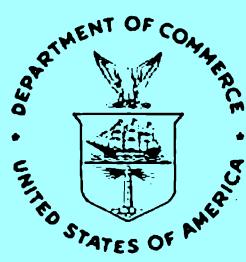




National
Geodetic
Survey

NOAA Manual NOS NGS 2



Input Formats and Specifications of the National Geodetic Survey Data Base

Volume II. Vertical Control Data

Rockville, Md.
October 1980

**U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Survey**

NOAA Manual NOS NGS 2



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Volume II. Vertical Control Data

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Rockville, Md.
October 1980

U.S. DEPARTMENT OF COMMERCE
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PREFACE

The User's Guide to the "Input Formats and Specifications of the National Geodetic Survey Data Base," which has come to be commonly known as the "Blue Book," is a standard vehicle for the transmittal of raw geodetic data in computer-readable form. Its purpose is to serve as a "pipeline" conveying the flow of geodetic data, both archival and newly acquired, from its holders and producers to the National Geodetic Survey for centralized processing, integration into the national geodetic networks, and timely dissemination to its users among the general public.

The concept of such a standard vehicle was articulated as early as 1974 by the Project Manager for the New Adjustment of the North American Datum, Captain John D. Bossler, NOAA, (now Director), National Geodetic Survey. The need for such a computerized medium became obvious in the course of preparation for the New Adjustment of the North American Datum, and grew more pressing with the passage of time. The task of putting together this User's Guide was assigned to me in mid-1975.

The production of the "Blue Book," as it now stands, was a monumental task involving widespread consultation, coordination, systems analysis, and standard setting. I benefited greatly from the work of the late Carl F. Kelley and from that of Ms. Jeannie H. Holdahl, who had put together a preliminary set of formats and specifications for Chapters 1, 2, and 3. Although the "Blue Book" in its present form bears little resemblance to that early version, their pioneering work served as a valuable basis on which to build and improve. Ms. Nancy L. Morrison co-authored the Vertical Control portion of the "Blue Book" (Chapters 5, 6, and 7). She organized the data flow, sketched out the respective format diagrams, and prepared a draft of the accompanying text.

The authors gratefully acknowledge the comments and ideas of many others who reviewed various editions of this work. The advice and criticism of users of this publication in the formulative period have been invaluable.

Ludvik Pfeifer
Commander, NOAA
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NOTE: Contents are current up to and including Revision 801001.

NOTE: Volume I (Chapters 1-4, Annexes A-I,K) contains input formats and specifications for horizontal control data.

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Chapter 5

VERTICAL CONTROL (VERT) DATA

INTRODUCTION

For coding and processing purposes, the data associated with geodetic vertical control (VERT data) have been divided into three groups. The three vertical control data groups are (1) the field observations of elevation differences between survey points (OBS data), (2) descriptive data including original descriptions and recovery descriptions (DESC data), and (3) adjusted elevations (ELEV data). Detailed instructions and formats for the coding and keying of the OBS, DESC, and ELEV vertical control data sets are contained in Chapters 1, 7, and 8, respectively.

Although data of all three types are normally generated in connection with a vertical control survey project, OBS, DESC, and ELEV data must be submitted to NGS as separate data sets. There are two modes in which vertical control data may be submitted to NGS for insertion in the National Geodetic Survey Data Base. In order of reference, they are:

MODE 1 - Field Observations and Descriptive Data (VERT OBS and VERT DESC data)

MODE 2 - Adjusted Elevations and Descriptive Data (VERT ELEV and VERT DESC data).

The foregoing implies that every vertical control survey project (or several projects submitted as one "job" - see below) will be received at NGS as two distinct data sets: either OBS and DESC data sets under MODE 1, or ELEV and DESC data sets under MODE 2. The two data sets of each vertical control job must be submitted at the same time.

There are distinct benefits to be realized when vertical control data intended for insertion in the National Geodetic Survey Data Base are submitted in the MODE 1 configuration. Because the field observations which connect the survey points are given, MODE 1 data can be rigorously combined with data held by NGS and incorporated (adjusted) into the national vertical control network. This process insures that the elevations of the new survey points will be consistent with the existing vertical control in that area. By contrast, MODE 2 data consist of isolated points whose elevations are accepted as determined by the submitting agency. Because the connecting observations are not available, these elevations cannot be verified, and they cannot be rigorously updated when the vertical control network in their vicinity is readjusted.

For reasons cited in the preceding paragraph, vertical control data intended for insertion in the National Geodetic Survey Data Base should be submitted as MODE 1 data. MODE 2 data will be accepted only on an exception basis after consultation between NGS and the submitting agency.

JOB CODE AND SURVEY POINT NUMBERING

The basic unit or grouping of data to be submitted is given the name "job". A vertical control job may consist of data for a maximum 9999 survey points - see definition of "survey point" below. A job may consist of a single project (i.e., one unit of field work), or a number of projects may be included in one job. It is suggested that geographic proximity be the determining factor in selecting vertical control projects for inclusion in any one job. This approach eliminates duplicate keying of DESC data for vertical control survey projects which have points in common (e.g., a releveling over a previously established line, when both projects are to be submitted for insertion in the National Geodetic Survey Data Base).

A two-character alphanumeric code must be assigned to each vertical control job submitted by an agency in accordance with this publication. This job code, the data set type, the name of the submitting agency, and the data set creation date will serve to uniquely identify every data set received by NGS. The first character of the two-character job code must always be a letter; the second character may be either a letter or a number (1 through 9). Begin the assigning of job codes with A1 and end with ZZ, i.e., A1, A2, ..., B1, ..., Z1, ..., Z9, AA, AB, ..., ZZ. This allows for a total of 910 uniquely identified vertical control jobs to be submitted by any one agency. Should this sequence be exhausted, start assigning job codes again from the beginning: A1, A2, etc.

A vertical control point is defined as a survey point which is monumented (or otherwise permanently marked) and/or described and whose (adjusted) elevation is given (ELEV data), whose elevation is to be determined in an adjustment (OBS data), or whose elevation is available from other sources. A vertical control point is commonly known as a "bench mark" (BM). A survey point, in turn, is defined as any point which has one or more elevation differences measured to it or from it. A survey point may be a temporary bench mark (TBM, neither permanently marked nor described and therefore nonrecoverable), a described TBM, or a permanent bench mark (monumented and described). Henceforth, the term "bench mark" will be understood to also include the special class of described temporary bench marks (TBMs).

Each survey point that is leveled to in a vertical control job must be assigned a unique four-digit serial number (not necessarily consecutive)

LEGEND

- Bench Mark
- Temporary Bench Mark
- ⊗ Junction TBM

— Epoch 1 Project

- - - Epoch 2 Project

..... Epoch 3 Project

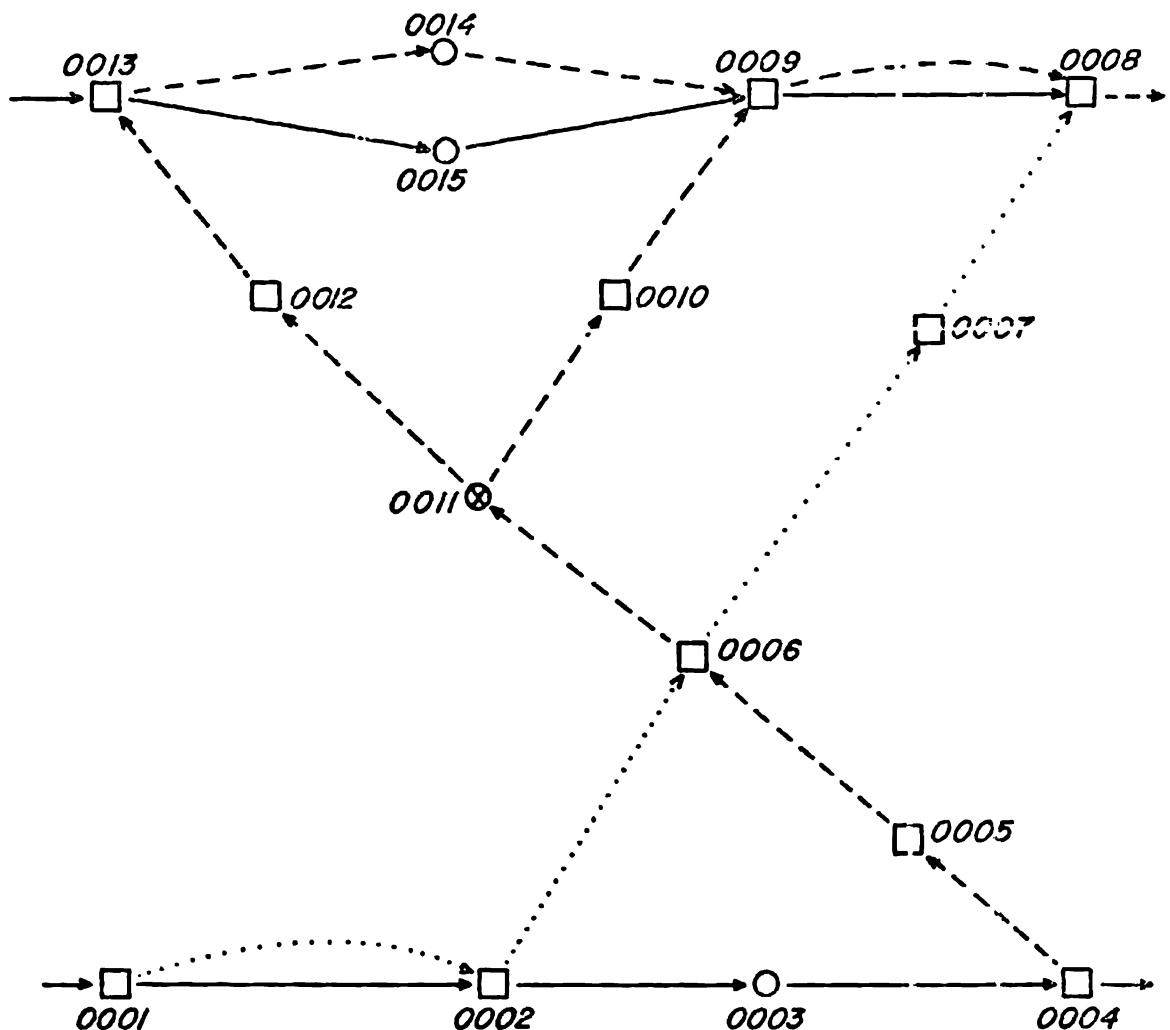


FIGURE 5-1 - Example of vertical survey point numbering.

in the range 0001 through 9999. If the number of survey points exceeds 9999, the vertical control data in question must be divided and submitted as two or more jobs. In general, level lines should not be subdivided. Figure 5-1 illustrates the assignment of survey point serial numbers (SPSNs). This numbering system provides a unique identifier for every survey point which is leveled in a vertical control job. The same survey point serial number (SPSN) must be consistently used whenever reference is made to the same point in either the OBS, DESC, or ELEV data sets of a vertical control job. All survey points for which recovery descriptions are written in this current project, but which are not leveled in this current project, will be assigned the SPSN code 0000.

*
*
*
*

As pointed out in the INTRODUCTION, a vertical control job consists of two separate data sets - either the VERT OBS and VERT DESC data sets under MODE 1, or the VERT ELEV and VERT DESC data sets under MODE 2. When MODE 2 data are submitted, there will be one-to-one correspondence between points in the respective ELEV and DESC data sets, because every control point in the ELEV data set must also have an original description and/or recovery description(s) in the corresponding DESC data set. When MODE 1 data are submitted, however, there will normally be a greater number of points in the OBS data set than in the corresponding DESC data set. This condition is brought about by the fact that there are, in general, temporary bench marks (TBMs) in the OBS data set for which no descriptive data have been prepared. It must be emphasized, however, that descriptive data should exist for all recoverable vertical control points.

When the data-recording medium is magnetic tape (see below), the two data sets of a vertical control job must be submitted as two separate files. These files may be on the same reel of tape or on different reels if the data are organized so that a tape contains data sets of only one type (e.g., VERT OBS data sets) when many jobs are being submitted. When the data-recording medium is punched cards, the two data sets must be submitted as two separate decks. In any case, the first record of every data set (see Chapters 6, 7, and 8) must contain the information by means of which the respective data sets are positively identified and correlated - the job code, the data set type, the name of the submitting agency, and the data set creation date.

