verification of the deletion. The system must make deletions reciprocally so that all links to and from deleted terms are deleted with the term (see Figure A21). The system should inform the thesaurus editor when the deletion creates an orphan term (a descriptor without associative or hierarchical relationships).

10.9 Candidate Terms

The system should include a mechanism for the entry of candidate terms, designated as such, and candidate relationships, which are not admitted to the thesaurus until reviewed and approved by thesaurus editors. It should be possible to retrieve, display, and print out these candidate terms and relationships. Candidate relationships should be reciprocated automatically. Whoever enters the proposed term should be able to record its source and to enter suggested relationships and a proposed scope note, because that person may be looking at relevant explanatory material at the time of entry. The structure of candidate term records should be the same as that of descriptor records (see section 8.5), because the former may be upgraded to the latter.

It is also useful for the system to be able to capture terms used by database searchers, as these may be useful entry terms for the thesaurus. The system may also provide a mechanism for searchers to propose candidate terms directly.

A merge or transfer function that allows for the comparison and merger of two similar terms can be useful in choosing among candidate terms entered by different indexers, or where revisions of a thesaurus are necessary in a quickly changing environment. The preferred term receives the relationships and notes from the nonpreferred term, and the nonpreferred term becomes a USE reference.

10.10 Field Definition

The system should provide for the definition of fields other than those enumerated for term records

(section 8.5), for purposes such as assigning codes from other systems to descriptors, e.g., Standard Industrial Classification (SIC) codes to the names of industries; or providing term definitions as well as scope notes. (Scope notes often differentiate between two descriptors for indexing purposes; definitions give the dictionary meaning.)

It may also be useful to be able to define and name specialized relationship types which are more specific than USE/UF, and BT/NT or RT/RT, e.g., designating abbreviations, or expressing the exact nature of various types of narrower terms, such as the subsidiary of a company. See section 5 for a discussion of term relationships, and Figure A22 for an example of a screen display featuring specialized codes.

10.11 Reports

It should be possible to obtain printouts and screen displays in whatever format the user requirements for an individual thesaurus dictate. (See section 6 on print displays and section 7 on screen displays.) In addition to reports designed for both users and maintainers, thesaurus managers need specific “housekeeping” reports. These reports may be displayed on a screen or printed, but in either case, they should be clear and legible and should use space and paper as economically as possible. Section 6 discusses the space implications of various printed thesaurus display formats. Screen displays should follow the guidelines in section 7. Thesaurus reports may include, but are not limited to, the following:

- a) term listings, including:
 - terms added or modified since a certain date;
 - descriptors that do or do not have a particular type of note or relationship (SN, UF, BT, NT, or RT);
 - orphan terms, with no hierarchical or associative relationships;
 - top terms;
- b) displays of term relationships, including:
 - all the relationships for an individual term;
 - hierarchical displays;

- listings at various levels of a hierarchy;
 - reports of special links created for a given thesaurus;
 - the entire hierarchical context for an individual term;
- c) statistical reports on terms and their characteristics, including:
 - the number of descriptors and of all terms in the thesaurus;
 - the number of terms featuring a certain characteristic, for example, those that consist of three words or those that end in a certain string of characters, e.g., *itis*;
 - the number of terms added, modified, deleted, or merged since a certain date;
 - the number of BTs, NTs, UFs, RTs, SNs, or other value in the thesaurus;
 - the average number of characters per term and the size of the longest term;
 - postings reports for thesauri linked to databases.

10.12 Subsets

10.12.1 Copying Function

It is useful to be able to copy a subset of terms from one thesaurus to another where more than one thesaurus is being maintained on a system.

10.12.2 Microthesauri

Omnibus indexing services (organizations that produce multiple specialized indexes through a single indexing operation) or documentation centers may maintain a thesaurus of broad scope, subsets of which, known as microthesauri, are used in specific indexing products. When such subsets are extracted, only relationships to descriptors in the microthesaurus should be included. A microthesaurus must be able to stand alone.

Microthesauri may contain additional highly specific descriptors required for their application, but such descriptors should map to the hierarchical structure of the broad thesaurus.

References

This list includes sources cited in the text as well as in the Glossary, which follows. References to older thesaurus standards that are not cited in the text are found at the end of the Foreword. A bibliography of manuals of thesaurus construction is in Appendix E.

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Glossary of Terms

The following definitions are derived from several related standards and specialized dictionaries, but all have been modified for the purposes of this standard. References to other standards appear in brackets. Underlined terms within definitions are defined elsewhere in this glossary.

assignment indexing. An indexing method by which descriptors or subject headings from a controlled vocabulary are selected by a human or computer to represent the concepts or items in a document. The terms may or may not occur in the document. Cf. **derivative indexing**.

authority file. A set of records of established headings and the cross-references to be made to and from each heading, often citing the authority for the preferred form or variants. Types of authority files include name authority files, subject authority files, and thesauri.

autoposting. See **up-posting**.

bound term. A descriptor consisting of a compound term. (The term was originated by Mortimer Taube in his *Studies in Coordinate Indexing*, vol. 1, 1953, p. 43.)

broader term. A descriptor to which another descriptor or multiple descriptors are subordinate in a hierarchy. The relationship indicator for this type of term is BT.

candidate term. A term considered for admission into a thesaurus because of its potential usefulness as a descriptor. Cf. **provisional term**.

category. A grouping of descriptors that are semantically or statistically associated, but which do not constitute a strict hierarchy based on genus-species or part-whole relationships.

classified display. See **tree structure**.

compound term. A term consisting of more than one word. A compound term may be selected as a descriptor.

concept. A unit of thought, formed by mentally combining some or all of the characteristics of a concrete or abstract, real or imaginary object. Concepts exist in the mind as abstract entities independent of terms used to express them.

controlled vocabulary. A subset of the lexicon of a natural language. A list of preferred and nonpreferred terms produced by the process of vocabulary control. Types of controlled vocabulary include subject heading lists and thesauri.

cross-reference. A direction from one term to another. Cross-references are of three types: (a) *equivalence relationship*, beginning with the word *see* or USE, which leads to one or more descriptors that are to be used instead of the term from which the cross-reference is made; (b) *associative relationship*,

beginning with the words *see also*, or related term (RT), which leads from one descriptor to other descriptors that are related to or associated with it in the context of a thesaurus; (c) *hierarchical*, beginning with the words broader term (BT), or narrower term (NT), which represent generic and specific relationships, respectively. (It is possible to display hierarchical relationships without the use of cross-references.)

derivative indexing. An indexing method by which words occurring in the title or text of a document are extracted by a human or computer to serve as indexing terms.

descriptor. A type of heading that is a term chosen as the preferred expression of a concept in a thesaurus.

difference. In a compound term, one or more components that serve to narrow the extension of a focus and specify one of its subclasses. Also known as 'modifier.'

document. Any item, printed or otherwise, that is amenable to cataloging and indexing. The term applies not only to written and printed materials in paper or microform versions (e.g., books, journals, maps, diagrams), but also to nonprint media (e.g., machine-readable records, transparencies, audiotapes, videotapes) and, by extension, to three-dimensional objects or realia (e.g., museum objects and specimens).

entry term. The nonpreferred term in a cross-reference that leads to a descriptor in a thesaurus. Also known as 'lead-in term.' The relationship indicator for this type of term is USE; its reciprocal is UF (used for).

entry vocabulary. The set of nonpreferred terms (USE references) which lead to descriptors in a thesaurus. (This term is used by some thesaurus designers to represent the preferred as well as the nonpreferred terms in a thesaurus.)

eponym. A term incorporating the name of a real or mythical person, generally the discoverer of a phenomenon or inventor of an object, e.g., Herculean labor, Parkinson's disease, pasteurization.

facet indicator. See **node label**.

false drop. An irrelevant reference retrieved when natural language terms or descriptors are postcoordinated.

flat format. An alphabetical display format of thesauri in which only one level of broader terms and one level of narrower terms are shown for each descriptor.

focus. In a compound term, the noun component that identifies the class of concepts to which the term as a whole refers. *See also* **difference**.

free text. Antonym of controlled vocabulary. Natural language terms appearing in documents, which may complement descriptors in an information storage and retrieval system. In free text searching, descriptors may also be retrieved. Cf. **keyword**.

generic posting. (1) In thesauri, the treatment of narrower terms as quasi-synonyms, e.g., **furniture** UF beds; UF sofas. (2) In indexing and subject cataloging, the assignment of a broader term instead of a specific term, e.g., **furniture** to a document on sofas. Cf. **up-posting**.

generic structure. A thesaurus format that indicates all hierarchical levels of descriptors within an alphabetic display by means of codes, indention, and/or punctuation marks.

gloss. *See* **qualifier**.

heading. A preferred name or term. Types of heading include proper name headings (which may be called identifiers), subject headings, and descriptors. A heading may include a qualifier.

hierarchy. Generic (broader)-specific (narrower) or whole-part relationships, which are generally indicated in a thesaurus through codes or indention. *See also* **broader term**; **narrower term**.

history note. A note in a term record in a thesaurus that provides the date of entry of a descriptor as well as the history of modifications to its scope, relationships, etc.

homograph. One of two or more words that have the same spelling, but different meanings and origins. In thesauri, homographs are generally distinguished by qualifiers.

identifier. (1) A proper name (or its abbreviation or acronym) of an institution, person, place, object, or process, optionally treated as a category of heading distinct from descriptor. Identifiers may be held in a separate file (cf. authority file), and their form may be controlled (e.g., the name of an international organization having different names in various languages, only one of which is selected). (2) In some systems, a provisional term that may be upgraded to descriptor status, or a highly specific term that is not eligible for descriptor status, but which is considered useful for retrieval and is assigned to one or more documents without vocabulary control.

indexing. An operation intended to represent the results of the content analysis of a document by means of a controlled indexing language or by natural language. [ISO 5127/1]

indexing language. A controlled vocabulary or classification system and the rules for its application. An indexing language is used for the representation of concepts dealt with in documents and for the retrieval of such documents from an information storage and retrieval system. [ISO 5127/1]

indexing term. The representation of a concept in an indexing language, generally in the form of a noun or noun phrase. Descriptors, subject headings, and heading-subheading combinations are examples of indexing terms.

information storage and retrieval system. A set of operations and the associated equipment, software, and documentation by which documents are indexed and the records are stored, so that selected records can be retrieved in response to requests employing commands that can be handled by the system.

keyword. A word occurring in the natural language of a document that is considered significant for indexing and retrieval. Cf. **free text**.

KWIC (Key Word In Context) index. A type of index, arranged alphabetically, in which each significant word in a string of text serves as an access point, by being graphically emphasized and surrounded by the rest of the string. The keyword is generally in a centered column and is followed on the right by the continuation of the string, which provides the context. The balance of the string, if any, is positioned to the left of the keyword. A KWIC index of descriptors and entry vocabulary may serve as an auxiliary alphabetic display in a thesaurus.

KWOC (Key Word Out Of Context) index. A type of index, arranged alphabetically, in which each significant word in a string of text serves as an access point, usually positioned in the left-hand column of a page, followed by the complete string. The keyword may therefore not be in the immediate context of the words that surround it. A KWOC index of descriptors and entry vocabulary may serve as an auxiliary alphabetic display in a thesaurus.

lead-in term. *See* **entry term**.

lexeme. A lexical unit in a language; a vocabulary item, which is not necessarily limited to a single word.

literary warrant. Justification for the representation of a concept in an indexing language or for the selection of a preferred term because of its frequent

occurrence in the literature. Cf. **user warrant**.

microthesaurus. A subset of a thesaurus, covering a limited range of topics within the domain of the thesaurus. A microthesaurus may contain highly specialized descriptors that are not in the broad thesaurus. Such descriptors should map to the hierarchical structure of the broad thesaurus. A microthesaurus is internally consistent with respect to relationships among terms.

modifier. See **difference**.

narrower term. A descriptor that is subordinate to another descriptor or to multiple descriptors in a hierarchy. The relationship indicator for this type of term is NT.

natural language. A language used by human beings for verbal communication. Words extracted from natural language texts for indexing purposes without vocabulary control are often called key-words.

near-synonym. See **quasi-synonym**.

node label. A “dummy” term, often a phrase, that is not assigned to documents when indexing, but which is inserted into the hierarchical section of some thesauri to indicate the logical basis on which a class has been divided; also known as a ‘facet indicator’ [ISO 2788]. Node labels may also be used to group categories of related terms in the alphabetic section of a thesaurus.

nonpreferred term. One of two or more synonyms or lexical variants that serves as an entry term.

orphan term. A descriptor that has no associative or hierarchical relationship to any other descriptor in a thesaurus.

polyseme. A word with multiple meanings. In spoken language, polysemes are called homonyms; in written language they are called homographs. Only the latter are relevant to thesauri designed for textual information.

postcoordination. The combining of descriptors at the searching stage rather than at the subject heading list construction stage or indexing stage.

postings. The number of documents to which a descriptor is assigned.

precoordination. The formulation of a multiword subject heading or the linking of a heading with a subheading at the subject heading list construction stage or at the indexing stage to express a compound concept, e.g., **cataloging of serials**, **cataloging—serials**, or **serials cataloging**. Precoordination differs from the establishment of compound terms as descriptors.

preferred term. One of two or more synonyms or lexical variants selected as a descriptor.

provisional term. A descriptor with temporary status in a thesaurus; it often represents a new concept in a field in which the terminology has not yet been standardized. Cf. **candidate term**; **identifier** (definition 2).

qualifier. A defining term, also known as ‘gloss,’ used in a controlled vocabulary to distinguish homographs. A qualifier is considered part of a descriptor, subject heading, or entry term, but is separated from it by punctuation (the qualifier is generally enclosed in parentheses).

quasi-synonym. A term whose meaning is not exactly synonymous with that of another term, yet which may nevertheless be treated as its equivalent in a thesaurus.

related term. A descriptor that is associatively but not hierarchically linked to another descriptor in a thesaurus. The relationship indicator for this type of descriptor is RT.

relationship indicator. A word, phrase, abbreviation, or symbol identifying a semantic relationship between terms. Examples of relationship indicators are USE, UF (used for), and RT (related term).

romanization. The conversion of a non-roman script by means of transcription or transliteration or a combination of the two methods.

scope note. A note following a descriptor explaining its coverage, specialized usage, or rules for assigning it.

sibling. A descriptor that shares the same broader term (one level higher) as other descriptors.

stop list. A list of words considered to be of no value for retrieval. It consists primarily of function words—articles, conjunctions, and prepositions—but may also include words that occur very frequently in the literature of a domain.

subheading. A term appended to a heading in order to modify or delimit the heading by indicating a particular aspect or relationship pertaining to it. A term with a subheading may be subject to further modification. Cf. **precoordination**.

subject heading. A word or phrase, or any combination of words, phrases, and modifiers used to indicate the overall content of a document or part of a document. Precoordination of terms for multiple and related concepts is a characteristic of subject headings that distinguishes them from thesaurus descriptors.

subject heading list. An alphabetical list of subject headings with cross-references from nonpreferred terms and links to related terms. These lists often include separate sequences of

standardized subheadings that may be combined with all or only some subject headings. Rules for applying subheadings usually accompany such lists.

synonym. A word or term having exactly or very nearly the same meaning as another word or term. [Cf. ISO 5127/6]

systematic display. *See* **tree structure**.

term. One or more words designating a concept. *See also* **compound term; descriptor; entry term**.

term record. A set of fields of information about a descriptor in a thesaurus, including the history of the descriptor, its relationships to other terms, and, optionally, authorities for the descriptor.

thesaurus (pl. thesauri, also thesauruses). A controlled vocabulary arranged in a known order in which equivalence, homographic, hierarchical, and associative relationships among terms are clearly displayed and identified by standardized relationship indicators, which must be employed reciprocally. Its purposes are to promote consistency in the indexing of documents, predominantly for postcoordinated information storage and retrieval systems, and to facilitate searching by linking entry terms with descriptors. Thesauri may also facilitate the retrieval of documents in free text searching.

