

Guide to Recommended Format for Concrete in Materials Property Database

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This guide presents recommended formats for concrete materials property data for entry into computerized databases. The purpose of this guide is to facilitate efficient storage and retrieval of information about concrete and its constituents with a computer and allow meaningful comparison of data from different sources. It is intended for use by those responsible for planning and maintaining a concrete materials property database as well as those who enter data. Recommended formats are provided for organizing and subdividing information about hydraulic cements, aggregates, chemical admixtures, mineral admixtures, fibers, water, concrete processing, and concrete properties and performance suitable for use in developing a computerized database. ACI Committee 126 developed this guide to be consistent with the principles of ASTM Committee E-49, Computerization of Material and Chemical Property Data. Before computers can replace laboratory notebooks and published reports as a more efficient means for storing and retrieving concrete materials property data, recording standards are needed. The recommended formats in this guide are a first step toward fulfilling this need.

Keywords: admixtures; aggregates; cements; concretes; database management; fibers; materials property database; recommended format.

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CONTENTS

Chapter 1—Scope, p. 126.3R-2

- 1.1—Introduction
- 1.2—Objective
- 1.3—Use of guide

Chapter 2—General database terminology, p. 126.3R-3

Chapter 3—General formats, p. 126.3R-4

- 3.1—Units
- 3.2—Standards-producing organization information
- 3.3—Temperature
- 3.4—Date and time

Chapter 4—Concrete identification, p. 126.3R-5

- 4.1—Concrete designation
- 4.2—Concrete supplier
- 4.3—Constituent designation
- 4.4—Concrete mixture proportions
- 4.5—Concrete processing
- 4.6—Concrete property

Chapter 5—Hydraulic cement, p. 126.3R-6

- 5.1—Hydraulic cement designation
- 5.2—Hydraulic cement processing
- 5.3—Hydraulic composition and characteristics
- 5.4—Hydraulic cement performance in concrete

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Chapter 6—Aggregates, p. 126.3R-7

- 6.1—Aggregate designation
- 6.2—Composition and characteristics
- 6.3—Aggregate performance in concrete

Chapter 7—Chemical admixtures, p. 126.3R-8

- 7.1—Chemical admixture designation
- 7.2—Composition and characteristics
- 7.3—Manufacturer recommendations
- 7.4—Chemical admixture performance in concrete

Chapter 8—Mineral admixtures, p. 126.3R-9

- 8.1—Mineral admixture designation
- 8.2—Composition and characteristics
- 8.3—Manufacturer recommendations
- 8.4—Mineral admixture performance in concrete

Chapter 9—Fibers, p. 126.3R-10

- 9.1—Fiber designation
- 9.2—Composition and characteristics
- 9.3—Manufacturer recommendations
- 9.4—Fiber performance in concrete

Chapter 10—Water, p. 126.3R-11

- 10.1—Water designation
- 10.2—Composition and characteristics
- 10.3—Water performance in concrete

Chapter 11—Concrete processing, p. 126.3R-12

- 11.1—Project information
- 11.2—Concrete specification
- 11.3—Concrete supplier
- 11.4—Concrete mixture proportions
- 11.5—Concrete batching
- 11.6—Concrete mixing
- 11.7—Concrete transportation
- 11.8—Concrete placement
- 11.9—Concrete consolidation
- 11.10—Concrete finishing
- 11.11—Concrete curing
- 11.12—Concrete processing environment

Chapter 12—Properties and performance of concrete, p. 126.3R-15

- 12.1—Concrete property
- 12.2—Constituent property

Chapter 13—References, p. 126.3R-16

- 13.1—Recommended references
- 13.2—Cited references

Chapter 14—Figures and tables, p. 126.3R-17**Appendix A—Example use of guide, p. 126.3R-33****CHAPTER 1—SCOPE****1.1—Introduction**

Concrete has been used worldwide as a construction material for at least 100 years. Scientific research, new discoveries, and in-service experience have contributed to many advances in the

state of the art. The key to continued advancement in this field is to provide a means of accurately reporting and widely distributing new information about concrete in an organized and rapid manner. The means to this end is a computerized database of concrete material properties.

Currently, printed materials, such as journals and textbooks, are the most prevalent means of sharing information regarding concrete. Comprehensive reports, such as the Portland Cement Association's report on long-term performance of cement in concrete (Klieger 1957, Wood 1992) are published from time to time, but too infrequently to be an efficient way of disseminating information. The information in notebook databases (Rumble 1993) developed in laboratories is invaluable to the specific project for which they are developed, but is not always sufficiently detailed, or even published at all, for use in future projects. As a result, the information recorded in these databases is often used only once, and is not as useful as it could be to the industry as a whole.

A computerized database can provide ready access to countless analyses of concrete materials property data, thereby eliminating the need for lengthy testing and analysis that may have already been performed by another group. This guide addresses the task of developing a standard format for recording and retrieving information in a database that would most benefit its users and the concrete industry at large.

1.2—Objective

A concrete materials property database is a collection of data files in which properties of concretes and their constituents are organized and stored. Each data file is unique because it only contains information for one particular concrete. For example, ACI Committee 207, Mass Concrete, has developed such a collection. ACI 207.1R contains data files for 30 concretes used in dams located throughout the world. The usefulness of such databases depends on the types and amount of data that they contain.

Accessing the information in a concrete materials property database can be difficult or impossible if the database management system poses constraints or if there are inconsistencies in format and completeness among data files. To consistently report all of the properties that may be available for a particular concrete, a comprehensive set of guidelines should be followed. The guidelines should address concrete identification and include guidance for presenting constituent information; processing parameters; and data on mechanical, thermal, and physical properties.

This document is a guide for establishing the content of a comprehensive concrete materials property database. Recommended formats for categorizing information about concrete constituents including hydraulic cements, aggregates, chemical admixtures, mineral admixtures, fibers, and water; concrete processing; and concrete properties and performance are provided. The information is organized into data segments and data elements suitable for use in developing a computerized database. If needed, data segments and data elements for other constituents may be developed using the recommended formats presented in this guide as an example. Constituents that may be used in concrete production but are

not covered in this guide include binders such as asphalt, gypsum, sulfur, and polymers; solids such as metal shot, pigments, carbon black, and redispersible powders; and liquids such as latex and other chemical solutions.

Recommendations in this guide are consistent with the principles of ASTM Committee E-49, Computerization of Material and Chemical Property Data. Guides prepared by ASTM E-49 for metals (ASTM E 1309 and E 1338); composite materials (ASTM E 1471); database terminology (ASTM E 1443); and data records (ASTM E 1313) were used in preparing this document. Although compliance with the recommended formats is considered essential for efficient computerization of concrete properties, this guide is not intended to replace reporting requirements established in consensus standards or contractual agreements, nor is it intended to serve as a step-by-step manual for use in database management or computer implementation.

1.3—Use of guide

This guide is intended for use by those responsible for planning a database management system, entering data into a concrete materials property database, or preparing tables of concrete properties for use by others. It should be of particular use to those who wish to share data with others, either within the same organization or between organizations. When necessary, users of this guide may expand the number of data segments or create different data elements so that the required information is included in the database. The order of the data elements is not rigid and can be varied, depending on the protocol of the database management system. It is important, however, that the relationships among the data elements and data segments be considered during the database development process.

Database development begins with a list of essential and desirable data elements to be included in the database. These data elements form the basis for a data dictionary. A data dictionary is a guide for understanding the information in a database and has features similar to those in a language dictionary (Begley 1993). In the data dictionary, one can find a description, the origin, and the usage of each specific piece of data presented in the database. It also provides information describing the relationship of a given piece of data to all other pieces of data, including the format that best fits the data. The data dictionary is a framework on which the database schema is built. A database schema is a perspective, a way of seeing the information in the database (Begley 1993). The schema provides a transition from the data elements to the user's viewpoint.

CHAPTER 2—GENERAL DATABASE TERMINOLOGY

A concrete materials property database consists of data files that are composed of data segments and data elements. These terms, along with others used to describe the components of a concrete materials property database, are presented in this section. It is essential that standardized terminology related to materials databases be developed (Newton 1993). Terms and definitions provided here are intended to complement those already provided in ACI 116R

and ASTM C 125, C 219, E 1013, and E 1443. Relationships among the individual components of a concrete materials property database are shown in Fig. 2.1.

Concrete materials property database—A collection of data files in which properties of concretes and its constituents are organized and stored.

Data—The set of scientific or technical measurements, observations, or facts that can be represented by numbers, tables, graphs, models, text, or symbols used as a basis for reasoning or calculation.

Data dictionary—A guide for understanding all of the essential and desirable data about concrete and its constituents that are included in the database.

Data element—One individual piece of information used in describing a material or to record test results; for example, a variable name or test parameter (ASTM E 1313). Each data element in this guide is represented by a data element number, data element name, data element type, and data element format. Certain data elements included in this guide are essential for unique concrete identification. Entries for these particular data elements may be recorded at various locations throughout a data file.

Data element format—The presentation style used to report information or data. Alphanumeric, floating-point, and special-entry formats are specified in this guide for use in reporting information, unit designations, numerical values, and text. Details concerning date and time are presented in Section 3.4.

Data element name—A descriptive term or title that designates the type of information or data to be reported in the data element.

Data element number—A four- or six-digit number used to denote an individual data element. These numbers represent the entire set of information in a particular data element. Data element numbers are considered a functional part of the database and may be used for data element reference. Data element numbers are not, however, considered data. The first digit in the data element number is used as a cross reference. Assigned ranges of data element numbers are presented in Table 2.1.

Data element type—A designation that reflects the significance of the data element entry. All data element entries are considered either essential or desirable. Data elements are considered essential if they are required to make a meaningful comparison of property data from different sources. A comparison of data from different sources may still be possible if essential information is omitted, but the value of the comparison may be greatly reduced. Nonessential or desirable data elements are used to report supplementary information.

Data file—A complete set of concrete materials property database entries or data records that contain information and properties for a particular concrete.

Data record—The collection of data elements used to describe a material or the results of a specified test in their entirety (ASTM E 1313).

Data segment—A category of information that is used to subdivide and designate sets of related data elements. Certain

data segments may be used a number of times to report constituent information and properties for a particular concrete.

Database scheme—A way of representing the information in the database so that the data are meaningful and useful.

Desirable data element—A data element in a record that provides supplementary information necessary to make the record comprehensive or complete.

Essential data element—A data element in a record that must be completed to make the record meaningful in accordance with the pertinent guidelines. Failure to complete an essential data element may render the record unusable in a database or in data exchange. Comparison may still be possible if essential information is omitted, but the value of the comparison may be greatly reduced.

Material class—Any of several broad groups of materials into which a given material may be classified; for example, metals, ceramics, composites, or energetic materials (ASTM E 1443). The class of materials covered by this guide is concrete.

Property—A measurable or derivable attribute of a material. A property of a given material may take different values as influenced by one or more independent variables. It is therefore often referred to as a dependent variable (ASTM E 1443). In this guide, a concrete property is any property of the concrete. A constituent property is any property determined by testing to quantify the effects a constituent has on the properties and performance of concrete made using the constituent.

Property class—Any of several broad groups of properties; for example, physical, mechanical, or chemical properties (ASTM E 1443).

CHAPTER 3—GENERAL FORMATS

The recommended formats for concrete in this guide are represented by individual data elements that cover all aspects of concrete materials technology. Data elements that address similar topics are grouped together to form data segments. The following chapters identify the data segments and data elements developed specifically for hydraulic cements, aggregates, chemical admixtures, mineral admixtures, fibers, water, processing, properties and performance, and concrete identification. Each of these data categories includes a table that contains sets of data elements that, together, create the recommended format for concrete.

This chapter defines general formats that are used repeatedly for each category of the database.

3.1—Units

Numerical values that represent data, such as length and stress, have historically been reported using units that reflect local customs and practices. To minimize the possibility for misunderstanding and confusion associated with use of customary units, use of the International System of Units (SI) is essential. The following three data elements are recommended for use whenever a numerical value representing such measurement is reported in a concrete materials property database.

Customary units designation—The customary units that correspond to the reported numerical value. Example entries include in. and psi.

SI units designation—The units in the International System of Units (SI) that correspond to the reported numerical value. These designations should conform to requirements provided in IEEE/ASTM SI 10. Example entries include mm and MPa.

Customary to SI units conversion factor—A conversion factor required to convert customary units to SI units. This number is reported as a floating point decimal. For example, the conversion factors for in. to mm and psi to MPa are 25.4 and 0.006894757, respectively.

3.2—Standards-producing organization information

Requirements for concrete constituents and techniques for determining concrete properties are routinely provided in standardized material specifications and test methods. These documents may be issued by companies and industries as well as national and international organizations. Information that identifies and defines an applicable standard is a meaningful part of a concrete materials property database. The following four data elements are recommended for use whenever a standard specification, material property, or test result is reported in a concrete materials property database.

Standards organization—A name or title of the company, industry, or national or international organization that issued the applicable standard. ASTM is an example of an organization that issues standard specifications and test methods for concrete.

Standard number—The number of the standard issued by the organization reported previously. C 39, C 78, C 138, C 143, C 173, and C 293 are examples of ASTM test method standard numbers that correspond to test methods for determining properties of concrete.

Standard designation—A designation, if any, within the standard reported. Type I, Type A, and Class F are examples of standard designations for certain ASTM material specifications. Standard designation entries may not be applicable for test methods and standard specifications that do not include such designations.

Standard version—A version is usually a number that represents the year of issue.

3.3—Temperature

Although the SI unit for temperature is Kelvin (K), wide use is also made of degrees Celsius (C), which is the SI unit used for expressing Celsius temperature and temperature intervals. To minimize the possibility for misunderstanding and confusion, it is recommended that temperature and temperature interval values be reported in a concrete materials property database using degrees Celsius (C). If temperature and temperature interval values are reported using degrees Fahrenheit (F), then equivalent values in degrees Celsius (C) should also be reported.

3.4—Date and time

For consistency, special formats are provided for use in reporting date and time-of-day data in a concrete materials property database. The YYYYMMDD (year:month:day)

format should be used to report the date. The first four digits of this format represent the year, the next two digits represent the month, and the last two digits represent the day. For example, 19941024 represents October 24, 1994.

The HH:MM (hour:minute) format should be used to report the time of day. The first two digits represent the hour of the day and is based on a 24 hr clock. The last two digits represent minutes. For example, a data entry of 14:30 represents 2:30 p.m.

CHAPTER 4—CONCRETE IDENTIFICATION

Essential and desirable data elements necessary for the unique identification of a concrete in a materials property database are provided herein. Distinguishing one concrete from another is difficult to accomplish with a single database entry. Most data elements for concrete identification serve a dual role as concrete identifiers and data elements for other data categories. Data elements for the concrete designation data segment, however, are used solely for concrete identification. Data segments and corresponding data elements for concrete identification are listed in [Table 4.1](#). Although it is not necessary for every data element to be used for every concrete, it is suggested that entries be provided for each essential data element.

Data elements for concrete identification are organized into six data segments. The corresponding data elements are listed following each data segment description.

4.1—Concrete designation

The concrete designation data segment includes descriptive identifiers for each concrete in a concrete materials property database. These identifiers are based on a multilevel classification system that uses established terminology and designations to categorize the concrete.

- *Material class*—The class of materials covered by this guide is concrete.
- *Binder type*—Suggested entries for this data element are provided in [Table 4.2](#).
- *Concrete category*—These entries are based on bulk density. Suggested entries for this data element are provided in [Table 4.2](#).
- *Concrete group*—These entries indicate the end use or application of the concrete or other types of unique features or characteristics. Suggested entries for this data element are provided in [Table 4.2](#).
- *Processing group*—These entries distinguish concretes from the same class, type, category, and group from one another. The processing group identifier generally reflects the procedure or manufacturing technique used to process the concrete. Suggested entries for this data element are provided in [Table 4.2](#).
- *Concrete identification number*—A unique alphanumeric concrete identifier generally established by the organization that prepares the concrete specification and may be used by the database manager to represent the concrete in the materials property database. A unified numbering system (UNS) for metals and alloys has been developed and is described in ASTM E 527, but a standardized numbering system for concrete has not yet been developed.

- *Common name*—The common name is often provided by the concrete supplier and may be used by the database manager to represent the concrete in the materials property database. Mixture A, Lightweight Concrete, and 3000 psi Concrete are examples of commonly used concrete names.
- *Concrete designation notes*—These entries contain any additional information that may be useful in establishing a unique identifier for the concrete. A similar data element is used in each constituent category.

4.2—Concrete supplier

The concrete supplier data segment is used to report information that reflects the origin of the concrete. This data segment is included in concrete processing described in [Chapter 11](#).

- *Concrete supplier name*—The name of a concrete producer, research organization, or contractor may be used as an entry in this data element.
- *Concrete supplier address*
- *Concrete supplier plant location*—An address, batch plant designation, or other type of identifier may be entered in this data element.
- *Concrete supplier identification number*—This entry is an alphanumeric designation provided by the concrete supplier to distinguish one concrete batch or mixture from another.

4.3—Constituent designation

The constituent designation data segment includes descriptive identifiers for a constituent in a concrete mixture. This data segment is repeated for each constituent used in the concrete. Data elements for a generic constituent are listed in [Table 4.1](#). Data elements that provide descriptive identifiers intended specifically for hydraulic cement, aggregate, chemical admixture, mineral admixture, fibers, and water designation are presented in [Chapters 5 to 10](#), respectively.

- *Constituent class*—Cement, aggregate, chemical admixture, mineral admixture, fibers, and water are examples of constituent classes.
- *Constituent common name*—Portland cement, crushed limestone (coarse), crushed limestone (fine), fly ash, air-entraining admixture, water-reducer, and water are examples of common names for constituents.
- *Constituent producer name*
- *Constituent producer plant location*
- *Constituent producer identification number*—This alphanumeric designation is assigned by the producer or supplier.
- *Constituent designation notes*—This entry includes any additional information that may be useful to create an identifier for the constituent.

4.4—Concrete mixture proportions

The concrete mixture proportions data segment is used to report the amount of each constituent in a given volume of concrete. Data elements in this data segment are included in concrete processing described in [Chapter 11](#). Because this

data segment is used repeatedly for each constituent in the concrete, entries should be consistent with corresponding entries in the constituent designation data segment.

- *Constituent quantity per unit volume of concrete*—This quantity may be expressed as mass or volume.

4.5—Concrete processing

The concrete processing data segment is used to report information related to batching, mixing, transporting, placing, consolidating, finishing, and curing of concrete. Data elements in this data segment are included in concrete processing described in [Chapter 11](#).

- *Batching process*—Manual weight batching, semiautomatic weight batching, automatic weight batching, cumulative automatic weight batching, individual automatic weight batching, and volumetric batching are examples of concrete batching processes.
- *Mixing equipment*—Colloid mixer, horizontal shaft mixer, non-tilting mixer, open-top mixer, pan mixer, paddle mixer, continuous mixer, tilting mixer, transit mixer, and vertical shaft mixer are examples of types of mixers used to prepare a batch of concrete.
- *Processing date*—Use the YYYYMMDD format described in [Section 3.4](#) to indicate the date the concrete was mixed (or batched).
- *Transporting equipment*—Wheelbarrow, buggy, chute, dump bucket, truck with agitator, truck without agitator, conveyor belt, portable conveyor, feeder or series conveyor, spreading conveyor, radial spreader, straight line spreader, piston pump, pneumatic pump, and squeeze pressure pump are examples of transporting equipment.
- *Placing equipment*—Scoops, shovels, buckets, hoppers, chutes, tremie, paving equipment, and slipforming equipment are examples of placing equipment.
- *Consolidating equipment*—Spades, hand tampers, rods, power tampers or rammers, internal vibrators, external vibrators, surface vibrators, and table vibrators are examples of consolidating equipment.
- *Surface finish*—Exposed aggregate, trowelled, broomed, rubbed, floated, screeded, polished, grooved, and formed are examples of surface finishes.
- *Curing technique*—Curing with water and curing by moisture retention are two techniques that are typically used to cure concrete members. Wet burlap, damp sand, sprinkling, soaking, and ponding are examples of curing materials or procedures used in the wet curing technique. Polyethylene film, plastic membranes, waterproof paper, and curing compounds are examples of curing materials used in the moisture retention curing technique.

4.6—Concrete property

The concrete property data segment is used to report any property of freshly mixed or hardened concrete that provides information essential to the identification of the concrete. Data elements in this data segment are included in properties and performance described in [Chapter 12](#).

- *Concrete property*—Water-cement ratio, unit weight, air content, slump, compressive strength, modulus of rup-

ture, and splitting tensile strength are examples of properties that could be considered properties of concrete.