MEDIA FOR SUBMITTING DATA

Although in principle any computer-readable, general-purpose data-recording medium can be handled, the two media acceptable to NGS on a routine basis at the present time are punched cards (80 columns) and standard 1/2-inch magnetic tape. Magnetic tape is the preferred medium for both small and large volumes of data; agencies submitting

large volumes of data should use this medium exclusively. Punched cards should be used only for small, isolated jobs.

When the data are submitted as decks of punched cards, care must be taken to package each deck separately in order to minimize the likelihood of cards from different decks becoming intermingled. Provision is made for a sequence number to appear on every card of a deck; however, only the first card of each deck contains the deck identification data. The following information must be given for each data set submitted as a deck of cards:

1. Name and address of the submitting agency.
2. Contents of the deck by job code and data type (e.g., AI VERT OBS, XX VERT DESC, etc.).
3. Character representation code (BCD, EBCDIC, etc.) and/or keypunch equipment used (e.g., IBM 026, IBM 129, etc.).
4. Name and telephone number of person to be contacted in case of difficulty with the data.

This information should be given in a letter of transmittal, a copy of which should be packed with the data set in question.

When the data are submitted as files of formatted records on magnetic tape, the following information is expected to be given for each reel of tape:

1. Name and address of the submitting agency.
2. Reel number or identification symbol assigned by the submitting agency.
3. Number of files and contents of each file by job code and data type (e.g., AI VERT OBS, XX VERT DESC, etc.).
4. Computer system on which the tape was created (e.g., IBM 360/XXX, CDC 6600, etc.).
5. Internal label information (e.g., non-labeled, standard IBM label, etc.).
6. Number of tracks (7 or 9) and parity (even or odd).
7. Recording density (556, 800, or 1600 BPI).
8. Record length (LRECL) and block size (BLKSIZE).

9. Character representation code (BCD, EBCDIC, etc.) and keytape equipment designation, if applicable.
10. Name and telephone number of person to be contacted in case of difficulty with the data.

In addition to being given in the respective letter of transmittal, this information should be entered on one or more "stick-on" labels affixed to the magnetic tape reel.

A letter of transmittal in which the data are described and itemized should always be prepared for each data shipment. One copy should be enclosed with the data shipment, one sent by separate mail to NGS, and another copy should be retained by the sender. See ANNEX K for the current mailing instructions. In every case, the submitting agency should retain a backup copy of all data included in a shipment until the receipt of that specific data is acknowledged by NGS.

CODING, KEYING, AND DATA VERIFICATION

All data submitted to NGS for insertion in the National Geodetic Survey Data Base must be coded and keyed in strict conformity with the formats and specifications contained in this publication. In addition, the keying of all data must be verified. Detailed formats and specifications for the coding and keying of vertical control jobs are contained in Chapter 6 (VERT OBS data), Chapter 7 (VERT DESC data), and Chapter 8 (VERT ELEV data). The formats were designed to allow the keying and verification of the data to be accomplished on standard keypunch or keytape equipment. The 80-character record (one punched card image) has been adopted for all applications.

In keying the data entries, care must be taken to insure that alphabetic characters (letters) are always keyed using the alphabetic keys on the keying device, and that numeric characters (numbers) are always keyed using numeric keys. In particular, the miskeying of the following characters must be avoided:

0 - number "zero" 1 - number "one" 2 - number "two"
0 - letter "O" L - letter "L" Z - letter "Z"

SPECIAL CHARACTERS

In addition to alphabetic characters (letters A through Z) and numeric characters (numbers 0 through 9), the following special characters are allowed:

| | |
|--------------------------------|--------------------------|
| (*) asterisk | (+) plus sign |
| () blank or space | (-) minus sign or hyphen |
| (,) comma | (=) equal sign |
| (.) period or decimal point | (/) slash or solidus |
| (\\$) dollar sign | (()) left parenthesis |
| | (()) right parenthesis |

NOTE: A further restriction on characters is imposed for Bench Mark designations (see Annex D).

SEQUENTIAL RECORD NUMBERING

The first six characters of every record are reserved for a record sequence number. The purpose of the sequential numbering of records is to insure that the proper sequence of individual records in a data set can be verified and, if necessary, restored. The record sequence numbers must form one continuing sequence throughout each data set, starting with the first record (the Data Set Identification Record) and ending with the last record (the Data Set Termination Record).

Start with assigning sequence number 000010 to the first record in the data set (the Data Set Identification Record) and increment by 10 on each successive record. This numbering system allows up to nine records to be inserted between any two originally numbered records without the necessity of renumbering any records in the data set. Even when a large block of omitted records must be inserted, only a few of the existing records will have to be renumbered. However, to allow for the detection of missing records, all insertions and/or deletions which cause deviation from the basic 000010, 000020, 000030, etc. "increment-by-ten" record sequence must be accounted for in the respective letter of transmittal.

Discounting any after-the-fact insertions, the above-described sequential numbering system will permit a maximum of 99,999 uniquely numbered records in any one data set. Should there ever be a need for a greater number of records in a data set, retain only the last six digits of the higher sequence numbers, i.e., ... 999930, 999990, 000010, etc.

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Chapter 6

VERTICAL OBSERVATION (VERT OBS) DATA

INTRODUCTION

The purpose of this chapter is to provide detailed specifications and instructions for the coding and keying of the observation data set of a vertical control job. As was explained in Chapter 5, a vertical control job consists of two distinct data sets which must be submitted together. The companion data set to the vertical observation (VERT OBS) data set treated in this chapter is the data set containing original descriptions and/or recovery descriptions for the control points which occur in the vertical control job. This descriptive (VERT DESC) data set is treated in Chapter 7.

VERT OBS DATA SET RECORDS

The data which constitute a VERT OBS data set are organized into four categories:

1. Line Identification Data
2. Survey Equipment Data
3. Field Abstract Data
4. Observation Data

Within these categories, the respective data have been grouped into one or more logical units called "records." A record is a string of characters containing data coded according to a specific format. Every record in a VERT OBS data set consists of 80 characters or "columns" (standard punched card image). Within each record, the 80 columns are divided into fixed-length "character fields," each field being the space reserved for a specific data item. Accordingly, for every desired data item, there exists a field of appropriate length into which the data item in question is to be entered after it is converted into a string of alphanumeric characters. The set of rules according to which specific data items are converted into strings of alphanumeric characters to be entered in the fields of a record is known as the "format" of that record.

The types of records which may appear in a VERT OBS data set are listed in Table 6-1. Each type of record has been given a name, and a block diagram illustrating the respective format has been prepared to serve as a model for that record - see FORMAT DIAGRAMS.

Except for the first and last records of the data set, the second character field of each record (columns 7-10) contains a two-digit numerical data code, preceded and followed by an asterisk, which specifies the type of that record (*10*, *11*, ..., *43* - see Table 6-1). The first and last records of the data set (the Data Set Identification Record and the Data Set Termination Record) display the two-character alphanumeric job code assigned by the submitting agency in this field (*AA*, *A2*, ..., *ZZ* - see Chapter 5). The first character field of every record (columns 1-6) is reserved for the respective record sequence number - see Chapter 5. The remaining portion of each record (columns 11-80) contains character fields which are peculiar to each individual record type.

TABLE 6-1
VERTICAL OBSERVATION DATA SET RECORDS

FIRST RECORD

AA - Data Set Identification Record

LINE IDENTIFICATION DATA

.0 - Line Information Record
.1 - Line Title Record (Optional)
.2 - Line Title Continuation Record (Optional)
.3 - Line Title Continuation Record (Optional)
.4 - Line Title Continuation Record (Optional)
.5 - Comment Record (Optional)

SURVEY EQUIPMENT DATA

.0 - Instrument Information Record
.1 - Rod Information Record
.2 - Rod Standardization Record
.3 - Rod Calibration Record

FIELD ABSTRACT DATA

.0 - Field Abstract Record

OBSERVATION DATA

.0 - Survey Equipment Record
.1 - Tunning Record
.2 - River/Valley Crossing Record
.3 - Correction/Rejection Record

LAST RECORD

AA - Data Set Termination Record

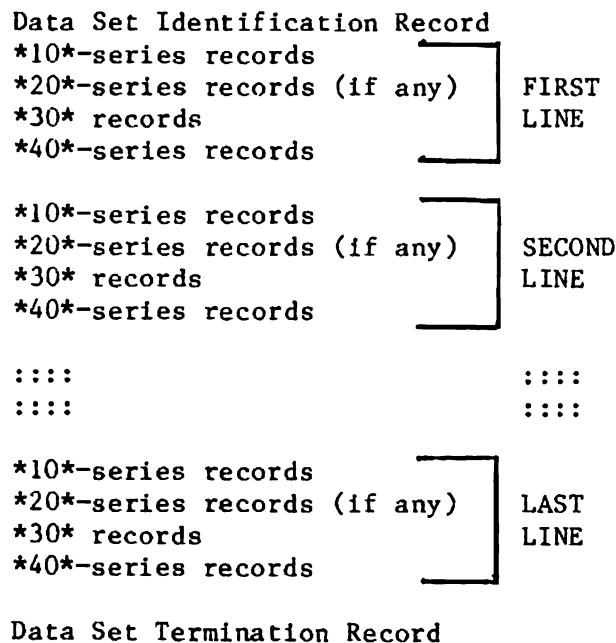
Note: The symbol *AA* denotes the two-character job code assigned by the submitting agency - see Chapter 5.

STRUCTURE OF THE VERT OBS DATA SET

The first record of a VERT OBS data set must be the Data Set Identification Record which contains the required information to identify the data set and to correlate it with its companion VERT DESC data set - job code, data type (VERT OBS), name of submitting agency, and date the data set was created. The last record of the data set must be the Data Set Termination Record. It is the only other record in the data set on which the respective job code appears in the same field (columns 7-10) as on the Data Set Identification Record.

The VERT OBS data set records which are bracketed by these two delimiting records may pertain to one or more units of field work; i.e., field observation data for several leveling lines may be submitted in one VERT OBS data set under the same job code, provided that the total number of survey points (bench marks and temporary bench marks) in the job does not exceed 9,999 (see Chapter 5). When two or more leveling lines are included in a vertical control job, each line must appear as a complete unit in the respective VERT OBS data set, i.e., as a block of records which contains all information pertinent to that line (see table 6-2). Each line must begin with a *10* record, contain any appropriate number of the other types of records in proper sequence, followed by one or more *40 - series records.

TABLE 6-2
STRUCTURE OF THE VERT OBS DATA SET



A leveling line is a unit of field work consisting of a number of survey points (bench marks and temporary bench marks - see Chapter 5) which are connected by chains of differential leveling observations called "runnings." When coded as part of a VERT OBS data set, a leveling line is a block of records comprising record groups arranged in the following order:

1. Line Identification Data (*10*-Series) Records:

10 record
11 record (optional; possibly *12*, *13*, and *14* records as well)
15 records (optional, any number allowed)

2. Survey Equipment Data (*20*-Series) Records:

20 records (at least one if instrument not previously reported; in general, one for each previously unreported stadia factor determination) for the first instrument used
20 records (at least one if instrument not previously reported; in general, one for each previously unreported stadia factor determination) for the second instrument used
:::::
20 records (at least one if instrument not previously reported; in general, one for each previously unreported stadia factor determination) for the last instrument used
21, *22*, and/or *23* record(s) - *21* record alone if rod not previously reported and no standardization or calibration data are available; in general, one *21* record followed by one or more *22* records (one for each previously unreported rod standardization), one or more *22*, *23*,..., *23* record sets (one such set for each previously unreported single-temperature rod calibration), and/or one or more *23*, *23*,..., *23* record sets (one such set for each previously unreported multiple-temperature rod calibration with one or more *23* record(s) for each calibration temperature) - for the first rod used
21, *22*, and/or *23* record(s) - *21* record alone if rod not previously reported and no standardization or calibration data are available; in general, one *21* record followed by one or more *22* records (one for each previously unreported rod standardization), one or more *22*, *23*,..., *23* record sets (one such set for each previously unreported single-temperature rod calibration), and/or one or more *23*, *23*,..., *23* record sets (one such set for each previously unreported multiple-temperature rod calibration with one or more *23* record(s) for each calibration temperature) - for the second rod used
:::::
21, *22*, and/or *23* record(s) - *21* record alone if rod not

previously reported and no standardization or calibration data are available; in general, one *21* record followed by one or more *22* records (one for each previously unreported rod standardization), one or more *22*, *23*,..., *23* record sets (one such set for each previously reported single-temperature rod calibration), and/or one or more *23*, *23*,..., *23* record sets (one such set for each previously unreported multiple-temperature rod calibration with one or more *23* record(s) for each calibration temperature) - for the last rod used

Note that for instruments and/or rods which are used in more than one leveling line submitted in the same or in different vertical control jobs, it is not necessary to repeat the same *20*-series records in each such line or each such VERT OBS data set. It is sufficient to submit the respective *20*-series records once as part of the first line submitted in which such instruments and/or rods appear, and thereafter only if the stadia factor is redetermined for an instrument and/or if a rod is restandardized or recalibrated - see SURVEY EQUIPMENT DATA RECORDS.