Note: The term “thesaurus” is the Latin form of the Greek word *thesauros*, originally meaning “treasure store.” In the 16th century, it began to be used as a synonym for “dictionary” (a treasure store of words), but later it fell into disuse. Peter Mark Roget resurrected the term in 1852 for the title of his dictionary of synonyms. The purpose of that work is to give the user a choice among similar terms when the one first thought of does not quite seem to fit.

A hundred years later, in the early 1950s, the word “thesaurus” began to be employed again as the name for a word list, but one with the exactly opposite aim: to prescribe the use of only one term

(a “descriptor”) for a concept that may have synonyms. A similarity between *Roget’s Thesaurus* and thesauri for indexing and information retrieval is that both list terms that are related hierarchically or associatively to descriptors, in addition to synonyms.

top term. The broadest descriptor in a thesaurus hierarchy, sometimes indicated by the abbreviation TT.

transcription. The process of recording the phonological and/or morphological elements of a language in terms of a specific writing system.

transliteration. The process of recording the graphic symbols of one writing system in terms of the corresponding graphic symbols of another writing system.

tree structure. A thesaurus display format in which the complete hierarchy of descriptors is shown. Each descriptor is assigned a tree number or line number which leads from the alphabetical display to the hierarchical one; the latter is sometimes called ‘systematic display’ or ‘classified display.’

up-posting. The automatic assignment of broader terms in addition to the specific descriptor by which a document is indexed. Also known as ‘autoposting.’ Cf. **generic posting**.

user warrant. Justification for the representation of a concept in an indexing language or for the selection of a preferred term because of frequent requests for information on the concept or free-text searches on the term by users of an information storage and retrieval system.

vocabulary control. The process of organizing a list of terms (a) to indicate which of two or more synonymous terms is authorized for use; (b) to distinguish between homographs; and (c) to indicate hierarchical and associative relationships among terms in the context of a thesaurus or subject heading list. *See also* **controlled vocabulary**.

Appendix A

(This Appendix is not a part of the American National Standard Guidelines for the Construction, Format, and Management of Monolingual Thesauri, ANSI/NISO Z39.19-2003. It is included for information only.)

Supplementary Figures

The following samples of thesaurus displays and forms are included to illustrate specific points made in the standard, primarily in sections 6 and 7 (print and screen display). Because certain illustrations may not comply with all recommendations of the standard, they have been placed in an Appendix rather than embedded in the text.

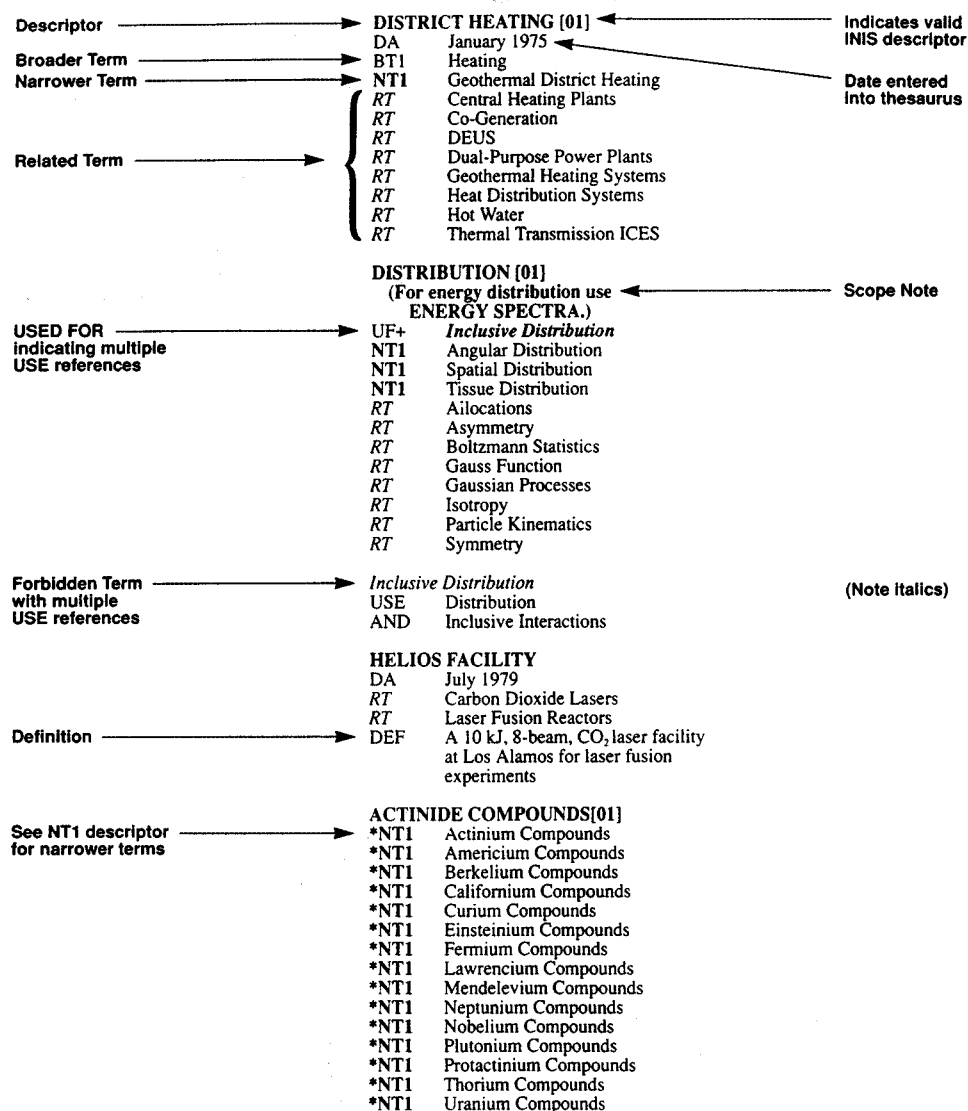


Figure A1. The Relationship Indicators USE AND and USED FOR+. These are applied, respectively, to refer from compound terms to two descriptors that represent them, and to record the reciprocal of the cross-reference under each of the descriptors. These codes are discussed in section 5.2.5.

Source: *International Energy Subject Thesaurus*. 1990.

	DWELLINGS	Use HOUSING
	DYADIC COMMUNICATION	Use INTERPERSONAL COMMUNICATION
GROUP	DYNAMICS	
MINIMAL BRAIN	DYSFUNCTION	
	DYSLEXIA	
	DYSPHONIA	Use VOICE DISORDERS
	DYSTHYMIA	Use DEPRESSION (PSYCHOLOGY)
	DYULA	
R D AND	E	Use RESEARCH AND DEVELOPMENT
	EARLY ADMISSION	
	EARLY CHILDHOOD (1966 1980)	Use YOUNG CHILDREN
	EARLY CHILDHOOD EDUCATION	
	EARLY DETECTION	Use IDENTIFICATION
	EARLY EXPERIENCE	
	EARLY INTERVENTION	
	EARLY PARENTHOOD	
	EARLY READING	
	EARLY RETIREMENT	
	EARLY SCHOOL LEAVERS	Use DROPOUTS
DUAL	EARNER PARENTS	Use EMPLOYED PARENTS
	EARS	
	EARTH SCIENCE	
	EARTHQUAKES	
	EASTERN CIVILIZATION	Use NON WESTERN CIVILIZATION
MIDDLE	EASTERN HISTORY	
NEAR	EASTERN HISTORY	Use MIDDLE EASTERN HISTORY
MIDDLE	EASTERN STUDIES	
	EATING HABITS	
	EBONICS	Use BLACK DIALECTS
	ECHOLALIA	
	ECHOLOCATION	
	ECHOPHASIA	Use ECHOLALIA
	ECOLOGICAL FACTORS	
	ECOLOGY	
	ECONOMIC ANALYSIS	Use ECONOMIC RESEARCH
	ECONOMIC CHANGE	
	ECONOMIC CLIMATE	
	ECONOMIC CYCLES	Use BUSINESS CYCLES
	ECONOMIC DEVELOPMENT	
	ECONOMIC DISADVANTAGEMENT (1966 1980)	Use POVERTY
	ECONOMIC EDUCATION (1971 1980)	Use ECONOMICS EDUCATION
	ECONOMIC EFFECTS	Use ECONOMIC IMPACT
	ECONOMIC FACTORS	
	ECONOMIC FLUCTUATIONS	Use BUSINESS CYCLES
	ECONOMIC GEOGRAPHY	Use HUMAN GEOGRAPHY
	ECONOMIC IMPACT	
	ECONOMIC INFLUENCES	Use ECONOMIC FACTORS
	ECONOMIC INSECURITY	Use POVERTY
	ECONOMIC OPPORTUNITIES	
	ECONOMIC PLIGHT	Use POVERTY
	ECONOMIC PROGRESS	
	ECONOMIC RESEARCH	
	ECONOMIC STATUS	
	ECONOMIC SUPPORT	Use FINANCIAL SUPPORT
	ECONOMICALLY ADVANCED NATIONS	Use DEVELOPED NATIONS
	ECONOMICALLY ADVANTAGED	Use ADVANTAGED
	ECONOMICALLY DEPRESSED AREAS	Use POVERTY AREAS
	ECONOMICALLY DEPRIVED	Use ECONOMICALLY DISADVANTAGED
	ECONOMICALLY DISADVANTAGED	
	ECONOMICS	
CONSUMER	ECONOMICS	
	ECONOMICS CURRICULUM	Use ECONOMICS EDUCATION
DISTRIBUTION	(ECONOMICS)	Use MARKETING
	ECONOMICS EDUCATION	
HOME	ECONOMICS EDUCATION	
EDUCATIONAL	ECONOMICS	
FAMILY	ECONOMICS	Use CONSUMER ECONOMICS
HOME	ECONOMICS	
INFLATION	(ECONOMICS)	
	ECONOMICS INSTRUCTION	Use ECONOMICS EDUCATION
LABOR	ECONOMICS	
OCCUPATIONAL HOME	ECONOMICS	
	ECONOMICS OF EDUCATION	Use EDUCATIONAL ECONOMICS
RURAL	ECONOMICS	
HOME	ECONOMICS SKILLS	
HOME	ECONOMICS TEACHERS	
	ECONOMY	Use ECONOMICS
LAISSEZ FAIRE	ECONOMY	Use FREE ENTERPRISE SYSTEM
MARKET	ECONOMY	Use FREE ENTERPRISE SYSTEM
TOKEN	ECONOMY	

Figure A2. KWIC (Keyword in Context) Index to a Thesaurus. Every word in descriptors and entry terms is an access point. This display is discussed in section 6.1.1.

Source: *Thesaurus of ERIC Descriptors*, 12th ed., 1990, edited by James E. Houston, with permission from The Oryx Press, 4041 N. Central at Indian School Rd., Phoenix AZ 85012, 602-265-2651.

PERMUTED INDEX

Bomb

- Bionics**
Biophysics
Biopsy
Biosensors
Biosphere
 Earth biosphere
Biostatistics
Biosynthesis
Biotelemetry
Biotin
Biotite
Biphenyl
Bipolar
 • Bipolar transistors
Biopollutants
Biquadratic
 • Biquadratic equations
Birch
 Birch trees
 Birch wood
Bird
 Bird diseases
 Bird lice
 • Bird navigation
 MAD towed bird system
Birds
 Game birds
 • Wild birds
Birefringence
 • Flow birefringence
Birth
 Birth and death processes
 Birth control
 Birth injuries
Bisazo
 • Bisazo compounds
Bishydroxycoumarin
Bismuth
 Bismuth alloys
 • Bismuth chlorides
 Bismuth halides
 Bismuth inorganic compounds
 Bismuth isotopes
 Bismuth organic compounds
 Bismuth oxides
 • Bismuth oxychlorides
 Bismuth tellurides
Blatant
 • Blatant multivibrators
Blatatic
 Blatatic radar
Blauflide
 • Carbon bisulfide
Blit
 • Bit capacity
Blite
 • Rat bite fever
Bites
 Animal bites
 Bites and stings
 Insect bites
Bits
 • Bits (digits)
 • Bits (tools)
 Cable tool bits
 • Core bits
 Coring bits
 Diamond bits
 Drag bits
 Drill bits
 • Fishtail bits
 Percussion drill bits
 Roller bits
 Rotary drill bits
Bitumens
 Natural bitumens
Bituminous
 Bituminous bonded refractories
 Bituminous cements
 Bituminous coal
 Bituminous coatings
 • Bituminous concrete pavements
 Bituminous concretes
 • Bituminous materials
 Bituminous sands
 • Bituminous shale
Bivariate
 Bivariate analysis
Black
 Black liquors
 • Black powder
 Carbon black
 • Channel black
 • Furnace black
Blackbody
 Blackbody radiation
Blackening
- Blackout**
 • Blackout (physiology)
 Blackout (propagation)
 • Communication blackout
 • Radar blackout
Bladder
 Bladder (urinary)
 Bladder calculi
 Bladder fistula
 Bladder neck obstruction
 Bladder neoplasms
Blade
 • Blade coaters
 Blade coating
Blades
 Compressor blades
 Doctor blades
 Gas turbine blades
 Propeller blades
 • Rotor blades (rotary wings)
 Rotor blades (turbomachinery)
 Stator blades
 Steam turbine blades
 Turbine blades
Blanket
 Blanket brazing
Blanketing
Blankets
 • Blankets (atmospheres)
Blanking
 Blanking (cutting)
Blanks
 • Blanks (forms)
Blast
 Air blast circuit breakers
 • Blast cleaning
 Blast effects
 Blast furnace gas
 Blast furnaces
 • Blast furnace stoves
 Blast injuries
 Blast loads
 • Blast resistant construction
 Blast resistant structures
 • Blast shelters
Blasting
 Abrasive blasting
 • Blasting caps
 • Grit blasting
 • Sand blasting
 Shot blasting
Blastocaulis
Blastomyces
Blastomycosis
Blasts
 • Air blasts
Blattidae
Bleaches
Bleaching
 Bleaching agents
Blenders
Blending
Blends
 Blighted areas
Blimps
 Blind
 • Blind flying
 • Blind landing
Blindness
 • Color blindness
Blinds
 • Shutters (blinds)
Blister
 Blister copper
 Blister packaging
Blistering
 • Blistering agents
Blisters
 • Blisters (injuries)
 • Blisters (protuberances)
Blizzards
Bloch
 • Bloch walls
Block
 • Block (counteraction)
 Block brazing
 • Block caving mining
 Block design
 Block explosives
 Heart block
Blockades
 Military blockades
Blocking
 Adrenergic blocking agents
 Blocking oscillators
 Cholinergic blocking agents
 Ganglionic blocking agents
- Neuromuscular blocking agents**
Blocks
 Concrete blocks
 Crown blocks
 • Cylinder blocks
 Engine blocks
Blood
 Blood analysis
 Blood banks
 Blood cells
 Blood chemical analysis
 Blood circulation
 • Blood coagulants
 Blood coagulation
 Blood coagulation diseases
 Blood counts
 Blood diseases
 Blood donors
 Blood flow
 Blood gas analysis
 Blood group disorders
 Blood groups
 Blood plasma
 • Blood plasma expanders
 Blood plasma substitutes
 • Blood platelets
 Blood preservation
 Blood pressure
 Blood pressure manometers
 Blood proteins
 Blood serum
 Blood transfusion
 • Blood types
 Blood vessels
 Blood viscosity
 Blood volume
 • Serum (blood)
 • Vessels (blood)
Blooming
 Blooming mills
Blooms
 Blooms (metals)
 • Phytoplankton blooms
 Plankton blooms
 • Zooplankton blooms
Blow
 • Blow down
 Blow molding
 Blow torches
Blowby
Blowcases
Blowers
Blowholes
Blowing
 Blowing agents
Blown
 Air blown converters
 Bottom blown converters
 Oxygen blown converters
 Side blown converters
 Top blown converters
Blowoff
 • Blowoff valves
Blowout
 Blowout preventers
Blowouts
Blowpipes
Blowtanks
Blue
 • Blue brittleness
 • Blue green algae
 Methylene blue
Blueprinting
Blueprints
Bluff
 • Bluff bodies
Bluffs
 • Bluffs (landforms)
Bluing
Blunging
Blunt
 Blunt bodies
Blushing
Board
 Container board
Boards
 Building boards
 Control boards
 Insulating boards
 Panel boards (electricity)
 Particle boards
 Plotting boards
 Wood particle boards
Boat
 Flying boat hulls
Boats
 Aircraft rescue boats
 • Crash rescue boats
 Ferry boats
- Flying boats**
 • Hydrofoil boats
 • Jet flying boats
 Lighters (boats)
 Motor boats
 Plastic boats
Bobbins
BOD
Bode
 Bode diagrams
Bodies
 • Astronomical bodies
 Automobile bodies
 • Bluff bodies
 Blunt bodies
 Bodies of revolution
 Celestial bodies
 • Ceramic bodies
 Conical bodies
 Convex bodies
 Cylindrical bodies
 Ducted bodies
 Falling bodies
 Floating bodies
 Foreign bodies
 Lifting bodies
 Parabolic bodies
 Prismatic bodies
 Rectangular bodies
 Slender bodies
 Towed bodies
Body
 Body armor
 • Body attitude
 Body centered cubic lattices
 Body centered orthorhombic lattices
 Body centered tetragonal lattices
 Body composition
 Body fat
 Body fluids
 Body temperature
 Body weight
 • Depressed body temperature
 Many body problem
 • N body problem
 Partial body irradiation
 • Reduced body temperature
 Three body problem
 Two body problem
 Whole body irradiation
 Wing body configurations
Boghead
 • Boghead coal
Bogs
Boiler
 Boiler codes
 Boiler explosions
 • Boiler feedwater
 • Boiler furnaces
 Boiler plate
 • Boiler scale
 Boiler tubes
Boilers
 Fire tube boilers
 • Steam boilers
 Waste heat boilers
 • Water boilers
 Water tube boilers
Bolling
 Bolling points
 • Bolling superheat reactors
 Bolling water reactors
 Film bolling
 Nucleate bolling
Bolff
Bolls
 • Bolls (sand)
 • Frost bolls
 Sand bolls
Bolometers
 Infrared bolometers
Bolted
 Bolted joints
Bolting
Bolts
 Anchor bolts
 Expansion bolts
 Hexagonal head bolts
 High strength bolts
 Lag bolts
 Rock bolts
 Round head bolts
 Square head bolts
 Structural bolts
 Toggle bolts
Boltzmann
 Boltzmann equation
Bomb
 • Bomb bay doors

Single word terms that appear as descriptors in the Thesaurus of Terms Section are in bold italics; (•) indicates USE reference.