- *Concrete property value*—This is the property value of freshly mixed or hardened concrete that provides reference information essential to the identification of the concrete, data useful in making meaningful comparisons between concretes with similar compositions and characteristics, or results for use in establishing acceptability in accordance with project or material specification requirements, such as those described in [Section 11.2](#).
- *Concrete phase*—Fresh or hardened are examples of concrete phase.
- *Concrete age*—This entry represents the time elapsed between the start of mixing and end of testing of the concrete.

CHAPTER 5—HYDRAULIC CEMENT

Data segments and corresponding data elements for reporting information about hydraulic cement in a materials property database are listed in [Table 5.1](#) and defined here. Data elements for hydraulic cement information are organized into four data segments.

5.1—Hydraulic cement designation

Many types of binders are used to produce concrete and mortar. Materials such as asphalt, gypsum, hydraulic cement, polymers, and sulfur are used for this purpose. Hydraulic cements including portland cement, calcium-aluminate cement, blended cement, expansive cement, and natural cement are used most often. These materials are called hydraulic cements because they set and harden by chemical interaction with water. The hydraulic cement designation data segment includes descriptive terms used to establish a unique identifier for each hydraulic cement in the concrete mixture. Data elements in this data segment are used repeatedly for each hydraulic cement. As described in [Chapter 4](#), data elements for this data segment serve a dual role as concrete identifiers. If needed, data elements for other types of binders used in the concrete may be developed using the recommended formats for hydraulic cement as an example.

- *Constituent class*—The class of constituents covered by this data category is hydraulic cement.
- *Hydraulic cement common name*—Aluminate, blended, expansive, natural, and portland cement are examples of common names for hydraulic cements.
- *Hydraulic cement producer name*
- *Hydraulic cement producer plant location*
- *Hydraulic cement producer identification number*—An alphanumeric designation assigned by the producer or supplier to distinguish one lot or batch of the hydraulic cement from another.
- *Hydraulic cement designation notes*

5.2—Hydraulic cement processing

The hydraulic cement processing data segment is used to report information about the equipment used to produce the hydraulic cement. Two data elements are used repeatedly to identify the constituents used to produce the hydraulic

cement, and two are used repeatedly to report their chemical composition.

- *Processing date*
- *Kiln system*
- *Grinding mill*
- *Grinding mill manufacturer*
- *Grinding mill manufacturer address*
- *Hydraulic cement constituent*—Clinker, calcium sulfate (gypsum), and additives such as limestone and fly ash are commonly used constituents in hydraulic cement production.
- *Hydraulic cement constituent percent by mass*
- *Chemical compound*—The name or chemical formula for a chemical compound in the hydraulic cement constituent.
- *Chemical compound percent by mass*
- *Hydraulic cement constituent composition test method*
- *Hydraulic cement processing notes*

5.3—Hydraulic composition and characteristics

The hydraulic cement composition and characteristics data segment is used to report information that defines the chemical composition and characteristics of the hydraulic cement. Four data elements are used repeatedly to report the oxide and phase contents and two are used repeatedly to report sieve analysis results.

- *Oxide*—The name or chemical formula for an oxide in the hydraulic cement.
- *Oxide content*—(Percent by mass)
- *Phase*—The name or chemical formula for a phase in the hydraulic cement.
- *Phase content*—(Percent by mass)
- *Carbon dioxide content*—(Percent by mass)
- *Water content*—(Percent by mass)
- *Insoluble residue*—(Percent by mass)
- *Hydraulic cement composition test method*
- *Sieve analysis test method*
- *Sieve designation*—The nominal size or number of the sieve used during the sieve analysis to establish hydraulic cement particle size distribution.
- *Sieve opening dimension*
- *Total percentage of material passing sieve*—A floating point numerical value between 0 and 100 that represents the percentage of material that passes the sieve.
- *Total percentage of material retained on sieve*—A floating point numerical value between 0 and 100 that represents the percentage of material retained on the sieve.
- *Cement property*—The name of the cement property, such as specific surface area, being reported.
- *Hydraulic cement property value*
- *Color*
- *Color test method*
- *Composition and characteristics notes*

5.4—Hydraulic cement performance in concrete

The hydraulic cement performance in concrete data segment is used to report test results that quantify the effect a hydraulic cement has on the properties and performance of concrete made using the material. Results that could be re-

ported include, but are not limited to, rheological properties, setting time, compressive strength, and flexural strength. These results may be obtained from tests performed using concrete, cement paste, or mortar. Twelve data elements are used repeatedly for each constituent property being reported. Data elements for reporting additional information about the test method used to determine the property are provided in [Section 12.2](#). Recommended formats for reporting information about processing of the concrete that was prepared to determine hydraulic cement performance in concrete are presented in the processing data category provided in [Chapter 11](#). To eliminate repetition and minimize redundancy, data elements for processing data are not included in this data segment. For the hydraulic cement portion of a concrete materials property database to be considered comprehensive and complete, however, they need to be included as part of this data segment.

- *Constituent property*—The name of the property being reported to quantify the effect the hydraulic cement has on the properties and performance of concrete made using the hydraulic cement. Heat of hydration, compressive strength, and flexural strength are examples of constituent properties.
- *Constituent property value*
- *Concrete phase*
- *Concrete age*
- *Constituent property notes*

CHAPTER 6—AGGREGATES

Data segments and corresponding data elements for reporting information about aggregates in a materials property database are listed in [Table 6.1](#) and defined here. Data elements for aggregates are organized into three data segments.

6.1—Aggregate designation

Aggregate is a granular material consisting of individual particles that range in size, shape, composition, and density. It is the principle constituent in concrete. Fine aggregate includes materials that pass the 9.5 mm (3/8-in.) sieve and predominantly retained on the 75 μm (No. 200) sieve; or that portion that passes the 4.75 mm (No. 4) sieve and predominantly retained on the 75 μm (No. 200) sieve. Coarse aggregate is material that is predominantly retained on the 4.75 mm (No. 4) sieve. Common names for aggregate include sand, gravel, crushed stone, crushed hydraulic-cement concrete, or iron blast-furnace slag. Lightweight materials such as perlite, normalweight materials such as limestone, and heavy-weight materials such as magnetite may be used as aggregates in concrete. Most normalweight concrete is produced using a combination of coarse and fine aggregate particles that have a density comparable to that of limestone (specific gravity equals approximately 2.7). Lightweight and heavyweight concretes, however, may also be produced by using combinations of aggregate particles with either low, normal, or high density. The aggregate designation data segment includes descriptive terms used to establish a unique identifier for each aggregate in the concrete mixture. Data elements in

this data segment are used repeatedly for each aggregate. They also serve a dual role as concrete identifiers.

- *Constituent class*—The class of constituents covered by this data category is aggregate.
- *Aggregate common name*—Coarse and fine aggregate are examples of common names for aggregates.
- *Aggregate producer name*
- *Aggregate producer plant location*
- *Aggregate producer identification number*—An alphanumeric designation assigned by the producer or supplier to distinguish one lot or production run of aggregate from another.
- *Aggregate designation notes*

6.2—Composition and characteristics

The composition and characteristics data segment is used to report information that defines the chemical or mineralogical composition and characteristics of the aggregate. Two data elements are used repeatedly to report information about the mineralogical composition of the aggregate, and two are used repeatedly to report results of the sieve analysis.

- *Material*—The name of the material used to produce the aggregate. Aggregate may be produced from natural materials such as granite, limestone, and magnetite or manufactured materials such as iron blast-furnace slag.
- *Mineralogical name*—The name of a chemical compound or mineral constituent present in the aggregate.
- *Percent by mass*—The amount (percent by mass) of the chemical compound or mineral constituent present in the aggregate.
- *Shape*—Flat, elongated, and cubical are terms that may be used to describe the shape of aggregate particles.
- *Angularity*
- *Surface texture*
- *Sieve analysis test method*
- *Sieve designation*
- *Sieve opening dimension*
- *Total percentage of material passing sieve*
- *Total percentage of material retained on sieve*
- *Aggregate property*—Specific gravity, absorption, moisture content, surface moisture, maximum nominal size, size number (coarse aggregate), clay lumps and friable particles, inorganic impurities, fineness modulus, unit weight, and voids are examples of aggregate properties.
- *Aggregate property value*
- *Petrographic notes*—Information obtained from a petrographic examination of a representative sample of the aggregate.
- *Composition and characteristics notes*

6.3—Aggregate performance in concrete

The aggregate performance in concrete data segment is used to report test results that quantify the effect an aggregate has on the properties and performance of concrete made using the material. These results may be obtained from tests performed using concrete or mortar. This data segment is represented by 12 data elements that are used repeatedly for

each constituent property being reported. Data elements for reporting additional information about the test method used to determine the property are provided in [Section 12.2](#). Recommended formats for reporting information about processing of the concrete that was prepared to determine aggregate performance in concrete are provided in [Chapter 11](#). To eliminate repetition and minimize redundancy, data elements for processing data are not included in this data segment. For the aggregate portion of a concrete materials property database to be considered comprehensive and complete, however, they need to be included as part of this data segment.

- *Constituent property*—The name of the property being reported to quantify the effect the aggregate has on the properties and performance of concrete made using the aggregate. Potential volume change and potential alkali reactivity are examples of constituent properties.
- *Constituent property value*
- *Concrete phase*
- *Concrete age*
- *Constituent property notes*

CHAPTER 7—CHEMICAL ADMIXTURES

Data segments and corresponding data elements for reporting information about chemical admixtures in a materials property database are listed in [Table 7.1](#) and defined here. Data elements for chemical admixture information are organized into four data segments.

7.1—Chemical admixture designation

Chemical admixtures are either liquids or water-soluble solids that are added to concrete, grout, or mortar to modify the properties and performance of the fresh or hardened product. These materials may be added before or during mixing. Guidelines for use of chemical admixtures in concrete are generally provided by the manufacturer. The chemical admixture designation data segment includes descriptive terms used to establish a unique identifier for each chemical admixture in the concrete mixture. Data elements in this data segment are used repeatedly for each chemical admixture. They also serve a dual role as concrete identifiers.

- *Constituent class*—The class of constituents covered by this data category is chemical admixture.
- *Chemical admixture common name*—Air-entraining admixture and water reducer are examples of common names for chemical admixtures.
- *Chemical admixture producer name*
- *Chemical admixture producer plant location*
- *Chemical admixture producer identification number*—An alphanumeric designation assigned by the producer or supplier to distinguish one lot or batch of the chemical admixture from another.
- *Chemical admixture designation notes*

7.2—Composition and characteristics

The composition and characteristics data segment is used to report information that defines the chemical composition and characteristics of the chemical admixture. Two data ele-

ments are used repeatedly to report the chemical constituents in the admixture.

- *Chemical constituent*—The name of a chemical compound used in the manufacture of the chemical admixture.
- *Percent by mass*—The amount (percent by mass) of the chemical constituent used in the manufacture of the chemical admixture.
- *Total active agent*—The mass of the active agent per unit mass of the chemical admixture.
- *pH*
- *Density*
- *Composition and characteristics notes*

7.3—Manufacturer recommendations

The manufacturer recommendations data segment is used to report information provided by the manufacturer about the chemical admixture including guidelines for its use in concrete. If necessary, additional data elements can be developed to report other recommendations provided by the manufacturer.

- *Safety information*—Any known hazard linked to the use of the chemical admixture. References to a material safety data sheet (MSDS) may be sufficient.
- *Dosage*—The amount of a chemical admixture per unit mass of cement or unit volume of concrete recommended by the chemical admixture manufacturer.
- *Time of addition*—The recommended time after the first contact of the water and the cement that the chemical admixture is to be added to the concrete.
- *Method of addition*—The method recommended for adding the chemical admixture to the concrete. Methods that may be recommended include mechanical (a metering pump) or manual (pouring the chemical admixture into the mixer) techniques.
- *Recommended use*—Directions to the user on obtaining the desired result.
- *Temperature limit for use, high*—The maximum recommended temperature limit for use of the chemical admixture in concrete.
- *Temperature limit for use, low*—The minimum recommended temperature limit for use of the chemical admixture in concrete.
- *Shelf life*—The length of time that the chemical admixture can be stored without losing its effectiveness.
- *Storage temperature limit, high*—The maximum ambient temperature (C) recommended for storage of the chemical admixture during its shelf life.
- *Storage temperature limit, low*—The minimum ambient temperature (C) recommended for storage of the chemical admixture during its shelf life.
- *Freezing point*
- *Boiling point*
- *Modification mechanism*—A brief description of the mechanism by which the chemical admixture modifies the properties and performance of the concrete.
- *Compatibility with other constituents*—Information about the potentially deleterious effect on concrete that

could occur when the chemical admixture is used in combination with other chemical admixtures or concrete constituents.

- *Manufacturer recommendations notes*

7.4—Chemical admixture performance in concrete

The chemical admixture performance in concrete data segment is used to report test results that quantify the effect a chemical admixture has on the properties and performance of concrete made using the admixture. Results that could be reported include, but are not limited to, rheological properties, setting time, air content, compressive strength, flexural strength, length change, and freeze-thaw resistance. These results may be obtained from tests performed using concrete, cement paste, or mortar.

This data segment is represented by 12 data elements that are used repeatedly for each constituent property being reported. Data elements for reporting additional information about the test method used to determine the property are provided in [Section 12.2](#). Recommended formats for reporting information about processing of the concrete that was prepared to determine chemical admixture performance in concrete are provided in [Chapter 11](#). To eliminate repetition and minimize redundancy, data elements for processing data are not included in this data segment. For the chemical admixture portion of a concrete materials property database to be considered comprehensive and complete, however, they need to be included as part of this data segment.

- *Constituent property*—The name of the property being reported to quantify the effect the chemical admixture has on the properties and performance of concrete made using the chemical admixture. Slump and air content are examples of constituent properties.
- *Constituent property value*
- *Concrete phase*
- *Concrete age*
- *Constituent property notes*

CHAPTER 8—MINERAL ADMIXTURES

Data segments and corresponding data elements for reporting information about mineral admixtures in a materials property database are listed in [Table 8.1](#) and defined herein. Data elements for mineral admixture information are organized into four data segments.

8.1—Mineral admixture designation

Mineral admixtures are finely divided natural or byproduct materials that are added to concrete before mixing to modify the properties of the fresh or hardened product. Coal fly ash, raw or calcined natural pozzolans, and silica fume are commonly used as mineral admixtures when cementitious or pozzolanic action is necessary or when other properties attributed to mineral admixtures are desired. The mineral admixture designation data segment includes descriptive terms used to establish a unique identifier for each mineral admixture in the concrete mixture. Data elements in this data segment are used repeatedly for each mineral admixture. They also serve a dual role as concrete identifiers.

- *Constituent class*—The class of constituents covered by this data category is mineral admixture.
- *Mineral admixture common name*—Fly ash and silica fume are examples of common names for mineral admixtures.
- *Mineral admixture producer name*
- *Mineral admixture producer plant location*
- *Mineral admixture producer identification number*—An alphanumeric designation assigned by the producer or supplier to distinguish one lot or batch of the mineral admixture from another.
- *Mineral admixture designation note*

8.2—Composition and characteristics

The composition and characteristics data segment is used to report information that defines the chemical composition and characteristics of the mineral admixture. Two data elements are used repeatedly to report the chemical constituents in the admixture.

- *Chemical constituent*—The name of a chemical compound in the mineral admixture.
- *Percent by mass*—The amount (percent by mass) of the chemical constituent in the mineral admixture.
- *Mineral admixture property*—The name of the mineral admixture property being reported. Density, moisture content, fineness, specific surface area, and loss on ignition are examples of mineral aggregate properties.
- *Mineral admixture property value*
- *Composition and characteristics notes*

8.3—Manufacturer recommendations

The manufacturer recommendations data segment is used to report information provided by the manufacturer about the mineral admixture including guidelines for its use in concrete. If necessary, additional data elements can be developed to report other recommendations provided by the manufacturer.

- *Safety information*
- *Dosage*
- *Storage conditions*—The environmental conditions recommended by the mineral admixture manufacturer for storage of the mineral admixture.
- *Manufacturer recommendations notes*

8.4—Mineral admixture performance in concrete

The mineral admixture performance in concrete data segment is used to report test results that quantify the effect a mineral admixture has on the properties and performance of concrete made using the admixture. Results that could be reported include, but are not limited to, rheological properties, setting time, air content, compressive strength, flexural strength, length change, and freeze-thaw resistance. These results may be obtained from tests performed using concrete, cement paste, or mortar.

This data segment is represented by 12 data elements that are used repeatedly for each property being reported. Data elements for reporting additional information about the test method used to determine the concrete property are provided

in [Section 12.2](#). Recommended formats for reporting information about processing of the concrete that was prepared to determine mineral admixture performance in concrete are provided in [Chapter 11](#). To eliminate repetition and minimize redundancy, data elements for processing data are not included in this data segment. For the mineral admixture portions of a concrete materials property database to be considered comprehensive and complete, however, they need to be included as part of this data segment.

- *Constituent property*—The name of the property being reported to quantify the effect the mineral admixture has on the properties and performance of concrete made using the mineral admixture. Slump and air content are examples of constituent properties.
- *Constituent property value*
- *Concrete phase*
- *Concrete age*
- *Constituent property notes*

CHAPTER 9—FIBERS

Data segments and corresponding data elements for reporting information about fibers in a materials property database are listed in [Table 9.1](#) and defined here. Data elements for fibers are organized into four data segments.

9.1—Fiber designation

Fibers are slender discontinuous elements in the form of bundles, networks, or strands of any natural or manufactured material that can be distributed throughout freshly mixed concrete. Each element is usually less than approximately 64 mm (2.5 in.) in length. Fibers can have either a round, oval, rectangular, or crescent-shaped cross section, depending on the raw materials used in the manufacturing process. Many types of metallic and nonmetallic materials are used to manufacture fibers for use in fiber-reinforced concrete and shotcrete. Guidelines for use of fibers in concrete are generally provided by the manufacturer. The fiber designation data segment includes descriptive terms used to establish a unique identifier for each type of fiber in the concrete mixture. Data elements in this data segment are used repeatedly for each type of fiber. They also serve a dual role as concrete identifiers.

- *Constituent class*—The class of constituents covered by this data category is fibers.
- *Fiber common name*—A product number or trade name may be used as a common name for the fibers.
- *Fiber producer name*
- *Fiber producer plant location*
- *Fiber producer identification number*—An alphanumeric designation assigned by the producer or supplier to distinguish one lot or production run of fibers from another.
- *Fiber designation notes*

9.2—Composition and characteristics

The composition and characteristics data segment is used to report information that defines the materials used to produce the fibers and the characteristics of individual fibers.

- *Material*—The name of the material used to manufacture

the fibers. Carbon steel, stainless steel, glass, polymeric, and natural materials are commonly used to manufacturer fibers.

- *Nonfiber constituents*—A description of the nonfiber constituents, if any, that are added to the concrete mixture along with the fibers. These constituents may be adhesives, cellulose products, or other items used to package the fibers for delivery to the concrete mixture.
- *Configuration*—A description of the shape of an individual fiber. Terms that may be used to describe the configuration of a fiber include deformed, hooked, mesh, monofilament, and variable length.
- *Cross-sectional area*—(of individual fiber)
- *Surface area*—(of individual fiber)
- *Length*—(of individual fiber)
- *Width*— (of individual fiber)
- *Diameter*—(of individual fiber)
- *Aspect ratio*—The length or nominal length of an individual fiber divided by the diameter or equivalent diameter of the fiber.
- *Delivery method*—A description of the method used to package, contain, or confine the fibers before their addition to the concrete mixture. Terms that may be used to describe the delivery method include loose, collated, box, bag, and bundled.
- *Fiber property*—The name of the fiber property being reported. Tensile strength, specific gravity, and density are examples of fiber properties.
- *Fiber property value*
- *Composition and characteristics notes*

9.3—Manufacturer recommendations

The manufacturer recommendations data segment is used to report information provided by the manufacturer about the fibers including guidelines for its use in concrete. If necessary, additional data elements can be developed to report other recommendations provided by the manufacturer.

- *Safety information*
- *Dosage*
- *Storage conditions*
- *Manufacturer recommendations notes*

9.4—Fiber performance in concrete

The fiber performance in concrete data segment is used to report test results that quantify the effect fibers have on the properties and performance of concrete made using the fibers. This data segment is represented by 12 data elements that are used repeatedly for each constituent property being reported. Data elements for reporting additional information about the test method used to determine the property are provided in [Section 12.2](#). Recommended formats for reporting information about processing of the concrete that was prepared to determine fiber performance in concrete are provided in [Chapter 11](#). To eliminate repetition and minimize redundancy, data elements for processing data are not included in this data segment. For the fiber portion of a concrete materials property database to be considered

comprehensive and complete, however, they need to be included as part of this data segment.