3. Field Abstract Data (*30*) Records:

30 records - one for the first (starting) survey point (bench mark or temporary bench mark) followed by one *30* record for each elevation carried forward to a survey point along the leveling line.

The order of the *30* records is important; normally they should follow in sequence as the respective survey points (bench marks and temporary bench marks) occur along the leveling line. However, one or more spurs may emanate from any given survey point - in which case, after the *30* record for such a "base" point, the *30* records for all survey points along the longest spur must follow first, then those along the next-longest spur, etc. Only when all spurs emanating from that base point have thus been exhausted, should the *30* record for the elevation carried forward to the next survey point along the main route be given - see example in Figure 6-1.

In the absence of any closed loops, there will be as many *30* records as there are survey points along the leveling line. However, if a loop is closed (as in the case of a spur loop or if the line itself forms a closed loop), an additional *30* record must appear in proper sequence (see above) for the endpoint of every such loop, reflecting the elevation carried forward to that bench mark or temporary bench mark via the loop.

4. Observation Data (*40*-Series) Records:

40 record giving the date, instrument/rod combination, and collimation error data for the first set of runnings
41 record for the first running in the first set *
43 record (if needed) for the first running in the first set *
41 record for the second running in the first set *
43 record (if needed) for the second running in the first set *
:::::
41 record for the last running in the first set
43 record (if needed) for the last running in the first set *
40 record giving the date, instrument/rod combination, and collimation error data for the second set of runnings
41 record for the first running in the second set *
43 record (if needed) for the first running in the second set *
41 record for the second running in the second set *
43 record (if needed) for the second running in the second set *
:::::
41 record for the last running in the second set
43 record (if needed) for the last running in the second set *
:::::
40 record giving the date, instrument/rod combination, and collimation error data for the last set of runnings
41 record for the first running in the last set *
43 record (if needed) for the first running in the last set *
41 record for the second running in the last set *
43 record (if needed) for the second running in the last set *
:::::
41 record for the last running in the last set
43 record (if needed) for the last running in the last set *
42 record for the first river/valley crossing along the line
43 record (if needed) for the first river/valley crossing along line *
42 record for the second river/valley crossing along the line
43 record (if needed) for the second river/valley crossing along line *
:::::
42 record for the last river/valley crossing along the line
43 record (if needed) for the last river/valley crossing along line *

LINE IDENTIFICATION DATA RECORDS

- *J0* Line Information Record
- *J1* Line Title Record (Optional)
- *J2* Line Title Continuation Record (Optional)
- *J3* Line Title Continuation Record (Optional)
- *J4* Line Title Continuation Record (Optional)
- *J5* Comment Record (Optional)

The line identification data records, bearing the *10*-series data codes, are listed above; the block diagrams illustrating the respective formats will be found under FORMAT DIAGRAMS.

The *10* record contains essential line identification data and is always required. The *11* record is optional; however, it is highly desirable that a line title (reflecting the geographic location of the line - see below) be given. The line title should be concise so as to fit on the *11* record (up to 70 characters); however, one, two, or three continuation records (the *12*, *13*, and *14* records) may be appended if the title is lengthy or if a main title followed by subtitle(s) is called for. Following the *11* record (or else the last title continuation record), there may appear as many *15* records as appropriate to give comments pertinent to the leveling line (e.g., significant problems encountered, deviations from standard procedures, etc.), if any.

The entries on these records (see FORMAT DIAGRAMS) are for the most part self-explanatory; however, the following data items will be explained in greater detail:

Leveling Line: As was stated in the preceding section, a leveling line is a unit of field work consisting of a number of survey points (bench marks and temporary bench marks) which are connected by chains of differential leveling observations called "runnings." Each segment of a leveling line consisting of two neighboring survey points connected by a running is called a "section" of the leveling line.

The objective of differential leveling is the extension of vertical control by precise determination of differences of elevation between successive survey points along the leveling line. The end product is a string of permanently marked vertical control points or bench marks (BMs).

Tolerance Factor: To control the accumulation of error in the differential leveling process, each section of a leveling line is normally "double-run," i.e., observed twice by runnings in opposite directions, and the disagreement between the respective differences of elevation as determined by the two runnings must not exceed a tolerance limit computed as the product of the appropriate tolerance factor and the square root of the section length.

Aside from the units of measurement involved, the numerical value of the tolerance factor used for this purpose depends on the type and intended accuracy of the vertical control survey in question; it is one of the specification parameters which characterizes a given order and class of vertical control survey (see below).

Note that the tolerance factor is expressed in mixed units, i.e., in "Units of Elevation Difference Disagreement Per Square-Root of Units of Section Length." For the purposes of this publication two such unit combinations are allowed (must be specified by the respective units code given as part of the tolerance factor data group on the *10* record):

1. Millimeter; per square-root of kilometers (units code MM), and
2. Feet per square-root of statute miles (units code FT).

Order and Class of Survey: A two-digit code is provided on the *10* record to specify the order of accuracy of the survey. The first digit of this code reflects the order and the second digit the class of the survey in accordance with the "Classification, Standards of Accuracy, and General Specifications of Geodetic Control Surveys," prepared by the Federal Geodetic Control Committee (FGCC), and published by the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, Rockville, MD (February 1974). In addition to the five vertical control survey categories defined in this publication, three other survey categories need to be considered - odd vertical control surveys of first or second order for which no class is specified, and surveys of lower-than-third-order accuracy. The respective two-digit codes are as follows:

- 10 - First-Order (Class Unspecified)
- 11 - First-Order, Class I
- 12 - First-Order, Class II
- 20 - Second-Order (Class Unspecified)
- 21 - Second-Order, Class I
- 22 - Second-Order, Class II
- 30 - Third-Order
- 40 - Lower-Than-Third-Order

The order-and-class code assigned to a leveling line should reflect the procedures and specifications according to which that entire line has been observed. When well-defined segments of a leveling line fall into different order-and-class categories, the line must be divided accordingly and the respective parts submitted as separate lines.

State or Country Code: Provision is made on the *10* record to indicate the political unit(s) and/or geographic area(s) in which the leveling line is located using the two-letter state or country codes given in ANNEX A. Up to three such codes may be entered, in the order of progress along the line in question. In the United States or in Canada, enter the appropriate code for the respective state, commonwealth, province, or territory; elsewhere enter the appropriate code for the respective country, island group, or geographic area - see ANNEX A.

Line Title: The desired elements of information in the title of a leveling line are (1) the respective line number or other identification symbol, (2) the order of accuracy of the survey, (3) whether original leveling or releveling, and (4) the geographic locality (or localities) of the survey. Since the first three elements are explicitly coded on the *10* Line Information Record (see FORMAT DIAGRAM), it would be superfluous to repeat them in the line title, and hence only the geographic location needs to be specified. The use of geographic location alone as the title of a leveling line has traditionally been the practice of the NGS and its predecessors.

In general, the title by which the leveling line is known to the submitting agency should be given, supplemented to reflect geographic location, as required. Omit punctuation marks (periods, commas, etc.) and parentheses whenever their omission can be tolerated, and use ANNEX A state and country codes whenever reference to a state or country is necessary. Furthermore, edit and/or abbreviate the line title in the interest of fitting the entire title on the *11* Line Title Record, if at all possible. However, up to three additional records (the *12*, *13*, and *14* Line Title Continuation Records) may follow the *11* Line Title Record if the title must be lengthy or when a main title followed by one or more subtitles is desired.

The geographic location of the leveling line should be descriptive of the route followed, i.e., the starting locality, any prominent "via" points, and the ending locality should be specified in the order of progress of the survey (Example: ALBANY GA VIA MORVEN TO CALLAHAN FL). If the leveling line is a member of a special project or of an area network to which a specific name or title has been assigned, such a name or title should be carried as a main title on the *11* record and the title of the line proper should follow as a subtitle on one or more of the continuation records. Example:

11 Record: TULARE-VASCO ARVIN-MARICOPA AREA CA
12 Record: 9.1 KM SE OF KETTLEMAN CITY TO PIXLEY

DATE AND TIME

Date of the VERT OBS data set creation must appear on the Data Set Identification Record, and the dates on which survey operations commenced and terminated are to be entered on the *10* Line Information Record. In addition, character fields are reserved for the date and/or time on several other records of the VERT OBS data set. Throughout the VERT OBS data set, date and time are to be coded as follows:

Date: Full date is coded as an eight-digit integer number consisting of four two-digit groups denoting (from left to right) the last whole century, number of full years since the turn of century, month of the year, and day of the month (CCYYMMDD). For the 20th

century, the "century" columns may be omitted, and the date coded as a six-digit integer number denoting the year, month, and day (YYMMDD). If the day is not known (e.g., in connection with old data extracted from archives for which the date is not fully specified), leave the last two columns of the field blank; if the month is not known, leave the last four columns of the field blank. For example, February 8, 1970, would be coded as follows

- | | | | |
|------------------------------------|----------|----|--------|
| 1. Full date is known: | 19700208 | or | 700208 |
| 2. Day of the month is not known: | 197002 | or | 7002 |
| 3. Month of the year is not known: | 1970 | or | 70 |

Time: The time of day is coded as a four-digit integer number consisting of two two-digit groups denoting (from left to right) the hours and minutes (HHMM) of a 24-hour clock. Each four-character time field or pair of (beginning and ending) time fields is preceded by a one-character field reserved for the appropriate one-letter U.S. Navy time zone designation (see below). In every case, the local zone time is to be used; in this manner ambiguities are avoided concerning the date, which is always assumed to be the "local" date (i.e., the date changes at local midnight).

Time Zone A time zone is a geographic region in which uniform time differing by an integer number of hours from Greenwich Mean Time (GMT) is maintained by law. In theory, a time zone extends 7-1/2 degrees in longitude east and west of a "time meridian" whose longitude is a multiple of 15 degrees (since the Earth rotates 360 degrees in 24 hours, 15 degrees of longitude difference equals one hour of time difference). In practice, the lines which separate adjacent time zones often follow political boundaries and are therefore irregular. Associated with every time zone is a "time zone description" - an integer number positive west of Greenwich and negative east of Greenwich - which represents the number of hours which must be added (algebraically) to the local zone time in order to obtain the corresponding MT. The time zone description is reduced by one hour when the standard zone time is changed to daylight-saving time.

Instead of the numerical time zone description, it is more convenient to use the U.S. Navy one-letter codes which uniquely identify each time zone. In this system, GMT is the "Z" (Zulu) Time Zone. Time zones east of Greenwich are identified by letters A, B, C, etc., through L, with the letter J omitted. Time zones west of Greenwich are identified by letters N, O, P, etc., through X. The letter Y is used to designate the western half of the time zone centered on the meridian of longitude 180 degrees (International Date Line), and the letter M is used to designate the eastern half of this zone.

The world-wide use of the time zone descriptions and the U.S. Navy one-letter designations is illustrated in ANNEX H. In the continental

United States, Alaska (AK), and Hawaii (HI) the time zones are as given in Table 6-3:

TABLE 6-3 - U.S. NAVY TIME ZONE DESIGNATIONS

| STANDARD TIME | DAYLIGHT TIME | TIME MERIDIAN | TIME ZONE DESCRIP'N | U.S. NAVY DESIG IATION |
|------------------|------------------|------------------|------------------------|---------------------------|
| Atlantic AST | Eastern EDT | 60W | +4 | Q (Qu:bec) |
| Eastern EST | Central CDT | 75W | +5 | R (Romeo) |
| Central CST | Mountain MDT | 90W | +6 | S (Sierra) |
| Mountain MST | Pacific PDT | 105W | +7 | T (Tango) |
| Pacific PST | Yukon YDT | 120W | +8 | U (Un:iform) |
| Yukon YST | AK/HI HDT | 135W | +9 | V (Vi:ctor) |
| AK/HI HST | Bering BDT | 150W | +10 | W (Wh:skey) |

If the time zone cannot be reliably ascertained, leave the time zone field blank. In this case, the time given will be interpreted as the standard time in a zone determined on the basis of the longitude of the vertical control point from which the respective leveling observations (running) originate.