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Figure A3. KWOC (Keyword Out of Context) Index to a Thesaurus. Words are extracted from descriptors and entry terms. This display is discussed in section 6.1.1.

Source: *Thesaurus of Engineering and Scientific Terms*, 1967.

DESCRIPTORS			ACTIVISM / 3		
ACCOUNTING Jul. 1966 CJE: 441 RIE: 479 GC: 620			ACHIEVEMENT TESTS Jul. 1966 CJE: 1333 RIE: 2788 GC: 630		
NT Property Accounting		Gifted	SN Tests used to measure knowledge, abilities, understanding, or skills acquired from academic work (note: prior to mar80, the instruction "achievement prediction, use achievement tests" was carried in the thesaurus)		ACOUSTICS Jul. 1966 CJE: 311 RIE: 159 GC: 490
BT Technology		Mastery Learning	UF Proficiency Tests (Academic)		SN Science of sound -- includes the study of the transmission of sound through various media or in various enclosures
RT Accountants		Motivation	NT Equivalency Tests	UF Sound	UF Sound Transmission
Bookkeeping		National Competency Tests	RT Mastery Tests	NT Psychoacoustics	BT Sound Waves
Budgeting		Performance	RT National Competency Tests	BT Sciences	RT Acoustic Insulation
Business Education		Performance Factors	BT Tests	RT Acoustic Phonetics	RT Acoustical Environment
Business Skills		Prerequisites	RT Achievement	Architecture	Audio Equipment
Certified Public Accountants		Productivity	RT Achievement Gains	Auditory Stimuli	Noise (Sound)
Farm Accounts		Qualifications	RT Achievement Rating	Physics	Sound Effects
Financial Audits		Recognition (Achievement)	RT Aptitude Tests		
Financial Services		Self Efficacy	RT College Entrance Examinations		
Office Occupations Education		Standards	RT Criterion Referenced Tests		
Spreadsheets		Success	RT Educational Testing		
		Talent	RT Essay Tests		
ACCREDITATION (INSTITUTIONS) Jul. 1966 CJE: 876 RIE: 1080 GC: 330			RT Language Tests		
BT Certification		Achievement Comparison	RT Listening Comprehension Tests		
RT Academic Standards		USE ACHIEVEMENT RATING	RT Mathematics Tests		
Accrediting Agencies			RT Norm Referenced Tests		
Eligibility		ACHIEVEMENT GAINS Jul. 1966 CJE: 358 RIE: 1302 GC: 310	RT Open Book Tests		
Institutional Evaluation		SN Progress towards attaining a specified level of proficiency or bringing about a desired end	RT Performance Tests		
Quality Control		UF Achievement Losses	RT Reading Tests		
Standards		BT Improvement	RT Science Tests		
State Standards		RT Academic Achievement	RT Writing Tests		
ACCREDITING AGENCIES Mar. 1980 CJE: 245 RIE: 214 GC: 330			ACID RAIN Dec. 1988 CJE: 50 RIE: 30 GC: 410		
SN Agencies that establish operating standards for educational or professional institutions and programs, determine the extent to which the standards are met, and publicly announce their findings		Achievement	SN Precipitation (rain, snow, fog, etc.) containing destructive acid concentrations, caused when pollutants, chiefly oxides of sulfur and nitrogen, are chemically combined with water vapor in the atmosphere		
UF Accrediting Associations		Achievement Rating	BT Air Pollution		
BT Agencies		Achievement Tests	RT Water Pollution		
RT Academic Standards		Knowledge Level	RT Meteorology		
Accreditation (Institutions)		Mathematics Achievement	RT Water Quality		
Agency Role		Reading Achievement			
Educational Quality		Success			
Institutional Evaluation		Writing Achievement			
State Licensing Boards					
State Standards					
Accrediting Associations Jul. 1966 USE ACCREDITING AGENCIES			Acoustic Barriers Nov. 1969 USE ACOUSTIC INSULATION		
ACCULTURATION Jul. 1966 CJE: 698 RIE: 1061 GC: 580			ACOUSTIC INSULATION Nov. 1969 CJE: 32 RIE: 18 GC: 920		
SN Absorption into any group of certain features of the culture		Achievement Incentives Jul. 1966 CJE: 386 RIE: 256 GC: 120	UF Acoustic Barriers		
UF Assimilation (Cultural)		SN Forces that drive an individual to improve, succeed, or excel in things considered both difficult and important (note: prior to mar80, the instruction "achievement motivation, use motivation" was carried in the thesaurus)	UF Anechoic Materials		
RT Biculturalism		UF Achievement Motivation	BT Sound Barriers		
Cultural Pluralism		BT Motivation	RT Sound Insulation		
Culture		RT Psychological Needs	BT Soundproofing		
Immigrants		Achievement	RT Structural Elements (Construction)		
Refugees		Affiliation Need	RT Acoustical Environment		
Social Integration		Aspiration	BT Acoustics		
Subcultures		Competition	RT Construction (Process)		
Acetylene Welding Jul. 1966 USE WELDING			RT Construction Materials		
ACHIEVEMENT Jul. 1966 CJE: 1102 RIE: 1475 GC: 120			RT Noise (Sound)		
SN Level of attainment or proficiency in relation to a standard measure of performance, or, of success in bringing about a desired end (note: use a more specific term if possible)		Achievement Prediction Jul. 1966 CJE: 338 RIE: 481 GC: 820	ACOUSTIC PHONETICS Jul. 1966 CJE: 169 RIE: 114 GC: 450		
UF Achievement Level		SN Judging individuals or groups' levels of attainment or accomplishment and assigning quantitative or qualitative values to them according to specified standards or procedures	SN Study of the physical properties of speech sounds during transmission and as they are heard by the listener (note: prior to mar80, the use of this term was not restricted by a scope note)		
NT Achievement Prediction #		UF Achievement Comparison	BT Phonetics		
RT Academic Achievement		NT Grading	RT Acoustics		
Black Achievement		BT Measurement	RT Artificial Speech		
Graduation		RT Academic Achievement	RT Auditory Perception		
High Achievement		Achievement	RT Consonants		
Knowledge Level		Achievement Gains	RT Distinctive Features (Language)		
Low Achievement		Achievement Tests	RT Sound Spectrographs		
Mathematics Achievement		Awards	RT Speech		
Overachievement		Merit Rating			
Reading Achievement		Merit Scholarships			
Scholarship		Rating Scales			
Underachievement		Report Cards			
Writing Achievement		Student Evaluation			
Ability					
Achievement Gains					
Achievement Need					
Achievement Rating					
Achievement Tests					
Aptitude					
Aspiration					
Competence					
Evaluation					
Expectation					
Failure					
Fear Of Success					

= Two or more Descriptors are used to represent this term.
The term's main entry shows the appropriate coordination.

Figure A4. Flat Thesaurus Structure. For each descriptor, hierarchical information (BT, NT) is limited to one broader level and one narrower level. This display is discussed in section 6.2.1.

Source: *Thesaurus of ERIC Descriptors*, 12th ed., 1990, edited by James E. Houston, with permission from The Oryx Press, 4041 N. Central at Indian School Rd., Phoenix AZ 85012, 602-265-2651.

RT Planning	BT2 National Organizations	FEDERAL REGION V
RT Productivity	RT Radiation Protection	(Prior to June 1982 this concept was indexed to GREAT LAKES REGION.)
RT Technology Assessment		DA June 7, 1982
RT Technology Utilization		UF <i>Great Lakes Region</i>
RT Testing		UF <i>Region V</i>
FEATHERS [01]	FEDERAL REGION I	BT1 USA
DA December 1, 1974	(Prior to June 1982 this concept was indexed to NORTH ATLANTIC REGION.)	BT2 North America
RT Birds	DA June 7, 1982	NT1 Illinois
RT Skin	UF <i>New England</i>	NT2 Chicago
	UF <i>North Atlantic Region</i>	NT1 Indiana
	UF <i>Region I</i>	NT1 Michigan
FECES [01]	BT1 USA	NT1 Minnesota
DA December 1, 1974	BT2 North America	NT1 Ohio
BT1 Biological Wastes	NT1 Connecticut	NT2 Cleveland
BT2 Biological Materials	NT1 Maine	NT1 Wisconsin
BT3 Materials	NT1 Massachusetts	
BT2 Wastes	NT1 New Hampshire	
RT Body Fluids	NT1 Rhode Island	
RT Excretion	NT1 Vermont	
RT Large Intestine		
RT Proteus		
RT Rectum		
FEDAL	FEDERAL REGION II	FEDERAL REGION VI
DA December 1, 1974	(Prior to June 1982, this concept was indexed to MID-ATLANTIC REGION.)	(Prior to June 1982 this concept was indexed to SOUTHWEST REGION.)
USE Failed Element Detection	DA June 7, 1982	DA June 7, 1982
	UF <i>Mid-Atlantic Region</i>	UF <i>Region VI</i>
	UF <i>Region II</i>	UF <i>Southwest Region</i>
FEDERAL ASSISTANCE PROGRAMS	BT1 USA	BT1 USA
DA October 20, 1977	BT2 North America	BT2 North America
RT Affirmative Action	NT1 New Jersey	NT1 Arkansas
RT Federal Expenditures	NT1 New York	NT1 Louisiana
RT Government Policies	NT2 New York City	NT1 New Mexico
RT Local Government	NT1 Puerto Rico	NT2 Jemez Mountains
RT National Government	NT1 Virgin Islands	NT2 Los Alamos
RT State Government		NT1 Oklahoma
		NT1 Texas
		RT Great Plains
		RT Ozark Region
<i>Federal Aviation Administration</i>	FEDERAL REGION III	FEDERAL REGION VII
DA September 13, 1978	(Prior to June 1982 this concept was indexed to CENTRAL REGION.)	(Prior to June 1982 this concept was indexed to MIDWEST REGION.)
USE US FAA	DA June 7, 1982	DA June 7, 1982
	UF <i>Central Region</i>	UF <i>Midwest Region</i>
FEDERAL BUILDINGS	UF <i>Region III</i>	UF <i>Region VII</i>
DA February 23, 1979	BT1 USA	BT1 USA
BT1 Buildings	BT2 North America	BT2 North America
RT Military Facilities	NT1 Delaware	NT1 Iowa
RT Office Buildings	NT1 Maryland	NT1 Kansas
RT Public Buildings	NT1 Pennsylvania	NT1 Missouri
	NT2 Pittsburgh	NT1 Nebraska
FEDERAL BUREAU OF INVESTIGATION	NT1 Virginia	RT Great Plains
DA December 10, 1979	NT1 West Virginia	RT Ozark Region
UF FBI		
BT1 US DOJ	FEDERAL REGION IV	FEDERAL REGION VIII
BT2 US Organizations	(Prior to June 1982 this concept was indexed to SOUTHEAST REGION.)	(Prior to June 1982 this concept was indexed to ROCKY MOUNTAIN REGION.)
BT3 National Organizations	DA June 7, 1982	DA June 7, 1982
	UF <i>Region IV</i>	UF <i>Region VIII</i>
<i>Federal Driving Cycle</i>	UF <i>Southeast Region</i>	UF <i>Rocky Mountain Region</i>
DA November 12, 1975	BT1 USA	BT1 USA
USE Federal Test Procedure	BT2 North America	BT2 North America
	NT1 Alabama	NT1 Colorado
<i>Federal Emergency Management Agency</i>	NT1 Florida	NT2 Mahogany Zone
DA February 10, 1984	NT2 Cape Kennedy	NT2 Sand Wash Basin
USE US FEMA	NT1 Georgia	NT1 Montana
	NT2 Atlanta	NT2 Powder River Basin
<i>Federal Energy Administration</i>	NT1 Kentucky	NT1 North Dakota
DA May 15, 1975	NT1 Mississippi	NT1 South Dakota
USE US FEA	NT1 North Carolina	NT2 Table Mountain Area
	NT1 South Carolina	NT1 Utah
<i>Federal Energy Regulatory Commission</i>	NT1 Tennessee	NT2 Roosevelt Hot Springs
DA February 14, 1978	NT2 Chattanooga	NT1 Wyoming
USE US FERC	NT2 Oak Ridge	NT2 Powder River Basin
	RT Appalachia	NT2 Rock Springs Sites
FEDERAL EXPENDITURES	FEDERAL REGION IX	NT2 Washakie Basin
DA August 25, 1980	(Prior to June 1982 this concept was indexed to WESTERN REGION.)	RT Great Plains
UF <i>Government Spending</i>	DA June 7, 1982	RT Regional Analysis
RT Federal Assistance Programs	UF <i>Region IX</i>	RT Rocky Mountains
RT National Government	UF <i>Western Region</i>	
	BT1 USA	FEDERAL REGION X
<i>Federal Government</i>	BT2 North America	(Prior to June 1982 this concept was indexed to PACIFIC NORTHWEST REGION.)
DA March 4, 1980	NT1 Arizona	DA June 7, 1982
SEE National Government	NT1 California	UF <i>Pacific Northwest Region</i>
	NT2 Brawley Geothermal Field	UF <i>Region X</i>
FEDERAL POWER COMMISSION	NT2 Coso Hot Springs	BT1 USA
DA October 13, 1976	NT2 Imperial Valley	BT2 North America
UF FPC	NT2 Long Valley	NT1 Alaska
BT1 US Organizations	NT2 Los Angeles	NT2 Alaskan North Slope
BT2 National Organizations	NT1 Hawaii	NT1 Idaho
	NT1 Nevada	NT2 Raft River Valley
FEDERAL RADIATION COUNCIL [01]	NT2 Steamboat Springs	NT1 Oregon
DA January 28, 1975	RT Great Basin	NT2 Mt Hood
UF FRC		
BT1 US Organizations		

Figure A5. Multilevel Broader and Narrower Terms. All the broader and narrower terms of a given descriptor are given within the alphabetic display. This display is discussed in section 6.2.2.1.