- *Constituent property*—The name of the property being reported to quantify the effect the fibers have on the properties and performance of concrete made using the fibers. Setting time, Vebe time, and slump are examples of constituent properties.
- *Constituent property value*
- *Concrete phase*
- *Concrete age*
- *Constituent property notes*

CHAPTER 10—WATER

Data segments and corresponding data elements for reporting information about water in a materials property database are listed in [Table 10.1](#) and defined here. Data elements for water are organized into three data segments.

10.1—Water designation

Water is an essential part of concrete mixtures whose binding medium is hydraulic cement. The amount of water included in the mixture and its properties strongly affect the quality of the concrete produced. The water designation data segment includes descriptive terms used to establish a unique identifier for the water used in the concrete mixture. Data elements in this data segment serve a dual role as concrete identifiers and should be used repeatedly whenever water is provided by more than one supplier.

- *Constituent class*—the class of constituents covered by this data category is water.
- *Water common name*—municipal, tap, distilled, and potable are examples of common names for water.
- *Water supplier name*
- *Water supplier plant location*
- *Water supplier identification number*—an alphanumeric designation assigned by the producer or supplier to distinguish one lot or production run of water from another.
- *Water designation notes*

10.2—Composition and characteristics

Although distilled and demineralized water can be used to produce concrete, most water used for this purpose contains additional solids or liquids. Chemicals, substances, and impurities are terms often used to describe these constituents. The composition and characteristics data segment is used to report information about solid or liquid constituents in the water. Two data elements are used repeatedly to identify each constituent in the water.

- *Chemical constituent*
- *Percent by mass*—The amount (percent by mass) of the chemical constituent in the water.
- *Water composition test method*
- *Water property*—The name of the water property being reported. Chloride ion concentration, sulfate ion concentration, pH, and total solids are examples of water properties.

- *Water property value*
- *Composition and characteristics note*

10.3—Water performance in concrete

The water performance in the concrete data segment is used to report test results that quantify the effect a water has on the properties and performance of concrete made using the water. This data segment is represented by 12 data elements that are used repeatedly for each constituent property being reported. Data elements for reporting additional information about the test method used to determine the property are provided in [Section 12.2](#). Recommended formats for reporting information about processing of the concrete that was prepared to determine water performance in concrete are provided in [Chapter 11](#). To eliminate repetition and minimize redundancy, data elements for processing data are not included in this data segment. For the water portion of a concrete materials property database to be considered comprehensive and complete, however, they need to be included as part of this data segment.

- *Constituent property*—The name of the property being reported to quantify the effect the water has on the properties and performance of concrete made using the water. Time of setting and air content are examples of constituent properties.
- *Constituent property value*
- *Concrete phase*
- *Concrete age*
- *Constituent property note*

CHAPTER 11—CONCRETE PROCESSING

Concrete processing represents a broad category of project-specific information and production data related to mixture proportions, batching, mixing, transporting, placing, consolidating, finishing, and curing of the concrete placement or batch. Data segments and corresponding data elements for reporting information about concrete processing in a materials property database are listed in [Table 11.1](#) and defined herein. As described in [Chapter 4](#), selected data elements in this data category serve a dual role as concrete identifiers. Data elements for concrete processing are organized into 12 data segments.

11.1—Project information

The project information data segment is used to report relevant facts pertaining to the project in which the concrete is used. Applicable data elements can be used repeatedly, if necessary. Data elements in addition to those included in this data segment may need to be developed to report other project-specific information that may be available.

- *Project owner*—The owner of the project for which the concrete was produced.
- *Project identifier*—The name of the project.
- *Project location*
- *Concrete component*—A term that identifies a component that was constructed using the concrete.
- *Concrete component support*—A description of the type of subgrade or formwork used to support the con-

crete component identified above.

- *Project contractor*
- *Project contractor address*
- *Processing procedure*—The procedure should be a written and approved document that identifies the specification requirements and acceptance criteria for the concrete processing activities. An alphanumeric designation or procedure number may be a suitable processing procedure identifier.
- *Processing procedure title*
- *Processing procedure date*
- *Project information notes*

11.2—Concrete specification

The concrete specification data segment is used to report information about the specified concrete mixture and property requirements. Selected data elements are used repeatedly for each constituent in the concrete and each specified concrete property. Specified concrete properties include those provided in project or material specifications for use in establishing limits of acceptability. Data elements, in addition to those included in this data segment, may need to be developed to report additional requirements that may be available.

- *Specified constituent quantity*—The quantity (mass or volume) of a constituent specified in the concrete mixture design. This data element is used repeatedly for each constituent in the concrete mixture.
- *Specified minimum constituent quantity*—The minimum quantity (mass or volume) of a constituent permitted for use in the production of the concrete. This data element is used repeatedly for each constituent in the concrete mixture.
- *Specified maximum constituent quantity*—The maximum quantity (mass or volume) of a constituent permitted for use in the production of the concrete. This data element is used repeatedly for each constituent in the concrete mixture.
- *Specified property*
- *Specified property value*—The property value of freshly mixed or hardened concrete obtained from a project or material specification and used to establish limits of acceptability.
- *Specified minimum property value*
- *Specified maximum property value*
- *Concrete phase*
- *Concrete age*
- *Specified property notes*

11.3—Concrete supplier

The concrete supplier data segment is used to report information that reflects the origin of the concrete.

- *Concrete supplier name*
- *Concrete supplier address*
- *Concrete supplier plant location*
- *Concrete supplier identification number*

11.4—Concrete mixture proportions

The concrete mixture proportions data segment is used to report the amount of each constituent in a given volume of concrete. Selected data elements are used repeatedly for each constituent in the concrete. To ensure consistency and thereby minimize possible confusion, each set of constituent quantity data entries should be related to the corresponding constituent which is identified using recommended formats provided in [Chapters 5 to 10](#).

- *Constituent quantity*—The quantity (mass or volume) of a constituent that was measured and used to prepare the concrete. This data element is used repeatedly for each constituent in the concrete mixture.
- *Constituent addition location*—Locations where constituents are typically added include the batch plant and the project site. Entries for this data element should correspond to the constituent quantity reported previously.
- *Constituent total quantity*—The total quantity (mass or volume) of a constituent that was used to prepare the concrete. This data element is used repeatedly for each constituent in the concrete mixture.
- *Constituent quantity per unit volume of concrete*
- *Volume of concrete produced*—The reported value should reflect the total volume of all constituents as well as the volume of entrained and entrapped air.
- *Mixture proportions notes*

11.5—Concrete batching

The concrete batching data segment is used to report information about the equipment and technique used to batch the concrete.

- *Batching process*
- *Batch controller manufacturer*—The name of the manufacturer of the equipment used to control batching functions such as opening and closing hoppers, bins, and admixture dispenser containers.
- *Batch controller manufacturer address*
- *Batch controller operator identifier*—The name or alphanumeric identifier for the operator of the batch controller.
- *Aggregate storage equipment*
- *Cementitious material storage equipment*
- *Chemical admixture storage equipment*
- *Bulk material storage equipment*—A description of the equipment or method used to store bulk materials, such as fibers, before batching.
- *Moisture meter*—The general class of moisture meter used to determine the moisture content of the aggregates used in the concrete. Types of moisture meters that are available include electrical resistance, nuclear, and microwave. Moisture content may also be determined using a manual test method.
- *Moisture meter manufacturer*
- *Moisture meter calibration date*
- *Moisture meter probe location*
- *Aggregate surface moisture condition*—Oven dry and saturated surface dry (SSD) are terms that may be used

as entries for this data element.

- *Batch plant certification*—Data entries may consist of the batch plant prequalification certification number and date of issuance.
- *Scale*—The type of scale used to weigh the concrete constituents.
- *Scale manufacturer*
- *Scale manufacturer address*
- *Scale calibration date*
- *Batching sequence*—The order and timing sequence in which the constituents were introduced into the mixing equipment.
- *Batching start time*—The time the first constituent was introduced into the measurement device using the HH:MM format described in [Section 3.4](#).
- *Batching discharge time*—The time the last constituent was discharged from the measurement device and into the mixing equipment using the HH:MM format described in [Section 3.4](#).
- *Batching air temperature*—The air temperature (C) near the batching equipment at the batching discharge time.
- *Batching relative humidity*—The relative humidity (%) near the batching equipment at the batching discharge time.
- *Batching notes*

11.6—Concrete mixing

The concrete mixing data segment is used to report information about the equipment and technique used to mix the concrete. Applicable data elements may be used repeatedly, if necessary.

- *Mixing equipment*
- *Mixing equipment manufacturer*
- *Mixing equipment manufacture address*
- *Mixing equipment uniformity test*
- *Mixing equipment uniformity test result*—A data entry of either pass or fail may be sufficient.
- *Mixer start time*
- *Mixer discharge time*
- *Mixing equipment revolutions*—The number of revolutions or cycles that occurred between the time the first constituent was added to the mixer (start time) and the time the fresh concrete was discharged from the mixer (discharge time). Revolutions are reported as an integer.
- *Mixing equipment speed*—The time required for the mixing equipment to complete one revolution or cycle. Speed is reported in units of seconds.
- *Concrete mixing time*—Concrete mixing time represents the difference between the time the first constituent was added to the mixer (start time) and the time the fresh concrete was discharged from the mixer (discharge time).
- *Mixing equipment amperage*—The amperage at which the mixing equipment operated immediately before discharge of the concrete in units of amperes.
- *Processing date*
- *Mixing notes*

11.7—Concrete transportation

The concrete transportation data segment is used to report information about the equipment and technique used to transport the concrete from the mixer to the point of placement. Applicable data elements may be used repeatedly, if necessary.

- *Transporting equipment*
- *Transporting equipment manufacturer*
- *Transporting equipment manufacturer address*
- *Transporting equipment features*—Terms used to describe features about the equipment used to transport the concrete. The model number assigned by the manufacturer may be an appropriate entry.
- *Transporting equipment identifier*—The name or alphanumeric identifier assigned to the transporting equipment for identification purposes.
- *Transporting equipment operator*—The name or alphanumeric identifier for the operator of the transporting equipment.
- *Transportation start time*
- *Transportation discharge time*—The time when the concrete was completely discharged from the transporting equipment using the HH:MM format described in [Section 3.4](#).
- *Transportation notes*

11.8—Concrete placement

The concrete placement data segment is used to report information about the equipment and technique used to place the concrete. Applicable data elements may be used repeatedly, if necessary.

- *Placing equipment*
- *Placing equipment manufacturer*
- *Placing equipment manufacturer address*
- *Placing equipment identifier*—This data element is used to report an alphanumeric identifier for the placing equipment.
- *Placing equipment operator*—The name or alphanumeric identifier for the operator of the placing equipment.
- *Placing supervisor*—The name or alphanumeric identifier for the supervisor responsible for placing the concrete.
- *Placement location*
- *Placement volume*
- *Placement start time*
- *Placement finish time*
- *Placement notes*

11.9—Concrete consolidation

The concrete consolidation data segment is used to report information about the equipment and technique used to consolidate the concrete. Applicable data elements may be used repeatedly, if necessary.

- *Consolidating equipment*
- *Consolidating equipment manufacturer*
- *Consolidating equipment manufacturer address*
- *Consolidating equipment operator*—The name or alphanumeric identifier for the operator of the consolidating equipment.
- *Consolidation supervisor*—The name or alphanumeric identifier for the supervisor of the concrete consolidation activities.

- *Consolidating equipment spacing*—The distance between locations where the consolidating equipment was used or installed. Consolidating equipment spacing could be based on the distance between locations where an internal vibrator was inserted or correspond to the distance between locations where external vibrators were attached to the formwork or screed.
- *Internal vibration depth*—The distance the internal vibrator was inserted below the surface of the fresh concrete, if applicable.
- *Consolidation time*—The length of time that the concrete was consolidated.
- *Consolidation notes*

11.10—Concrete finishing

The concrete finishing data segment is used to report information about the equipment and technique used to finish the concrete. Applicable data elements may be used repeatedly, if necessary.

- *Surface finish*
- *Surface finish material*—A description of the type of material, if any, applied to the concrete surface as part of the finishing operation. Floor hardeners, coloring matter (pigment), and special aggregates are examples of materials that may be applied to a concrete surface during finishing to produce a desired property or characteristic in the finished surface.
- *Surface finish material manufacturer*
- *Surface finish material manufacturer address*
- *Surface finish material application rate*—The amount of surface finish material that was applied per unit surface area of finished concrete.
- *Surface finish material installer*—The name or alphanumeric identifier for the installer of the surface finish material.
- *Concrete finishing supervisor*—The name or alphanumeric identifier for the concrete finishing supervisor.
- *Strike-off technique*
- *Strike-off tool*
- *Strike-off start time*
- *Strike-off stop time*
- *Finishing tool*
- *Finishing start time*
- *Finishing stop time*
- *Finishing notes*

11.11—Concrete curing

The concrete curing data segment is used to report information about the materials and technique used to cure the concrete. Applicable data elements may be used repeatedly, if necessary.

- *Curing technique*
- *Curing material*
- *Curing material manufacturer*
- *Curing material manufacturer address*
- *Curing material application rate*
- *Curing material application time*
- *Curing notes*

11.12—Concrete processing environment

The concrete processing environment data segment is used to report information about the environment in the vicinity where the concrete component is located or stored. For consistency, entries for individual data elements should be related to a corresponding time-of-day entry. Applicable data elements may be used repeatedly, if necessary.

- *Concrete temperature*
- *Air temperature*
- *Relative humidity*—The relative humidity (%) near the location where the fresh concrete was placed or the hardened concrete was stored.
- *Wind velocity*—The wind velocity near the location where the fresh concrete was placed or the hardened concrete was stored.
- *Weather*—A description of the weather conditions and other relevant environmental factors near the location where the fresh concrete was placed or the hardened concrete was stored.
- *Time of day*—The time when the processing environment parameters listed previously were obtained using the HH:MM format described in [Section 3.4](#).
- *Processing environment notes*

CHAPTER 12—PROPERTIES AND PERFORMANCE OF CONCRETE

Data segments and corresponding data elements for reporting properties and performance data in a concrete materials property database are listed in [Table 12.1](#) and defined here. A list of selected properties that could be reported in a concrete materials property database is presented in [Table 12.2](#). Data elements for properties and performance of concrete are organized into two data segments.

12.1—Concrete property

The concrete property data segment is used to report:

- Any property of freshly mixed or hardened concrete that provides information essential to the identification of the concrete;
- Data useful in making meaningful comparisons between concretes with similar compositions and characteristics; or
- Test results for use in establishing acceptability in accordance with project or material specification requirements such as those described in [Section 11.2](#).

Results obtained from a test conducted on either the fresh or hardened concrete or derived values obtained using the mixture proportions and related test results may be considered concrete property data. Selected data elements in this data segment serve a dual role as concrete identifiers.

- *Concrete property*—A concrete property is any property of the concrete.
- *Concrete property value*
- *Testing organization*—The name of the organization responsible for determining the concrete property.
- *Testing organization address*
- *Testing organization certification*—The title or description of qualifications or certification records held by the

testing organization.

- *Testing location*—Testing is routinely performed in the field or a laboratory that is at a different location from the address identified previously.
- *Testing equipment*
- *Testing equipment calibration date*
- *Testing equipment manufacturer*
- *Testing equipment manufacturer address*
- *Testing equipment operator*—The name or alphanumeric identifier for the operator of the testing equipment.
- *Testing supervisor*—The name or alphanumeric identifier for the supervisor of the concrete testing activities.
- *Test specimen size*—A description of the concrete test specimen configuration.
- *Test specimen conditioning*—A description of the procedure used to prepare or condition the concrete specimen for testing. For example, some test methods require concrete specimens to be stored under water for 24 h before testing.
- *Concrete phase*
- *Concrete age*
- *Test date*
- *Test time*
- *Concrete temperature*—The temperature (C) of the concrete at the time the specimen was tested.
- *Air temperature*—The temperature (C) of the air in the vicinity of the test specimen at the time the specimen was tested.
- *Concrete property notes*

12.2—Constituent property

The constituent property data segment is used to report any property of freshly mixed or hardened concrete that provides information about constituent performance in concrete. This data segment is used repeatedly for each constituent property reported. Selected data elements in this data segment are an integral part of the constituent data segments described in [Chapters 5 to 10](#).

- *Constituent property*—A constituent property is any property determined by testing to quantify the effects a constituent has on the properties and performance of concrete made using the constituent.
- *Constituent property value*
- *Testing organization*
- *Testing organization address*
- *Testing organization certification*
- *Testing location*
- *Testing equipment*
- *Testing equipment calibration date*
- *Testing equipment manufacturer*
- *Testing equipment manufacturer address*
- *Testing equipment operator*
- *Testing supervisor*
- *Test specimen size*
- *Test specimen conditioning*
- *Concrete phase*
- *Concrete age*
- *Test date*

- *Test time*
- *Concrete temperature*
- *Air temperature*
- *Constituent property notes*

CHAPTER 13—REFERENCES

13.1—Recommended references

American Concrete Institute

- 116R Cement and Concrete Terminology
207.1R Mass Concrete

American Society for Testing and Materials

- A 820 Standard Specification for Steel Fibers for Fiber-Reinforced Concrete
C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C 78 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
C 125 Terminology Relating to Concrete and Concrete Aggregates
C 138 Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
C 143/C 143M Standard Test Method for Slump of Hydraulic-Cement Concrete
C 150 Standard Specification for Portland Cement
C 173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Methods
C 219 Terminology Relating to Hydraulic Cement
C 293 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
C 494 Standard Specification for Chemical Admixtures for Concrete
C 618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
E 527 Practice for Numbering Metals and Alloys (UNS)
E 1013 Terminology Related to Computerized Systems

- E 1309 Guide for the Identification of Composite Materials in Computerized Material Property Databases
E 1313 Guide for Recommended Formats for Data Records Used in Computerization of Mechanical Test Data for Metals
E 1338 Guide for the Identification of Metals and Alloys in Computerized Material Property Databases
E 1443 Terminology Relating to Building and Accessing Material and Chemical Databases
E 1471 Guide for the Identification of Fibers, Fillers, and Core Materials in Computerized Material Property Databases
IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System

The above publications may be obtained from the following organizations:

American Concrete Institute
P.O. Box 9094
Farmington Hills, Mich. 48333-9094

American Society of Testing and Materials
100 Barr Harbor Drive
West Conshohocken, Pa. 19428-2959

13.2—Cited references

- Begley, E. F., 1993, "Program Infrastructure," *Manual on the Building of Materials Databases*, ASTM Manual Series: MNL 19, C. H. Newton, ed., ASTM, Philadelphia, Pa., Nov., pp. 13-26.
Klieger, P., 1957, "Long-Term Study of Cement Performance in Concrete: Chapter 10—Progress Report on Strength and Elastic Properties of Concrete," *ACI JOURNAL, Proceedings* V. 54, No. 6, American Concrete Institute, Farmington Hills, Mich., Dec., pp. 481-504.
Newton, C. H., 1993, "Introduction to the Building of Materials Databases," *Manual on the Building of Materials Databases*, ASTM Manual Series: MNL 19, C. H. Newton, ed., ASTM, Philadelphia, Pa., Nov., pp. 1-12.
Rumble, J. R., Jr., 1993, "Types of Materials Databases," *Manual on the Building of Materials Databases*, ASTM Manual Series: MNL 19, C. H. Newton, ed., ASTM, Philadelphia, Pa., Nov., pp. 27-33.
Wood, S. L., 1992, "Evaluation of the Long-Term Properties of Concrete," *Research and Development Bulletin RD102T*, Portland Cement Association, Skokie, Ill.

CHAPTER 14—FIGURES AND TABLES

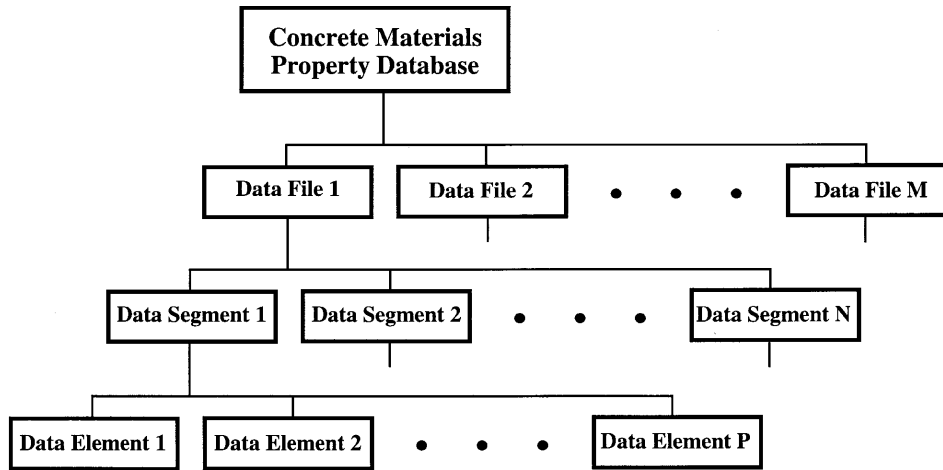


Fig. 2.1—Relationship among components of a concrete materials property database.