SURVEY EQUIPMENT DATA RECORDS

- *20* Instrument Information Record
- *21* Rod Information Record
- *22* Rod Standardization Record
- *23* Rod Calibration Record

The survey equipment data records, identified by *20*-series data codes, are listed above; the block diagrams illustrating the respective formats are given in the FORMAT DIAGRAMS. The survey equipment data records contain identification and calibration data pertaining to the leveling instruments and rods used to carry out the differential leveling observations. See STRUCTURE OF THE VERT OBS DATA SET for the proper sequence in which the *20*-series records must appear in the block of records which constitutes a leveling line in a VERT OBS data set.

The *20* Instrument Information Record contains the data required to identify a leveling instrument (the appropriate NCS survey equipment code and the instrument serial number), date of stadia factor determination, and the stadia factor itself. This stadia factor will be used in the computation of the lengths of sights made with that instrument subsequent to the respective stadia factor determination date. Several *20* records may be submitted as a group for a leveling instrument; one for each past stadia factor determination.

The *21* Rod Information Record contains analogous data (the appropriate NGS survey equipment code and the rod serial number) required to identify a leveling rod; however, it does not contain any calibration data. Rod calibration data, which are required only for rods used in first- and second-order differential leveling work, must follow the *21* record in the form of a *22* record, a record set consisting of a *22* record and one or more *23* record(s), or a record set consisting of two or more *23* records, all bearing the same standardization/calibration date.

Again, several such *22* records, *22*, *23*,..., *23* record sets, and/or record sets of the form *23*, *23*,..., *23*, as appropriate, may be submitted as a group for a leveling rod following the respective *21* Rod Information Record; one such *22* record, *22*, *23*,..., *23* record set, or *23 *23*,..., *23* record set for each past calibration of the leveling rod in question.

The *22* Rod Standardization Record contains the summary of a rod calibration. For the purposes of this chapter, the term "standardization" will be used to denote a group of data which is the end product of a rod calibration (i.e., the respective coefficient of thermal expansion, rod excess, and index error - see below).

The *22* Rod Standardization Record may appear alone, or it may be followed by one or more *23* Rod Calibration Record(s) containing the (single-temperature) calibration data on which the standardization summary is based. Optionally, a *22* record may also precede a set of two or more *23* records of a multiple-temperature calibration; in this case, however, all data contained on the leading *22* record are inferable from the accompanying *23* records.

The *23* Rod Calibration Record contains data pertaining to the calibration of a leveling rod at one temperature. For single-temperature calibrations, submit one or more *23* record(s) following the corresponding *22* record (see above) - as many as required to accommodate all calibration intervals (three per *23* record - see FORMAT DIAGRAMS). For multiple-temperature calibrations, submit a set of *23* records (one or more per calibration temperature), with or without a preceding *22* record, which is optional in this case. In general, *23* Rod Calibration Records should be submitted whenever the respective data are available.

NGS Leveling Instrument and Rod File: The purpose of the *20*-series records is to provide input to a permanent computer file in which a historic record is maintained for each leveling instrument and leveling rod ever used in a VERT OBS data set submitted to the National Geodetic Survey. A record is established in this file for an instrument or rod at the first time it is encountered in the processing of a VERT OBS data set. Thereafter, the file is updated by adding new information to the respective instrument and/or rod records whenever

standardization or calibration data not previously available are encountered among the *20*-series records of a subsequently processed leveling line in the same or different VERT OBS data set.

Accordingly, it is not necessary to repeat identical *20* Instrument Information Records among the *20*-series records of every leveling line in which that instrument appears. It is sufficient, for any instrument, to submit one or more such records (one for each past determination of the respective stadia factor) once initially, and thereafter only when a new stadia factor is determined (e.g., following the installation of a new reticle). Of course, for each leveling line, care must be taken to insure that any omitted *20* Instrument Information Records have previously been made available for inclusion in the NGS Leveling Instrument and Rod File.

Analogously, it is not necessary to repeat identical *21* Rod Information Records, *22* Rod Standardization Records and/or *23* Rod Calibration Records among the *20*-series records of every leveling line in which the respective rod appears. It is sufficient, for any rod, to submit an appropriate grouping of these records (covering all past calibrations) only once initially, and thereafter only when the leveling rod in question is recalibrated. Again, in connection with every leveling line, care must be taken to insure that any omitted *21*, *22*, and/or *23* records have previously been made available for inclusion in the NGS Leveling Instrument and Rod File.

To summarize, submit a *20* record for every previously unreported leveling instrument and/or previously unreported stadia factor determination. For every leveling rod, submit a *21* record alone if the rod has not previously been reported and no calibration data follow (e.g., a rod used in third- or lower-order differential leveling work exclusively). Otherwise, submit (as a group) one *21* record followed by one or more *22* records, one or more *21*, *23*, ..., *23* record sets, and/or one or more *23*, *23*, ..., *23* record sets, as appropriate; one such *22* record, *22*, *23*, ..., *23* record set, or *23*, *23*, ..., *23* record set for each previously unreported calibration of the leveling rod in question.

NGS Survey Equipment Code: A three-digit numeric identification code assigned to each category of survey equipment, and within each category to specific instruments or other commonly used items. In particular, leveling instruments are assigned 200-series survey equipment codes, while leveling rods and staves are assigned 300-series survey equipment codes (see ANNEX F).

Instrument/Rod Serial Number: Assigned by the manufacturer, the serial number is the ultimate identifier of a specific leveling instrument or leveling rod. Serial numbers are normally numeric;

however, alphabetic characters are often used as prefixes, suffixes, etc., and special characters such as a blank (space), hyphen (minus sign), slash (solid is), etc., may appear imbedded in the respective alphanumeric character group. For this reason, a serial number must be treated as alphanumeric information to be entered in the respective character field left-justified and blank-filled on the right.

The instrument or rod serial number will be used together with the respective survey equipment code (see above) to create appropriate entries in the NGS Leveling Instrument and Rod File, to maintain these entries up to date, and to access this file for the retrieval of the respective stadia factor and/or rod calibration data in the course of routine processing of VERT OBS data sets. It is therefore of utmost importance that the respective serial number be faithfully reproduced as given by the manufacturer, character for character, including any leading zeros, imbedded blanks, etc., and that identical serial number representation be used consistently whenever reference is made to that specific instrument or rod in any VERT OBS data set.

Stadia Factor: An instrument-specific constant numerically equal to the ratio of the focal length of the instrument to the respective stadia interval, i.e., to the distance which separates the stadia lines (two horizontal lines spaced equally above and below the level line) in the reticle of the leveling instrument. By design, the stadia interval is chosen so that the stadia factor is a convenient integer number such as 100.

The stadia factor is used to obtain the distance between the leveling instrument and a rod as the product of the stadia factor multiplied by the respective (full) stadia intercept - see OBSERVATION DATA RECORDS. Note that a sight length so obtained is in the same units as the stadia intercept, i.e., in rod units, and hence must be further multiplied by a conversion factor to obtain the sight length in other units.

Rod Units: The units in which the respective rod scale is graduated. Four different rod units are acceptable, each identified by a two-letter code. They are as follows:

(F - centifeet (0.01 ft)
(M - centimeters (0.01 m = 1 cm)
(Y - centiyards (0.01 yd = 0.03 ft)
HC - half-centimeters (0.005 m = 0.5 cm = 5 mm)

Rod Graduation Code: A one-digit code denoting the type of graduation of the respective leveling rod:

- 1 - 1 line graduation (single scale)
- 2 - 1 line graduation (double scale)
- 3 - block graduation (including checkerboard)
- 4 - other

Temperature Scale: The temperature at which the leveling rod was calibrated must be given on both the *22* Rod Standardization Record (Standardization Temperature) and the *23* Rod Calibration Record (Calibration Temperature). On either record, provision is made to indicate which of the two possible temperature scales applies by means of a one-letter code immediately preceding the respective temperature field:

C - Celsius Temperature Scale
 F - Fahrenheit Temperature Scale

Coefficient of Expansion: The relative change in linear dimension (expansion or contraction) per unit of temperature change peculiar to the material of the respective leveling rod scale (these include INVAR or other low-expansion metal alloys for modern rods, and specially treated wood for rods used in older differential leveling work of high precision). Aside from the scale factor 10,000 mentioned below, the coefficient of expansion given on the *22* Rod Standardization Record must be in units which are compatible with the respective temperature scale and rod units (see above), as specified in Table 6-4.

TABLE 6-4
 UNITS OF COEFFICIENT OF EXPANSION

| ROD UNITS | TEMPERATURE SCALE | |
|--------------|---------------------------|------------------------------|
| | C | F |
| CF | feet per degree Celsius | feet per degree Fahrenheit |
| CM | meters per degree Celsius | meters per degree Fahrenheit |
| CY | feet per degree Celsius | feet per degree Fahrenheit |
| HC | meters per degree Celsius | meters per degree Fahrenheit |

The coefficient of expansion expressed in either one of the four possible unit combinations (see above) is always a very small decimal fraction. To avoid the keying of a long string of zeros preceding the first significant digit, enter the respective coefficient of expansion multiplied by 10,000, i.e., with the decimal point moved four places to the right (Example: A coefficient of expansion of 0.0000079 is entered as 0.0079 or .0079).

A-Flag: Enter 'A' if the coefficient of expansion (see above) is an "assumed" value (i.e., as given by the manufacturer, or a standard value for the material in question). Leave the field blank if the coefficient of expansion has been determined by means of a multiple-temperature calibration of the respective leveling rod.

Rod Excess: A factor used to compute the rod correction for a single running of a section of a leveling line. The rod calibration process precisely determines the actual length of the respective rod (or of a representative segment thereof). Rod excess is the ratio of the difference between the actual and nominal length (actual minus nominal) to the nominal length of the rod (or calibrated segment thereof).

Note that the rod excess is a unitless number; however, since it is always a small (positive or negative) decimal fraction, it is convenient to express rod excess as the aforementioned ratio multiplied by 1,000 (i.e., as millimeters per meter, if metric units are being used). Accordingly, regardless of the respective rod units, enter the rod excess with the decimal point moved three places to the right.

Index Error: The distance above or below the bottom surface (foot) of the leveling rod at which the nominal origin (zero) of the respective graduated scale is located (the origin of the low scale of a rod with a double-scale graduation). The index error is positive when the scale origin falls below the foot of the rod; it is negative when the scale origin falls above the foot of the rod. Note that the index error is expressed in rod units (see above) of the leveling rod in question.

FIELD ABSTRACT DATA RECORDS

30 Field Abstract Record

The purpose of the *30* record is to provide cross-reference between the primary identifier (i.e., the designation) of a vertical control point and the corresponding job-specific survey point serial number (SPSN). In addition, the accumulated distance along the leveling line and the respective "field" elevation (see below) are given on this record. Following established practice, these latter two data items are computed from the detailed differential leveling field notes as the work progresses and are normally recorded on a form called the "Field Abstract" - hence the name "Field Abstract Record." The block diagram illustrating the respective format will be found with the FORMAT DIAGRAMS.

Submit a *30* record for the first (starting) survey point (bench mark or temporary bench mark), followed by a *30* record for each elevation carried forward to a survey point by the differential leveling process. Normally, in the absence of any closed loops, there will be as many

30 records as there are survey points along the leveling line. However, if a loop is closed (as in the case of a spur loop or if the line itself forms a closed loop), an additional *30* record must appear in proper sequence (see below) for the endpoint of each such loop, reflecting the elevation carried forward to that bench mark or temporary bench mark via the loop.

Order of the *30* Records: As was previously covered in the section on the STRUCTURE OF THE VERT OBS DATA SET, the order of the *30* records is crucial. This is because the *30* records, as a group, define the leveling line in question, i.e., they define the nominal sequence of bench marks and temporary bench marks along the leveling line.

Normally, the *30* records should follow the same sequence as the respective survey points occur along the leveling line. However, one or more spurs may emanate from any survey point - in which case, after the *30* record for such a "base" point, the *30* records for all survey points along the longest spur must follow first, then those along the next-longest spur, etc. Only when all spurs emanating from that base point have thus been exhausted should the *30* record for the elevation carried forward to the next survey point along the main route of the leveling line be given - see example in Figure 5-1.