Source: *International Energy Subject Thesaurus*. 1990.

LATERAL STABILITY		
LASER WEAPONS-(CONT.)		
	LASERS	
	MILITARY TECHNOLOGY	
	SPACE WEAPONS	
	STIMULATED EMISSION DEVICES	
LASER WELDING		
GS	WELDING	
	.. LASER WELDING	
	.. FUSION WELDING	
	.. GAS WELDING	
	.. BRAZING	
	.. LOW TEMPERATURE BRAZING	
RT	BONDING	
	HEATING	
	PULSED LASERS	
	SOLDERING	
LASER WINDOWS		
GS	WINDOWS (INTERVALS)	
	.. LASER WINDOWS	
RT	BANDWIDTH	
	ENERGY BANDS	
	LASERS	
LASERS		
UF	FABRY-PEROT LASERS	
	NATURAL LASERS	
	OPTICAL MASERS	
GS	STIMULATED EMISSION DEVICES	
	.. LASERS	
	.. AIRBORNE LASERS	
	.. ARGON LASERS	
	.. ATMOSPHERIC LASERS	
	.. CARBON LASERS	
	.. CHEMICAL LASERS	
	.. HCL LASERS	
	.. CONTINUOUS WAVE LASERS	
	.. DISTRIBUTED FEEDBACK LASERS	
	.. FREE ELECTRON LASERS	
	.. GAMMA RAY LASERS	
	.. GAS LASERS	
	.. CARBON DIOXIDE LASERS	
	.. CARBON MONOXIDE LASERS	
	.. DF LASERS	
	.. EXCIMER LASERS	
	.. HCL LASERS	
	.. HCL ARGON LASERS	
	.. HCN LASERS	
	.. HELIUM-NEON LASERS	
	.. HF LASERS	
	.. KRYPTON FLUORIDE LASERS	
	.. NITROGEN LASERS	
	.. TEA LASERS	
	.. ULTRAVIOLET LASERS	
	.. XENON CHLORIDE LASERS	
	.. XENON FLUORIDE LASERS	
	.. GASDYNAMIC LASERS	
	.. GLASS LASERS	
	.. HIGH POWER LASERS	
	.. NOVA LASER SYSTEM	
	.. SHIVA LASER SYSTEM	
	.. INFRARED LASERS	
	.. INJECTION LASERS	
	.. IODINE LASERS	
	.. LIQUID LASERS	
	.. METAL VAPOR LASERS	
	.. NEODYMIUM LASERS	
	.. NUCLEAR PUMPED LASERS	
	.. ORGANIC LASERS	
	.. DYE LASERS	
	.. PLASMADYNAMIC LASERS	
	.. PULSED LASERS	
	.. Q SWITCHED LASERS	
	.. ULTRASHORT PULSED LASERS	
	.. ULTRAVIOLET LASERS	
	.. RAMAN LASERS	
	.. RARE GAS-HALIDE LASERS	
	.. KRYPTON FLUORIDE LASERS	
	.. XENON CHLORIDE LASERS	
	.. XENON FLUORIDE LASERS	
	.. RING LASERS	
	.. SEMICONDUCTOR LASERS	
	.. GALLIUM ARSENIDE LASERS	
	.. SOLAR-PUMPED LASERS	
	.. SOLID STATE LASERS	
	.. GALLIUM ARSENIDE LASERS	
	.. RUBY LASERS	
	.. YAG LASERS	
	.. SPACEBORNE LASERS	
	.. TUNABLE LASERS	
	.. TWO-WAVELENGTH LASERS	
	.. WAVEGUIDE LASERS	
	.. X RAY LASERS	
RT	ALKALI VAPOR LAMPS	
LASERS-(CONT.)		
	AMPLIFIERS	
	BEAM SWITCHING	
	∞ COHERENCE	
	COHERENT ELECTROMAGNETIC RADIATION	
	COHERENT LIGHT	
	ELECTRON PUMPING	
	GARNETS	
	HOLE BURNING	
	HOLOGRAPHY	
	INFRARED WINDOWS	
	INTERPLANETARY COMMUNICATION	
	INTERSTELLAR MASERS	
	KERR ELECTROOPTICAL EFFECT	
	LASER ALTIMETERS	
	LASER ANNEALING	
	LASER APPLICATIONS	
	LASER CAVITIES	
	LASER MODE LOCKING	
	LASER PLASMAS	
	LASER PUMPING	
	LASER TARGET INTERACTIONS	
	LASER TARGETS	
	LASER WEAPONS	
	LASER WINDOWS	
	LASING	
	LIGHT AMPLIFIERS	
	LIGHT BEAMS	
	LIGHT MODULATION	
	LIGHT SOURCES	
	LIGHT TRANSMISSION	
	LUNAR COMMUNICATION	
	MASERS	
	MICROBALLOONS	
	MOLECULAR OSCILLATORS	
	NUCLEAR PUMPING	
	OPTICAL COMMUNICATION	
	OPTICAL DATA PROCESSING	
	OPTICAL MEMORY (DATA STORAGE)	
	OPTICAL PUMPING	
	OPTICAL RESONATORS	
	∞ OPTICS	
	PHASE MATCHING	
	PHOTODIODES	
	PHOTONICS	
	POWER TRANSMISSION (LASERS)	
	PULSE GENERATORS	
	PULSED RADIATION	
	QUANTUM AMPLIFIERS	
	QUANTUM ELECTRONICS	
	RAPID BALLISTICS IDENTIFICATION	
	SENARMONT POLARISCOPES	
	SOLID STATE DEVICES	
	SPACE COMMUNICATION	
	STIMULATED EMISSION	
	THERMAL BLOOMING	
	THRESHOLD CURRENTS	
	TRANSIENT OSCILLATIONS	
	TRAVELING WAVE MODULATION	
LASING		
RT	DISTRIBUTED FEEDBACK LASERS	
	ELECTRON TRANSITIONS	
	EXCIMER LASERS	
	HOLE BURNING	
	KRYPTON FLUORIDE LASERS	
	LASERS	
	NITROGEN LASERS	
	OPTICAL TRANSITION	
	RARE GAS-HALIDE LASERS	
	STIMULATED EMISSION DEVICES	
LASV		
USE	F-111 AIRCRAFT	
LATCH-UP		
RT	CMOS	
	ELECTRICAL IMPEDANCE	
	INTEGRATED CIRCUITS	
	P-N-P-N JUNCTIONS	
	SWITCHING CIRCUITS	
LATCHES		
RT	FASTENERS	
	HOLDERS	
	LINKAGES	
	PINS	
LATE STARS		
GS	CELESTIAL BODIES	
	.. STARS	
	.. LATE STARS	
	.. COOL STARS	
	.. CARBON STARS	
LATE STARS-(CONT.)		
	.. FLARE STARS	
	.. K STARS	
	.. M STARS	
	.. VAN BIESBROECK STAR	
	.. MIRA VARIABLES	
	.. OMICRON CETI STAR	
	.. S STARS	
RT	ASYMPTOTIC GIANT BRANCH STARS	
	DWARF STARS	
	EARLY STARS	
	GIANT STARS	
	MAIN SEQUENCE STARS	
	RED DWARF STARS	
	RED GIANT STARS	
	STELLAR EVOLUTION	
	SUBGIANT STARS	
LATENESS		
RT	DELAY	
	SCHEDULING	
LATENT HEAT		
GS	CHEMICAL PROPERTIES	
	.. THERMOCHEMICAL PROPERTIES	
	.. LATENT HEAT	
	.. HEAT OF FUSION	
	.. HEAT OF VAPORIZATION	
	HEAT	
	.. ENTHALPY	
	.. LATENT HEAT	
	.. HEAT OF FUSION	
	.. HEAT OF VAPORIZATION	
	THERMODYNAMIC PROPERTIES	
	.. ENTHALPY	
	.. LATENT HEAT	
	.. HEAT OF FUSION	
	.. HEAT OF VAPORIZATION	
	THERMOCHEMICAL PROPERTIES	
	.. LATENT HEAT	
	.. HEAT OF FUSION	
	.. HEAT OF VAPORIZATION	
	THERMOPHYSICAL PROPERTIES	
	.. LATENT HEAT	
	.. HEAT OF FUSION	
	.. HEAT OF VAPORIZATION	
	THERMOPHYSICAL PROPERTIES	
	.. LATENT HEAT	
	.. HEAT OF FUSION	
	.. HEAT OF VAPORIZATION	
	THERMOPHYSICAL PROPERTIES	
LATENT HEAT OF FUSION		
USE	HEAT OF FUSION	
LATERAL CONTROL		
UF	LATERALIZATION	
	ROLL CONTROL	
GS	ATTITUDE CONTROL	
	.. LATERAL CONTROL	
RT	AILERONS	
	AIRCRAFT CONTROL	
	ALTITUDE CONTROL	
	AUTOMATIC CONTROL	
∞	CONTROL	
	DIRECTIONAL CONTROL	
	ELEVONS	
	HELICOPTER CONTROL	
	LONGITUDINAL CONTROL	
	MANUAL CONTROL	
	MISSILE CONTROL	
	ROLL	
	SATELLITE ATTITUDE CONTROL	
	SATELLITE CONTROL	
LATERAL OSCILLATION		
UF	SNAGGING	
RT	DIRECTIONAL STABILITY	
	ROLL	
	STABILITY AUGMENTATION	
	TRANSVERSE OSCILLATION	
	TURNING FLIGHT	
	YAW	
	YAWING MOMENTS	
LATERAL STABILITY		
UF	DIHEDRAL EFFECT	
	LATERALITY	
GS	DYNAMIC CHARACTERISTICS	
	.. DYNAMIC STABILITY	
	.. MOTION STABILITY	
	.. ATTITUDE STABILITY	
	.. LATERAL STABILITY	
	STABILITY	
	.. DYNAMIC STABILITY	
	.. MOTION STABILITY	
	.. ATTITUDE STABILITY	
	.. LATERAL STABILITY	
RT	AERODYNAMIC STABILITY	
	AIRCRAFT STABILITY	

Figure A6. Generic Structure. A full hierarchical display, excluding sibling terms, is given for each descriptor within the alphabetic sequence of the thesaurus. This display is discussed in section 6.2.2.2.

Source: NASA *Thesaurus*. Vol. 1. Hierarchical Listing, 1988, p. 409.

C10 - DISEASES-NEUROLOGIC

Nervous System Diseases			
Central Nervous System Diseases			
Brain Diseases			
Cerebrovascular Disorders			
Cerebral Hemorrhage			
Subarachnoid Hemorrhage			
Subarachnoid Hemorrhage	C10.228.140.300.420.811	C14.907.253.	C23.542.115.
Cerebral Infarction	C10.228.140.300.449	C14.907.253.	
Cerebral Ischemia	C10.228.140.300.459	C14.907.253.	
Cerebral Ischemia, Transient	C10.228.140.300.459.278	C14.907.253.	
Subclavian Steal Syndrome	C10.228.140.300.459.832	C14.907.253.	
Vertebrobasilar Insufficiency	C10.228.140.300.459.956	C14.907.253.	
Dementia, Vascular	C10.228.140.300.470	C10.228.140. F3.709.680.	F3.709.508.
Dementia, Multi-Infarct	C10.228.140.300.470.408	C10.228.140. F3.709.680.	F3.709.508.
Leukomalacia, Periventricular	C10.228.140.300.550	C10.228.140. C16.614.521.	C14.907.253.
Vascular Headache	C10.228.140.300.937	C14.907.253.	C23.888.592.
Cluster Headache	C10.228.140.300.937.210	C14.907.253.	C23.888.592.
Migraine	C10.228.140.300.937.542	C14.907.253.	C23.888.592.
Dementia	C10.228.140.380	F3.709.508.	F3.709.680.
AIDS Dementia Complex	C10.228.140.380.70	C2.782.815. C2.839.70 C20.673.483. F3.709.680.	C2.800.801. C10.228.228. F3.709.508.
Dementia, Presenile	C10.228.140.380.150	F3.709.508.	F3.709.680.
Alzheimer's Disease	C10.228.140.380.150.60	C10.228.140. F3.709.508. F3.709.680.	C10.228.140. F3.709.508. F3.709.680.
Creutzfeldt-Jakob Syndrome	C10.228.140.380.150.230	C10.228.140. F3.709.508.	C10.228.228. F3.709.680.
Dementia, Senile	C10.228.140.380.220	F3.709.508.	F3.709.680.
Alzheimer's Disease	C10.228.140.380.220.60	C10.228.140. F3.709.508. F3.709.680.	C10.228.140. F3.709.508. F3.709.680.
Supranuclear Palsy, Progressive	C10.228.140.380.220.882	C10.228.140. F3.709.680.	F3.709.508.
Dementia, Vascular	C10.228.140.380.230	C10.228.140. F3.709.680.	F3.709.508.
Dementia, Multi-Infarct	C10.228.140.380.230.250	C10.228.140. F3.709.680.	F3.709.508.
Encephalitis	C10.228.140.437	C10.228.228.	
Encephalitis, Epidemic	C10.228.140.437.238	C2.81.343	C10.228.228.
Encephalitis, Japanese	C10.228.140.437.238.255	C2.81.343. C10.228.228.	C2.782.350.
Encephalitis, St. Louis	C10.228.140.437.238.356	C2.81.343. C10.228.228.	C2.782.350.
Encephalitis, Tick-Borne	C10.228.140.437.238.456	C2.81.343. C2.782.350.	C2.81.885. C10.228.228.
Parkinson Disease, Postencephalitic	C10.228.140.437.238.739	C10.228.140.	
Encephalitis Periaxialis	C10.228.140.437.321	C10.228.140.	C10.228.337.
Encephalitis, Post-Vaccinal	C10.228.140.437.404		
Meningoencephalitis	C10.228.140.437.615	C10.228.228.	
Uveomeningoencephalitic Syndrome	C10.228.140.437.615.729	C10.228.228.	C11.941.879.
Subacute Sclerosing Panencephalitis	C10.228.140.437.851	C2.782.650. C10.228.140.	C2.839.862. C10.228.228.
Encephalomalacia	C10.228.140.461		
Leukomalacia, Periventricular	C10.228.140.461.550	C10.228.140. C16.614.521.	C14.907.253.
Epilepsy	C10.228.140.490		
Epilepsy, Generalized	C10.228.140.490.300		
Epilepsy, Absence	C10.228.140.490.300.260		
Epilepsy, Myoclonic	C10.228.140.490.300.280		
MERRF Syndrome	C10.228.140.490.300.280.530	C5.651.460. C18.452.648.	C10.228.140.
Epilepsy, Tonic-Clonic	C10.228.140.490.300.290		
Spasms, Infantile	C10.228.140.490.300.760	F3.709.346.	
Epilepsy, Partial	C10.228.140.490.360		
Epilepsy, Complex Partial	C10.228.140.490.360.260		
Epilepsy, Frontal Lobe	C10.228.140.490.360.270		
Epilepsy, Temporal Lobe	C10.228.140.490.360.290		
Epilepsy, Post-Traumatic	C10.228.140.490.380		
Status Epilepticus	C10.228.140.490.690		
Epilepsia Partialis Continua	C10.228.140.490.690.260		

Figure A7. Tree Structure. Indention and the length of the tree number (center column) indicate hierarchical level. The tree numbers on the right (in smaller type) indicate additional hierarchies in which the descriptor is found. This display is discussed in section 6.2.3.

Source: *Medical Subject Headings. Tree Structures*. 1992.