Table 2.1—Data elements number range designation

Data element number range	Data category
1000-1999	Hydraulic cement
2000-2999	Aggregates
3000-3999	Chemical admixture
4000-4999	Mineral admixture
5000-5999	Fibers
6000-6999	Water
7000-7999	Processing
8000-8999	Properties and performance
9000-9999	Concrete identification

Table 4.1—Data elements for the identification of concrete

Concrete designation data segment			
<i>Number^a</i>	<i>Name</i>	<i>Type^b</i>	<i>Format</i>
9001	Material class	Essential	Alphanumeric string
9002	Binder type	Essential	Alphanumeric string
9003	Concrete category	Essential	Alphanumeric string
9004	Concrete group	Desirable	Alphanumeric string
9005	Processing group	Desirable	Alphanumeric string
9006	Concrete identification number	Desirable	Alphanumeric string
9007	Common name	Essential	Alphanumeric string
9008	Concrete designation notes	Desirable	Alphanumeric string
Concrete supplier data segment			
7032	Concrete supplier name	Essential	Alphanumeric string
7033	Concrete supplier address	Essential	Alphanumeric string
7034	Concrete supplier plant location	Desirable	Alphanumeric string
7035	Concrete supplier identification number	Desirable	Alphanumeric string
Constituent designation data segment^c			
X001.xx	Constituent class	Essential	Alphanumeric string
X002.xx	Constituent common name	Essential	Alphanumeric string
X003.xx	Constituent producer name	Essential	Alphanumeric string
X004.xx	Constituent producer plant location	Essential	Alphanumeric string
X005.xx	Constituent producers identification number	Essential	Alphanumeric string
X006.xx	Constituent standards organization	Desirable	Alphanumeric string
X007.xx	Constituent specification number	Desirable	Alphanumeric string
X008.xx	Constituent specification designation	Desirable	Alphanumeric string
X009.xx	Constituent specification version	Desirable	Alphanumeric string
X010.xx	Constituent designation notes	Desirable	Alphanumeric string
Concrete mixture proportions data segment^d			
7045.yx	Constituent quantity per unit volume of concrete	Essential	Floating point
7046.yx	Constituent quantity per unit volume of concrete (Customary units designation)	Essential	Alphanumeric string
7047.yx	Constituent quantity per unit volume of concrete (SI units designation)	Essential	Alphanumeric string
7048.yx	Constituent quantity per unit volume of concrete (Customary to SI units conversion factor)	Essential	Floating point
Concrete processing data segment			
7054	Batching process	Essential	Alphanumeric string
7078	Mixing equipment	Essential	Alphanumeric string
7090	Processing date	Essential	YYYYMMDD
7092	Transporting equipment	Essential	Alphanumeric string
7101	Placing equipment	Essential	Alphanumeric string
7115	Consolidating equipment	Essential	Alphanumeric string
7131	Surface finish	Essential	Alphanumeric string
7149	Curing technique	Essential	Alphanumeric string
Concrete property data segment^e			
8001.xx	Concrete property	Essential	Alphanumeric string
8002.xx	Concrete property standards organization	Desirable	Alphanumeric string
8003.xx	Concrete property standard number	Desirable	Alphanumeric string
8004.xx	Concrete property standard version	Desirable	Alphanumeric string
8005.xx	Concrete property value	Essential	Floating point
8006.xx	Concrete property value (Customary units designation)	Essential	Alphanumeric string
8007.xx	Concrete property value (SI units designation)	Essential	Alphanumeric string
8008.xx	Concrete property value (Customary to SI units conversion factor)	Essential	Floating point
8021.xx	Concrete phase	Essential	Alphanumeric string
8022.xx	Concrete age	Essential	Floating point
8023.xx	Concrete age units	Essential	Alphanumeric string

^aData element numbers represent the entire set of information in a particular data element and are considered a functional part of the guide.

^bAll data elements are considered desirable. Essential data elements are important for unique concrete identification.

^cRepeat the data elements in this data segment for each constituent in the concrete mixture. The X in the data element number equals either 1 for hydraulic cement, 2 for aggregate, 3 for chemical admixture, 4 for mineral admixture, 5 for fibers, or 6 for water. The xx in the data element number can be used as an index (that is, 01, 02...) to distinguish one constituent of the same class from another.

^dRepeat the data elements in this data segment for each constituent in the concrete mixture. The y in the data element number can be used as an index to the corresponding constituent (see note c). The x in the data element number can be used as an index (that is, 1, 2...) to distinguish one constituent of the same class from another.

^eRepeat the data elements in this data segment for each concrete property. The xx in the data element number can be used as an index (that is, 01, 02...) to distinguish one concrete property from another.

Table 4.2—Suggested data element entries for the concrete designation data segment

Data element				
Material class	Binder type	Concrete category	Concrete group	Processing group
Concrete	Asphalt	Lightweight	Architectural	Castable
	Blended cement	Normalweight	Mass	Central-mixed
	Calcium-aluminate cement	Heavyweight	Backfill	Dry-mix shotcrete
	Expansive cement		Cast-in-place	Foamed
	Gypsum		Fiber-reinforced	Grouted-aggregate
	Masonry cement		Insulating	Manually-mixed
	Natural cement		Masonry grout	Packaged
	Polymer		Masonry mortar	Prepacked
	Portland cement		Overlay	Preplaced-aggregate
	Portland blast-furnace slag cement		Plain	Pumped
	Portland-pozzolan cement		Plaster	Ready-mixed
	Refractory cement		Precast	Roller-compacted
	Slag cement		Prestressed	Shrink-mixed
	Sulfur		Reinforced	Sprayed
			Shielding	Spun
			Structural	Transit-mixed
			Stucco	Truck-mixed
			Terrazzo	Vacuum
				Wet-mix shotcrete
Examples of data element entry combinations				
Material class	Binder type	Concrete category	Concrete group	Processing group
Concrete	Portland cement	Normalweight	Fiber-reinforced	Ready-mixed
Concrete	Refractory cement	Lightweight	Insulating	Castable
Concrete	Polymer	Normalweight	Overlay	Truck-mixed
Concrete	Expansive cement	Normalweight	Plain	Manually-mixed
Concrete	Masonry cement	Normalweight	Masonry mortar	Packaged
Concrete	Portland cement	Heavyweight	Shielding	Transit-mixed
Concrete	Portland cement	Normalweight	Mass	Roller-compacted
Concrete	Portland cement	Normalweight	Fiber-reinforced	Dry-mix shotcrete
Concrete	Portland blast-furnace slag cement	Normalweight	Structural	Central-mixed

Table 5.1—Data elements for hydraulic cement in concrete

Hydraulic cement designation data segment ^a			
Number ^b	Name	Type ^c	Format
1001.xx	Constituent class	Essential	Alphanumeric string
1002.xx	Hydraulic cement common name	Essential	Alphanumeric string
1003.xx	Hydraulic cement producer name	Essential	Alphanumeric string
1004.xx	Hydraulic cement producer plant location	Essential	Alphanumeric string
1005.xx	Hydraulic cement producer identification number	Essential	Alphanumeric string
1006.xx	Hydraulic cement standards organization	Desirable	Alphanumeric string
1007.xx	Hydraulic cement specification number	Desirable	Alphanumeric string
1008.xx	Hydraulic cement specification designation	Desirable	Alphanumeric string
1009.xx	Hydraulic cement specification version	Desirable	Alphanumeric string
1010.xx	Hydraulic cement designation notes	Desirable	Alphanumeric string
Hydraulic cement processing data segment			
1011	Processing date	Essential	YYYYMMDD
1012	Kiln system	Desirable	Alphanumeric string
1013	Grinding mill	Desirable	Alphanumeric string
1014	Grinding mill manufacturer	Desirable	Alphanumeric string
1015	Grinding mill manufacturer address	Desirable	Alphanumeric string
1016.xx	Hydraulic cement constituent ^d	Desirable	Alphanumeric string

Table 5.1—Data elements for hydraulic cement in concrete (continued)

<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
1017.xx	Hydraulic cement constituent percent by mass ^d	Desirable	Floating point
1018.xx	Chemical compound ^e	Desirable	Alphanumeric string
1019.xx	Chemical compound percent by mass ^e	Desirable	Floating point
1020	Hydraulic cement constituent composition test method	Desirable	Alphanumeric string
1021	Hydraulic cement constituent composition test method standards organization	Desirable	Alphanumeric string
1022	Hydraulic cement constituent composition test method standard number	Desirable	Alphanumeric string
1023	Hydraulic cement constituent composition test method standard version	Desirable	Alphanumeric string
1024	Hydraulic cement processing notes	Desirable	Alphanumeric string
Composition and characteristics data segment			
1025.xx	Oxide ^f	Essential	Alphanumeric string
1026.xx	Oxide content ^f	Essential	Floating point
1027.xx	Phase ^g	Essential	Alphanumeric string
1028.xx	Phase content ^g	Essential	Floating point
1029	Carbon dioxide content	Essential	Floating point
1030	Water content	Essential	Floating point
1031	Insoluble residue	Essential	Floating point
1032	Hydraulic cement composition test method	Desirable	Alphanumeric string
1033	Hydraulic cement composition test method standards organization	Desirable	Alphanumeric string
1034	Hydraulic cement composition test method standard number	Desirable	Alphanumeric string
1035	Hydraulic cement composition test method standard version	Desirable	Alphanumeric string
1036	Sieve analysis test method	Essential	Alphanumeric string
1037	Sieve analysis test method standards organization	Desirable	Alphanumeric string
1038	Sieve analysis test method standard number	Desirable	Alphanumeric string
1039	Sieve analysis test method standard version	Desirable	Alphanumeric string
1040.xx	Sieve designation ^h	Essential	Alphanumeric string
1041.xx	Sieve opening dimension ^h	Essential	Floating point
1042.xx	Sieve opening dimension (Customary units designation) ^h	Essential	Alphanumeric string
1043.xx	Sieve opening dimension (SI units designation) ^h	Essential	Alphanumeric string
1044.xx	Sieve opening dimension (Customary to SI units conversion factor) ^h	Essential	Floating point
1045.xx	Total percentage of material passing through sieve ^h	Essential	Floating point
1046.xx	Total percentage of material retained on sieve ^h	Essential	Floating point
1047.xx	Hydraulic cement property ⁱ	Essential	Alphanumeric string
1048.xx	Hydraulic cement property standards organization ⁱ	Desirable	Alphanumeric string
1049.xx	Hydraulic cement property standard number ⁱ	Desirable	Alphanumeric string
1050.xx	Hydraulic cement property standard version ⁱ	Desirable	Alphanumeric string
1051.xx	Hydraulic cement property value ⁱ	Essential	Floating point
1052.xx	Hydraulic cement property value (Customary units designation) ⁱ	Essential	Alphanumeric string
1053.xx	Hydraulic cement property value (SI units designation) ⁱ	Essential	Alphanumeric string
1054.xx	Hydraulic cement property value (Customary to SI units conversion factor) ⁱ	Essential	Floating point
1055.xx	Color	Desirable	Alphanumeric string
1056.xx	Color test method	Desirable	Alphanumeric string
1057.xx	Color test method standards organization	Desirable	Alphanumeric string
1058.xx	Color test method standard number	Desirable	Alphanumeric string
1059.xx	Color test method standard version	Desirable	Alphanumeric string
1060.xx	Composition and characteristics notes	Desirable	Alphanumeric string
Hydraulic cement performance in concrete data segment^j			
8029.xx	Constituent property	Essential	Alphanumeric string
8030.xx	Constituent property standards organization	Desirable	Alphanumeric string
8031.xx	Constituent property standard number	Desirable	Alphanumeric string
8032.xx	Constituent property standard version	Desirable	Alphanumeric string
8033.xx	Constituent property value	Essential	Floating point

Table 5.1—Data elements for hydraulic cement in concrete (continued)

<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
8034.xx	Constituent property value (Customary units designation)	Essential	Alphanumeric string
8035.xx	Constituent property value (SI units designation)	Essential	Alphanumeric string
8036.xx	Constituent property value (Customary to SI units conversion factor)	Essential	Floating point
8049.xx	Concrete phase	Essential	Floating point
8050.xx	Concrete age	Essential	Floating point
8051.xx	Concrete age units	Essential	Alphanumeric string
8056.xx	Constituent property notes	Desirable	Alphanumeric string

^aData elements in this data segment serve a dual role as concrete identifiers. Repeat the data elements in this data segment for each hydraulic cement in the concrete mixture.

^bData element numbers represent the entire set of information in a particular data element and are considered a functional part of the guide.

^cAll data elements are considered an important part of the hydraulic cement portion of a concrete materials property database. Essential data elements are considered necessary for meaningful comparisons among hydraulic cements with similar compositions and characteristics.

^dRepeat this data element for each constituent used to produce the hydraulic cement.

^eRepeat this data element for each chemical compound in the hydraulic cement constituent.

^fRepeat this data element for each oxide in the hydraulic cement.

^gRepeat this data element for each phase in the hydraulic cement.

^hRepeat this data element for each sieve used in the sieve analysis.

ⁱRepeat this data element for each hydraulic cement property.

^jRepeat the data elements in this data segment for each constituent property.

Table 6.1—Data elements for aggregates in concrete

Aggregate designation data segment^a			
<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
2001.xx	Constituent class	Essential	Alphanumeric string
2002.xx	Aggregate common name	Essential	Alphanumeric string
2003.xx	Aggregate producer name	Essential	Alphanumeric string
2004.xx	Aggregate producer plant location	Essential	Alphanumeric string
2005.xx	Aggregate producer identification number	Essential	Alphanumeric string
2006.xx	Aggregate standards organization	Desirable	Alphanumeric string
2007.xx	Aggregate specification number	Desirable	Alphanumeric string
2008.xx	Aggregate specification designation	Desirable	Alphanumeric string
2009.xx	Aggregate specification version	Desirable	Alphanumeric string
2010.xx	Aggregate designation notes	Desirable	Alphanumeric string
Composition and characteristics data segment			
2011	Material	Essential	Alphanumeric string
2012.xx	Mineralogical name ^d	Essential	Alphanumeric string
2013.xx	Percent by mass ^d	Essential	Floating point
2014	Shape	Essential	Alphanumeric string
2015	Angularity	Essential	Alphanumeric string
2016	Surface texture	Essential	Alphanumeric string
2017	Sieve analysis test method	Essential	Alphanumeric string
2018	Sieve analysis test method standards organization	Desirable	Alphanumeric string
2019	Sieve analysis test method standard number	Desirable	Alphanumeric string
2020	Sieve analysis test method standard version	Desirable	Alphanumeric string
2021.xx	Sieve designation ^e	Essential	Alphanumeric string
2022.xx	Sieve opening dimension ^e	Essential	Floating point
2023.xx	Sieve opening dimension (Customary units designation) ^e	Essential	Alphanumeric string
2024.xx	Sieve opening dimension (SI units designation) ^e	Essential	Alphanumeric string
2025.xx	Sieve opening dimension (Customary to SI units conversion factor) ^e	Essential	Floating point
2026.xx	Total percentage of material passing sieve ^e	Essential	Floating point
2027.xx	Total percentage of material retained on sieve ^e	Essential	Floating point
2028.xx	Aggregate property ^f	Essential	Alphanumeric string
2029.xx	Aggregate property standards organization ^f	Desirable	Alphanumeric string
2030.xx	Aggregate property standard number ^f	Desirable	Alphanumeric string
2031.xx	Aggregate property standard version ^f	Desirable	Alphanumeric string
2032.xx	Aggregate property value ^f	Essential	Floating point
2033.xx	Aggregate property value (Customary units designation) ^f	Essential	Alphanumeric string
2034.xx	Aggregate property value (SI units designation) ^f	Essential	Alphanumeric string

Table 6.1—Data elements for aggregates in concrete (continued)

<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
2035.xx	Aggregate property value (Customary SI units conversion factor) ^f	Essential	Floating point
2036	Petrographic notes	Desirable	Alphanumeric string
2037	Composition and characteristics notes	Desirable	Alphanumeric string
Aggregate performance in concrete data segment^g			
8029.xx	Constituent property	Essential	Alphanumeric string
8030.xx	Constituent property standards organization	Desirable	Alphanumeric string
8031.xx	Constituent property standard number	Desirable	Alphanumeric string
8032.xx	Constituent property standard version	Desirable	Alphanumeric string
8033.xx	Constituent property value	Essential	Floating point
8034.xx	Constituent property value (Customary units designation)	Essential	Alphanumeric string
8035.xx	Constituent property value (SI units designation)	Essential	Alphanumeric string
8036.xx	Constituent property value (Customary to SI units conversion factor)	Essential	Floating point
8049.xx	Concrete phase	Essential	Floating point
8050.xx	Concrete age	Essential	Floating point
8051.xx	Concrete age units	Essential	Alphanumeric string
8056.xx	Constituent property notes	Desirable	Alphanumeric string

^aData elements in this data segment serve a dual role as concrete identifiers. Repeat the data elements in this data segment for each aggregate in the concrete mixture.

^bData element numbers represent the entire set of information in a particular data element and are considered a functional part of the guide.

^cAll data elements are considered an important part of the aggregate portion of a concrete materials property database. Essential data elements are considered necessary for meaningful comparisons among aggregates with similar compositions and characteristics.

^dRepeat this data element for each chemical compound or mineral constituent in the aggregate.

^eRepeat this data element for each sieve used in the sieve analysis.

^fRepeat this data element for each aggregate property.

^gRepeat the data elements in this data segment for each constituent property.

Table 7.1—Data elements for chemical admixtures in concrete

Chemical admixture designation data segment^a			
<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
3001.xx	Constituent class	Essential	Alphanumeric string
3002.xx	Chemical admixture common name	Essential	Alphanumeric string
3003.xx	Chemical admixture producer name	Essential	Alphanumeric string
3004.xx	Chemical admixture producer plant location	Essential	Alphanumeric string
3005.xx	Chemical admixture identification number	Essential	Alphanumeric string
3006.xx	Chemical admixture standards organization	Desirable	Alphanumeric string
3007.xx	Chemical admixture specification number	Desirable	Alphanumeric string
3008.xx	Chemical admixture specification designation	Desirable	Alphanumeric string
3009.xx	Chemical admixture specification version	Desirable	Alphanumeric string
3010.xx	Chemical admixture designation notes	Desirable	Alphanumeric string
Composition and characteristics data segment			
3011.xx	Chemical constituent ^d	Essential	Alphanumeric string
3012.xx	Percent by mass ^d	Essential	Floating point
3013	Total active agent	Essential	Floating point
3014	Total active agent (Customary units designation)	Desirable	Alphanumeric string
3015	Total active agent (SI units designation)	Essential	Alphanumeric string
3016	Total active agent (Customary to SI units conversion factor)	Desirable	Floating point
3017	pH	Desirable	Floating point
3018	Density	Desirable	Floating point
3019	Density (Customary units designation)	Desirable	Alphanumeric string
3020	Density (SI units designation)	Desirable	Alphanumeric string
3021	Density (Customary to SI units conversion factor)	Desirable	Floating point
3022	Composition and characteristics notes	Desirable	Alphanumeric string
Manufacturer recommendations data segment			
3023	Safety information	Essential	Alphanumeric string
3024	Dosage	Essential	Floating point
3025	Dosage (Customary units designation)	Essential	Alphanumeric string
3026	Dosage (SI units designation)	Essential	Alphanumeric string
3027	Dosage (Customary to SI units conversion factor)	Essential	Floating point

Table 7.1—Data elements for chemical admixtures in concrete (continued)

<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
3028	Time of addition	Desirable	Floating point
3029	Time of addition units	Desirable	Alphanumeric string
3030	Method of addition	Desirable	Alphanumeric string
3031	Recommended use	Desirable	Alphanumeric string
3032	Temperature limit for use, high (C)	Desirable	Floating point
3033	Temperature limit for use, low (C)	Desirable	Floating point
3034	Shelf life	Desirable	Floating point
3035	Shelf life units	Desirable	Alphanumeric string
3036	Storage temperature limit, high (C)	Desirable	Floating point
3037	Storage temperature limit, low (C)	Desirable	Floating point
3038	Freezing point (C)	Desirable	Floating point
3039	Boiling point (C)	Desirable	Floating point
3040	Modification mechanism	Desirable	Alphanumeric string
3041	Compatibility with other constituents	Desirable	Alphanumeric string
3042	Manufacturer recommendation notes	Desirable	Alphanumeric string
Chemical admixture performance in concrete data segment^c			
8029.xx	Constituent property	Essential	Alphanumeric string
8030.xx	Constituent property standards organization	Desirable	Alphanumeric string
8031.xx	Constituent property standard number	Desirable	Alphanumeric string
8032.xx	Constituent property standard version	Desirable	Alphanumeric string
8033.xx	Constituent property value	Essential	Floating point
8034.xx	Constituent property value (Customary units designation)	Essential	Alphanumeric string
8035.xx	Constituent property value (SI units designation)	Essential	Alphanumeric string
8036.xx	Constituent property value (Customary to SI units conversion factor)	Essential	Floating point
8049.xx	Concrete phase	Essential	Floating point
8050.xx	Concrete age	Essential	Floating point
8051.xx	Concrete age units	Essential	Alphanumeric string
8056.xx	Constituent property notes	Desirable	Alphanumeric string

^aData elements in this data segment serve a dual role as concrete identifiers. Repeat the data elements in this data segment for each chemical admixture in the concrete mixture.