Survey Point Serial Number: For the purpose of identifying the initial and terminal points of each section of the leveling line in a concise and unique manner (e.g., on the respective *41* and *42* records - see OBSERVATION DATA RECORDS), each survey point that is leveled to in a vertical control job (bench mark or temporary bench mark) is assigned a job-specific serial number in the range 0001 to 9999. All survey points for which recovery descriptions are written, but which were not leveled to in the current project, are to be assigned the SPSN code 0000. See Chapter 5 for a detailed explanation of the survey point numbering system.

The survey point serial number (SPSN) is also used in the correlation of the data pertaining to the bench marks and temporary bench marks which appear in the VERT OBS data set with the corresponding descriptive data contained in the companion VERT DESC data set of the vertical control job. For this reason, special care must be taken to insure that the identical survey point serial number assigned to a bench mark or temporary bench mark in the VERT OBS data set is also used to identify the same survey point in the respective companion VERT DESC data set.

Designation: A vertical control point or bench mark is normally identified by a numeric or alphanumeric symbol which is stamped on the disk marker (or is otherwise inscribed on the bench mark monument) to which is appended the abbreviation or acronym (see Annex C) of the agency whose name is precast in the monument - if other than the

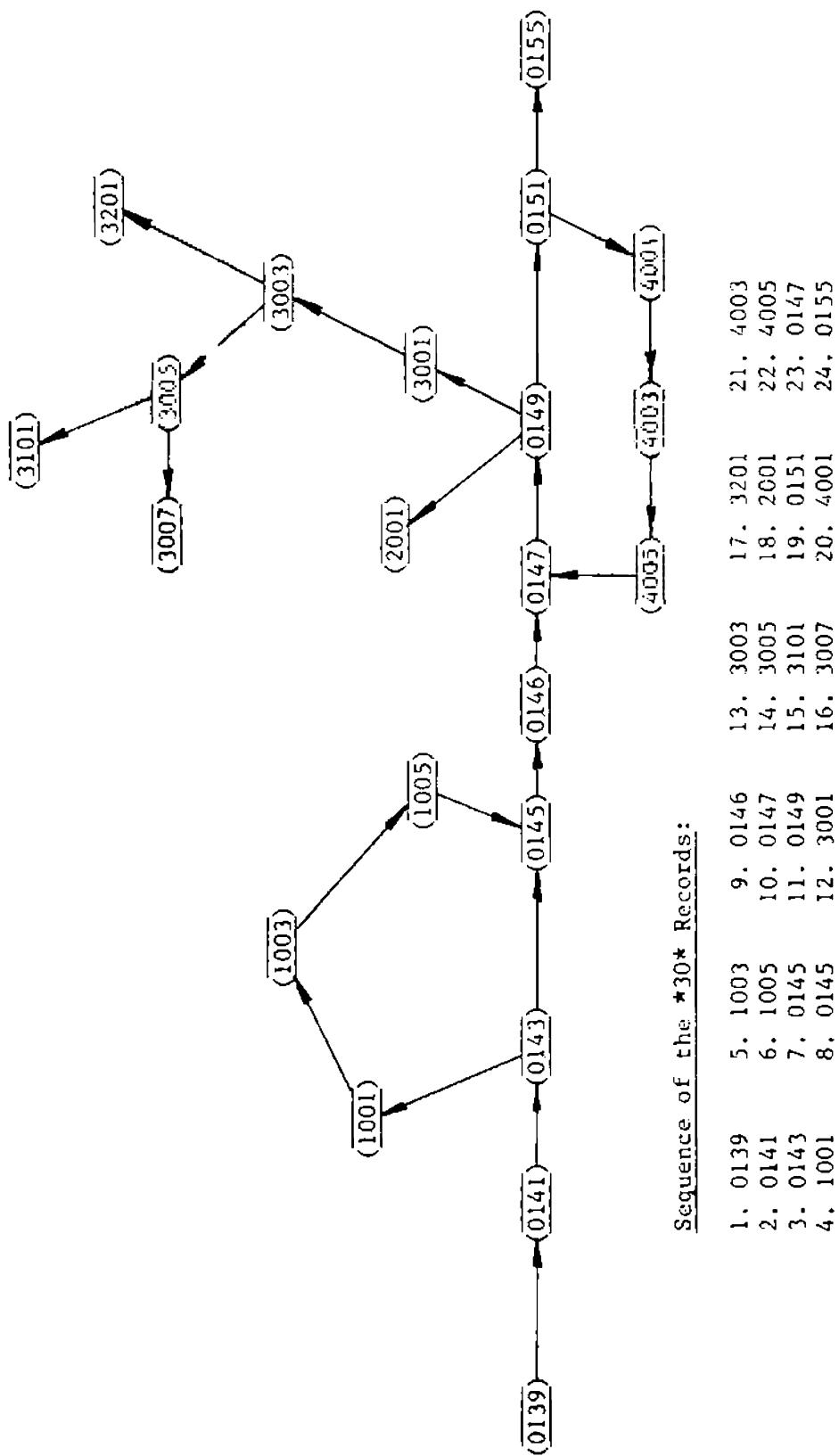


FIGURE 6-1 - Example of Field Abstract Record sequence.

National Geodetic Survey, National Ocean Survey, or Coast and Geodetic Survey (see Origin). For marks not having a precast agency name, append the acronym or abbreviation of the agency which set the mark (see Setting-by-Agency). If the agency cannot be determined, do not append an agency acronym or abbreviation. Less frequently, a bench mark is assigned a concise, intelligible name (e.g., when a horizontal control point also becomes a bench mark); the appropriate acronym or abbreviation should be appended to these also. A maximum of 25 characters (including all imbedded blanks) is allowed.

In every case, the bench mark designation entered on the *30* record must be identical to the (primary) designation used to identify the same vertical control point in the companion VERT DESC data set of the vertical control job - refer to Chapter 7. Use the same general guidelines for the designations of any survey points which lack descriptive data (e.g., undescribed temporary bench marks which may have to be carried in the VERT OBS data set but which do not appear in the companion VERT DESC data set).

Accumulated Distance: The distance covered by the differential leveling operation from the nominal starting point of the leveling line to the survey point in question. It is obtained by successively adding the lengths of the intervening sections (following the line-order conventions used for the ordering of the *30* records in the case of a survey point located on a spur or leveled to via a spur loop - see Order of the *30* Records). Recall that "section" is a segment of the leveling line consisting of two neighboring survey points connected by a chain of differential leveling observations (i.e., connected by a "running").

The individual section lengths are obtained by accumulating the lengths of the backsight and foresight of each setup of the respective running, which in turn are usually obtained as a function of the corresponding stadia intercepts (see Stadia under OBSERVATION DATA RECORDS) and the stadia factor of the leveling instrument used. For this purpose, use the minimum section length if more than one running has been made over a section, as is the normal case.

The accumulated distance (as well as the field elevation - see below) is carried on the *30* record to provide a check against certain undetected keying errors, line order errors, errors in the assignment of survey point serial numbers, etc. For this reason, the accumulated distance entered in this field must be the value which is normally computed and "abstracted" in the course of the differential leveling operation. In particular, the accumulated distance must not be generated (e.g., by software) from the respective *41* and *42* records (see OBSERVATION DATA RECORDS), as this would defeat the purpose for which it is intended.

Field Elevation: The approximate elevation of the survey point in question is obtained as the (algebraic) sum of the elevation of the starting point of the leveling line and the raw (i.e., uncorrected) elevation differences determined for the intervening sections (following the line-order conventions used for the ordering of the *30* records in the case of a survey point located on a spur or leveled to via a spur loop - see Order of the *30* Records). (Recall that a "section" is a segment of the leveling line consisting of two neighboring survey points connected by a chain of differential leveling observations referred to as a "running.")

The end product of every running over a section of the leveling line is the respective observed, uncorrected elevation difference (see Elevation Difference under OBSERVATION DATA RECORDS). When more than one running has been made over a section, as is the normal case, a "section mean" must be computed using all forward and backward runnings made over that section which have passed appropriate field rejection criteria.

Noting that a backward running produces an elevation difference of opposite sign, the respective section mean is defined as the algebraic difference between the sum of elevation differences determined by forward runnings and the sum of elevation differences determined by backward runnings divided by the number of runnings. In other words, if ΣF is the sum of all acceptable forward-running elevation differences, and ΣB is the sum of all acceptable backward-running elevation differences, the desired section mean is $(\Sigma F - \Sigma B)/n$, where n is the number of runnings.

The field elevation (as well as the accumulated distance - see above) is carried on the *30* record to provide a check against certain undetected keyin errors, line order errors, errors in the assignment of survey point serial numbers, etc. For this reason, the field elevation entered in this field must be the value which is normally computed and "abstracted" in the course of the differential leveling operation. In particular, the field elevation must not be generated (e.g., by software) from the respective *41* and *42* records (see OBSERVATION DATA RECORDS), as this would defeat the purpose for which it is intended.

OBSERVATION DATA RECORDS

- *40* Survey Equipment Record
- *41* Running Record
- *42* River/Valley Crossing Record
- *43* Correction/Rejection Record

The observation data records, identified by *40*-series data codes, are listed above; the block diagrams illustrating the respective formats are given in the FORMAT DIAGRAMS. The purpose of the *40*-series

records is to provide the means to record the differential leveling observations carried out along a leveling line. Recall that a leveling line is a unit of field work consisting of a number of survey points (bench marks and temporary bench marks) connected by differential leveling observations, and that "section" is a segment of the leveling line consisting of two neighboring survey points which are connected by one or more differential leveling observations.

The differential leveling observations carried out over a section of leveling line are of two basic types - runnings and crossings - see below.

Normally, the (observed) elevation difference between the endpoints of a section is determined as the accumulation of a continuous series of small elevation difference measurements, each obtained as the difference between the respective backsight and foresight reading; on a pair of leveling rods positioned vertically over "turning points" at a relatively short sight distance from the leveling instrument. This type of differential leveling observation which consists of a chain of small elevation difference measurements (i.e., leveling instrument "setups") is called a "running."

When carried out in the nominal direction of progress of the leveling line, it is called a "forward" running; when carried out in the opposite direction, it is called a "backward" running. A section which is "double-run" (as is the normal case) will have at least one forward and one backward running (among possibly several runnings in either direction) which meet field acceptance criteria (i.e., the disagreement between the respective observed elevation differences does not exceed the tolerance which is in effect for the order and class of the vertical survey in question).

Submit a *41* record for every running carried out along the leveling line, regardless of its field acceptance or rejection status (rejected runnings may be brought within the respective tolerance after various corrections are applied in the course of subsequent data processing). The *41* records must be submitted in sets consisting of a *40* record followed by one or more *41* records - one for each running made on the same date, using the same leveling instrument and the same leveling rods, and subject to the same level collimation error (see below) as specified in the respective leading *40* record - see STRUCTURE OF THE VERT OBS DATA SET.

The other type of differential leveling observation is the "river/valley crossing" (or "crossing") which is used when a gap larger than the maximum allowable sight length of a setup must be spanned, as when a river (or dry canyon) must be crossed without using a suitable bridge. This type of differential leveling observation is the result of a series of reciprocal measurements carried out simultaneously from both sides of

such a gap using special "valley-crossing" equipment. Note that each individual river/valley crossing must be treated as a separate section of the leveling line.

Submit a *42* record for every river/valley crossing along the leveling line. The *42* records, if any, must appear as the last group of records of the respective leveling line block in the VERT OBS data set (see STRUCTURE OF THE VERT OBS DATA SET).

Submit a *43* record for each running or river/valley crossing for which a refraction correction was determined from temperature profile measurements made by field personnel, or for which a rod correction was determined using detailed rod calibrations furnished by the National Bureau of Standards. Also, if a running or river/valley crossing was rejected, include a *43* record indicating the source of the rejection (field or office). Each required *43* record should immediately follow its corresponding *41* or *42* record.

Level Collimation Error: The (small) angle by which the line of sight defined by the horizontal crossline in the reticle of a leveling instrument departs from the actual level surface when the instrument is "leveled": positive when the line of sight deviates upward, and negative when the line of sight deviates downward from the level surface. The collimation error is due to a small misalignment of the respective bubble vial (in the case of spirit-level instruments) or compensator mechanism (in the case of self-aligning instruments).

The level collimation error can be resolved into two components--a residual constant component (which can be minimized by careful adjustment of the instrument) and a variable component which is caused by transient deformation of the structural parts of the instrument brought about by stresses and strains due to uneven temperature distribution (differential heating) and other intermittent physical forces which are active in the course of the daily handling of the leveling instrument.