	<i><visual works></i>
	<i><visual works by medium or technique></i>
VC.246	mail art
VC.247	montages
VC.248	photomontages
VC.249	mosaics
VC.250	multimedia works
VC.251	niellos
VC.252	paintings
VC.253	<i><paintings by form></i>
VC.254	cabinet pictures
VC.255	dummy board figures
VC.256	easel paintings
VC.257	miniatures (paintings)
VC.258	panel paintings
VC.259	scroll paintings
VC.260	handscrolls
VC.261	emakimono
VC.262	shaped canvases
VC.263	tondi
VC.264	<i><paintings by location or context></i>
VC.265	mummy portraits
VC.266	mural paintings
VC.267	quadrature
VC.268	quadri riportati
VC.269	rock paintings
VC.270	cave paintings
VC.271	vase paintings
VC.272	<i><paintings by material or technique></i>
VC.273	acrylic paintings
VC.274	encaustic paintings
VC.275	finger paintings
VC.276	frescoes
VC.277	oil paintings
VC.278	oil sketches
VC.279	watercolors
VC.280	gouaches
VC.281	paper cutouts
VC.282	pastels (visual works)
VC.283	photographs
VC.284	<i><photographs by form></i>
VC.285	negatives
VC.286	color separation negatives
VC.287	halftone negatives
VC.288	internegatives
VC.289	<i><negatives by color></i>
VC.290	black-and-white negatives
VC.291	color negatives
VC.292	<i><negatives by process></i>
VC.293	calotypes
VC.294	dry collodion negatives

May be used in combination with other descriptors, for example, **over life-size + statues; tempera + paintings; Late Baroque + portraits; landscape (representation) + sketches; still life + painters (artists).**

Figure A8. Hierarchical Thesaurus Display Featuring Node Labels (italicized, in brackets) and Line Numbers. Indention indicates hierarchical level. This display is discussed in section 6.2.3.

Source: *Art and Architecture Thesaurus*, 2nd ed. 5 vols. New York: Oxford University, 1994. Vol. 2, p. 486.

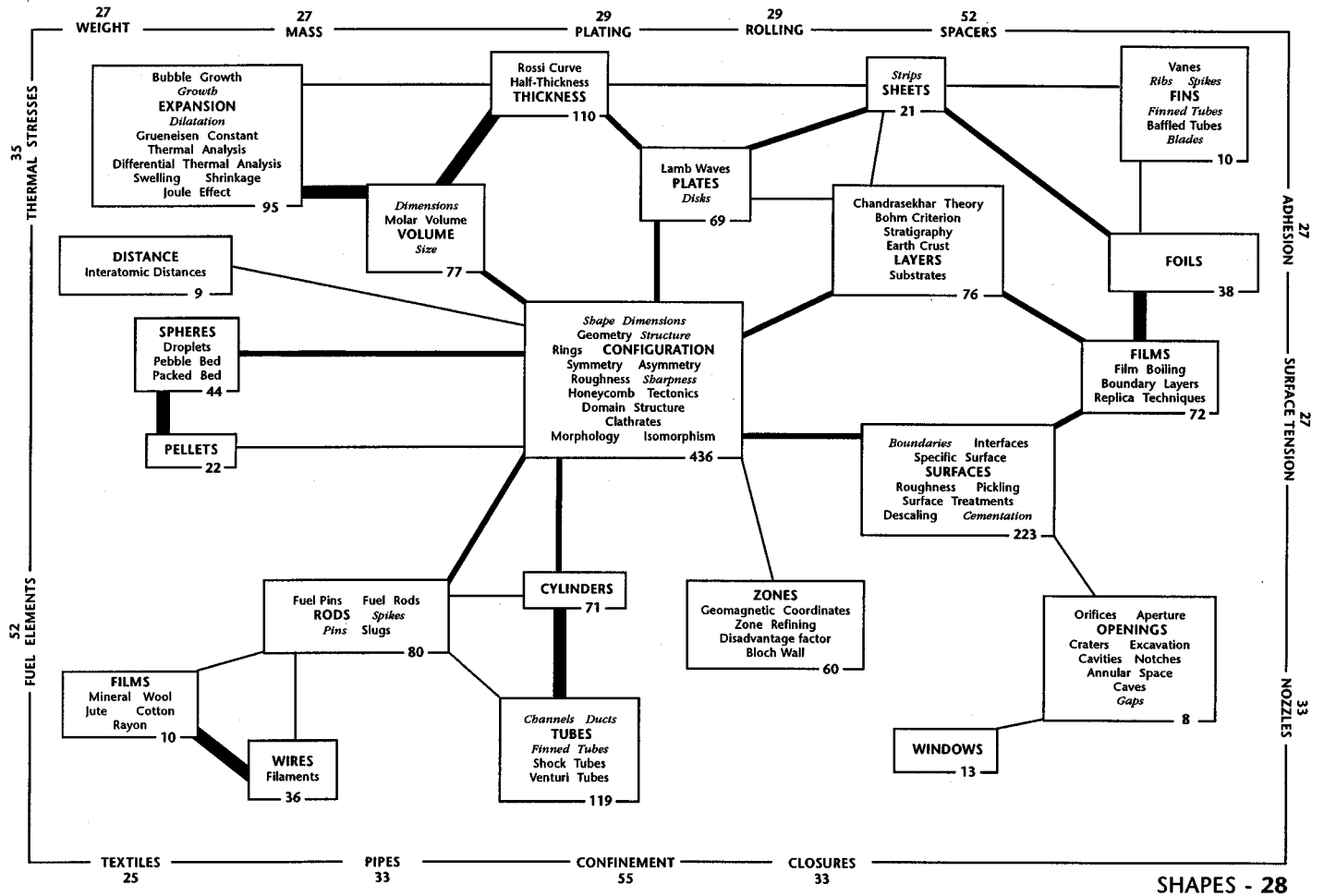


Figure A9. Graphic Display. Synonyms and narrower terms are contained within the boxes. Other relationships are indicated by lines connecting the boxes. This display is discussed in section 6.2.4.

Source: *Euratom Thesaurus*. Part II. Terminology Charts, 2nd ed., 1967.

interfaces, mechanical USE mechanical contact	interferometers cont. interferometry DI January 1969
interfacial chemistry USE surface chemistry	interferometry <i>for interferometry involving electromagnetic waves use electromagnetic wave interferometry or light interferometry as appropriate</i>
interfacial energy USE surface energy	NT acoustic wave interferometry electromagnetic wave interferometry holographic interferometry particle interferometry
interfacial tension USE surface tension	RT distance measurement holography interference (wave) interferometers micrometry schlieren systems DI January 1969
interfacial waves USE surface waves (fluid)	intergalactic magnetic fields BT magnetic fields TT magnetic fields RT intergalactic matter CC A9850T DI January 1989 PT magnetic fields
interference UF telegraph interference NT interference (signal) interference (wave) CC B5230; B6200 DI January 1969	intergalactic matter UF intergalactic medium RT clusters of galaxies cosmic dust galaxies intergalactic magnetic fields interstellar matter CC A9850T DI January 1972 PT cosmology galaxies
interference (signal) NT crosstalk electromagnetic interference intersymbol interference BT interference TT interference RT interference suppression noise noise measurement reception CC B5230; B6200 DI January 1977 PT interference noise	intergalactic medium USE intergalactic matter
interference (wave) NT acoustic wave interference electromagnetic wave interference BT interference TT interference RT interference spectrometers interferometers interferometry DI January 1977 PT interference	intergranular fracture USE brittle fracture
interference nulling USE interference suppression	intermediate boson decay BT elementary particle decay intermediate bosons TT elementary particle decay elementary particle interactions elementary particles RT Higgs bosons W bosons Z bosons CC A1338 DI January 1985 PT elementary particle decay
interference spectrometers UF Fourier transform spectrometers BT spectrometers TT instruments RT interference (wave) CC A0765 DI January 1973 PT spectrometers	intermediate boson interactions BT elementary particle interactions TT elementary particle interactions RT Higgs bosons intermediate bosons W bosons Z bosons CC A1300 DI January 1991
interference spectroscopy BT spectroscopy TT spectroscopy RT Fourier transform spectroscopy two-dimensional spectroscopy CC A0765 DI January 1977 PT spectroscopy	intermediate boson mass BT elementary particle mass TT mass RT intermediate bosons CC A1480F DI January 1989 PT elementary particle mass, intermediate bosons
interference suppression UF interference nulling noise control (interference) noise elimination echo suppression RT compandors interference (signal) noise telecommunication systems CC B5230; B6200 DI January 1969	intermediate boson production RT Higgs bosons intermediate bosons W bosons Z bosons CC A1300 DI January 1991
interferometers UF etalons NT acoustic wave interferometers electromagnetic wave interferometers BT instruments TT instruments RT interference (wave)	intermediate bosons UF axions NT Higgs bosons intermediate boson decay

Figure A10. Top Terms (TT) in an Alphabetic Thesaurus. These represent the highest level in a hierarchy and may be the same as the BT (broader term). This display is discussed in section 6.2.5.

Source: 1993 *Inspec Thesaurus*, with permission from INSPEC, the Institution of Electrical Engineers, Michael Faraday House, Six Hills Way, Stevenage Herts. SG1 2AY UK.

1993 Hierarchical List of Thesaurus Terms

instruments - cont.

- . . . scanning electron microscopes
- . . . scanning-transmission electron microscopes
- . . . transmission electron microscopes
- . . ion microscopes
- . . . field emission ion microscopes
- . . optical microscopes
- . musical instruments
- . optical instruments
- . . colorimeters
- . . coronagraphs
- . . ellipsometers
- . . light interferometers
- . . optical microscopes
- . . optical sensors
- . . . fibre optic sensors
- . . photometers
- . . . spectrophotometers
- . . polarimeters
- . . refractometers
- . portable instruments
- . recorders
- . . data loggers
- . . oscillographs
- . . plotters
- . . tape recorders
- . . . audio tape recorders
- . . . digital audio tape
- . . . video tape recorders
- . spectrometers
- . . interference spectrometers
- . . magnetic resonance spectrometers
- . . mass spectrometers
- . . . time of flight mass spectrometers
- . . particle spectrometers
- . . . alpha-particle spectrometers
- . . . beam choppers
- . . . beta-ray spectrometers
- . . . electron spectrometers
- . . . gamma-ray spectrometers
- . . . neutron spectrometers
- . . . particle separators
- . . . time of flight spectrometers
- . . . time of flight mass spectrometers
- . . radiofrequency spectrometers
- . . . microwave spectrometers
- . . X-ray spectrometers
- . strain gauges
- . telescopes
- . . astronomical telescopes
- . . . radiotelescopes
- . thermocouples

insulation

- . cable insulation
- . machine insulation
- . transformer insulation
- . vacuum insulation

integrated circuit technology

- . clean rooms
- . semiconductor process modelling

interactive systems

- . interactive video

intercalation compounds

- . graphite intercalation compounds

interface phenomena

- . composite material interfaces
- . . delamination
- . . crystal surface and interface vibrations
- . . magnetic interface phenomena
- . . magnetic multilayers

interference

- . interference (signal)
- . . crosstalk
- . . electromagnetic interference
- . . . radiofrequency interference
- atmospherics
- jamming
- radar interference
- radar clutter
- whistlers
- white noise
- . . . telephone interference
- . . . television interference
- . . intersymbol interference
- . . interference (wave)
- . . . acoustic wave interference
- . . . electromagnetic wave interference
- . . . light interference
- . . . moire fringes

interference suppression

- . echo suppression

interferometry

- . acoustic wave interferometry
- . electromagnetic wave interferometry
- . . light interferometry
- . . . electronic speckle pattern interferometry
- . . radiowave interferometry
- . . holographic interferometry
- . . particle interferometry

interstellar matter

- . H I regions
- . H II regions
- . interstellar molecular clouds
- . interstellar molecules
- . nebulae
- . . planetary nebulae
- . . supernova remnants

ion beam applications

- . focused ion beam technology
- . ion beam lithography

ion emission

- . field ion emission
- . secondary ion emission
- . thermionic ion emission

ionisation

- . associative ionisation

Figure A11. Hierarchical Display of Top Terms. Periods represent hierarchical level. Whereas the alphabetic display contains only a single level of narrower term, this one displays the complete hierarchy. This display is discussed in section 6.2.5.

Source: 1993 *Inspec Thesaurus*, with permission from INSPEC, the Institution of Electrical Engineers, Michael Faraday House, Six Hills Way, Stevenage Herts. SG1 2AY UK.