^bData element numbers represent the entire set of information in a particular data element and are considered a functional part of the guide.

^cAll data elements are considered an important part of the chemical admixture portion of a concrete materials property database. Essential data elements are considered necessary for meaningful comparisons among chemical admixtures with similar compositions and characteristics.

^dRepeat this data element for each chemical or chemical constituent used in the manufacturer of the chemical admixture.

^eRepeat the data elements in this data segment for each constituent property.

Table 8.1—Data elements for mineral admixtures in concrete

Mineral admixture designation data segment^a			
<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
4001.xx	Constituent class	Essential	Alphanumeric string
4002.xx	Mineral admixture common name	Essential	Alphanumeric string
4003.xx	Mineral admixture producer name	Essential	Alphanumeric string
4004.xx	Mineral admixture producer plant location	Essential	Alphanumeric string
4005.xx	Mineral admixture identification number	Essential	Alphanumeric string
4006.xx	Mineral admixture standards organization	Desirable	Alphanumeric string
4007.xx	Mineral admixture specification number	Desirable	Alphanumeric string
4008.xx	Mineral admixture specification designation	Desirable	Alphanumeric string
4009.xx	Mineral admixture specification version	Desirable	Alphanumeric string
4010.xx	Mineral admixture designation notes	Desirable	Alphanumeric string
Composition and characteristics data segment			
4011.xx	Chemical constituent ^d	Essential	Alphanumeric string
4012.xx	Percent by mass ^d	Essential	Floating point
4013.xx	Mineral admixture property ^e	Essential	Alphanumeric string
4014.xx	Mineral admixture property standards organization ^e	Desirable	Alphanumeric string
4015.xx	Mineral admixture property standard number ^e	Desirable	Alphanumeric string
4016.xx	Mineral admixture property standard version ^e	Desirable	Alphanumeric string
4017.xx	Mineral admixture property value ^e	Essential	Floating point

Table 8.1—Data elements for mineral admixtures in concrete (continued)

<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
4018.xx	Mineral admixture property value (Customary units designation) ^e	Essential	Alphanumeric string
4019.xx	Mineral admixture property value (SI units designation) ^e	Essential	Alphanumeric string
4020.xx	Mineral admixture property value (Customary to SI units conversion factor) ^e	Essential	Floating point
4021	Composition and characteristics notes	Desirable	Alphanumeric string
Manufacturer recommendations data segment			
4022	Safety information	Essential	Alphanumeric string
4023	Dosage	Essential	Floating point
4024	Dosage (Customary units designation)	Desirable	Alphanumeric string
4025	Dosage (SI units designation)	Essential	Alphanumeric string
4026	Dosage (Customary to SI units conversion factor)	Desirable	Floating point
4027	Manufacturer recommendation notes	Desirable	Alphanumeric string
Mineral admixture performance in concrete data segment^f			
8029.xx	Constituent property	Essential	Alphanumeric string
8030.xx	Constituent property standards organization	Desirable	Alphanumeric string
8031.xx	Constituent property standard number	Desirable	Alphanumeric string
8032.xx	Constituent property standard version	Desirable	Alphanumeric string
8033.xx	Constituent property value	Essential	Floating point
8034.xx	Constituent property value (Customary units designation)	Essential	Alphanumeric string
8035.xx	Constituent property value (SI units designation)	Essential	Alphanumeric string
8036.xx	Constituent property value (Customary to SI units conversion factor)	Essential	Floating point
8049.xx	Concrete phase	Essential	Floating point
8050.xx	Concrete age	Essential	Floating point
8051.xx	Concrete age units	Essential	Alphanumeric string
8056.xx	Constituent property notes	Desirable	Alphanumeric string

^aData elements in this data segment serve a dual role as concrete identifiers. Repeat the data elements in this data segment for each mineral admixture in the concrete mixture.

^bData element numbers represent the entire set of information in a particular data element and are considered a functional part of the guide.

^cAll data elements are considered an important part of the mineral admixture portion of a concrete materials property database. Essential data elements are considered necessary for meaningful comparisons among mineral admixtures with similar compositions and characteristics.

^dRepeat this data element for each chemical or chemical constituent used in the mineral admixture.

^eRepeat this data element for each mineral admixture property.

^fRepeat the data elements in this data segment for each constituent property.

Table 9.1—Data elements for fibers in concrete

Fiber designation data segment^a			
<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
5001.xx	Constituent class	Essential	Alphanumeric string
5002.xx	Fiber common name	Essential	Alphanumeric string
5003.xx	Fiber producer name	Essential	Alphanumeric string
5004.xx	Fiber producer plant location	Essential	Alphanumeric string
5005.xx	Fiber producer identification number	Essential	Alphanumeric string
5006.xx	Fiber standards organization	Desirable	Alphanumeric string
5007.xx	Fiber specification number	Desirable	Alphanumeric string
5008.xx	Fiber specification designation	Desirable	Alphanumeric string
5009.xx	Fiber specification version	Desirable	Alphanumeric string
5010.xx	Fiber designation notes	Desirable	Alphanumeric string
Composition and characteristics data segment			
5011	Material	Essential	Alphanumeric string
5012	Nonfiber constituent	Essential	Alphanumeric string
5013	Configuration	Essential	Alphanumeric string
5014	Cross-sectional area	Desirable	Floating point
5015	Cross-sectional area (Customary units designation)	Desirable	Alphanumeric string
5016	Cross-sectional area (SI units designation)	Desirable	Alphanumeric string
5017	Cross-sectional area (Customary to SI units conversion factor)	Desirable	Floating point
5018	Surface area	Desirable	Floating point
5019	Surface area (Customary units designation)	Desirable	Alphanumeric string
5020	Surface area (SI units designation)	Desirable	Alphanumeric string
5021	Cross-sectional area (Customary to SI units conversion factor)	Desirable	Floating point
5022	Length	Desirable	Floating point

Table 9.1—Data elements for fibers in concrete (continued)

<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
5023	Length (Customary units designation)	Desirable	Alphanumeric string
5024	Length (SI units designation)	Desirable	Alphanumeric string
5025	Length (Customary to SI units conversion factor)	Desirable	Floating point
5026	Width	Desirable	Floating point
5027	Width (Customary units designation)	Desirable	Alphanumeric string
5028	Width (SI units designation)	Desirable	Alphanumeric string
5029	Width (Customary to SI units conversion factor)	Desirable	Floating point
5030	Diameter	Desirable	Floating point
5031	Diameter (Customary units designation)	Desirable	Alphanumeric string
5032	Diameter (SI units designation)	Desirable	Alphanumeric string
5033	Diameter (Customary to SI units conversion factor)	Desirable	Floating point
5034	Aspect ratio	Desirable	Floating point
5035	Delivery method	Desirable	Alphanumeric string
5036.xx	Fiber property ^d	Essential	Alphanumeric string
5037.xx	Fiber property standards organization ^d	Desirable	Alphanumeric string
5038.xx	Fiber property standard number ^d	Desirable	Alphanumeric string
5039.xx	Fiber property standard version ^d	Desirable	Alphanumeric string
5040.xx	Fiber property value ^d	Essential	Floating point
5041.xx	Fiber property value (Customary units designation) ^d	Essential	Alphanumeric string
5042.xx	Fiber property value (SI units designation) ^d	Essential	Alphanumeric string
5043.xx	Fiber property value (Customary to SI units conversion factor) ^d	Essential	Floating point
5044	Composition and characteristics notes	Desirable	Alphanumeric string
Manufacturer recommendations data segment			
5045	Safety information	Essential	Alphanumeric string
5046	Dosage	Essential	Floating point
5047	Dosage (Customary units designation)	Desirable	Alphanumeric string
5048	Dosage (SI units designation)	Essential	Alphanumeric string
5049	Dosage (Customary to SI units conversion factor)	Desirable	Floating point
5050	Manufacturer recommendation notes	Desirable	Alphanumeric string
Fiber performance in concrete data segment^e			
8029.xx	Constituent property	Essential	Alphanumeric string
8030.xx	Constituent property standards organization	Desirable	Alphanumeric string
8031.xx	Constituent property standard number	Desirable	Alphanumeric string
8032.xx	Constituent property standard version	Desirable	Alphanumeric string
8033.xx	Constituent property value	Essential	Floating point
8034.xx	Constituent property value (Customary units designation)	Essential	Alphanumeric string
8035.xx	Constituent property value (SI units designation)	Essential	Alphanumeric string
8036.xx	Constituent property value (Customary to SI units conversion factor)	Essential	Floating point
8049.xx	Concrete phase	Essential	Floating point
8050.xx	Concrete age	Essential	Floating point
8051.xx	Concrete age units	Essential	Alphanumeric string
8056.xx	Constituent property notes	Desirable	Alphanumeric string

^aData elements in this data segment serve a dual role as concrete identifiers. Repeat the data elements in this data segment for each type of fiber in the concrete mixture.

^bData element numbers represent the entire set of information in a particular data element and are considered a functional part of the guide.

^cAll data elements are considered an important part of the fiber portion of a concrete materials property database. Essential data elements are considered necessary for meaningful comparisons among fibers with similar compositions and characteristics.

^dRepeat this data element for each fiber property.

^eRepeat the data elements in this data segment for each constituent property.

Table 10.1—Data elements for water in concrete

Water designation data segment^a			
<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
6001.xx	Constituent class	Essential	Alphanumeric string
6002.xx	Water common name	Essential	Alphanumeric string
6003.xx	Water producer name	Essential	Alphanumeric string
6004.xx	Water producer plant location	Essential	Alphanumeric string
6005.xx	Water producer identification number	Essential	Alphanumeric string
6006.xx	Water standards organization	Desirable	Alphanumeric string
6007.xx	Water specification number	Desirable	Alphanumeric string
6008.xx	Water specification designation	Desirable	Alphanumeric string
6009.xx	Water specification version	Desirable	Alphanumeric string
6010.xx	Water designation notes	Desirable	Alphanumeric string
Composition and characteristics data segment			
6011.xx	Chemical constituent ^d	Essential	Alphanumeric string
6012.xx	Percent by mass ^d	Essential	Floating point
6013	Water composition test method	Desirable	Alphanumeric string
6014	Water composition test method standards organization	Desirable	Alphanumeric string
6015	Water composition standard number	Desirable	Alphanumeric string
6016	Water composition standard version	Desirable	Alphanumeric string
6017.xx	Water property ^e	Essential	Alphanumeric string
6018.xx	Water property standards organization ^e	Desirable	Alphanumeric string
6019.xx	Water property standard number ^e	Desirable	Alphanumeric string
6020.xx	Water property standard version ^e	Desirable	Alphanumeric string
6021.xx	Water property value ^e	Essential	Floating point
6022.xx	Water property value (Customary units designation) ^e	Essential	Alphanumeric string
6023.xx	Water property value (SI units designation) ^e	Essential	Alphanumeric string
6024	Water property value (Customary to SI units conversion factor) ^e	Essential	Floating point
6025	Composition and characteristics notes	Desirable	Alphanumeric string
Water performance in concrete data segment^f			
8029.xx	Constituent property	Essential	Alphanumeric string
8030.xx	Constituent property standards organization	Desirable	Alphanumeric string
8031.xx	Constituent property standard number	Desirable	Alphanumeric string
8032.xx	Constituent property standard version	Desirable	Alphanumeric string
8033.xx	Constituent property value	Essential	Floating point
8034.xx	Constituent property value (Customary units designation)	Essential	Alphanumeric string
8035.xx	Constituent property value (SI units designation)	Essential	Alphanumeric string
8036.xx	Constituent property value (Customary to SI units conversion factor)	Essential	Floating point
8049.xx	Concrete phase	Essential	Floating point
8050.xx	Concrete age	Essential	Floating point
8051.xx	Concrete age units	Essential	Alphanumeric string
8056.xx	Constituent property notes	Desirable	Alphanumeric string

^aData elements in this data segment serve a dual role as concrete identifiers. Repeat the data elements in this data segment for each supplier of water in the concrete mixture.

^bData element numbers represent the entire set of information in a particular data element and are considered a functional part of the guide.

^cAll data elements are considered an important part of the water portion of a concrete materials property database. Essential data elements are considered necessary for meaningful comparisons among water with similar compositions and characteristics.

^dRepeat this data element for each chemical constituent in the water.

^eRepeat this data element for each water property.

^fRepeat the data elements in this data segment for each constituent property.

Table 11.1—Data elements for concrete processing

Project information data segment			
<i>Number^a</i>	<i>Name</i>	<i>Type^b</i>	<i>Format</i>
7001	Project owner	Essential	Alphanumeric string
7002	Project identifier	Essential	Alphanumeric string
7003	Project location	Essential	Alphanumeric string
7004	Concrete component	Essential	Alphanumeric string
7005	Concrete component support	Desirable	Alphanumeric string
7006	Project contractor	Desirable	Alphanumeric string
7007	Project contractor address	Desirable	Alphanumeric string
7008	Processing procedure	Desirable	Alphanumeric string
7009	Processing procedure title	Desirable	Alphanumeric string
7010	Processing procedure date	Desirable	YYMMDD
7011	Project information notes	Desirable	Alphanumeric string
Concrete specification data segment ^c			
7012.yx	Specified constituent quantity	Essential	Floating point
7013.yx	Specified minimum constituent quantity	Essential	Floating point
7014.yx	Specified maximum constituent quantity	Essential	Floating point
7015.yx	Specified constituent quantity (Customary units designation)	Essential	Alphanumeric string
7016.yx	Specified constituent quantity (SI units designation)	Essential	Alphanumeric string
7017.yx	Specified constituent quantity (Customary to SI units conversion factor)	Essential	Floating point
7018.xx	Specified property	Essential	Alphanumeric string
7019.xx	Specified property standards organization	Essential	Alphanumeric string
7020.xx	Specified property standard number	Desirable	Alphanumeric string
7021.xx	Specified property standard version	Desirable	Alphanumeric string
7022.xx	Specified property value	Desirable	Floating point
7023.xx	Specified minimum property value	Essential	Floating point
7024.xx	Specified maximum property value	Essential	Floating point
7025.xx	Specified property value (Customary units designation)	Essential	Alphanumeric string
7026.xx	Specified property value (SI units designation)	Essential	Alphanumeric string
7027.xx	Specified property value (Customary to SI units conversion factor)	Essential	Floating point
7028.xx	Concrete phase	Essential	Alphanumeric string
7029.xx	Concrete age	Essential	Floating point
7030.xx	Concrete age units	Essential	Alphanumeric string
7031.xx	Specified property notes	Desirable	Alphanumeric string
Concrete supplier data segment			
7032	Concrete supplier name ^d	Essential	Alphanumeric string
7033	Concrete supplier address ^d	Essential	Alphanumeric string
7034	Concrete supplier plant location ^d	Desirable	Alphanumeric string
7035	Concrete supplier identification number ^d	Desirable	Alphanumeric string
Concrete mixture proportions data segment ^c			
7036.yx	Constituent quantity	Essential	Floating point
7037.yx	Constituent quantity (Customary units designation)	Essential	Alphanumeric string
7038.yx	Constituent quantity (SI units designation)	Essential	Alphanumeric string
7039.yx	Constituent quantity (Customary to SI units conversion factor)	Essential	Floating point
7040.yx	Constituent addition location	Desirable	Alphanumeric string
7041.yx	Constituent total quantity	Essential	Floating point
7042.yx	Constituent total quantity (Customary units designation)	Essential	Alphanumeric string
7043.yx	Constituent total quantity (SI units designation)	Essential	Alphanumeric string
7044.yx	Constituent total quantity (Customary to SI units conversion factor)	Essential	Floating point
7045.yx	Constituent quantity per unit volume of concrete ^d	Essential	Floating point
7046.yx	Constituent quantity per unit volume of concrete (Customary units designation) ^d	Essential	Alphanumeric string
7047.yx	Constituent quantity per unit volume of concrete (SI units designation) ^d	Essential	Alphanumeric string
7048.yx	Constituent quantity per unit volume of concrete (Customary to SI units conversion factor) ^d	Essential	Floating point

Table 11.1—Data elements for concrete processing (continued)

<i>Number^a</i>	<i>Name</i>	<i>Type^b</i>	<i>Format</i>
7049	Volume of concrete produced	Desirable	Floating point
7050	Volume of concrete produced (Customary units designation)	Desirable	Alphanumeric string
7051	Volume of concrete produced (SI units designation)	Desirable	Alphanumeric string
7052	Volume of concrete produced (Customary to SI units conversion factor)	Desirable	Floating point
7053	Mixture proportions notes	Desirable	Alphanumeric string
Concrete batching data segment			
7054	Batching process ^d	Essential	Alphanumeric string
7055	Batch controller manufacturer	Desirable	Alphanumeric string
7056	Batch controller manufacturer address	Desirable	Alphanumeric string
7057	Batch controller operator identifier	Desirable	Alphanumeric string
7058	Aggregate stone equipment	Desirable	Alphanumeric string
7059	Cementitious material storage equipment	Desirable	Alphanumeric string
7060	Chemical admixture storage equipment	Desirable	Alphanumeric string
7061	Bulk material storage equipment	Desirable	Alphanumeric string
7062	Moisture meter	Desirable	Alphanumeric string
7063	Moisture meter manufacturer	Desirable	Alphanumeric string
7064	Moisture meter calibration date	Desirable	YYYYMMDD
7065	Moisture meter probe location	Desirable	Alphanumeric string
7066	Aggregate surface moisture condition	Desirable	Alphanumeric string
7067	Batch plant certification	Desirable	Alphanumeric string
7068	Scale	Desirable	Alphanumeric string
7069	Scale manufacturer	Desirable	Alphanumeric string
7070	Scale manufacturer address	Desirable	Alphanumeric string
7071	Scale calibration date	Desirable	YYYYMMDD
7072	Batching sequence	Desirable	Alphanumeric string
7073	Batching start time	Desirable	HH:MM
7074	Batching discharge time	Desirable	HH:MM
7075	Batching air temperature	Desirable	Floating point
7076	Batching relative humidity	Desirable	Floating point
7077	Batching notes	Desirable	Alphanumeric string
Concrete mixing data segment			
7078	Mixing equipment ^d	Essential	Alphanumeric string
7079	Mixing equipment manufacturer	Desirable	Alphanumeric string
7080	Mixing equipment manufacturer address	Desirable	Alphanumeric string
7081	Mixing equipment uniformity test	Desirable	Alphanumeric string
7082	Mixing equipment uniformity test result	Desirable	Alphanumeric string
7083	Mixer start time	Desirable	HH:MM
7084	Mixer discharge time	Desirable	HH:MM
7085	Mixing equipment revolutions	Desirable	Integer
7086	Mixing equipment speed(s)	Desirable	Floating point
7087	Concrete mixing time	Desirable	Floating point
7088	Concrete mixing time units	Desirable	Alphanumeric string
7089	Mixing equipment amperage (amperes)	Desirable	Floating point
7090	Processing date ^d	Essential	YYYYMMDD
7091	Mixing notes	Desirable	Alphanumeric string
Concrete transportation data segment^c			
7092	Transporting equipment ^d	Essential	Alphanumeric string
7093	Transporting equipment manufacturer	Desirable	Alphanumeric string
7094	Transporting equipment manufacturer address	Desirable	Alphanumeric string
7095	Transporting equipment features	Desirable	Alphanumeric string
7096	Transporting equipment identifier	Desirable	Alphanumeric string
7097	Transporting equipment operator	Desirable	Alphanumeric string
7098	Transportation start time	Desirable	HH:MM
7099	Transportation discharge time	Desirable	HH:MM
7100	Transportation notes	Desirable	Alphanumeric string

Table 11.1—Data elements for concrete processing (continued)