Because of the unpredictable nature of the intermittent component, the level collimation error must be determined at sufficiently frequent intervals to permit the application of meaningful corrections to the respective leveling rod readings. Note that the effect of the collimation error cancels for a setup with backsight and foresight of equal length; it is the total accumulated length imbalance between all the backsights and foresights of a running to which the correction for collimation error is applicable.

Tangent of Collimation Error: The observing procedure by means of which the collimation error is determined (commonly known as the "C-Test") produces the ratio of the corresponding rod reading error to the length of line of sight, i.e., the trigonometric function tangent of the collimation error.

Note that the tangent of an angle is a unitless number; however, since it is a very small (positive or negative) decimal fraction, it is convenient to use the tangent of collimation error multiplied by 1000 (i.e., as millimeters per meter, if the metric units are being used). Accordingly, enter the tangent of collimation error with the decimal point moved three places to the right.

Wind Code: A one-character numeric code, the purpose of which is to denote the approximate wind conditions prevailing during the course of the running. The three wind codes are:

- 0 - wind speed less than 10 kilometers per hour
- 1 - wind speed from 10 to 25 kilometers per hour
- 2 - wind speed greater than 25 kilometers per hour

Sun Code: A one-character numeric code, the purpose of which is to denote the approximate conditions of insolation prevailing during the course of the running. The three sun codes are:

- 0 - less than 25% of setups under sunny conditions
- 1 - 25% to 75% of setups under sunny conditions
- 2 - more than 75% of setups under sunny conditions

Stadia, Stadia Intercept, and Stadia Intercept Code: Stadia is a method of obtaining the approximate distance (typically to the nearest 0.1 meter) between the leveling instrument and a vertically positioned leveling rod as the product of the instrument's stadia factor (as specified in the corresponding *20* record) and the respective stadia intercept - the difference between the high and low stadia line readings on the respective rod. Recall that stadia lines are two horizontal lines spaced equally above and below the horizontal crossline in the reticle of the leveling instrument. Note that the distance obtained in this manner is in the same units as the stadia intercept, i.e., in rod units of the respective leveling rod (as specified in the corresponding *21* record).

For differential leveling observations, stadia information is desired (1) to compute the total length of the running, and (2) to compute the total accumulated length imbalance between the backsights and foresights of the running (to eliminate the residual effect of collimation error - see Level Collimation Error above). Because of the latter requirement, two fields are provided for the entry of stadia information, one for the Sum of Backsight Stadia Intercepts and the other for the Sum of Foresight Stadia Intercepts.

As was mentioned previously, the two stadia lines are equidistant from the horizontal crossline (level line) of the leveling instrument. The use of full stadia intercepts requires the observation and recording of two rod readings (the stadia high and the stadia low readings) in

addition to the level line reading. It is possible to observe only one stadia line reading (either the stadia high or the stadia low) in addition to the level line reading, in which case half stadia intercepts are obtained. Note that either full stadia intercepts or half intercepts must be observed consistently throughout a running. To specify which one of the two possible procedures has been followed, provision is made on the *41* record for a one-letter Stadia Intercept Code:

F - full stadia intercepts observed
H - half stadia intercepts observed

Units: A set of two-letter codes for the various units of length in which the length of running (*41* record), length of crossing (*42* record), and elevation difference (*41* and *42* records) may be given. It is the same set of unit codes which is used on the *30* record to denote the units of accumulated distance and field elevation - see FIELD ABSTRACT DATA RECORDS. The specific unit codes are:

MT - meters KM - kilometers
FT - feet KF - kilofeet
YD - yards SM - statute miles

Running Length: The overall length of the running (i.e., the distance covered by the differential leveling observations), preceded by the respective unit code, only if the stadia information (see above) is not available; otherwise leave blank.

Crossing Length: Enter the overall length of the crossing (i.e., the distance spanned by the river/valley crossing observations), preceded by the respective units code.

Elevation Difference: Enter the observed difference of elevation as determined by the running or crossing in question, preceded by the respective units code. Note that this must be the raw observed elevation difference, i.e., the result of the running or crossing observations to which no corrections have been applied.

FORMAT DIAGRAMS

For each record which appears in a VERT OBS data set (see Table 6-1), a block diagram has been prepared to illustrate the respective format. These "format diagrams" have been designed to fulfill the following objectives:

1. Each record is 80 characters long (standard punched card image).
2. Each record has a fixed format, i.e., every data field has a specific length and specific position within the record.

3. Each format diagram is a graphic image of the respective record.
4. Within the limits of available space, information and instructions concerning the data item to be entered in each data field are provided on the format diagram to render them self-explanatory.
5. When appropriate, sample entries are shown in the data entry line of each format diagram.
6. Each data field is characterized as to its type by a string of lower-case characters which appear immediately below the data entry line.

Data Field Types:

1. Alpha Field (aa...a) - intended for a data item which is coded as a string of alphabetic, numeric, and/or special characters, with or without imbedded blanks, to be entered into the respective data field left-justified and blank-filled on the right. See Chapter 5 for a list of special characters which are allowed.

2. Blank Field (bb...b) - to be blank-filled. Data fields which are designated as blank fields must be left blank, i.e., no data items may be entered in these fields.

3. Constant (Numeric) Field (cc...c) - intended for a data item which is a number (i.e., an integer, a proper or improper fraction, or a decimal fraction) coded as a string of numeric characters (prefixed with a minus sign if the number is negative) which may contain one leading or imbedded (but not trailing) decimal point if it is a decimal fraction, or an imbedded hyphen and/or slash if it is a proper or improper (mixed) fraction such as 3/4, 5-1/2, etc., to be entered into the respective data field left-justified and blank-filled on the right.

4. Floating-Point Field (ff...fdd...d) - intended for a data item which is coded as a decimal number, i.e., as a string of numeric characters (prefixed with a minus sign if the number is negative) which may not contain any imbedded blanks. If the decimal point is present, the character string representing the integer digits, the decimal point, and the decimal fraction digits may be positioned anywhere within the respective field (generally left-justified), and the unused columns of the data field are blank-filled.

When the decimal point is not coded, the "f" portion of the floating-point field is to contain the integer part of the decimal number, and the "d" portion the corresponding decimal fraction part,

the decimal point being implied between the rightmost "f" column and the leftmost "d" column of the field.

Accordingly, a string of numeric characters representing m integer digits followed by n decimal fraction digits with the decimal point absent must be positioned in the floating-point field in such a manner that its integer part falls into the m rightmost "f" columns, and its decimal fraction part into the n leftmost "d" columns, with any unused columns of the data field being blank-filled. When a negative number is entered, code the minus sign immediately preceding the leading digit.

5. Integer Field (ii...i) - intended for a data item which is coded as a string of numeric characters representing a positive or negative integer number, to be entered into the respective data field right-justified. In the case of a positive integer number, zero-fill any unused columns on the left. In the case of a negative integer number, code the minus sign immediately preceding the leftmost non-zero digit, and blank-fill any unused columns to the left of the minus sign.

6. Specific Character Field (ss...s) - intended to contain a specific alphabet: c, numeric, special character, or a specific group of characters. Every "s" column of a specific character field must contain the character shown in that position in the data line of the respective format diagram.

Required Data In general, only those records which are applicable to the data at hand should be included in a VERT OBS data set (e.g., no *42* records need be submitted if there are no river/valley crossings along the respective leveling line). The character fields intended for data items which are essential have been shaded on the format diagrams; if applicable to the data being coded, these character fields must be in accordance with the instructions given on the respective format diagrams or in the text of this chapter. Records which are optional or those which may be omitted under certain circumstances are clearly designated in the headings, footnotes, or bodies of the corresponding format diagrams.

Data Set Identification Record. This must be the first record of every data set submitted. A data set may be submitted either as a deck of cards or as a magnetic tape file containing

Magnetic tape is preferred; use punched cards for small, isolated jobs only. Magnetic tape may be stored on reels or as a magnetic tape cartridge containing formatted records. Magnetic tape is preferred; use punched cards for small, isolated jobs only.

| | | |
|--|---|----------------------|
| <u>Date Data Set Created</u> (e.g. date this record keyed) Century, year, month, day (CCYYMMDD). If day is unknown, leave last two columns blank. If month is unknown, leave last four columns blank. | | 19 13 01 13 |
| <u>Name of Submitting Agency or Firm</u> Full Name <u>Abbreviation</u> - must be unique. Enter the symbol listed in ANNEX C. See footnote for other agencies or firms | | US GEOLOGICAL SURVEY |
| | | 19 13 01 13 |
| <u>Data Set Identification</u> | <u>Data Type</u> - OBS for field observation data. | 19 13 01 13 |
| | <u>Data Class</u> - VERT for vertical control data. | 19 13 01 13 |
| | <u>Job Code</u> - preceded and followed by asterisk. | 19 13 01 13 |
| <u>Sequence Number</u> - must be 000010 on this record. Increment by 10 on successive records to allow for insertions. | | |

Important: To insure uniqueness, agencies or firms not listed in ANNEX C must have their proposed abbreviation symbol accepted by NGS prior to first submittal of data - see ANNEX K.

10 Line Information Record. This must be the leading record of each leveling line included in the job - note that a VERT OBS job consists of one or more leveling lines. A code is provided to indicate whether the survey is an original leveling or a releveling of the line - see footnotes.

| | | | | | | | | | |
|-------|--|----|-----|----|------------------------|----|-------|------------------|--|
| | 1 = single or double - simultaneous run 2 = double run | | | | | | | | |
| | ORDER AND CLASS OF SURVEY | | | | | | | | |
| ORDER | 1st | | 2nd | | 3rd | | LOWER | | |
| CLASS | * | I | II | * | I | II | ** | ** | |
| CODE | 10 | 11 | 12 | 20 | 21 | 22 | 30 | 40 | |
| | Class unspecified | | | | **No class subdivision | | | | |
| | Agency which made the observations. For agencies or firms listed in ANNEX C, enter the respective six-character abbreviation. For others, enter the full or abbreviated name (up to 20 characters) - see ANNEX C for examples. | | | | | | | | |
| | Initials of Chief of Party - i.e., person responsible for the survey; leave blank if unknown. | | | | | | | | |
| | State or Country Code - see ANNEX A. Enter the code(s) for the state (or country) in which the leveling line begins (and into which it extends). | | | | | | | | |
| | Order and Class of Survey - see table above. | | | | | | | | |
| | Tolerance Factor used to compute maximum disagreement allowed for each double-run section of the line - see footnote. | | | | | | | Factor | |
| | | | | | | | | Units | |
| | Date Field Observations Terminated Century, year, month, day (CCYYMMDD). If day is unknown, leave last two columns blank. If month is unknown, leave last four columns blank. | | | | | | | | |
| | Date Field Operations Commenced Century, year, month, day (CCYYMMDD). If day is unknown, leave last two columns blank. If month is unknown, leave last four columns blank. | | | | | | | | |
| | Relevelling Code - see footnote. | | | | | | | | |
| | Agency-specific pointer to its own archive - usually given as an "accession number" (or other cataloguing symbol) which identifies the block of data, possibly supplemented by a further "line" or "part" designation. | | | | | | | Line/Part | |
| | | | | | | | | Accession Number | |
| | Data Code - preceded and followed by asterisk. (*10* - Line Information Record) | | | | | | | | |
| | Sequence Number Increment by 10 on successive records to allow for insertions. | | | | | | | | |
| | Relevelling Code: Enter R if releveling over previously established line; leave blank otherwise. | | | | | | | | |
| | Units (of Tolerance Factor): MM - mm/square-root of km, FT - feet/square-root of statute miles. | | | | | | | | |

11* Line Title Record (Optional)** and ***12*, *13*, *14 Line Title Continuation Records (Optional). Use the ***11** record to give the title of the line (or of area network or special project of which

the line is a part) and the *12*, *13*, *14* records for continuation and/or subtitles, if any.

Line Title - use *12*, *13*, *14* Line Title Continuation Record(s) as required if the title exceeds 70 characters or if subtitles are necessary (e.g. the title of an area network followed by title of the line).

The title of a leveling line should be descriptive of the route followed, i.e., it should indicate the starting and ending locations and prominent "via" points, if any (Example: ALBANY GA VIA MORVEN TO CALLAHAN FL).