TWO-WAY HIERARCHICAL TERM DISPLAY / 525

EVALUATION METHODS (CONTINUED)	:: GROUPS : STUDENTS EVENING STUDENTS	: EXPENDITURES EXPENDITURE PER STUDENT	::: METHODS :: EDUCATIONAL METHODS : TEACHING METHODS EXPERIMENTAL TEACHING
... META ANALYSIS		EXPENDITURES	EXPERIMENTER CHARACTERISTICS
... MULTIVARIATE ANALYSIS	: DEVELOPMENT	. CAPITAL OUTLAY (FOR FIXED ASSETS)	EXPERIMENTS
... CLUSTER ANALYSIS	EVOLUTION	. COMPENSATION (REMUNERATION)	. EDUCATIONAL EXPERIMENTS
... DISCRIMINANT ANALYSIS	. HEREDITY	. EXPENDITURE PER STUDENT	. LABORATORY EXPERIMENTS
... FACTOR ANALYSIS	::: LANGUAGES	. LIBRARY EXPENDITURES	. SCIENCE EXPERIMENTS
... OBLIQUE ROTATION	: AFRICAN LANGUAGES	. MERIT PAY	
... ORTHOGONAL ROTATION	EWE	. OPERATING EXPENSES	
... MULTIDIMENSIONAL SCALING		. PREMIUM PAY	
... PATH ANALYSIS		. SALARIES	
... REGRESSION (STATISTICS)	::::: GROUPS	. CONTRACT SALARIES	: FACILITIES
... MULTIPLE REGRESSION ANALYSIS	::: PERSONNEL	. TEACHER SALARIES	EXPERIMENT STATIONS
... ROBUSTNESS (STATISTICS)	::: NONPROFESSIONAL PERSONNEL	. SCHOOL DISTRICT SPENDING	
... STATISTICAL DISTRIBUTIONS	: CLERICAL WORKERS	. WAGES	
... STATISTICAL INFERENCE	EXAMINERS	. MINIMUM WAGE	: ARTIFICIAL INTELLIGENCE EXPERT SYSTEMS
... STATISTICAL SIGNIFICANCE			
... TREND ANALYSIS	EXCELLENCE IN EDUCATION	: BACKGROUND	: BEHAVIOR
... DRUG USE TESTING	. SCHOOL RESTRUCTURING	EXPERIENCE	EXPLORATORY BEHAVIOR
... HYPOTHESIS TESTING		. EARLY EXPERIENCE	
... INPUT OUTPUT ANALYSIS		. EDUCATIONAL EXPERIENCE	
... INSPECTION		. EMOTIONAL EXPERIENCE	
... INTERVIEWS	EXCEPTIONAL CHILD EDUCATION (1968 1980)	. CATHARSIS	: INTERNATIONAL TRADE EXPORTS
... EMPLOYMENT INTERVIEWS		. GROUP EXPERIENCE	
... FIELD INTERVIEWS		. INTELLECTUAL EXPERIENCE	
... JOB ANALYSIS	: RESEARCH	. LEARNING EXPERIENCE	
... LIFE CYCLE COSTING	EXCEPTIONAL CHILD RESEARCH	. CLINICAL EXPERIENCE	::: LITERACY
... NEED ANALYSIS (STUDENT FINANCIAL AID)	(1968 1980)	. LIFE EVENTS	::: LANGUAGE ARTS
... PHONETIC ANALYSIS		. PREREADING EXPERIENCE	. WRITING (COMPOSITION)
... PRETESTING	EXCEPTIONAL CHILD SERVICES (1968 1980)	. SENSORY EXPERIENCE	EXPOSITORY WRITING
... QUALITY CONTROL		. FIGURAL AFTEREFFECTS	
... READABILITY FORMULAS		. SENSORY DEPRIVATION	EXPRESSIONISM
... SITE ANALYSIS	: GROUPS	. SOCIAL EXPERIENCE	
... SKILL ANALYSIS	EXCEPTIONAL PERSONS	. STUDENT EXPERIENCE	
... STRUCTURAL ANALYSIS (LINGUISTICS)	. GIFTED	. TEACHING EXPERIENCE	::: COGNITIVE PROCESSES
... DISCOURSE ANALYSIS	. ACADEMICALLY GIFTED	. WORK EXPERIENCE	. LANGUAGE PROCESSING
... TAGMEMIC ANALYSIS	. GIFTED DISABLED	. EMPLOYMENT EXPERIENCE	EXPRESSIVE LANGUAGE
... STRUCTURAL ANALYSIS (SCIENCE)	. GIFTED DISADVANTAGED		
... SURVEYS		::: EDUCATIONAL MEDIA	
... COMMUNITY SURVEYS	: PROGRAMS	. INSTRUCTIONAL MATERIALS	: DISCIPLINE
... GRADUATE SURVEYS	EXCHANGE PROGRAMS	. VISUAL AIDS	EXPULSION
... LIBRARY SURVEYS	. STUDENT EXCHANGE PROGRAMS	. CHARTS	
... MAIL SURVEYS	. TEACHER EXCHANGE PROGRAMS	EXPERIENCE CHARTS	
... NATIONAL SURVEYS		: LEARNING	::: GROUPS
... OCCUPATIONAL SURVEYS		EXPERIENTIAL LEARNING	. FAMILY (SOCIOLOGICAL UNIT)
... SCHOOL SURVEYS	::: ACTIVITIES	. FIELD EXPERIENCE PROGRAMS	EXTENDED FAMILY
... STATE SURVEYS	: PHYSICAL ACTIVITIES	. SUPERVISED OCCUPATIONAL EXPERIENCE (AGRICULTURE)	
... STATISTICAL SURVEYS	EXERCISE	. INTERNSHIP PROGRAMS	::: PLANNING
... TELEPHONE SURVEYS	. AEROBICS		::: SCHEDULING
... TELEVISION SURVEYS	. CALISTHENICS		. SCHOOL SCHEDULES
... SYNTHESIS	. PLYOMETRICS		EXTENDED SCHOOL DAY
... TASK ANALYSIS			
	EXERCISE (PHYSIOLOGY) (1969 1980)	::: INSTITUTIONS	
: NEEDS		. SCHOOLS	
EVALUATION NEEDS		. EXPERIMENTAL SCHOOLS	::: PLANNING
	::::: LIBERAL ARTS	. INSTITUTIONS	. SCHEDULING
: PROBLEMS	::::: SCIENCES	. SCHOOLS	. SCHOOL SCHEDULES
EVALUATION PROBLEMS	::: NATURAL SCIENCES	. COLLEGES	EXTENDED SCHOOL YEAR
	::: BIOLOGICAL SCIENCES	EXPERIMENTAL COLLEGES	
::: RESEARCH	: PHYSIOLOGY	: CURRICULUM	::: PROGRAMS
: METHODS RESEARCH	EXERCISE PHYSIOLOGY	EXPERIMENTAL CURRICULUM	. TEACHER EDUCATION PROGRAMS
EVALUATION RESEARCH			EXTENDED TEACHER EDUCATION PROGRAMS
	: NONPRINT MEDIA	: GROUPS	
: INFORMATION UTILIZATION	EXHIBITS	EXPERIMENTAL GROUPS	
EVALUATION UTILIZATION	. SCIENCE FAIRS		::: GROUPS
		: PROGRAMS	. PERSONNEL
::: COGNITIVE PROCESSES	::::: LIBERAL ARTS	EXPERIMENTAL PROGRAMS	. GOVERNMENT EMPLOYEES
: CRITICAL THINKING	::: HUMANITIES		. GROUPS
EVALUATIVE THINKING	: PHILOSOPHY	::::: LIBERAL ARTS	. CHANGE AGENTS
. VALUE JUDGMENT	EXISTENTIALISM	::::: SCIENCES	EXTENSION AGENTS
		. BEHAVIORAL SCIENCES	
::: GROUPS		: PSYCHOLOGY	. EDUCATION
: PERSONNEL	: VISUAL AIDS	EXPERIMENTAL PSYCHOLOGY	EXTENSION EDUCATION
EVALUATORS	. TABLES (DATA)		. EXTERNAL DEGREE PROGRAMS
	EXPECTANCY TABLES		. LIBRARY EXTENSION
		: INSTITUTIONS	. RURAL EXTENSION
: PROGRAMS	EXPECTATION	. SCHOOLS	. URBAN EXTENSION
EVENING PROGRAMS	. SELF FULFILLING	EXPERIMENTAL SCHOOLS	
	. PROPHECIES	. EXPERIMENTAL COLLEGES	: EDUCATION
	. TEACHER EXPECTATIONS OF STUDENTS		EXTENSION EDUCATION
	. WORK LIFE EXPECTANCY		: PROGRAMS
			. COLLEGE PROGRAMS
			EXTERNAL DEGREE PROGRAMS

Figure A12. Two-way Hierarchical Display. For every descriptor in the thesaurus, complete hierarchical information is given. Colons precede broader terms; periods indicate narrower terms. This display is discussed in section 6.2.6.

Source: *Thesaurus of ERIC Descriptors*. 12th ed., 1990.

0100

Aeronautics

0102

Aeronautics

Aerial delivery
 Aerial pickup
 Aircraft collisions
 Aircraft defense
 Aircraft fires
 Aircraft landing
 Air routes
 Airspace
 Airspeed
 Air traffic
 Air transportation
 All weather aviation
 Approach
 Autorotation
 Aviation accidents
 Aviation safety
 Bailout
 Buffeting
 Civil aviation
 Climbing flight
 Collision avoidance
 Collision research
 Crash landing
 Crash tests
 Deicing
 Descent
 Ditching (landing)
 Flameout
 Flight
 Flight control
 Flight maneuvers
 Flight paths
 Flight plans
 Flight tests
 Formation flight
 Ground speed
 Holding patterns
 Hovering
 Hypersonic flight
 In flight refueling
 Instrument flight
 Instrument landing
 Landing
 Level flight
 Parachute descent
 Pursuit courses
 Shipboard landing
 Sideslip
 Subsonic flight
 Supersonic flight
 Takeoff
 Taxiing
 Transition flight
 Transonic flight
 Turning flight
 Water landing

Aircraft industry
 Aircraft lights
 Aircraft noses
 Aircraft nuclear propulsion
 Aircraft panels
 Aircraft propellers
 Aircraft protuberances
 Aircraft seats
 Aircraft skis
 Aircraft windows
 Airfoils
 Airframe bearings
 Airframes
 Airplanes
 Airships
 Amphibious aircraft
 Antisubmarine aircraft
 Area ruled configurations
 Aspect ratio
 Attack aircraft
 Avionics
 Balloons
 Bomb bays
 Bomb ejectors
 Bomber aircraft
 Bomb racks
 Boundary layer control
 Canard configurations
 Canopies
 Cargo aircraft
 Cargo extraction parachutes
 Cargo parachutes
 Carrier based aircraft
 Cockpits
 Commercial aircraft
 Compound helicopters
 Control sticks
 Control surfaces
 Cowlings
 Cruciform wings
 Deicers
 Delta wings
 Double delta wings
 Drag chutes
 Drone aircraft
 Dual rotation propellers
 Ejectionable capsules
 Ejection seats
 Electronic aircraft
 Elevators (control surfaces)
 Elevator tabs
 Elevons
 External stores
 Fighter aircraft
 Flaps (control surfaces)
 Flying boat hulls
 Flying boats
 Flying platforms
 Folding fins
 Folding rotors
 Folding wings
 Fuselages
 General aviation aircraft
 Gliders
 Gondolas
 Ground effect machines
 Helicopter engines
 Helicopter hoists
 Helicopters
 High lift devices
 Horizontal tail surfaces
 Hydroskis
 Hypersonic aircraft
 Hypersonic test vehicles
 Hypersonic vehicles
 Inlet guide vanes
 Jet aircraft
 Jet engine inlets
 Jet powered rotary wings
 Jettisonable cockpits
 Jettisonable fuel tanks
 Landing gear
 Leading edges
 Leading edge slats
 Lifting bodies
 Low drag airfoils

Meteorological balloons

Military aircraft
 Nacelles
 Nose wheels
 Observation aircraft
 Parachutes
 Parasite aircraft
 Parawings
 Passenger aircraft
 Patrol aircraft
 Periscopes
 Pilotless aircraft
 Pilot seats
 Pressurized cabins
 Propeller blades
 Propeller cuffs
 Propeller hubs
 Propeller models
 Propellers
 Propeller struts
 Ramjet inlets
 Ramjet test vehicles
 Reconnaissance drone aircraft
 Rectangular wings
 Research aircraft
 Ribbon parachutes
 Rings (aerodynamic configurations)
 Ring wings
 Rocket planes
 Rotary wing aircraft
 Rotary wings
 Rotochutes
 Rudders
 Rudder tabs
 Seaplane floats
 Seaplanes
 Short takeoff aircraft
 Shrouded propellers
 Skis
 Slender bodies
 Slotted flaps
 Spikes (aerodynamic configurations)
 Spinners (propellers)
 Spoilers
 Submersible aircraft
 Subsonic inlets
 Supersonic aircraft
 Supersonic airfoils
 Supersonic inlets
 Supersonic test vehicles
 Supersonic transports
 Surveillance drones
 Swept wings
 Tabs (control surfaces)
 Tactical aircraft
 Tail assemblies
 Tailless aircraft
 Tandem rotor helicopters
 Tanker aircraft
 Target drone aircraft
 Tethered balloons
 Thickness ratio
 Thin wings
 Tilt wing aircraft
 Tilt wings
 Towed bodies
 Towing aircraft
 Trailing control surfaces
 Trailing edges
 Training aircraft
 Transonic aircraft
 Transonic airfoils
 Transport aircraft
 Troop carrier helicopters
 Twisted wings
 Unidentified flying objects
 Utility aircraft
 Vanes
 Variable incidence wings
 Variable pitch propellers
 Variable sweep wings
 Varying sweep wings
 Vertical takeoff aircraft
 Vortex generators
 Water takeoff and landing aircraft
 Weather reconnaissance aircraft

Wing body configurations

Wing inlets
 Wings
 Wing slots
 Wing tips

0104

Aircraft Flight Instrumentation

Aircraft equipment
 Aircraft instruments
 Airspeed indicators
 Altimeters
 Angle of attack indicators
 Approach indicators
 Artificial horizon
 Automatic pilots
 Drift indicators
 Flight instruments
 Flight speed indicators
 Ground speed indicators
 Gyrohorizon
 Horizontal indicators
 Ice formation indicators
 Inclinometers
 Landing aids
 Radio altimeters
 Radio height finding
 Stall warning indicators
 Turn and bank indicators
 Vertical speed indicators

0105

Air Facilities

Aeronautical ground lights
 Aircraft crash equipment
 Aircraft landing areas
 Airfield arresting gear
 Airports
 Airport towers
 Approach lights
 Aviation lighting
 Avionic test units
 Bomb handling vehicles
 Bomb trucks
 Catapults
 Flight decks
 Ground support equipment
 Hangars
 Heliports
 Hydraulic test units
 Landing pads
 Military air facilities
 Runways
 Shipboard arresting gear
 Taxiways

0200

Agriculture

0103

Aircraft

Aerial rudders
 Aerodynamic brakes
 Aerodynamic configurations
 Aerospace engineering
 Aerospaceplanes
 Aerospace test vehicles
 Afterbodies
 Ailerons
 Aileron tabs
 Aircraft
 Aircraft armor
 Aircraft cabins
 Aircraft doors
 Aircraft engines
 Aircraft equipment
 Aircraft finishes
 Aircraft guns

0201

Agricultural Chemistry

Agricultural chemistry
 Agricultural wastes
 Animal products
 Chemurgy
 Composts
 Feeding stuffs
 Fertilizers
 Fertilizing
 Mulches
 Nitrogen fixation
 Soil chemistry
 Soil fertility

Figure A13. Category List. A numerically arranged list of broad categories. Each descriptor is assigned to one category or subcategory. This display is discussed in section 6.2.7.

Source: *Thesaurus of Engineering and Scientific Terms (TEST)*. 1967, p. 569.

- FERTILITY AGENTS, FEMALE, HORMONAL** *see* FERTILITY AGENTS, FEMALE
- FERTILITY AGENTS, FEMALE, SYNTHETIC** *see* FERTILITY AGENTS, FEMALE
- FERTILITY AGENTS, MALE**
D7.552.510
75; FERTILITY AGENTS, MALE, HORMONAL & FERTILITY AGENTS, MALE, SYNTHETIC were headings 1991, were *see* under FERTILITY AGENTS, MALE 1975-90
X FERTILITY AGENTS, MALE, HORMONAL
X FERTILITY AGENTS, MALE, SYNTHETIC
- FERTILITY AGENTS, MALE, HORMONAL** *see* FERTILITY AGENTS, MALE
- FERTILITY AGENTS, MALE, SYNTHETIC** *see* FERTILITY AGENTS, MALE
- FERTILITY FACTOR** *see* F FACTOR
- FERTILIZATION**
G8.520.277+
see related
GAMETE INTRAFALLOPIAN TRANSFER
X CONCEPTION
X FERTILIZATION, DELAYED
X FERTILIZATION, POLYSPERMIC
- FERTILIZATION, DELAYED** *see* FERTILIZATION
- FERTILIZATION IN VITRO**
E5.820.490
Apr 79; TEST-TUBE FERTILIZATION was TEST TUBE BABIES *see* FERTILIZATION IN VITRO Apr-Dec 1979, was TEST TUBE BABIES *see* ECTOGENESIS 1978-Mar 79
see related
EMBRYO TRANSFER
OVARIAN HYPERSTIMULATION SYNDROME
X TEST-TUBE FERTILIZATION
XR INSEMINATION, ARTIFICIAL
- FERTILIZATION, POLYSPERMIC** *see* FERTILIZATION
- FERTILIZED OVUM** *see* ZYGOTE
- FERTILIZERS**
J1.40.427
- FERULA**
B6.560.373 B6.660.357
91,63-85; was *see* under PLANTS, TOXIC 1986-90; was heading 1963-85
X ASAFOETIDA
X FENNEL
- FESTIVALS** *see* HOLIDAYS
- FETAL ALCOHOL SYNDROME**
C13.703.277.80 C16.614.330.80
C21.613.53.270.397
79
XR ALCOHOLISM
- FETAL ANOXIA**
C13.703.277.100 C16.614.330.100
75
see related
ASPHYXIA NEONATORUM
X ANOXIA, FETAL
- FETAL BLOOD**
A12.207.152.200 A15.145.300
A16.378.200
75
X CORD BLOOD
X UMBILICAL CORD BLOOD
- FETAL CIRCULATION, PERSISTENT** *see* PERSISTENT FETAL CIRCULATION SYNDROME
- FETAL DEATH**
C13.703.243+ C23.240.477+
N1.224.935.698.302
X STILLBIRTH
XR INFANT MORTALITY
- FETAL DEVELOPMENT**
G8.520.288+
85
X EMBRYO DEVELOPMENT
- FETAL DISEASES**
C13.703.277+ C16.614.330+
PRENATAL INFLUENCES was heading 1963-72
see related
ABNORMALITIES
CHORIONIC VILLI SAMPLING
X EMBRYOPATHIES
XR PERINATOLOGY
- FETAL DISTRESS**
C13.703.277.200 C16.614.330.200
75
- FETAL GLOBULINS** *see* FETAL PROTEINS
- FETAL GROWTH RETARDATION**
C13.703.277.370 C16.614.330.370
C23.509.370
78
see related
INFANT, SMALL FOR GESTATIONAL AGE
X GROWTH RETARDATION, INTRAUTERINE
X INTRAUTERINE GROWTH RETARDATION
X IUGR
- FETAL HEART**
A7.541.278+ A16.378.303+
- FETAL HEART RATE** *see* HEART RATE, FETAL
- FETAL HEMOGLOBIN**
D12.776.124.400.303 D12.776.422.512.320
X HEMOGLOBIN F
- FETAL HYDROPS** *see* HYDROPS FETALIS
- FETAL IMMUNITY, MATERNALLY-ACQUIRED** *see* IMMUNITY, MATERNALLY-ACQUIRED
- FETAL MACROSOMIA**
C13.703.277.570 C13.703.766.570
C16.614.330.570 C18.452.297.820.570
C19.246.820.570
87
X MACROSOMIA, FETAL
XR BIRTH WEIGHT
- FETAL MATURITY, CHRONOLOGIC** *see* GESTATIONAL AGE
- FETAL MATURITY, FUNCTIONAL** *see* FETAL ORGAN MATURITY
- FETAL MEMBRANES**
A16.254.403+
- FETAL MEMBRANES, PREMATURE RUPTURE**
C13.703.420.339+
75
X PROM (PREGNANCY)
- FETAL MONITORING**
E1.249.400+ E1.621.390+
78
see related
SIGNAL PROCESSING, COMPUTER-ASSISTED
X MONITORING, FETAL
XR LABOR
- FETAL MOVEMENT**
G7.553.370.300 G8.520.288.210
85
- FETAL ORGAN MATURITY**
G8.520.288.290
81
X FETAL MATURITY, FUNCTIONAL
- FETAL PRESENTATION** *see* LABOR PRESENTATION
- FETAL PRESENTATION, BREECH** *see* BREECH PRESENTATION
- FETAL PROTEINS**
D12.776.320+
84; was FETAL GLOBULINS 1970-83
X FETAL GLOBULINS
- FETAL RESORPTION**
C13.703.243.300 C23.240.477.300
91; was *see* under FETAL DEATH 1976-90

+ INDICATES THERE ARE INDENTED DESCRIPTORS IN MESH TREE STRUCTURES AT THIS NUMBER

Figure A14. Printed Alphabetic Thesaurus Designed for End-Users. The term records are not as detailed as they are in Figure A15. This display is discussed in section 6.4.