Concrete placement data segment ^c			
<i>Number^a</i>	<i>Name</i>	<i>Type^b</i>	<i>Format</i>
7101	Placing equipment ^d	Essential	Alphanumeric string
7102	Placing equipment manufacturer	Desirable	Alphanumeric string
7103	Placing equipment manufacturer address	Desirable	Alphanumeric string
7104	Placing equipment identifier	Desirable	Alphanumeric string
7105	Placing equipment operator	Desirable	Alphanumeric string
7106	Placing supervisor	Desirable	Alphanumeric string
7107	Placement location	Desirable	Alphanumeric string
7108	Placement volume	Desirable	Floating point
7109	Placement volume (Customary units designation)	Desirable	Alphanumeric string
7110	Placement volume (SI units designation)	Desirable	Alphanumeric string
7111	Placement volume (Customary to SI units conversion factor)	Desirable	Floating point
7112	Placement start time	Desirable	HH:MM
7113	Placement finish time	Desirable	HH:MM
7114	Placement notes	Desirable	Alphanumeric string
Concrete consolidation data segment ^c			
7115	Consolidating equipment ^d	Essential	Alphanumeric string
7116	Consolidating equipment manufacturer	Desirable	Alphanumeric string
7117	Consolidating equipment manufacturer address	Desirable	Alphanumeric string
7118	Consolidating equipment operator	Desirable	Alphanumeric string
7119	Consolidation supervisor	Desirable	Alphanumeric string
7120	Consolidating equipment spacing	Desirable	Floating point
7121	Consolidating equipment spacing (Customary units designation)	Desirable	Alphanumeric string
7122	Consolidating equipment spacing (SI units designation)	Desirable	Alphanumeric string
7123	Consolidating equipment spacing (Customary to SI units conversion factor)	Desirable	Floating point
7124	Internal vibration depth	Desirable	Floating point
7125	Internal vibration depth (Customary units designation)	Desirable	Alphanumeric string
7126	Internal vibration depth (SI units designation)	Desirable	Alphanumeric string
7127	Internal vibration depth (Customary to SI units conversion factor)	Desirable	Floating point
7128	Consolidation time	Desirable	Floating point
7129	Consolidation time units	Desirable	Alphanumeric string
7130	Consolidation notes	Desirable	Alphanumeric string
Concrete finishing data segment ^c			
7131	Surface finish ^d	Essential	Alphanumeric string
7132	Surface finish material	Desirable	Alphanumeric string
7133	Surface finish material manufacturer	Desirable	Alphanumeric string
7134	Surface finish material manufacturer address	Desirable	Alphanumeric string
7135	Surface finish material application rate	Desirable	Floating point
7136	Surface finish material application rate (Customary units designation)	Desirable	Alphanumeric string
7137	Surface finish material application rate (SI units designation)	Desirable	Alphanumeric string
7138	Surface finish material application rate (Customary to SI units conversion factor)	Desirable	Floating point
7139	Surface finish material installer	Desirable	Alphanumeric string
7140	Concrete finishing supervisor	Desirable	Alphanumeric string
7141	Strike-off technique	Desirable	Alphanumeric string
7142	Strike-off tool	Desirable	Alphanumeric string
7143	Strike-off start time	Desirable	HH:MM
7144	Strike-off stop time	Desirable	HH:MM
7145	Finishing tool	Desirable	Alphanumeric string
7146	Finishing start time	Desirable	HH:MM
7147	Finishing stop time	Desirable	HH:MM
7148	Finishing notes	Desirable	Alphanumeric string

Table 11.1—Data elements for concrete processing (continued)

Concrete curing data segment ^c			
<i>Number^a</i>	<i>Name</i>	<i>Type^b</i>	<i>Format</i>
7149	Curing technique ^d	Essential	Alphanumeric string
7150	Curing material	Desirable	Alphanumeric string
7151	Curing material manufacturer	Desirable	Alphanumeric string
7152	Curing material manufacturer address	Desirable	Alphanumeric string
7153	Curing material application rate	Desirable	Floating point
7154	Curing material application rate (Customary units designation)	Desirable	Alphanumeric string
7155	Curing material application rate (SI units designation)	Desirable	Alphanumeric string
7156	Curing material application rate (Customary to SI units conversion factor)	Desirable	Floating point
7157	Curing material application time	Desirable	HH:MM
7158	Curing notes	Desirable	Alphanumeric string
Concrete processing environment data segment ^c			
7159	Concrete temperature (C)	Essential	Floating point
7160	Air temperature (C)	Essential	Floating point
7161	Relative humidity (%)	Desirable	Floating point
7162	Wind velocity	Desirable	Floating point
7163	Wind velocity (Customary units designation)	Desirable	Alphanumeric string
7164	Wind velocity (SI units designation)	Desirable	Alphanumeric string
7165	Wind velocity (Customary to SI units conversion factor)	Desirable	Floating point
7166	Weather	Desirable	Alphanumeric string
7167	Time of day	Desirable	HH:MM
7168	Processing environment notes	Desirable	Alphanumeric string

^aData element numbers represent the entire set of information in a particular data element and are considered a functional part of the guide.

^bAll data elements are considered an important part of the processing portion of a concrete materials property database. Essential data elements are considered necessary for meaningful comparisons among concretes with similar compositions and characteristics.

^cApplicable data elements in this data segment may be used repeatedly (refer to Table 4.1, Notes d and e).

^dThis data element serves a dual role as a concrete identifier.

Table 12.1—Data elements for properties and performance of concrete

Concrete property data segment ^a			
<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
8001.xx	Concrete property ^d	Essential	Alphanumeric string
8002.xx	Concrete property standards organization ^d	Desirable	Alphanumeric string
8003.xx	Concrete property standard number ^d	Desirable	Alphanumeric string
8004.xx	Concrete property standard version ^d	Desirable	Alphanumeric string
8005.xx	Concrete property value ^d	Essential	Floating point
8006.xx	Concrete property value (Customary units designation) ^d	Essential	Alphanumeric string
8007.xx	Concrete property value (SI units designation) ^d	Essential	Alphanumeric string
8008.xx	Concrete property value (Customary to SI units conversion factor) ^d	Essential	Floating point
8009.xx	Testing organization	Desirable	Alphanumeric string
8010.xx	Testing organization address	Desirable	Alphanumeric string
8011.xx	Testing organization certification	Desirable	Alphanumeric string
8012.xx	Testing location	Desirable	Alphanumeric string
8013.xx	Testing equipment	Desirable	Alphanumeric string
8014.xx	Testing equipment calibration date	Desirable	YYYYMMDD
8015.xx	Test equipment manufacturer	Desirable	Alphanumeric string
8016.xx	Test equipment manufacturer address	Desirable	Alphanumeric string
8017.xx	Testing equipment operator	Desirable	Alphanumeric string
8018.xx	Testing supervisor	Desirable	Alphanumeric string
8019.xx	Test specimen size	Desirable	Alphanumeric string
8020.xx	Test specimen conditioning	Desirable	Alphanumeric string
8021.xx	Concrete phase ^d	Essential	Alphanumeric string
8022.xx	Concrete age ^d	Essential	Floating point
8023.xx	Concrete age units ^d	Essential	Alphanumeric string

Table 12.1—Data elements for properties and performance of concrete (continued)

<i>Number^b</i>	<i>Name</i>	<i>Type^c</i>	<i>Format</i>
8024.xx	Test date	Desirable	YYYYMMDD
8025.xx	Test time	Desirable	HH:MM
8026.xx	Concrete temperature (C)	Desirable	Alphanumeric string
8027.xx	Air temperature (C)	Desirable	Alphanumeric string
8028.xx	Concrete property notes	Desirable	Alphanumeric string
Constituent property data segment^a			
8029.xx	Constituent property	Essential	Alphanumeric string
8030.xx	Constituent property standards organization	Desirable	Alphanumeric string
8031.xx	Constituent property standard number	Desirable	Alphanumeric string
8032.xx	Constituent property standard version	Desirable	Alphanumeric string
8033.xx	Constituent property value	Essential	Floating point
8034.xx	Constituent property value (Customary units designation)	Essential	Alphanumeric string
8035.xx	Constituent property value (SI units designation)	Essential	Alphanumeric string
8036.xx	Constituent property value (Customary to SI units conversion factor)	Essential	Floating point
8037.xx	Testing organization	Desirable	Alphanumeric string
8038.xx	Testing organization address	Desirable	Alphanumeric string
8039.xx	Testing organization certification	Desirable	Alphanumeric string
8040.xx	Testing location	Desirable	Alphanumeric string
8041.xx	Testing equipment	Desirable	Alphanumeric string
8042.xx	Testing equipment calibration date	Desirable	YYYYMMDD
8043.xx	Testing equipment manufacturer	Desirable	Alphanumeric string
8044.xx	Testing equipment manufacturer address	Desirable	Alphanumeric string
8045.xx	Testing equipment operator	Desirable	Alphanumeric string
8046.xx	Testing supervisor	Desirable	Alphanumeric string
8047.xx	Test specimen size	Desirable	Alphanumeric string
8048.xx	Test specimen conditioning	Desirable	Alphanumeric string
8049.xx	Concrete phase	Essential	Alphanumeric string
8050.xx	Concrete age	Essential	Floating point
8051.xx	Concrete age units	Essential	Alphanumeric string
8052.xx	Test date	Desirable	YYYYMMDD
8053.xx	Test time	Desirable	HH:MM
8054.xx	Concrete temperature (C)	Desirable	Alphanumeric string
8055.xx	Air temperature (C)	Desirable	Alphanumeric string
8056.xx	Constituent property notes	Desirable	Alphanumeric string

^aRepeat the data elements in this data segment for each concrete or constituent property.

^bData element numbers represent the entire set of information in a particular data element and are considered a functional part of the guide.

^cAll data must be considered desirable. Essential data elements are important to minimize misunderstanding and to ensure meaningful comparisons between concrete with similar compositions and characteristics.

^dThis data element serves a dual role as a concrete identifier.

Table 12.2—Selected properties that could be reported in a concrete materials property database

Property	Fresh concrete	Hardened concrete
Water-cement ratio	X	
Water-cementitious materials ratio	X	
Air content	X	
Unit weight	X	
Slump	X	
Bleeding	X	
Initial set	X	
Final set	X	
Time of setting	X	
Volume change	X	X
Heat of hydration	X	X
Compressive strength		X
Flexural strength		X
Modulus of rupture		X
Tensile strength		X
Modulus of elasticity		X
Poisson's ratio		X
Rebound number		X
Penetration resistance		X
Pulse velocity		X
Abrasion resistance		X
Scaling resistance		X
Length change		X
Permeability		X
Shrinkage		X
Creep		X
Freeze-thaw resistance		X
Potential volume change		X
Potential alkali reactivity		X
Thermal conductivity		X
Thermal diffusivity		X
Specific heat		X
Coefficient of thermal expansion		X

APPENDIX A—EXAMPLE USE OF GUIDE

As an example of the use of the guide, sample data entries for normalweight, fiber-reinforced, and portland cement concrete are provided in [Tables A.1 to A.9](#). These entries reflect constituent information, properties and performance data, and processing parameters that may be available from many different sources for this particular concrete. Text and values used as entries are provided for illustration purposes only and do not necessarily reflect compatible property values or processing techniques. All of the example entries are intended to represent a comprehensive set of data for this particular concrete. Data sets like this, for a number of similar concretes, could be combined to create a concrete materials property database.

Concrete used in the example was made using ASTM C 150, Type I portland cement; ASTM C 618, Class F fly ash; rounded coarse and manufactured fine limestone aggregates; an ASTM C 494, Type A water-reducing chemical admixture; ASTM A 820, Type I deformed steel fibers; and potable

water. Sample material properties for each constituent are provided along with related information, such as potential volume change of cement-aggregate combinations that include results of tests performed to characterize or qualify the constituent for its intended use.

Example entries necessary for the unique identification of this particular concrete are contained in [Table A.1](#). Additional entries that serve a dual role as concrete identifiers are noted in [Tables A.2 to A.9](#). [Tables A.2 to A. 7](#) also contain example entries for hydraulic cement, aggregates, chemical admixture, mineral admixture, fibers, and water used to make the concrete. Information about concrete processing and concrete property data are provided in [Tables A.8 and A.9](#). Additional constituent and processing information as well as other material properties and test results can be included by adding appropriate sets of data elements based on guidelines described in [Chapters 4 through 12](#). Each data file created using these guidelines, however, should contain data that are unique to one concrete.

Table A.1—Example data entries for concrete identification

Concrete designation data segment ^a			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
9001	Material class	Essential	Concrete
9002	Binder type	Essential	Portland cement
9003	Concrete category	Essential	Normalweight
9004	Concrete group	Desirable	Fiber-reinforced
9005	Processing group	Desirable	Central mixed
9006	Concrete identification number	Desirable	9000-256
9007	Common name	Essential	Mix 9000
9008	Concrete designation notes	Desirable	(No entry)

^aExample entries in this data segment along with selected example entries noted in [Tables A.2 to A.9](#) establish a unique identity for this particular concrete in accordance with guidelines presented in [Chapter 4](#).

Table A.2—Example data entries for hydraulic cement

Hydraulic cement designation data segment ^a			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
1001.01	Constituent class	Essential	Hydraulic cement
1002.01	Hydraulic cement common name	Essential	Portland cement
1003.01	Hydraulic cement producer name	Essential	PCbest
1004.01	Hydraulic cement producer plant location	Essential	100 Main St., Columbia, Md.
1005.01	Hydraulic cement producer identification number	Essential	875-A3W
1006.01	Hydraulic cement standards organization	Desirable	ASTM
1007.01	Hydraulic cement specification number	Desirable	C 150
1008.01	Hydraulic cement specification designation	Desirable	Type I
1009.01	Hydraulic cement specification version	Desirable	97
1010.01	Hydraulic cement designation notes	Desirable	(No entry)
Hydraulic cement processing data segment			
1011	Processing date	Essential	19980405
1012	Kiln system	Desirable	Rotary
1013	Grinding mill	Desirable	Ball Mill
1014	Grinding mill manufacturer	Desirable	Ace Manufacturing Co.
1015	Grinding mill manufacturer address	Desirable	123 Grinder St., Ball City, Iowa
1016.01	Hydraulic cement constituent	Desirable	Clinker
1017.01	Hydraulic cement constituent, % by mass	Desirable	95

Table A.2—Example data entries for hydraulic cement (continued)

<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
1018.01	Chemical compound	Desirable	Varies
1019.01	Chemical compound, % by mass	Desirable	100
1016.02	Hydraulic cement constituent	Desirable	Gypsum
1017.02	Hydraulic cement constituent, % by mass	Desirable	5
1018.02	Chemical compound	Desirable	Hydrous calcium sulfate
1019.02	Chemical compound, % by mass	Desirable	99.5
1020	Hydraulic cement constituent composition test method	Desirable	Standard test method for chemical analysis of hydraulic cement
1021	Hydraulic cement constituent composition test method standards organization	Desirable	ASTM
1022	Hydraulic cement constituent composition test method standard number	Desirable	C 114
1023	Hydraulic cement constituent composition test method standard version	Desirable	97
1024	Hydraulic cement processing notes	Desirable	(No entry)
Composition and characteristics data segment			
1025.01	Oxide	Essential	Silicon dioxide
1026.01	Oxide content	Essential	21.4
1025.02	Oxide	Essential	Aluminum oxide
1026.02	Oxide content	Essential	4.0
1025.03	Oxide	Essential	Magnesium oxide
1026.03	Oxide content	Essential	63.8
1025.04	Oxide	Essential	Ferric oxide
1026.04	Oxide content	Essential	2.9
1025.05	Oxide	Essential	Sulfur trioxide
1026.05	Oxide content	Essential	2.1
1025.06	Oxide	Essential	Sulfur oxide
1026.06	Oxide content	Essential	3.0
1027.01	Phase	Essential	Tricalcium aluminate
1028.01	Phase content	Essential	5.0
1027.02	Phase	Essential	Dicalcium silicate
1028.02	Phase content	Essential	18.0
1027.03	Phase	Essential	Tetracalcium aluminoferrite and tricalcium aluminate
1028.03	Phase content	Essential	8.8
1027.04	Phase	Essential	Tricalcium silicate
1028.04	Phase content	Essential	57.0
1029	Carbon dioxide content	Essential	1.3
1030	Water content	Essential	0.77
1031	Insoluble residue	Essential	0.2
1032	Hydraulic cement composition test method	Desirable	Standard test method for chemical analysis of hydraulic cement
1033	Hydraulic cement composition test method standards organization	Desirable	ASTM
1034	Hydraulic cement composition test method standard number	Desirable	C 114
1035	Hydraulic cement composition test method standard version	Desirable	97
1036	Sieve analysis test method	Essential	Standard test method for fineness of hydraulic cement by the 150 and 75 μm (No. 100 and 200) sieves
1037	Sieve analysis test method standards organization	Desirable	ASTM
1038	Sieve analysis test method standard number	Desirable	C 184
1039	Sieve analysis test method standard version	Desirable	94
1040.01	Sieve designation	Essential	100
1041.01	Sieve opening dimension	Essential	150
1042.01	Sieve opening dimension (Customary units designation)	Essential	μm
1043.01	Sieve opening dimension (SI units designation)	Essential	μm

Table A.2—Example data entries for hydraulic cement (continued)

<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
1044.01	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
1045.01	Total percentage of material passing sieve	Essential	98.4
1046.01	Total percentage of material retained on sieve	Essential	1.6
1047.01	Hydraulic cement property	Essential	Loss on ignition
1048.01	Hydraulic cement property standards organization	Desirable	ASTM
1049.01	Hydraulic cement property standard number	Desirable	C 114
1050.01	Hydraulic cement property standard version	Desirable	97
1051.01	Hydraulic cement property value	Essential	2.7
1052.01	Hydraulic cement property value (Customary units designation)	Essential	%
1053.01	Hydraulic cement property value (SI units designation)	Essential	%
1054.01	Hydraulic cement property value (Customary to SI units conversion factor)	Essential	1
1055	Color	Desirable	Gray
1056	Color test method	Desirable	(No entry)
1057	Color test method standards organization	Desirable	(No entry)
1058	Color test method standard number	Desirable	(No entry)
1059	Color test method standard version	Desirable	(No entry)
1070	Composition and characteristics notes	Desirable	(No entry)

Hydraulic cement performance in concrete data segment

8029.01	Constituent property	Essential	Potential volume change of cement-aggregate combinations
8030.01	Constituent property standards organization	Desirable	ASTM
8031.01	Constituent property standard number	Desirable	C 342
8032.01	Constituent property standard version	Desirable	90
8033.01	Constituent property value	Essential	0.01
8034.01	Constituent property value (Customary units designation)	Essential	%
8035.01	Constituent property value (SI units designation)	Essential	%
8036.01	Constituent property value (Customary to SI units conversion factor)	Essential	1
8049.01	Concrete phase	Essential	Hardened
8050.01	Concrete age	Essential	28
8051.01	Concrete age units	Essential	Day
8056.01	Constituent property notes	Desirable	(No entry)

^aData elements in this data segment serve a dual role as concrete identifiers. See Table A.1.