Do not divide words (or other character groups) between the *11*, *12*, *13*, *14* Line Title and Line Title Continuation Records. Omit punctuation marks (periods, commas, etc.) and parentheses whenever possible. Use ANNEX A state and country codes whenever reference to a state or country is necessary.

Abbreviate and/or edit a line title in the interest of fitting the entire title on the *11* Line Title Record, if possible.

Data Code

(*11*,*12*,*13*,*14* Line Title Records)

Sequence Number

Increment by 10 on successive records to allow for insertions.

RECEIVED
FBI - MEMPHIS
JULY 1968
BY SPC VANCE MARICOPA AREA BY
MAIL ROOM
KENTUCKY CITY TO PIXIE

15 Comment Record (Optional). Use this record for any comments pertinent to the leveling line. If the comment(s) exceed 70 characters, use another *15* record for continuation; any number of *15* records is allowed. Do not divide words between consecutive *15* records.

000000000011111112222222233333334444444555555566666666777777778
1234567890123456789012345678901234567890123456789012345678901234567890

Comment

Data Code

(*15* - Comment Record)

Sequence Number

Sequence Number: Increment by 10 on successive records to allow for insertions.

REVIEW SURVEY OBSERVED OVER THIS LINE.

***20* Instrument Information Record.** Submit this record for every instrument (identified by the respective Survey Equipment Code and Instrument Serial Number) once for each past stadia factor determination (to form historical file) and when a new stadia factor is determined - see footnote.

Note: Omit for those instruments for which *20* record(s) containing identical information have been given in another line of this data set - or in a previously submitted VERT OBS data set.

21 Rod Information Record. Submit this record for every rod (identified by the respective Survey Equipment Code and Rod Serial Number) once initially with or without one or more *22* (Rod Standardization) and/or *23* (Rod Calibration). Records for that rod - see footnote.

| | |
|---|---|
| 00000000011111111122222222333333333444444444455555555566666666677777778 1234567890123456789012345678901234567890123456789012345678901234567890 | 1-line graduation (single scale) 2-line graduation (double scale) 3-block graduation (including checkerboard) 4-other <u>Graduation Code</u> - see above. <u>Rod Units</u> - CF, CM, CY, or HC - see below. |
| | <u>Rod Units:</u> CF-centifoot (0.01ft) CM-centimeter (0.01m) CY-centiyard (0.01yd) HC-half centimeter (0.005m) |
| | <u>Agency</u> which owns or has the custody of the rod. For agencies or firms listed in ANNEX C, enter the respective six-character abbreviation. For others, enter the full or abbreviated name (up to 20 characters) - see ANNEX C for examples. |
| | <u>Model or Type</u> - examples: INVAR NILEX LOVAR WOOD |
| | <u>Manufacturer</u> - examples: JSC+G WILD KERN ZEISS, OBERKOCHEM ZEISS, JENA K+E HILGER-WATTS |
| | <u>Rod Serial Number</u> - alphanumeric, left-justified. |
| | <u>Survey Equipment Code</u> - see ANNEX F. |
| | <u>Data Code</u> (*21* - Rod Information Record) |
| | <u>Sequence Number</u> Increment by 10 on successive records to allow for insertion. |

Note: Aside from being required at least once initially for every rod, this record must precede every *22* and/or *23*, ..., *22* and/or *23* record group subsequently submitted for any given rod.

22 Rod Standardization Record. Submit this record for every rod (with or without accompanying
23 record(s)) once for each past standardization or calibration (to form historical file) and whenever restandardized or recalibrated (NOT REQUIRED FOR 3RD AND LOWER ORDER) - see footnote.

whenever reganuarized or recalibrated (NOT REQUIRED FOR 3RD AND LOWER ORDER) - see footnote.

| UNITS OF COEFFICIENT OF EXPANSION | | | |
|---|-------------------|---------------|---|
| ROD UNITS | TEMPERATURE SCALE | | |
| | C | F | F |
| CF | feet/degree C | feet/degree | F |
| CM | meters/degree C | meters/degree | F |
| CY | feet/degree C | feet/degree | F |
| HC | meters/degree C | meters/degree | F |
| <u>NOTE - The *22* record is optional if all data elements hereunder are inferable from accompanying *23* records.</u> | | | |
| <u>Index Error in rod unit text.</u> <u>Rod Excess x1000 (i.e., enter with decimal point moved three places to the right) - see text.</u> <u>A-Flag - A-assumed, blank otherwise.</u> <u>Coefficient of Expansion x10000 (i.e., enter with decimal point moved four places to the right) - see text.</u> <u>Standardization Temperature</u> | | | |
| <u>Scale - C-Celsius, F-Fahrenheit.</u> <u>Date of Standardization - year, month, day (YYMMDD)</u> If day is unknown, leave last two columns blank. If month is unknown, leave last four columns blank. <u>Laboratory or other source of standardization - see ANNEX C. Enter MAKER if furnished by the manufacturer.</u> | | | |
| <u>Rod Serial Number - alphanumeric, left-justified</u> <u>NGS Survey Equipment Code - see ANNEX F.</u> | | | |
| <u>Data Code</u> (*22* - Rod Standardization Record) | | | |
| <u>Sequence Number</u> Increment by 10 on successive records to allow for insertions. | | | |

Note: Omit for those rods for which *22* and/or *23* record(s) containing identical data have been given in another line of this data set - or in a previously submitted VERT OBS data set.

***23* Rod Calibration Record.** In addition to the respective #22* record, submit one or more *23* records for every past single- and multiple-temperature calibration of the rod for which the data are available and when recalibrated (NOT REQUIRED FOR 3RD AND LOWER ORDER) - see footnote.

Note: Omit for those rods for which *22* and/or *23* record(s) containing identical data have been given in another line of this data set - or in a previously submitted VERT OBS data set.

***30* Field Abstract Record.** Submit this record for the first (starting) survey point (bench mark or temporary bench mark) and thereafter for each elevation carried forward (possibly more than once for any given survey point) in the order of occurrence along the leveling line - see text.

| INSTRUMENT | ROD 1 | ROD 2 | Tan s | Wit s | E/H | N |
|---|---|-------|----------|----------|-----|---|
| *40* Survey Equipment Record. | Submit this record at the start of every day's work and whenever an item of survey equipment changes and/or the collimation error is redetermined, to be followed by one or more *41* records for the runnings to which data on the *40* record are applicable. | | | | | |
| 00000000011111111112222222222333333334444444455555555666666667777777778 | | | | | | |
| 1234567890123456789012345678901234567890123456789012345678901234567890 | | | | | | |

Important: This must be the leading record of every *40*, *41*, *41*, ..., *41* set containing runnings made on the same date using the same equipment and affected by the same collimation error.

***41* Running Record.** Submit this record for every running other than river/valley crossing. The *41* records for all runnings made on the same date, using the same equipment, to which the same collimation error applies must follow, as a group, immediately behind the respective *40* record.

| | | | | | | | | | |
|---|---|--|--|--|---|-----|-----|-----|-----|
| Initials of the Observer - left-justified. | | | | | | | | | |
| <u>Elevation Difference - observed, uncorrected elevation difference determined by the running.</u> | | | | | <u>Elevation Difference - in the units indicated, left-justified.</u> | | | | |
| <u>Length of Running - if stadia data unavailable; leave blank otherwise.</u> | | | | | <u>Length of Running - in the units indicated, left-justified.</u> | | | | |
| <u>Stadia - enter to the nearest 0.1 of the respective rod unit. Note implied decimal point.</u> | | | | | <u>Sum of Fore sight Stadia Intercepts</u> | | | | |
| <u>Stadia Intercept Code - F-full, H-half. Number of Setups in the running.</u> | | | | | <u>Sum of Backsight Stadia Intercepts</u> | | | | |
| <u>Wind and Sun Codes - see footnotes.</u> | | | | | <u>sun wind</u> | | | | |
| <u>Temperature of Air</u> | <u>Temperature at ending time and place - left-justified.</u> | | | | | 102 | 124 | 154 | 172 |
| | <u>Temperature at starting time and place - left-justified.</u> | | | | | 118 | 138 | 168 | 186 |
| | <u>Scale - C-Celsius, F-Fahrenheit.</u> | | | | | 117 | 137 | 167 | 185 |
| <u>Local Time in hours and minutes (HHMM).</u> | | | | | <u>Ending Time of running.</u> | | | | |
| <u>Starting Time of running.</u> | | | | | <u>Starting Time of running.</u> | | | | |
| <u>Time Zone - see ANNEX H.</u> | | | | | <u>Time Zone - see ANNEX H.</u> | | | | |
| <u>Ending Survey Point Serial Number (SPSN) - must be same as SPSN on the corresponding *10* record.</u> | | | | | <u>SPSN</u> | | | | |
| <u>Starting Survey Point Serial Number (SPSN) - must be same as SPSN on the corresponding *10* record.</u> | | | | | <u>SPSN</u> | | | | |
| <u>Date of Running - year, month, day (YY M DD). If day is unknown, leave last two columns blank. If month is unknown, leave last four columns blank.</u> | | | | | <u>0000 0000 0000 0000 0000</u> | | | | |
| <u>Data Code (*41* - Running Record)</u> | | | | | <u>0000 0000 0000 0000 0000</u> | | | | |
| <u>Sequence Number</u> | | | | | <u>0000 0000 0000 0000 0000</u> | | | | |
| <u>Increment by 10 on successive records to allow for insertions.</u> | | | | | <u>0000 0000 0000 0000 0000</u> | | | | |
| <u>Wind Code: 0 - less than 10 km/hour, 1 - 10-25 km/hour, 2 - more than 25 km/hour wind speed.</u> | | | | | <u>0000 0000 0000 0000 0000</u> | | | | |
| <u>Sun Code: 0 - less than 25%, 1 - 25-75%, 2 - more than 75% of setups under sunny conditions.</u> | | | | | <u>0000 0000 0000 0000 0000</u> | | | | |

42 River/Valley Crossing Record. Submit this record for each river/valley crossing along the leveling line.

43 Correction/Rejection Record. Submit this record for each running or river/valley crossing when 1) temperature profiles were measured in the field, 2) a rod correction can be determined using detailed rod calibrations furnished by the National Bureau of Standards, or 3) the running or river/valley crossing is to be rejected.

| | |
|--|--|
| | <u>Note - Field/Office Rejection Codes:</u> |
| | F = Field rejection |
| | O = Office rejection |
| | B = not rejected |
| | Mean temperature for lower probe |
| | Mean temperature for upper probe |
| | Temperature scale C - Celsius F - Fahrenheit |
| | Rod Correction in mm. Enter left-justified and key the decimal point. |
| | Field/Office Rejection - see note above. |
| | Refraction Correction in mm. Enter left-justified and key the decimal point. |
| | Starting Time of Running or River/Valley Crossing |
| | Ending Survey Point Serial Number (SPN) |
| | Starting Survey Point Serial Number (PSN) |
| | Date of Running or River/Valley Crossing - year, month, day (YYMMDD) |
| | Data Code - preceded and followed by asterisk (*43* - Refraction Correction or Rejection Record) |
| | Sequence Number Increment by 10 on successive records to allow for insertions. |

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Data Set Termination Record. This must be the last record of every data set submitted.

Data Set Structure: A VERT OBS Data Set consists of one or more leveling lines.

| Data Set Identification Record | |
|--------------------------------|-------------|
| *10*-series records | |
| *20*-series records (if any) | FIRST LINE |
| *30* records | |
| *40*-series records | |
| *10*-series records | |
| *20*-series records (if any) | SECOND LINE |
| *30* records | |
| *40*-series records | |
| ::::: | ::::: |
| ::::: | ::::: |
| *10*-series records | |
| *20*-series records (if any) | |
| *30* records | LAST LINE |
| *40*-series records | |
| Data Set Termination Record | |

Job Code - preceded and followed by asterisk.

Sequence Number

Increment by 10 on successive records to allow for insertions.

Chapter 7

VERTICAL DESCRIPTIVE (VERT DESC) DATA

INTRODUCTION

The purpose of this chapter is to provide detailed specifications and instructions for the coding and keying of the descriptive data set of a vertical control job. This data set contains original descriptions and/or recovery descriptions pertaining to bench marks which occur in one or more leveling projects contained in the vertical control job.