Source: *Medical Subject Headings*. Supplement to *Index Medicus*, vol. 33, 1992, p. 232.

FERTILIZATION, POLYSPERMIC see FERTILIZATION
 G8.520.277+

FERTILIZED OVUM see ZYGOTE

 A5.360.490.690.970 A11.497.497.950
 A16.950

FERTILIZERS

 J1.40.427
 only likely qualif are /ad-poi-tox /anal /class /econ /hist /rad eff /stand /supply

FERULA

 B6.560.373 B6.660.357
 do not use /isol /pathogen
 91(86)63; was see under PLANTS, TOXIC 1986-90; was heading 1963-85
 X ASAFOETIDA
 X FENNEL

FESTIVALS see HOLIDAYS

I3.450.345

FETAL ALCOHOL SYNDROME

 C13.703.277.80 C16.614.330.80
 C21.613.53.270.397
 do not use /chem ind /congen & do not coord with INFANT, NEWBORN, DISEASES
 79; was in Cat C & F 1979-80
 XR ALCOHOLISM

FETAL ANOXIA

 C13.703.277.100 C16.614.330.100
 do not use /congen; do not confuse with ASPHYXIA NEONATORUM
 75
 see related
 ASPHYXIA NEONATORUM
 X ANOXIA, FETAL

FETAL BLOOD

 A12.207.152.200 A15.145.300
 A16.378.200
 only /chem /cytol /drug eff /enzymol /immunol /metab /microbiol /parasitol /physiol /rad eff
 75
 X CORD BLOOD
 X UMBILICAL CORD BLOOD

FETAL CIRCULATION, PERSISTENT see PERSISTENT FETAL CIRCULATION SYNDROME

C14.907.489.531.694 C16.614.694

FETAL DEATH

 C13.703.243+ C23.240.477+
 N1.224.935.698.302
 only Cat C qualif but must refer to fetus only & not to mother so many qualif do not apply; do not use /congen /diet ther /drug ther /mortal /nurs /psychol /radiother /rehabil /surg /ther /transm; death of fetus in utero = FETAL DEATH, not ABORTION; perinatal death can go here but consider also INFANT MORTALITY; fetal resorption = FETAL RESORPTION
 CATALOG: /geog /form
 X STILLBIRTH
 XR INFANT MORTALITY

FETAL DEVELOPMENT

 G8.520.288+
 only /drug eff /genet /immunol /physiol /rad eff; do not coord with EMBRYO /physiol unless embryo is particularly discussed
 85
 X EMBRYO DEVELOPMENT

FETAL DISEASES

 C13.703.277+ C16.614.330+
 GEN: prefer specifics; do not use /congen; FETAL DISTRESS is available; "fetal malnutrition" goes under PLACENTAL INSUFFICIENCY; anoxia = FETAL ANOXIA; do not confuse with ASPHYXIA NEONATORUM; edema or hydrops = HYDROPS FETALIS CATALOG: form qualif permitted
 PRENATAL INFLUENCES was heading 1963-72
 search PRENATAL INFLUENCES under PREGNANCY 1966-72
 see related
 CHORIONIC VILLI SAMPLING
 X EMBRYOPATHIES
 XR PERINATOLOGY

FETAL DISTRESS

 C13.703.277.200 C16.614.330.200
 do not confuse with RESPIRATORY DISTRESS SYNDROME (postnatal); do not use /congen
 75

FETAL GLOBULINS see FETAL PROTEINS

D12.776.320+

FETAL GROWTH RETARDATION

 C13.703.277.370 C16.614.330.370
 C23.509.370
 do not use /congen; note short form IUGR below
 78
 see related
 INFANT, SMALL FOR GESTATIONAL AGE
 X GROWTH RETARDATION, INTRAUTERINE
 X INTRAUTERINE GROWTH RETARDATION
 X IUGR

FETAL HEART

 A7.541.278+ A16.378.303+
 mammals only; use all pertinent qualif (except /blood supply) & do not coord with MYOCARDIUM for HEART/MYOCARDIUM restrictions; TN 195; not for chick embryo heart (= CHICK EMBRYO + HEART /embryol)

FETAL HEART RATE see HEART RATE, FETAL

G9.330.612.509.430

FETAL HEMOGLOBIN

 D12.776.124.400.303 D12.776.422.512.320
 only likely qualif are /anal /biosyn /chem /csf /class /genet /immunol /isol /metab /physiol /physiol /rad eff /urine; DF: HBF
 X HEMOGLOBIN F

FETAL HYDROPS see HYDROPS FETALIS

 C13.703.277.60.480 C15.378.71.141.150.518
 C15.378.120.413.480 C16.614.330.60.480
 C20.188.413.480

FETAL IMMUNITY, MATERNALLY-ACQUIRED see IMMUNITY, MATERNALLY-ACQUIRED

G4.610.570

FETAL MACROSOMIA

 C13.703.277.570 C13.703.766.570
 C16.614.330.570 C18.452.297.820.570
 C19.246.820.570
 fetus "weighing more than 4000 grams"; do not confuse with INFANT, POSTMATURE (born after 42 wks of gestation)
 87
 X MACROSOMIA, FETAL
 XR BIRTH WEIGHT

FETAL MATURITY, CHRONOLOGIC see GESTATIONAL AGE

G7.553.417 G8.520.288.380

FETAL MATURITY, FUNCTIONAL see FETAL ORGAN MATURITY

G8.520.288.290

FETAL MEMBRANES

 A16.254.403+
 mammalian only but specifics may be used with non-mammalian (e.g., CHICK EMBRYO); induced rupture = LABOR, INDUCED; premature rupture = FETAL MEMBRANES, PREMATURE RUPTURE; rupture in normal labor = FETAL MEMBRANES (IM) + LABOR (IM)

FETAL MEMBRANES, PREMATURE RUPTURE

 C13.703.420.339+
 do not use /congen
 75

FETAL MONITORING

 E1.249.400+ E1.621.390+
 only likely qualif are /adv eff /instrum /methods /stand /util (if by MeSH definition) /vet
 78
 see related
 SIGNAL PROCESSING, COMPUTER-ASSISTED
 X MONITORING, FETAL
 XR LABOR

FETAL MOVEMENT

 G7.553.370.300 G8.520.288.210
 only likely qualif are /drug eff /physiol /rad eff
 85

+ INDICATES THERE ARE INDENTED DESCRIPTORS IN MESH TREE STRUCTURES AT THIS NUMBER

Figure A15. Printed Alphabetic Thesaurus Designed for Indexers and Searchers. The term records include far more detail than those in the corresponding end-user thesaurus illustrated in Figure A14. This display is discussed in section 6.4.

Source: *Medical Subject Headings: Annotated Alphabetic List*. 1992, p. 345.

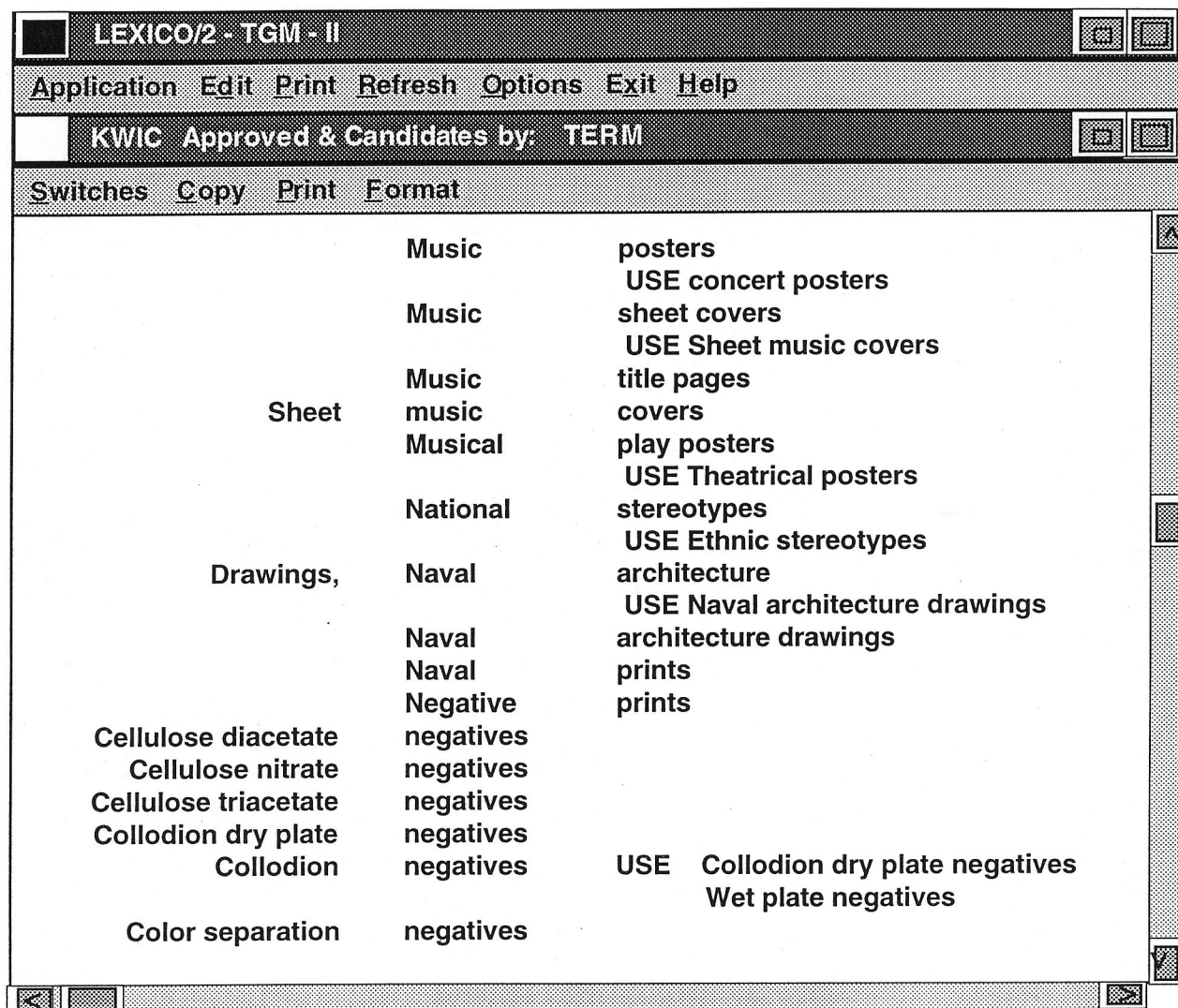


Figure A16. KWIC Screen Display of Thesaurus Terms. Like the corresponding print display illustrated in Figure A2, this one provides access to every word in descriptors and entry terms. This display is discussed in section 7.3.2.

Source: Project Management Enterprises, Inc. Bethesda, MD.

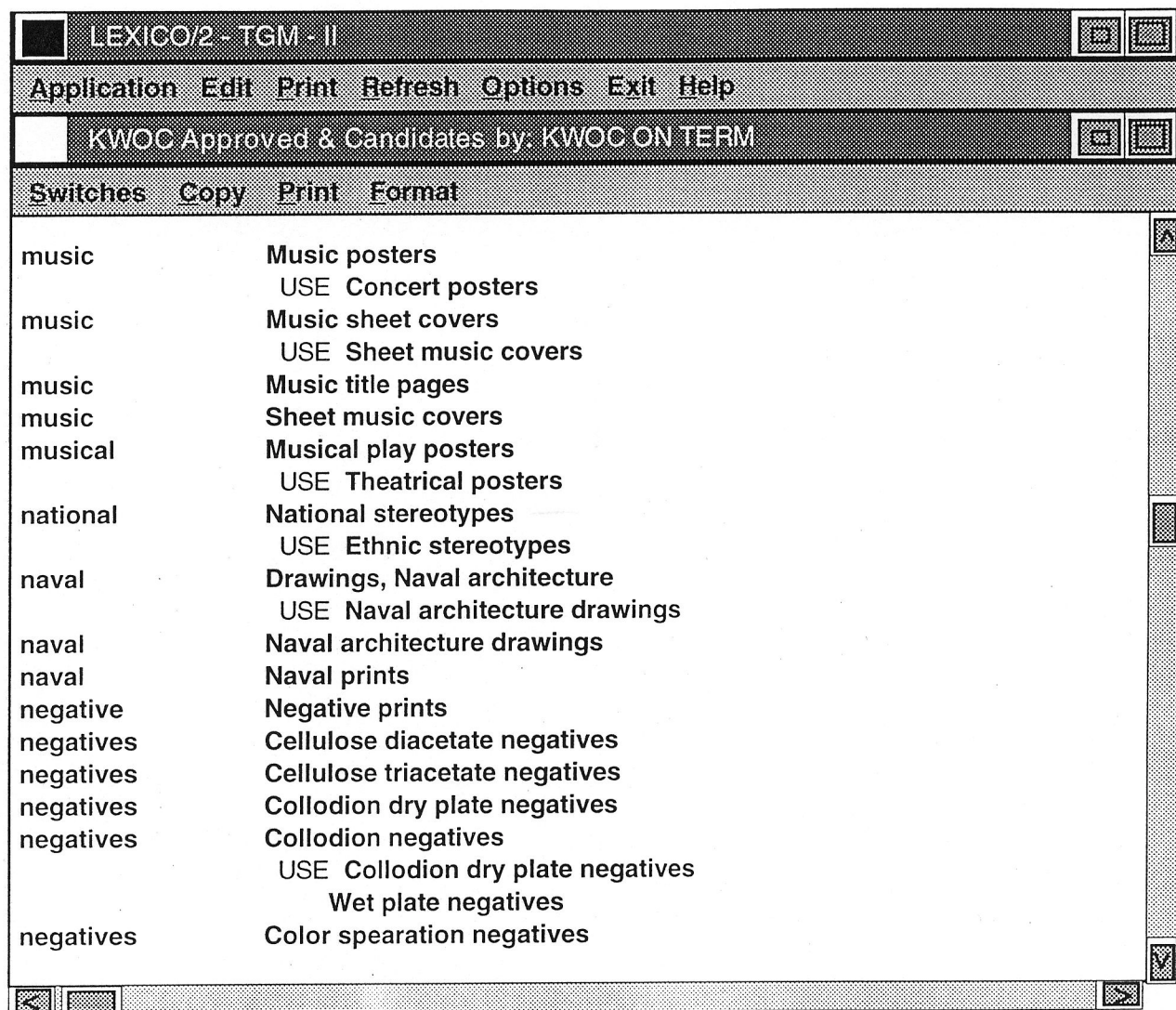


Figure A17. KWOC Screen Display of Thesaurus Terms. Like the corresponding print display illustrated in Figure A3, all descriptors and entry terms containing the keyword — in initial, medial, or final position — are identified. This display is discussed in section 7.3.2.