Table A.3(a)—Example data entries for coarse aggregates

Aggregate designation data segment^a			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
2001.01	Constituent class	Essential	Aggregate
2002.01	Aggregate common name	Essential	Coarse aggregate
2003.01	Aggregate producer name	Essential	CGson, Inc.
2004.01	Aggregate producer plant location	Essential	Laurel, Md.
2005.01	Aggregate producer identification number	Essential	456N43P
2006.01	Aggregate standards organization	Desirable	ASTM
2007.01	Aggregate specification number	Desirable	C 33
2008.01	Aggregate specification designation	Desirable	Size No. 8
2009.01	Aggregate specification version	Desirable	97
2010.01	Aggregate designation notes	Desirable	(No entry)
Composition and characteristics data segment			
2011	Material	Essential	Limestone
2012.01	Mineralogical name	Essential	Calcite
2013.01	% by mass	Essential	98.3
2014	Shape	Essential	Cubic
2015	Angularity	Essential	Irregular
2016	Surface texture	Essential	Rough

Table A.3(a)—Example data entries for coarse aggregates (continued)

<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
2017	Sieve analysis test method	Essential	Standard test method for sieve analysis of fine and coarse aggregates
2018	Sieve analysis test method standards organization	Desirable	ASTM
2019	Sieve analysis test method standard number	Desirable	C 136
2020	Sieve analysis test method standard version	Desirable	96a
2020.01	Sieve designation	Essential	1/2 in.
2022.01	Sieve opening dimension	Essential	12.5
2023.01	Sieve opening dimension (Customary units designation)	Essential	mm
2024.01	Sieve opening dimension (SI units designation)	Essential	mm
2025.01	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.01	Total percentage of material passing sieve	Essential	100
2027.01	Total percentage of material retained on sieve	Essential	0
2021.02	Sieve designation	Essential	3/8 in.
2022.02	Sieve opening dimension	Essential	9.5
2023.02	Sieve opening dimension (Customary units designation)	Essential	mm
2024.02	Sieve opening dimension (SI units designation)	Essential	mm
2025.02	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.02	Total percentage of material passing sieve	Essential	90
2027.02	Total percentage of material retained on sieve	Essential	10
2021.03	Sieve designation	Essential	No. 4
2022.03	Sieve opening dimension	Essential	4.75
2023.03	Sieve opening dimension (Customary units designation)	Essential	mm
2024.03	Sieve opening dimension (SI units designation)	Essential	mm
2025.03	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.03	Total percentage of material passing sieve	Essential	50
2027.03	Total percentage of material retained on sieve	Essential	40
2021.04	Sieve designation	Essential	No. 8
2022.04	Sieve opening dimension	Essential	2.36
2023.04	Sieve opening dimension (Customary units designation)	Essential	mm
2024.04	Sieve opening dimension (SI units designation)	Essential	mm
2025.04	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.04	Total percentage of material passing sieve	Essential	5
2027.04	Total percentage of material retained on sieve	Essential	45
2021.05	Sieve designation	Essential	No. 16
2022.05	Sieve opening dimension	Essential	1.18
2023.05	Sieve opening dimension (Customary units designation)	Essential	mm
2024.05	Sieve opening dimension (SI units designation)	Essential	mm
2025.05	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.05	Total percentage of material passing sieve	Essential	2
2027.05	Total percentage of material retained on sieve	Essential	3
Aggregate performance in concrete data segment			
8029.01	Constituent property	Essential	Length change of concrete due to alkali-carbonate rock reaction
8030.01	Constituent property standards organization	Desirable	ASTM
8031.01	Constituent property standard number	Desirable	C 1105
8032.01	Constituent property standard version	Desirable	95
8033.01	Constituent property value	Essential	0.014
8034.01	Constituent property value (Customary units designation)	Essential	%
8035.01	Constituent property value (SI units designation)	Essential	%
8036.01	Constituent property value (Customary to SI units conversion factor)	Essential	1
8049.01	Concrete phase	Essential	Hardened
8050.01	Concrete age	Essential	90
8051.01	Concrete age units	Essential	Day
8056.01	Constituent property notes	Desirable	(No entry)

^aData elements in this data segment serve a dual role as concrete identifiers. See Table A.1.

Table A.3(b)—Example data entries for fine aggregates

Aggregate designation data segment ^a			
Number	Name	Type	Example entry
2001.02	Constituent class	Essential	Aggregate
2002.02	Aggregate common name	Essential	Fine aggregate
2003.02	Aggregate producer name	Essential	CGson, Inc.
2004.02	Aggregate producer plant location	Essential	Laural, Md.
2005.02	Aggregate producer identification number	Essential	456N43P
2006.02	Aggregate standards organization	Desirable	ASTM
2007.02	Aggregate specification number	Desirable	C 33
2008.02	Aggregate specification designation	Desirable	(Not applicable)
2009.02	Aggregate specification version	Desirable	97
2010.02	Aggregate designation notes	Desirable	(No entry)
Composition and characteristics data segment			
2011	Material	Essential	Limestone
2012.01	Mineralogical name	Essential	Calcite
2013.01	% by mass	Essential	99.5
2014	Shape	Essential	Cubic
2015	Angularity	Essential	Irregular
2016	Surface texture	Essential	Rough
2017	Sieve analysis test method	Essential	Standard test method for sieve analysis of fine and coarse aggregates
2018	Sieve analysis test method standards organization	Desirable	ASTM
2019	Sieve analysis test method standard number	Desirable	C 136
2020	Sieve analysis test method standard version	Desirable	96a
2020.01	Sieve designation	Essential	3/8 in.
2022.01	Sieve opening dimension	Essential	9.5
2023.01	Sieve opening dimension (Customary units designation)	Essential	mm
2024.01	Sieve opening dimension (SI units designation)	Essential	mm
2025.01	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.01	Total percentage of material passing sieve	Essential	100
2027.01	Total percentage of material retained on sieve	Essential	0
2021.02	Sieve designation	Essential	No. 4
2022.02	Sieve opening dimension	Essential	4.75
2023.02	Sieve opening dimension (Customary units designation)	Essential	mm
2024.02	Sieve opening dimension (SI units designation)	Essential	mm
2025.02	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.02	Total percentage of material passing sieve	Essential	98
2027.02	Total percentage of material retained on sieve	Essential	2
2021.03	Sieve designation	Essential	No. 8
2022.03	Sieve opening dimension	Essential	2.36
2023.03	Sieve opening dimension (Customary units designation)	Essential	mm
2024.03	Sieve opening dimension (SI units designation)	Essential	mm
2025.03	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.03	Total percentage of material passing sieve	Essential	85
2027.03	Total percentage of material retained on sieve	Essential	13
2021.04	Sieve designation	Essential	No. 16
2022.04	Sieve opening dimension	Essential	1.18
2023.04	Sieve opening dimension (Customary units designation)	Essential	mm
2024.04	Sieve opening dimension (SI units designation)	Essential	mm
2025.04	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.04	Total percentage of material passing sieve	Essential	60
2027.04	Total percentage of material retained on sieve	Essential	45
2021.05	Sieve designation	Essential	No. 30
2022.05	Sieve opening dimension	Essential	600
2023.05	Sieve opening dimension (Customary units designation)	Essential	μm

Table A.3(b)—Example data entries for fine aggregates (continued)

<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
2024.05	Sieve opening dimension (SI units designation)	Essential	µm
2025.05	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.05	Total percentage of material passing sieve	Essential	45
2027.05	Total percentage of material retained on sieve	Essential	15
2021.06	Sieve designation	Essential	No. 50
2022.06	Sieve opening dimension	Essential	300
2023.06	Sieve opening dimension (Customary units designation)	Essential	µm
2024.06	Sieve opening dimension (SI units designation)	Essential	µm
2025.06	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.06	Total percentage of material passing sieve	Essential	20
2027.06	Total percentage of material retained on sieve	Essential	25
2021.07	Sieve designation	Essential	No. 100
2022.07	Sieve opening dimension	Essential	150
2023.07	Sieve opening dimension (Customary units designation)	Essential	µm
2024.07	Sieve opening dimension (SI units designation)	Essential	µm
2025.07	Sieve opening dimension (Customary to SI units conversion factor)	Essential	1
2026.07	Total percentage of material passing sieve	Essential	3
2027.07	Total percentage of material retained on sieve	Essential	17

Aggregate performance in concrete data segment

8029.01	Constituent property	Essential	Length change of concrete due to alkali-carbonate rock reaction
8030.01	Constituent property standards organization	Desirable	ASTM
8031.01	Constituent property standard number	Desirable	C 1105
8032.01	Constituent property standard version	Desirable	95
8033.01	Constituent property value	Essential	0.035
8034.01	Constituent property value (Customary units designation)	Essential	%
8035.01	Constituent property value (SI units designation)	Essential	%
8036.01	Constituent property value (Customary to SI units conversion factor)	Essential	1
8049.01	Concrete phase	Essential	Hardened
8050.01	Concrete age	Essential	90
8051.01	Concrete age units	Essential	Day
8056.01	Constituent property notes	Desirable	(No entry)

^aData elements in this data segment serve a dual role as concrete identifiers. See Table A.1.

Table A.4—Example data entries for chemical admixtures

Chemical admixture designation data segment^a			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
3001.01	Constituent class	Essential	Chemical admixture
3002.01	Chemical admixture common name	Essential	SuperMix
3003.01	Chemical admixture producer name	Essential	Acme Chemical Co.
3004.01	Chemical admixture producer plant location	Essential	39 Central St. NW Gaithersburg, Md.
3005.01	Chemical admixture producer identification number	Essential	N7623548
3006.01	Chemical admixture standards organization	Desirable	ASTM
3007.01	Chemical admixture specification number	Desirable	C 494
3008.01	Chemical admixture specification designation	Desirable	Type F
3009.01	Chemical admixture specification version	Desirable	92
3010.01	Chemical admixture designation notes	Desirable	(No entry)
Composition and characteristics data segment			
3011.01	Chemical constituent	Essential	Melamine
3012.01	% by mass	Essential	40
3011.02	Chemical constituent	Essential	Water
3012.02	% by mass	Essential	60
3013	Total active agent	Essential	40

Table A.4—Example data entries for chemical admixtures (continued)

<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
3014	Total active agent (Customary units designation)	Desirable	%
3015	Total active agent (SI units designation)	Essential	%
3016	Total active agent (Customary to SI units conversion factor)	Desirable	1
3017	pH	Desirable	8
3018	Density	Desirable	1200
3019	Density (Customary units designation)	Desirable	g/mm ²
3020	Density (SI units designation)	Desirable	g/mm ²
3021	Density (Customary to SI units conversion)	Desirable	1
3022	Composition and characteristic notes	Desirable	(No entry)
Manufacturer recommendations data segment			
3023	Safety information	Essential	Material safety data sheet
3024	Dosage	Essential	2
3025	Dosage (Customary units designation)	Essential	% by volume of cement
3026	Dosage (SI units designation)	Essential	% by volume of cement
3027	Dosage (Customary to SI units conversion factor)	Essential	1
3028	Time of addition	Desirable	10
3029	Time of addition units	Desirable	min
3030	Method of addition	Desirable	Volumetric gage
3031	Recommended use	Desirable	Water reduction
3032	Temperature limit for use, high (C)	Desirable	45
3033	Temperature limit for use, low (C)	Desirable	-10
3034	Shelf life	Desirable	1
3035	Shelf life units	Desirable	yr
3036	Storage temperature limit, high (C)	Desirable	30
3037	Storage temperature limit, low (C)	Desirable	10
3038	Freezing point (C)	Desirable	-15
3039	Boiling point (C)	Desirable	100
3040	Modification mechanism	Desirable	Increase dispersion
3041	Compatibility with other constituents	Desirable	All
3042	Manufacturer recommendation notes	Desirable	(No entry)
Chemical admixture performance in concrete data segment			
8029.01	Constituent property	Essential	Slump
8030.01	Constituent property standards organization	Desirable	ASTM
8031.01	Constituent property standard number	Desirable	C 143
8032.01	Constituent property standard version	Desirable	90a
8033.01	Constituent property value	Essential	5
8034.01	Constituent property value (Customary units designation)	Essential	in.
8035.01	Constituent property value (SI units designation)	Essential	mm
8036.01	Constituent property value (Customary to SI units conversion factor)	Essential	25.4
8049.01	Concrete phase	Essential	Fresh
8050.01	Concrete age	Essential	15
8051.01	Concrete age units	Essential	min
8056.01	Constituent property notes	Desirable	(No entry)

^aData elements in this data segment serve a dual role as concrete identifiers. See Table A.1.

Table A.5—Example data entries for mineral admixtures

Mineral admixture designation data segment^a			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
4001.01	Constituent class	Essential	Mineral admixture
4002.01	Mineral admixture common name	Essential	Fly ash
4003.01	Mineral admixture producer name	Essential	Kingston Steam Plant
4004.01	Mineral admixture producer plant location	Essential	Kingston, Tenn.
4005.01	Mineral admixture producer identification number	Essential	TN234-876
4006.01	Mineral admixture standards organization	Desirable	ASTM
4007.01	Mineral admixture specification number	Desirable	C 618
4008.01	Mineral admixture specification designation	Desirable	Class F
4009.01	Mineral admixture specification version	Desirable	97
4010.01	Mineral admixture designation notes	Desirable	(No entry)
Composition and characteristics data segment			
4011.01	Chemical constituent	Essential	Silica plus alumina plus ferric oxide
4012.01	% by mass	Essential	75
4011.02	Chemical constituent	Essential	Sulfur trioxide
4012.02	% by mass	Essential	4
4013.01	Mineral admixture property	Essential	Fineness
4014.01	Mineral admixture property standards organization	Desirable	ASTM
4015.01	Mineral admixture property standard number	Desirable	C 430
4016.01	Mineral admixture property standard version	Desirable	96
4017.01	Mineral admixture property value	Essential	88.5
4018.01	Mineral admixture property value (Customary units designation)	Essential	%
4019.01	Mineral admixture property value (SI units designation)	Essential	%
4020.01	Mineral admixture property value (Customary to SI units conversion factor)	Essential	1
4021	Composition and characteristics notes	Desirable	(No entry)
Manufacturer recommendations data segment			
4022	Safety information	Essential	Material safety data sheet
4023	Dosage	Essential	10
4024	Dosage (Customary units designation)	Desirable	% of cementitious material
4025	Dosage (SI units designation)	Essential	% of cementitious material
4026	Dosage (Customary to SI units conversion factor)	Desirable	1
4027	Manufacturer recommendation notes	Desirable	(No entry)
Mineral admixture performance in concrete data segment			
8029.01	Constituent property	Essential	Compressive strength
8030.01	Constituent property standards organization	Desirable	ASTM
8031.01	Constituent property standard number	Desirable	C 39
8032.01	Constituent property standard version	Desirable	96
8033.01	Constituent property value	Essential	3290
8034.01	Constituent property value (Customary units designation)	Essential	psi
8035.01	Constituent property value (SI units designation)	Essential	MPa
8036.01	Constituent property value (Customary to SI units conversion factor)	Essential	0.006894757
8049.01	Concrete phase	Essential	Hardened
8050.01	Concrete age	Essential	7
8051.01	Concrete age units	Essential	Day
8056.01	Constituent property notes	Desirable	(No entry)

^aData elements in this data segment serve a dual role as concrete identifiers. See Table A.1.

Table A.6—Example data entries for fibers

Fiber designation data segment ^a			
Number	Name	Type	Example entry
5001.01	Constituent class	Essential	Fibers
5002.01	Fiber common name	Essential	Deformed steel fibers
5003.01	Fiber producer name	Essential	Srebifa Steel Works
5004.01	Fiber producer plant location	Essential	Rome, Italy
5005.01	Fiber producer identification number	Essential	159NM2578
5006.01	Fiber standards organization	Desirable	ASTM
5007.01	Fiber specification number	Desirable	A 820
5008.01	Fiber specification designation	Desirable	Type I
5009.01	Fiber specification version	Desirable	96
5010.01	Fiber designation notes	Desirable	(No entry)
Composition and characteristics data segment			
5011	Material	Essential	Carbon steel
5012	Nonfiber constituent	Essential	None
5013	Configuration	Essential	Deformed
5014	Cross-sectional area	Desirable	1
5015	Cross-sectional area (Customary units designation)	Desirable	mm ²
5016	Cross-sectional area (SI units designation)	Desirable	mm ²
5017	Cross-sectional area (Customary to SI units conversion factor)	Desirable	1
5018	Surface area	Desirable	70
5019	Surface area (Customary units designation)	Desirable	mm ²
5020	Surface area (SI units designation)	Desirable	mm ²
5021	Surface area (Customary to SI units conversion factor)	Desirable	1
5022	Length	Desirable	20
5023	Length (Customary units designation)	Desirable	mm
5024	Length (SI units designation)	Desirable	mm
5025	Length (Customary to SI units conversion factor)	Desirable	1
5026	Width	Desirable	0.56
5027	Width (Customary units designation)	Desirable	mm
5028	Width (SI units designation)	Desirable	mm
5029	Width (Customary to SI units conversion factor)	Desirable	1
5030	Diameter	Desirable	0.56
5031	Diameter (Customary units designation)	Desirable	mm
5032	Diameter (SI units designation)	Desirable	mm
5033	Diameter (Customary to SI units conversion factor)	Desirable	1
5034	Aspect ratio	Desirable	0.03
5035	Delivery method	Desirable	Bag
5036.01	Fiber property	Essential	Plastic shrinkage
5037.01	Fiber property standards organization	Desirable	Acme Test Lab
5038.01	Fiber property standard number	Desirable	589-98
5039.01	Fiber property standard version	Desirable	1998
5040.01	Fiber property value	Essential	1
5041.01	Fiber property value (Customary units designation)	Essential	%
5042.01	Fiber property value (SI units designation)	Essential	%
5043.01	Fiber property value (Customary to SI units conversion factor)	Essential	1
Manufacturer recommendations data segment			
5044	Composition and characteristics notes	Desirable	Surface area of crack-to-total surface area ratio
5045	Safety information	Essential	Material safety data sheet
5046	Dosage	Essential	2
5047	Dosage (Customary units designation)	Desirable	% by volume of cement
5048	Dosage (SI units designation)	Essential	% by volume of cement
5049	Dosage (Customary to SI units conversion factor)	Desirable	1
5050	Manufacturer recommendation notes	Desirable	(No entry)

Table A.6—Example data entries for fibers (continued)

Fiber performance in concrete data segment			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
8029.01	Constituent property	Essential	Permeability
8030.01	Constituent property standards organization	Desirable	Acme Test Lab
8031.01	Constituent property standard number	Desirable	321-97
8032.01	Constituent property standard version	Desirable	1997
8033.01	Constituent property value	Essential	2.0E-11
8034.01	Constituent property value (Customary units designation)	Essential	m/s
8035.01	Constituent property value (SI units designation)	Essential	m/s
8036.01	Constituent property value (Customary to SI units conversion factor)	Essential	1
8049.01	Concrete phase	Essential	Hardened
8050.01	Concrete age	Essential	28
8051.01	Concrete age units	Essential	Day
8056.01	Constituent property notes	Desirable	(No entry)

^aData elements in this data segment serve a dual role as concrete identifiers. See Table A.1.

Table A.7—Example data entries for water

Water designation data segment^a			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
6001.01	Constituent class	Essential	Water
6002.01	Water common name	Essential	Potable
6003.01	Water producer name	Essential	Columbia Water District
6004.01	Water producer plant location	Essential	582 N. Lake St. Columbia, Md.
6005.01	Water producer identification number	Essential	(No entry)
6006.01	Water standards organization	Desirable	AASHTO
6007.01	Water specification number	Desirable	T26-79
6008.01	Water specification designation	Desirable	(No entry)
6009.01	Water specification version	Desirable	1990
6010.01	Water designation notes	Desirable	(No entry)
Composition and characteristics data segment			
6011.01	Chemical constituent	Essential	Sulfate
6012.01	% by mass	Essential	1
6011.02	Chemical constituent	Essential	Water
6012.02	% by mass	Essential	99
6013	Water composition test method	Desirable	Standard test method for sulfate ion in water
6014	Water composition test method standards organization	Desirable	ASTM
6015	Water composition standard number	Desirable	D516
6016	Water composition standard version	Desirable	90(1995)
6017.01	Water property	Essential	Total solids
6018.01	Water property standards organization	Desirable	AASHTO
6019.01	Water property standard number	Desirable	T26-79
6020.01	Water property standard version	Desirable	1990
6021.01	Water property value	Essential	0.2
6022.01	Water property value (Customary units designation)	Essential	%
6023.01	Water property value (SI units designation)	Essential	%
6024	Water property value (Customary to SI units conversion factor)	Essential	1
6025	Composition and characteristics notes	Desirable	Chlorinated

Table A.7—Example data entries for water (continued)

Water performance in concrete data segment			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
8029.01	Constituent property	Essential	Time of setting by vicat needle
8030.01	Constituent property standards organization	Desirable	ASTM
8031.01	Constituent property standard number	Desirable	C 191
8032.01	Constituent property standard version	Desirable	92
8033.01	Constituent property value	Essential	5
8034.01	Constituent property value (Customary units designation)	Essential	h
8035.01	Constituent property value (SI units designation)	Essential	s
8036.01	Constituent property value (Customary to SI units conversion factor)	Essential	3600
8049.01	Concrete phase	Essential	Fresh
8050.01	Concrete age	Essential	20
8051.01	Concrete age units	Essential	min
8056.01	Constituent property notes	Desirable	Test sample was obtained 20 min after mixing stopped

^aData elements in this data segment serve a dual role as concrete identifiers. See Table A.1.

Table A.8—Example data entries for processing

Project information data segment			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
7001	Project owner	Essential	Turner, Inc.
7002	Project identifier	Essential	MR456
7003	Project location	Essential	Columbia, Md.
7004	Concrete component	Essential	Second floor slab
7005	Concrete component support	Desirable	Steel formwork
7006	Project contractor	Desirable	Susan Jones
7007	Project contractor address	Desirable	567 First St., Phoenix, Ariz.
7008	Processing procedure	Desirable	Report No. 785
7009	Processing procedure title	Desirable	Slab placement procedure
7010	Processing procedure date	Desirable	19900505
7011	Project information notes	Desirable	(No entry)
Concrete specification data segment^a			
7012.11	Specified constituent quantity	Essential	875
7013.11	Specified minimum constituent quantity	Essential	850
7014.11	Specified maximum constituent quantity	Essential	900
7015.11	Specified constituent quantity (Customary units designation)	Essential	lb/yd ³
7016.11	Specified constituent quantity (SI units designation)	Essential	kg/m ³
7017.11	Specified constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7012.21	Specified constituent quantity	Essential	1550
7013.21	Specified minimum constituent quantity	Essential	1500
7014.21	Specified maximum constituent quantity	Essential	1600
7015.21	Specified constituent quantity (Customary units designation)	Essential	lb/yd ³
7016.21	Specified constituent quantity (SI units designation)	Essential	kg/m ³
7017.21	Specified constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7012.22	Specified constituent quantity	Essential	1025
7013.22	Specified minimum constituent quantity	Essential	1000
7014.22	Specified maximum constituent quantity	Essential	1050
7015.22	Specified constituent quantity (Customary units designation)	Essential	lb/yd ³
7016.22	Specified constituent quantity (SI units designation)	Essential	kg/m ³

Table A.8—Example data entries for processing (continued)

<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
7017.22	Specified constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7012.31	Specified constituent quantity	Essential	45
7013.31	Specified minimum constituent quantity	Essential	40
7014.31	Specified maximum constituent quantity	Essential	50
7015.31	Specified constituent quantity (Customary units designation)	Essential	fl oz/yd ³
7016.31	Specified constituent quantity (SI units designation)	Essential	mL/m ³
7017.31	Specified constituent quantity (Customary to SI units conversion factor)	Essential	38.680715
7012.41	Specified constituent quantity	Essential	115
7013.41	Specified minimum constituent quantity	Essential	110
7014.41	Specified maximum constituent quantity	Essential	120
7015.41	Specified constituent quantity (Customary units designation)	Essential	lb/yd ³
7016.41	Specified constituent quantity (SI units designation)	Essential	kg/m ³
7017.41	Specified constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7012.51	Specified constituent quantity	Essential	150
7013.51	Specified minimum constituent quantity	Essential	145
7014.51	Specified maximum constituent quantity	Essential	155
7015.51	Specified constituent quantity (Customary units designation)	Essential	lb/yd ³
7016.51	Specified constituent quantity (SI units designation)	Essential	kg/m ³
7017.51	Specified constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7012.61	Specified constituent quantity	Essential	400
7013.61	Specified minimum constituent quantity	Essential	395
7014.61	Specified maximum constituent quantity	Essential	405
7015.61	Specified constituent quantity (Customary units designation)	Essential	lb/yd ³
7016.61	Specified constituent quantity (SI units designation)	Essential	kg/m ³
7017.61	Specified constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7018.01	Specified property	Essential	Compressive strength
7019.01	Specified property standards organization	Essential	ASTM
7020.01	Specified property standard number	Desirable	C 39
7021.01	Specified property standard version	Desirable	96
7022.01	Specified property value	Desirable	9000
7023.01	Specified minimum property value	Essential	8750
7024.01	Specified maximum property value	Essential	9500
7025.01	Specified property value (Customary units designation)	Essential	psi
7026.01	Specified property value (SI units designation)	Essential	MPa
7027.01	Specified property value (Customary to SI units conversion factor)	Essential	0.006894757
7028.01	Concrete phase	Essential	Hardened
7029.01	Concrete age	Essential	56
7030.01	Concrete age units	Essential	Day
7031.01	Specified property notes	Desirable	(No entry)
Concrete supplier data segment			
7032	Concrete supplier name ^b	Essential	Assiral, Inc.
7033	Concrete supplier address ^b	Essential	908 Postcard Ln. Vacationville, Ark. 98409
7034	Concrete supplier plant location ^b	Desirable	Columbia, Md.
7035	Concrete supplier identification number ^b	Desirable	6842

Table A.8—Example data entries for processing (continued)

Concrete mixture proportions data segment ^a			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
7036.11	Constituent quantity	Essential	875
7037.11	Constituent quantity (Customary units designation)	Essential	lb/yd ³
7038.11	Constituent quantity (SI units designation)	Essential	kg/m ³
7039.11	Constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7040.11	Constituent addition location	Desirable	Batch plant
7041.11	Constituent total quantity	Essential	875
7042.11	Constituent total quantity (Customary units designation)	Essential	lb/yd ³
7043.11	Constituent total quantity (SI units designation)	Essential	kg/m ³
7044.11	Constituent total quantity (Customary to SI units conversion factor)	Essential	0.5932764
7045.11	Constituent quantity per unit volume of concrete	Essential	875
7046.11	Constituent quantity per unit volume of concrete (Customary units designation)	Essential	lb/yd ³
7047.11	Constituent quantity per unit volume of concrete (SI units designation)	Essential	kg/m ³
7048.11	Constituent quantity per unit volume of concrete (Customary to SI units conversion factor)	Essential	0.5932764
7036.21	Constituent quantity	Essential	1550
7037.21	Constituent quantity (Customary units designation)	Essential	lb/yd ³
7038.21	Constituent quantity (SI units designation)	Essential	kg/m ³
7039.21	Constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7040.21	Constituent addition location	Desirable	Batch plant
7041.21	Constituent total quantity	Essential	1550
7042.21	Constituent total quantity (Customary units designation)	Essential	lb/yd ³
7043.21	Constituent total quantity (SI units designation)	Essential	kg/m ³
7044.21	Constituent total quantity (Customary to SI units conversion factor)	Essential	0.5932764
7045.21	Constituent quantity per unit volume of concrete	Essential	1555
7046.21	Constituent quantity per unit volume of concrete (Customary units designation)	Essential	lb/yd ³
7047.21	Constituent quantity per unit volume of concrete (SI units designation)	Essential	kg/m ³
7048.21	Constituent quantity per unit volume of concrete (Customary to SI units conversion factor)	Essential	0.5932764
7036.22	Constituent quantity	Essential	1025
7037.22	Constituent quantity (Customary units designation)	Essential	lb/yd ³
7038.22	Constituent quantity (SI units designation)	Essential	kg/m ³
7039.22	Constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7040.22	Constituent addition location	Desirable	Batch plant
7041.22	Constituent total quantity	Essential	1025
7042.22	Constituent total quantity (Customary units designation)	Essential	lb/yd ³
7043.22	Constituent total quantity (SI units designation)	Essential	kg/m ³
7044.22	Constituent total quantity (Customary to SI units conversion factor)	Essential	0.5932764
7045.22	Constituent quantity per unit volume of concrete	Essential	1028
7046.22	Constituent quantity per unit volume of concrete (Customary units designation)	Essential	lb/yd ³
7047.22	Constituent quantity per unit volume of concrete (SI units designation)	Essential	kg/m ³
7048.22	Constituent quantity per unit volume of concrete (Customary to SI units conversion factor)	Essential	0.5932764
7036.31	Constituent quantity	Essential	40
7037.31	Constituent quantity (Customary units designation)	Essential	fl oz/yd ³
7038.31	Constituent quantity (SI units designation)	Essential	mL/m ³
7039.31	Constituent quantity (Customary to SI units conversion factor)	Essential	38.680715
7040.31	Constituent addition location	Desirable	Job site
7041.31	Constituent total quantity	Essential	45
7042.31	Constituent total quantity (Customary units designation)	Essential	fl oz/yd ³
7043.31	Constituent total quantity (SI units designation)	Essential	mL/m ³
7044.31	Constituent total quantity (Customary to SI units conversion factor)	Essential	38.680715
7045.31	Constituent quantity per unit volume of concrete	Essential	45
7046.31	Constituent quantity per unit volume of concrete (Customary units designation)	Essential	fl oz/yd ³
7047.31	Constituent quantity per unit volume of concrete (SI units designation)	Essential	mL/m ³
7048.31	Constituent quantity per unit volume of concrete (Customary to SI units conversion factor)	Essential	38.680715

Table A.8—Example data entries for processing (continued)

<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
7036.41	Constituent quantity	Essential	115
7037.41	Constituent quantity (Customary units designation)	Essential	lb/yd ³
7038.41	Constituent quantity (SI units designation)	Essential	kg/m ³
7039.41	Constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7040.41	Constituent addition location	Desirable	Batch plant
7041.41	Constituent total quantity	Essential	115
7042.41	Constituent total quantity (Customary units designation)	Essential	lb/yd ³
7043.41	Constituent total quantity (SI units designation)	Essential	kg/m ³
7044.41	Constituent total quantity (Customary to SI units conversion factor)	Essential	0.5932764
7045.41	Constituent quantity per unit volume of concrete	Essential	115
7046.41	Constituent quantity per unit volume of concrete (Customary units designation)	Essential	lb/yd ³
7047.41	Constituent quantity per unit volume of concrete (SI units designation)	Essential	kg/m ³
7048.41	Constituent quantity per unit volume of concrete (Customary to SI units conversion factor)	Essential	0.5932764
7036.51	Constituent quantity	Essential	150
7037.51	Constituent quantity (Customary units designation)	Essential	lb/yd ³
7038.51	Constituent quantity (SI units designation)	Essential	kg/m ³
7039.51	Constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7040.51	Constituent addition location	Desirable	Batch plant
7041.51	Constituent total quantity	Essential	150
7042.51	Constituent total quantity (Customary units designation)	Essential	lb/yd ³
7043.51	Constituent total quantity (SI units designation)	Essential	kg/m ³
7044.51	Constituent total quantity (Customary to SI units conversion factor)	Essential	0.5932764
7045.51	Constituent quantity per unit volume of concrete	Essential	150
7046.51	Constituent quantity per unit volume of concrete (Customary units designation)	Essential	lb/yd ³
7047.51	Constituent quantity per unit volume of concrete (SI units designation)	Essential	kg/m ³
7048.51	Constituent quantity per unit volume of concrete (Customary to SI units conversion factor)	Essential	0.5932764
7036.61	Constituent quantity	Essential	350
7037.61	Constituent quantity (Customary units designation)	Essential	lb/yd ³
7038.61	Constituent quantity (SI units designation)	Essential	kg/m ³
7039.61	Constituent quantity (Customary to SI units conversion factor)	Essential	0.5932764
7040.61	Constituent addition location	Desirable	Job site
7041.61	Constituent total quantity	Essential	397
7042.61	Constituent total quantity (Customary units designation)	Essential	lb/yd ³
7043.61	Constituent total quantity (SI units designation)	Essential	kg/m ³
7044.61	Constituent total quantity (Customary to SI units conversion factor)	Essential	0.5932764
7045.61	Constituent quantity per unit volume of concrete	Essential	398
7046.61	Constituent quantity per unit volume of concrete (Customary units designation)	Essential	lb/yd ³
7047.61	Constituent quantity per unit volume of concrete (SI units designation)	Essential	kg/m ³
7048.61	Constituent quantity per unit volume of concrete (Customary to SI units conversion factor)	Essential	0.5932764
7049	Volume of concrete produced	Desirable	200
7050	Volume of concrete produced (Customary units designation)	Desirable	yd ³
7051	Volume of concrete produced (SI units designation)	Desirable	m ³
7052	Volume of concrete produced (Customary to SI units conversion factor)	Desirable	0.764555
7053	Mixture proportion notes	Desirable	(No entry)
Concrete batching data segment			
7054	Batching process ^b	Essential	Automatic
7055	Batch controller manufacturer	Desirable	Batch Plants, Inc.
7056	Batch controller manufacturer address	Desirable	294 Paper St. Paperland, Wis. 95643
7057	Batch controller operator identifier	Desirable	684JT
7058	Aggregate storage equipment	Desirable	Hoppers
7059	Cementitious material storage equipment	Desirable	Hopper

Table A.8—Example data entries for processing (continued)

<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
7060	Chemical admixture storage equipment	Desirable	Tank
7061	Bulk material storage equipment	Desirable	Hopper
7062	Moisture meter	Desirable	Nuclear
7063	Moisture meter manufacturer	Desirable	Atomic Instruments, Inc. Idaho Falls, Idaho
7064	Moisture meter calibration date	Desirable	19973014
7065	Moisture meter probe location	Desirable	Top of hopper
7066	Aggregate surface moisture condition	Desirable	Dry
7067	Batch plant certification	Desirable	(No entry)
7068	Scale	Desirable	Electronic
7069	Scale manufacturer	Desirable	Scale Sales, Inc.
7070	Scale manufacturer address	Desirable	379 W. Pine St. Toronto, Ontario
7071	Scale calibration date	Desirable	19970124
7072	Batching sequence	Desirable	(No entry)
7073	Batching start time	Desirable	07:30
7074	Batching discharge time	Desirable	08:35
7075	Batching air temperature (C)	Desirable	20
7076	Batching relative humidity (%)	Desirable	50
7077	Batching notes	Desirable	(No entry)
Concrete mixing data segment			
7078	Mixing equipment ^b	Essential	Central mixer
7079	Mixing equipment manufacturer	Desirable	Trabo, Inc.
7080	Mixing equipment manufacturer address	Desirable	450 Paper St. Paperland, Wis. 95643
7081	Mixing equipment uniformity test	Desirable	(No entry)
7082	Mixing equipment uniformity test result	Desirable	(No entry)
7083	Mixer start time	Desirable	06:30
7084	Mixer discharge time	Desirable	06:35
7085	Mixing equipment revolutions	Desirable	50
7086	Mixing equipment speed(s)	Desirable	5
7087	Concrete mixing time	Desirable	5
7088	Concrete mixing time units	Desirable	min
7089	Mixing equipment average (amperes)	Desirable	(No entry)
7090	Processing date ^b	Essential	19980612
7091	Mixing notes	Desirable	(No entry)
Concrete transportation data segment			
7092	Transporting equipment ^b	Essential	Truck
7093	Transporting equipment manufacturer	Desirable	Truck Systems, Inc.
7094	Transporting equipment manufacturer address	Desirable	725 Mountain Dr. Treetopville, Minn. 98623
7095	Transporting equipment features	Desirable	(No entry)
7096	Transporting equipment identifier	Desirable	(No entry)
7097	Transporting equipment operator	Desirable	Bill Smith
7098	Transportation start time	Desirable	09:00
7099	Transportation discharge time	Desirable	10:23
7100	Transportation notes	Desirable	(No entry)

Table A.8—Example data entries for processing (continued)

Concrete placement data segment			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
7101	Placing equipment ^b	Essential	Pump
7102	Placing equipment manufacturer	Desirable	TUTU, Inc.
7103	Placing equipment manufacturer address	Desirable	345 N. Star Ave. Tulsa, Okla.
7104	Placing equipment identifier	Desirable	9874LI
7105	Placing equipment operator	Desirable	Sharon Ricon
7106	Placing supervisor	Desirable	Constanza Marci
7107	Placement location	Desirable	Second floor
7108	Placement volume	Desirable	200
7109	Placement volume (Customary units designation)	Desirable	yd ³
7110	Placement volume (SI units designation)	Desirable	m ³
7111	Placement volume (Customary to SI units conversion factor)	Desirable	0.764555
7112	Placement start time	Desirable	10:35
7113	Placement finish time	Desirable	11:56
7114	Placement notes	Desirable	(No entry)
Concrete mixing data segment			
7115	Consolidating equipment ^b	Essential	Internal vibrator
7116	Consolidating equipment manufacturer	Desirable	TUTU, Inc.
7117	Consolidating equipment manufacturer address	Desirable	345 N. Star Ave. Tulsa, Okla.
7118	Consolidating equipment operator	Desirable	Sylvie Jackson
7119	Consolidation supervisor	Desirable	Susan Jones
7120	Consolidating equipment spacing	Desirable	12
7121	Consolidating equipment spacing (Customary units designation)	Desirable	in.
7122	Consolidating equipment spacing (SI units designation)	Desirable	mm
7123	Consolidating equipment spacing (Customary to SI units conversion factor)	Desirable	25.4
7124	Internal vibration depth	Desirable	5
7125	Internal vibration depth (Customary units designation)	Desirable	in.
7126	Internal vibration depth (SI units designation)	Desirable	mm
7127	Internal vibration depth (Customary to SI units conversion factor)	Desirable	25.4
7128	Consolidation time	Desirable	30
7129	Consolidation time units	Desirable	s
7130	Consolidation notes	Desirable	(No entry)
Concrete finishing data segment			
7131	Surface finish ^b	Essential	Screeded
7132	Surface finish material	Desirable	None
7133	Surface finish material manufacturer	Desirable	(No entry)
7134	Surface finish material manufacturer address	Desirable	(No entry)
7135	Surface finish material application rate	Desirable	(No entry)
7136	Surface finish material application rate (Customary units designation)	Desirable	(No entry)
7137	Surface finish material application rate (SI units designation)	Desirable	(No entry)
7138	Surface finish material application rate (Customary to SI units conversion factor)	Desirable	(No entry)
7139	Surface finish material installer	Desirable	(No entry)
7140	Concrete finishing supervisor	Desirable	Giovanna Franzi
7141	Strike-off technique	Desirable	Manual
7142	Strike-off tool	Desirable	Trowel
7143	Strike-off start time	Desirable	12:45
7144	Strike-off stop time	Desirable	13:00
7145	Finishing tool	Desirable	Trowel
7146	Finishing start time	Desirable	13:30
7147	Finishing stop time	Desirable	14:00
7148	Finishing notes	Desirable	(No entry)

Table A.8—Example data entries for processing (continued)

Concrete curing data segment			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
7149	Curing technique ^b	Essential	Water curing
7150	Curing material	Desirable	Wet burlap
7151	Curing material manufacturer	Desirable	(No entry)
7152	Curing material manufacturer address	Desirable	(No entry)
7153	Curing material application rate	Desirable	(No entry)
7154	Curing material application rate (Customary units designation)	Desirable	(No entry)
7155	Curing material application rate (SI units designation)	Desirable	(No entry)
7156	Curing material application rate (Customary to SI units conversion factor)	Desirable	(No entry)
7157	Curing material application time	Desirable	15:00
7158	Curing notes	Desirable	Water spray applied every 20 min for 24 h
Concrete processing environment data segment			
7159	Concrete temperature (C)	Essential	21
7160	Air temperature (C)	Essential	25
7161	Relative humidity (%)	Desirable	50
7162	Wind velocity	Desirable	5
7163	Wind velocity (Customary units designation)	Desirable	mph
7164	Wind velocity (SI units designation)	Desirable	m/s
7165	Wind velocity (Customary to SI units conversion factor)	Desirable	0.44704
7166	Weather	Desirable	Fair
7167	Time of day	Desirable	06:30
7168	Processing environment notes	Desirable	(No entry)

^aIn this data segment, the two digits that follow the decimal in the data element number correspond to a particular constituent: .11 = hydraulic cement; .21 = coarse aggregate; .22 = fine aggregate; .31 = chemical admixtures; .41 = mineral admixtures; .51 = fibers; and .61 = water.

^bData element serves a dual role as concrete identifier. See Table A1.

Table A.9—Example data entries for properties and performance

Concrete property data segment			
<i>Number</i>	<i>Name</i>	<i>Type</i>	<i>Example entry</i>
8001.01	Concrete property ^a	Essential	Compressive strength
8002.01	Concrete property standards organization ^a	Desirable	ASTM
8003.01	Concrete property standard number ^a	Desirable	C 39
8004.01	Concrete property standard version ^a	Desirable	96
8005.01	Concrete property value ^a	Essential	7250
8006.01	Concrete property value (Customary units designation) ^a	Essential	psi
8007.01	Concrete property value (SI units designation) ^a	Essential	MPa
8008.01	Concrete property value (Customary to SI units conversion factor) ^a	Essential	0.006894757
8009.01	Testing organization	Desirable	TLC
8010.01	Testing organization address	Desirable	123 Wood Dr. Forest Hill, Minn. 29873
8011.01	Testing organization certification	Desirable	PCA
8012.01	Testing location	Desirable	Forest Hill, Minn.
8013.01	Testing equipment	Desirable	Tutu 600
8014.01	Testing equipment calibration date	Desirable	19981207
8015.01	Test equipment manufacturer	Desirable	TUTU, Inc.
8016.01	Test equipment manufacturer address	Desirable	567 Song Ln. Seaport, Fla. 87653
8017.01	Testing equipment operator	Desirable	Bob Doe
8018.01	Testing supervisor	Desirable	Jane Stone
8019.01	Test specimen size	Desirable	6 x 12 in. cylinder
8020.01	Test specimen conditioning	Desirable	Water cured
8021.01	Concrete phase ^a	Essential	Hardened
8022.01	Concrete age ^a	Essential	28
8023.01	Concrete age units ^a	Essential	Day
8024.01	Test date	Desirable	19980402
8025.01	Test time	Desirable	06:00
8026.01	Concrete temperature (C)	Desirable	21
8027.01	Air temperature (C)	Desirable	21
8028.01	Concrete property notes	Desirable	Property value reflects average results from three specimens

^aData element serves a dual role as concrete identifier. See Table A1.