Source: Project Management Enterprises, Inc. Bethesda, MD.

LEXICO/2 - TGM - II	
Application Edit Print Refresh Options Exit Help	
Contents of Record by: TERM	
Switches Copy Print Format	
Term	Bible cards
Record Type	Main Term
Approval Status	y
Approval Status Date	26-Aug-93
Public Note	Cards with a scriptural picture or quotation, or both. Sometimes issued in sets and often used as rewards of merit in Sunday schools.
Cataloger's Note	MARC filed 655.
Used For	Scripture cards Sunday school cards
Broader Term	Devotional images
Related Term	Collecting cards Rewards of merit
TGM-I Compatibility	i
Date Created	10-Nov-92
Latest Update	26-Aug-93
Term	Billboard posters
Record Type	Main Term
Approval Status	y
Approval Status Date	20-Aug-93
Public Note	Large multi-sheet posters; intended for posting on billboards, fences or similar surfaces.
Cataloger's Note	MARC filed 655
Broader Term	Posters

Figure A18. Screen Display of Term Record. The record includes unabbreviated relationship indicators and a history note. This display is discussed in section 7.3.4.

Source: Project Management Enterprises, Inc. Bethesda, MD.

NASA THESAURUS TERM REVIEW				DATE SUBMITTED DAY MONTH YEAR		NUMBER:
SUBJECT TERM:				THESAURUS CATEGORY CODES:		
ACTION REQUIRED						
ADD AS A NEW TERM POSTABLE <input type="checkbox"/> NONPOSTABLE <input type="checkbox"/>		CHANGE TERM TO: POSTABLE <input type="checkbox"/> NONPOSTABLE <input type="checkbox"/>		SPELLING FROM:		
CROSS REFERENCE ADD <input type="checkbox"/> DELETE <input type="checkbox"/> REFERENCES SHOWN BELOW		DELETE TERM DELETE ONLY <input type="checkbox"/> DELETE & TRANSFER POSTINGS TO <input type="checkbox"/>				
SOURCE DATA						
ACCESSION NO:	ISSUE:	CAT :	SUGGESTED BY AIAA <input type="checkbox"/> FACILITY <input type="checkbox"/>		OTHER:	
TERM USED IN LIEU OF REQUESTED TERM:						
AMPLIFYING INFORMATION						
SCOPE NOTE (SN):						
DEFINITION:						
CROSS REFERENCE STRUCTURE						
USE (U):				USED FOR (UF):		
BROADER TERMS (BT):				NARROWER TERMS (NT):		
RELATED TERMS (RT):						
COMMENTS:					SUBMITTED BY:	
					TITLE	
REVIEW AUTHORITY						
REVIEW COMMENTS:						
ACTION APPROVED <input type="checkbox"/> DISAPPROVED <input type="checkbox"/>		REVIEWER (Signature):			DATE DAY MONTH YEAR	

FF NO. 484 JAN 70

484 1 7001

Figure A19. Thesaurus Term Review Form. The form may be used to add, modify, or delete descriptors and entry terms. Addition of descriptors is discussed in section 9.1.1.

Source: NASA Center for AeroSpace Information.

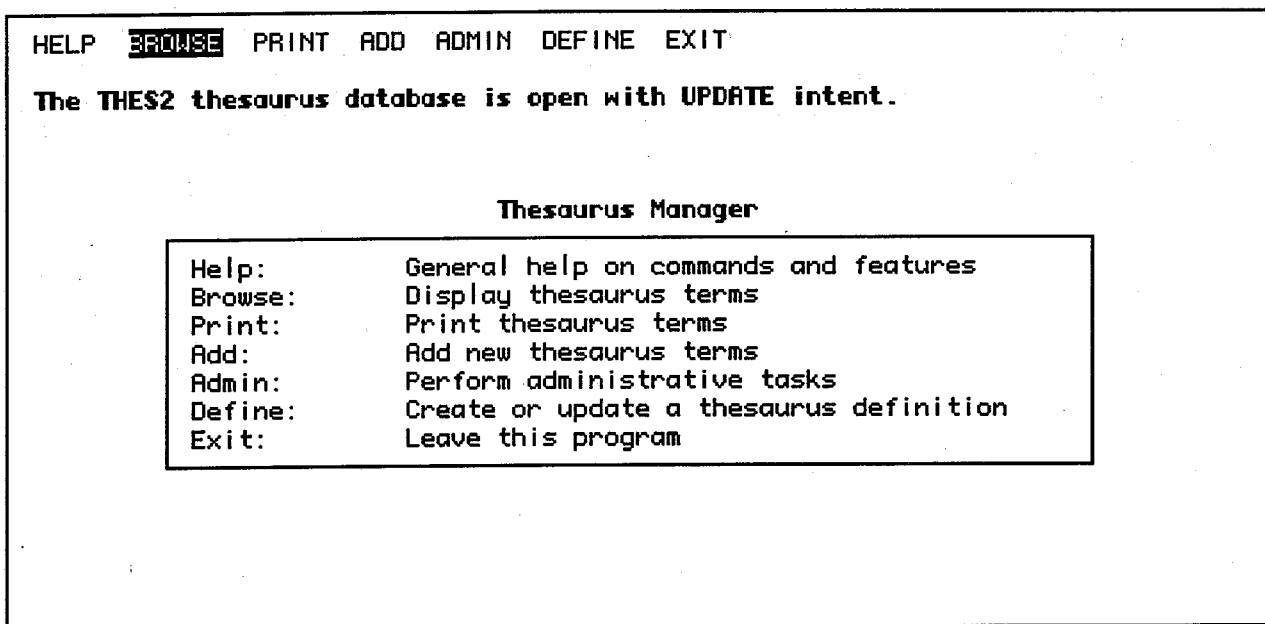


Figure A20. Menu of a Thesaurus Management System. This menu displays and defines commands. Editing capabilities of thesaurus management systems are discussed in section 10.5.

Source: BASISplus Thesaurus Manager, Information Dimensions, Inc., Dublin, Ohio.

Help Cancel ☒

Ok after making the desired modifications to the primary term
and its term tag.

LT _____

Primary Term

ABSORPTION

Term Tag

Help Cancel Ok

LT _____

Primary Term

ABSORPTION

Help Cancel ☒

Ok to confirm the deletion of the shown lead terms and their
relations and reciprocal relations which may or may not be shown.

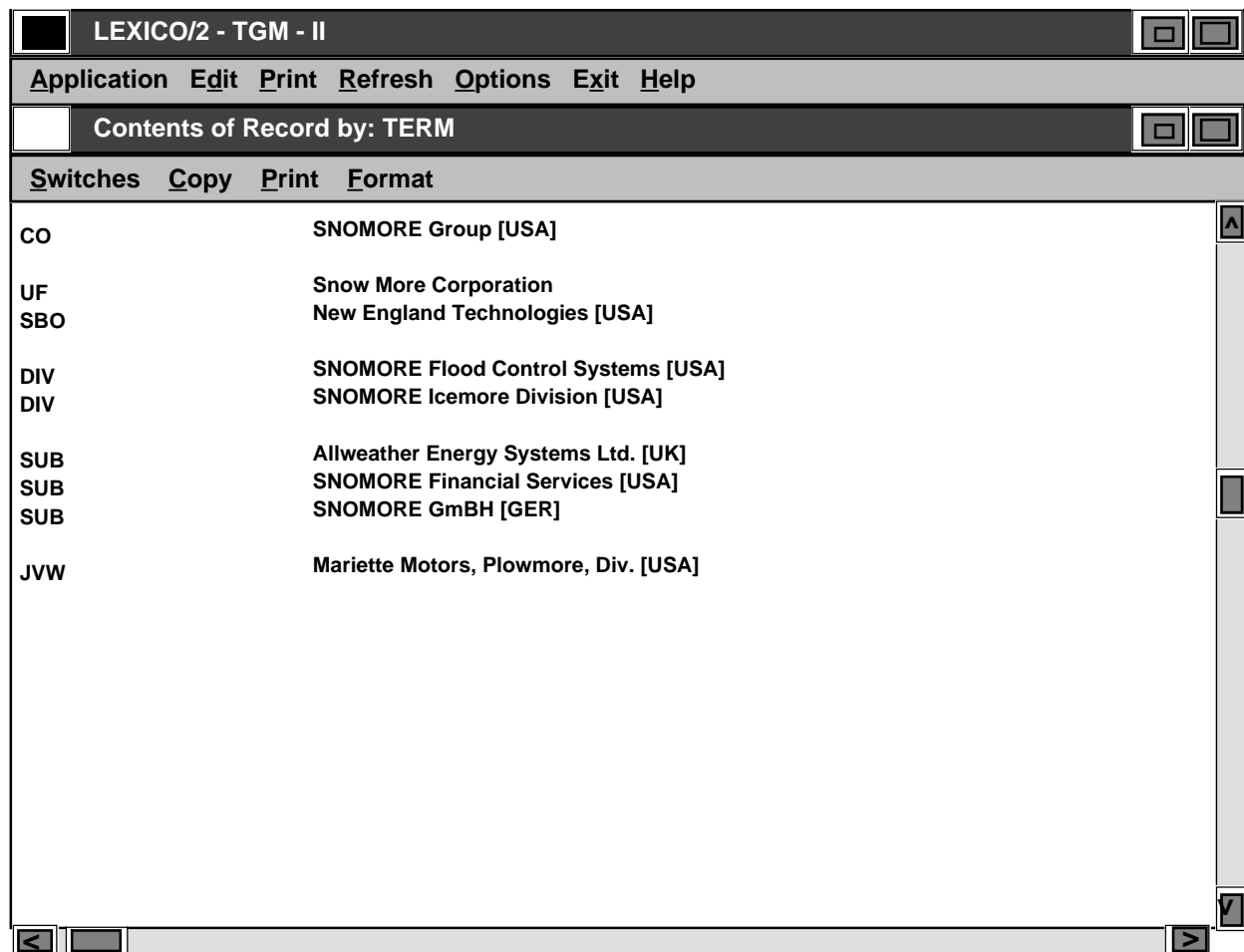
Op _____ The marked terms will be deleted

D ACOUSTIC WAVES

D BT WAVES

Figure A21. Screens for Modification and Deletion of Terms. The system requests confirmation of a command to delete a descriptor. Term deletion is discussed in section 10.8.

Source: BASISplus Thesaurus Manager, Information Dimensions, Inc., Dublin, Ohio.



CO	=	Company	descriptor, in this case a company name
DIV	=	Division	a type of narrower term
JVW	=	Joint Venture with	a type of related term
PAR	=	Parent	a type of broader term
SUB	=	Subsidiary	a type of narrower term
UF	=	Used For	UF reference, in this case a former name

Figure A22. Screen Display of Term Record Featuring Specialized Codes in a Company Thesaurus.

Appendix B

(This Appendix is not a part of the American National Standard Guidelines for the Construction, Format, and Management of Monolingual Thesauri, ANSI/NISO Z39.19-2003. It is included for information only.)

Minithesaurus of Thesaurus Terms

The following minithesaurus incorporates several optional features of thesaurus display that are described in the standard.

Flat Display Example

controlled vocabularies

BT **indexing languages**

NT **subject heading lists**
thesauri

descriptors

UF thesaurus terms

BTP **thesauri**

entry terms

SN the lead-in vocabulary of a thesaurus

UF use references

BTP **thesauri**

thesauri

BT **controlled vocabularies**

NT

<by display format>

alphabetical thesauri

faceted thesauri

hierarchical thesauri

<by size>

macrothesauri

minithesauri

<by number of languages>

monolingual thesauri

multilingual thesauri

NTP **descriptors**

entry terms

relationship indicators

RT **authority files**

computer-aided indexing

dictionaries

glossaries

nomenclature

thesaurus terms

USE **descriptors**

use references

USE **entry terms**

Generic Structure Example

thesauri

GS **indexing languages**

. **classification schemes**

. **controlled vocabularies**

. . **subject heading lists**

. . **thesauri**

. . . **alphabetical thesauri**

. . . **descriptors**

. . . **entry terms**

. . . **faceted thesauri**

. . . **macrothesauri**

. . . **minithesauri**

. . . **monolingual thesauri**

. . . **multilingual thesauri**

. . . **relationship indicators**

. . . **systematic thesauri**

Legend:

<> node label

BT Broader Term(s)

BTP Broader Term Partitive

GS Generic Structure

NT Narrower Term(s)

NTP Narrower Term Partitive

RT Related Term(s)

SN Scope Note

UF Used For

In the flat display format, optional node labels are used to organize narrower terms that are alphabetically arranged in the generic structure. Node labels could be used in the generic structure as well. The codes BTP and NTP indicate the whole-part relationship.

Related Terms, Used For *references*, and Scope Notes are the same for both systems. These examples do not provide a full set of semantic relationships.

Appendix C

(This Appendix is not a part of the American National Standard Guidelines for the Construction, Format, and Management of Monolingual Thesauri, ANSI/NISO Z39.19-2003. It is included for information only.)

User Interfaces

I. Standards

Human Factors Society. Human Computer Interaction (HCI) Standards Committee. This committee serves both as the ANSI accredited standards-developing body for HCI standards and as the U.S. Technical Advisory Group (TAG) to ISO TC159/SC4/WG5 (its international counterpart). Specific areas of standards development include: dialogue techniques (including menus, commands, forms, and direct manipulation); information presentation (including text, graphics, sound, and voice); user guidance (including system messages, status information, feedback, prompts, error handling, and help); window-based interaction; and the design process for developing successful HCI. Address: Human Factors Society, Inc., P.O. Box 1369, Santa Monica, CA 90406.

ISO 9241 (parts 1-n). Ergonomic Requirements for Office Work with Visual Display Terminals (drafts and works-in-progress). Part 14: Menus.

II. Authoritative Texts

Galitz, Wilbert O. Handbook of Screen Format Design, 3rd ed. Wellesley, MA: QED Information Sciences, Inc., 1989.

Mayhew, Deborah. Principles and Guidelines to Software User Interface Design. Englewood Cliffs: Prentice Hall, 1992.

Shneiderman, Ben. Designing the User Interface: Strategies for Effective Human-Computer Interaction, 2nd ed. Reading, MA: Addison-Wesley, 1992.

Appendix D

(This Appendix is not a part of the American National Standard Guidelines for the Construction, Format, and Management of Monolingual Thesauri, ANSI/NISO Z39.19-2003. It is included for information only.)

Thesaurus Clearinghouses

Thesauri should be deposited with one of the following international clearinghouses:

- a) Thesauri in the English language, including multilingual thesauri containing English-language sections:

Thesaurus Clearinghouse
The Library
Faculty of Library Service
University of Toronto
140 St. George Street
TORONTO
Ontario M5S 1A1
Canada

- b) Thesauri in other languages:

Instytut Informacji Naukowej,
Technicznej i Ekonomicznej
Clearinghouse
ul. Żurawia 3/5
00-926 WARSZAWA
Poland

Appendix E

(This Appendix is not a part of the American National Standard Guidelines for the Construction, Format, and Management of Monolingual Thesauri, ANSI/NISO Z39.19-2003. It is included for information only.)

Bibliography of Manuals on Thesaurus Construction

Details on some of the structures or procedures suggested in this standard may be found in the following English-language manuals on thesaurus construction. Inclusion of a publication on this list does not indicate approval of its contents by the committee developing this standard.

Aitchison, Jean; Alan Gilchrist. *Thesaurus Construction: A Practical Manual*. 2nd ed. London: Aslib, 1987. 173 pp.

Lancaster, F.W. *Vocabulary Control for Information Retrieval*. 2nd ed. Arlington, VA: Information Resources Press, 1986. 270 pp. (First edition, 1972, contains material omitted from the 2nd ed.)

Orna, Elizabeth. *Build Yourself a Thesaurus: A Step-By-Step Guide*. Norwich: Running Angel, 1983. 32 pp.

Soergel, Dagobert. *Indexing Languages and Thesauri: Construction and Maintenance*. Los Angeles: Melville, 1974. 632 pp.

Townley, Helen M.; Ralph D. Gee. *Thesaurus-Making: Grow Your Own Word-Stock*. London: Andre Deutsch, 1980. 206 pp.

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