VERT DESC DATA SET RECORDS

The data which constitute a VERT DESC data set are organized into four categories:

1. Bench Mark Identification and Location Data
2. Monumentation, Recovery, and Stamping Data
3. General Descriptive Text
4. Optional Partially Coded Descriptive Text

Within these categories, the respective data have been grouped into one or more logical units called "records." A record is a string of characters containing data coded according to a specific format. Every record in a VERT DESC data set consists of 80 characters or "columns" (standard punched card image). Within each record, the 80 columns are divided into fixed-length "character fields," each field being the space reserved for a specified data item. Accordingly, for every desired data item, there exists a field of appropriate length into which the data item in question is to be entered after it is converted into a string of alphanumeric characters. The set of rules according to which specific data items are converted into strings of alphanumeric characters to be entered in the fields of a record is known as the "format" of that record.

TABLE 7-1
VERTICAL DESCRIPTIVE DATA SET RECORDS

FIRST RECORD

aa - Data Set Identification Record

BENCH MARK IDENTIFICATION AND LOCATION DATA

10, *11*, *12* - Bench Mark Identification Record
13, *14* - Bench Mark Designation Record
15 - Alias Record
16 - Area Record
17, *18* - Nearest-City-or-Town Record

MONUMENTATION, RECOVERY, AND STAMPING DATA

20, *21*, *22* - Setting-by-Agency Record
23, *24*, *25* - Recovery-by-Agency Record
26, *27* - Setting and Monumentation Record
28 - Stamping Record

GENERAL DESCRIPTIVE TEXT

30 - Descriptive Text Record

OPTIONAL PARTIALLY CODED DESCRIPTIVE TEXT

40 - Concrete Post Record (Optional)
41 - Rod/Pipe Record (Optional)
42 - Vertical Reference Record (Optional)
43 - Witness Post Record (Optional)

LAST RECORD

aa - Data Set Termination Record

Note: The symbol "aa" denotes the two-character job code assigned by the submitting agency - see Chapter 5.

The types of records which may appear in a VERT DESC data set are listed in Table 7-1. Each type of record has been given a name, and a block diagram illustrating the respective format has been prepared to serve as a model for that record - see FORMAT DIAGRAMS.

The first character field of every record (columns 1-6) is reserved for the respective record sequence number - see Chapter 5. Except for the first and last records of the data set, the second character field of each record (columns 7-10) contains a two-digit numerical data code, preceded and followed by an asterisk, which specifies the type record (*10*, *13*, ..., *43* - see Table 7-1). On some of the records, more than one such data code appears in other fixed positions (i.e., columns 46-49 and 73-76) to serve as labels for important data items to be entered immediately following the respective data codes.

The first and last records of the data set (the Data Set Identification Record and the Data Set Termination Record) display the two-character alphanumeric job code, preceded and followed by an asterisk, in the field normally occupied by the first data code (columns 7-10). This job code is assigned sequentially (*A1*, *A2*, ..., *ZZ* - see Chapter 5) by the submitting agency.

STRUCTURE OF THE VERT DESC DATA SET

The first record of a VERT DESC data set must be the Data Set Identification Record which contains the required information to

identify the data set and to correlate it with its companion VERT OBS (or VERT ELEV) data set, i.e., the job code, data type (VERT DESC), name of submitting agency, and date the data set was created. The last record of the data set must be the Data Set Termination Record. It is the only other record in the data set in which the respective job code appears in the same field (columns 7-10) as on the Data Set Identification Record.

Between these two delimiting records, the descriptive data submitted in the VERT DESC data set must be organized as one or more blocks, each containing the original description and/or one or more recovery descriptions which pertain to the same vertical control point. See Chapter 5 for the definition of Survey Point Serial Number (SPSN). *

For descriptive data extracted from archives, each bench mark block of a VERT DESC data set should contain the original description or the oldest recovery description on file, followed by all subsequent recovery descriptions for that bench mark in chronological order. For descriptive data submitted at the completion of a leveling project, each bench mark block will normally contain one original description if the bench mark is a new vertical control point, or else one recovery description if the bench mark is a previously established vertical control point which was recovered in the course of the leveling project. The overall structure of the VERT DESC data set is shown in Table 7-2 below.

TABLE 7-2 - STRUCTURE OF THE VERT DESC DATA SET

Data Set Identification Record

| | | |
|----------------------------------|----------|------------|
| Original or Recovery Description | | |
| Subsequent Recovery Description | (if any) | First |
| :::: | | Bench Mark |
| Subsequent Recovery Description | | |

| | | |
|----------------------------------|----------|------------|
| Original or Recovery Description | | |
| Subsequent Recovery Description | (if any) | Second |
| :::: | | Bench Mark |
| Subsequent Recovery Description | | |

| | | |
|------|--|--|
| :::: | | |
| :::: | | |

| | | |
|----------------------------------|----------|------------|
| Original or Recovery Description | | |
| Subsequent Recovery Description | (if any) | Last |
| :::: | | Bench Mark |
| Subsequent Recovery Description | | |

Data Set Termination Description

TABLE 7-3
RECORD SEQUENCE (IN TH) ORIGINAL OR RECOVERY DESCRIPTION OF A BENCH MARK

| | |
|--|---|
| *10*, *11*, *12* Bench Mark Identification Record | |
| *13*, *14* Bench Mark Designation Record | |
| *15* | |
| :::: Alias Record(s) - at most three allowed - omit if no alias | |
| *15* | |
| *16* Area Record - omit if not applicable | |
| *17*, *18* Nearest-City-or-Town Record | |
| *20*, *21*, *22* Setting-by-Agency Record - optional in recovery desc | * |
| *23*, *24*, *25* Recovery-by-Agency Record - recovery description only | |
| *26*, *27* Setting and Monumentation Record - *26* is optional in | |
| recovery description | |
| *28* Stamping Record - required in original and recovery description | |
| if *27* Monumentation Code is C, D, F, or P. | |
| *30* | |
| *30* | |
| *30* Descriptive Text Record(s) - one paragraph of descriptive text | |
| :::: | |
| *30* | |

OPTIONAL, PARTIALLY CODED DESCRIPTIVE TEXT RECORDS

(Use in lieu of std phrases at the end of text paragraph)

| | |
|--|--|
| *40* Concrete Post Record <u>OR</u> *41* Rod/Pipe Record | |
| *42* Vertical Reference Record - if applicable | |
| *43* Witness Post Record - if applicable | |

NOTE: Numeric distance estimates or measurements in original or recovery descriptions of vertical control points may be given in either English or metric units. However, when values are given in metric units, English equivalencies are to follow in parentheses. This applies to all *18* and *30* records. Figure 7-2 includes properly written *18* and *30* records.

Original Description: An original bench mark description is a document which is normally prepared for every vertical control point when it is monumented. The purpose of the bench mark description is to provide, in a concise and standardized manner, all pertinent information which may be necessary or useful to locate, positively identify, and/or utilize the vertical control point in question - see example in Figure 7-1.

In addition to the respective identification, monumentation, and stamping data, a bench mark description normally contains a one-paragraph narrative section which gives specific directions how the

SECTION HAPK DESCRIPTIO H

• CHIQUILAH OH RECOVERY DESCRIPTIVE TEXT
Q-45-B14-Q-NORTHERN SPRINGS ROAD-FROM THE JUNCTION OF
STATE HIGHWAY 67 AT YUCCA VILLE, AT THE JUNCTION OF CRESTVIEW DRIVE,
STATE HIGHWAY 28 WEST, AT THE I JUNCTION, NEAR THE CENTERLINE OF THE
CENTRAL LINE, DE 248 ROAD, 32 FEET NORTH OF THE CENTERLINE, DE 72
Q-18-Q-45-CENTERLINE, DE 248 ROAD, POWER LINE AND A
POWER LINE.

Figure 7-1 - Example of Guided Original Question

bench mark may be reached from a readily locatable landmark such as a public building; in a nearby town or the crossroads of prominent highways, and pinpoints the location of the bench mark in terms of distance and direction (point of compass) from one or more reference objects in the immediate vicinity.

The narrative section should also describe in detail the mark or monument itself, provide vertical reference by pointing out that the bench mark is a certain distance above, below, or about level with a nearby reference object (if applicable), and should give the distance and direction (point of compass) to the bench mark from a witness post, if one has been set in the immediate vicinity. Optional partially coded descriptive text records (*40*, *41*, *42*, and *43* records - see Table 7-3) have been provided for use in lieu of standard phrases fulfilling these latter requirements.

Recovery Description: Similar in form to an original description, a recovery description is a document normally prepared for every previously established vertical control point which is "recovered" - i.e., either included in a leveling project or just visited and inspected. Aside from recovered vertical control points, recovery descriptions should also be prepared for other types of previously monumented survey points (e.g., horizontal control points) which are leveled to and hence established as vertical control points. The purpose of the recovery description is to provide a statement about the condition of the respective mark or monument, and to update, supplement, or correct the original description and/or previous recovery description(s) - see example in Figure 7-2.

A recovery description differs from an original description in two aspects. First, the Recovery-by-Agency Record must be present, either in place of or in addition to the Setting-by-Agency Record which is optional. Second, the narrative section of a recovery description may be limited to just the statement "RECOVERED AS DESCRIBED." - or it may be omitted altogether if the Condition Code entered as data item *25* on the Recovery-by-Agency Record (see MONUMENTATION, RECOVERY, AND STAMPING DATA RECORDS) is sufficient to convey the status of the bench mark in question. However, for every vertical control point which is recovered in usable condition, a complete new narrative section should be given whenever sufficient changes have taken place in its vicinity to render a previous description inadequate.

Combined Set: When one or more recovery descriptions are submitted in addition to the original description or leading recovery description in a bench mark block of a VERT DESC data set (e.g., when multiple descriptive data are extracted from archives for the same vertical control point), all recovery descriptions which follow the original description or the leading recovery description may start with the *23*, *24*, *25* Recovery-by-Agency Record (i.e., data items *10* through

2-94-1 BLACK SIS-1124104

DISSECTION #419 DATE 8 AUGUST 1970
DISSECTION #327-25

STATE OF NEW YORK
COUNTY OF RICHMOND
CITY OF NEW YORK
CLASSIFICATION #2

DECEASED-XLV-197-1965-#30, 695 ET

NAME OF DECEASED: **BUFFALO**
AGE: 66
SEX: M
TIME OF DEATH: 12:00 AM
TIME OF AUTOPSY: 12:00 PM

TIME OF DEATH: 12:00 AM
TIME OF AUTOPSY: 12:00 PM

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TIME OF AUTOPSY: 12:00 PM

Figure 7-2 - Example of Coded Recovery Description

22 may be omitted). Such a combined set consisting of a complete leading element (original or recovery description) followed by one or more abridged subsequent recovery descriptions must be flagged by the DRC Code "C" on the Bench Mark Identification Record of the leading element - see BENCH MARK IDENTIFICATION AND LOCATION DATA RECORDS.

BENCH MARK IDENTIFICATION AND LOCATION DATA RECORDS

- *10*, *11*, *12* Bench Mark Identification Record
- *13*, *14* Bench Mark Designation Record
- *15* Alias Record
- *16* Area Record
- *17*, * 8* Nearest-City-or-Town Record

The bench mark identification and location data records, bearing the *10*-series data codes, are listed above; the block diagrams illustrating the respective formats will be found in the FORMAT DIAGRAMS section. More than one data code appears in these records (see the respective format diagrams) to serve as labels for important data items and thereby to facilitate the extracting and coding of these data items from the source documents. The data items to be entered in these records are explained in detail below.

Survey Point Serial Number: Whether submitted as MODE 1 data (VERT OBS and VERT DESC data sets) or MODE 2 data (VERT ELEV and VERT DESC data sets), the data contained in a vertical control job (see Chapter 5) pertain to a set of survey points, each of which must be properly identified. To this end, every survey point that is leveled to in a vertical control job is assigned a four-digit survey point serial number (SPSN) in the range 0001 through 9999 to serve as a unique identifier of the respective survey point within that vertical control job - see Chapter 5 (JOB CODE AND SURVEY POINT NUMBERING). All survey points for which recovery descriptions are written in this vertical control job, but which are not leveled to in this vertical control job, will be assigned the SPSN code 0000.

The survey point serial number is the vital link by means of which data pertaining to the same survey point in either the VERT OBS and VERT DESC data sets (MODE 1 data) or the VERT ELEV and VERT DESC data sets (MODE 2 data) are positively correlated prior to their entry into the National Geodetic Survey Data Base. For this reason, the same survey point serial number must be consistently used to identify the same control point in either the OBS, DESC, or ELEV data sets of a vertical control job. In particular, the survey point serial number assigned to a bench mark in the VERT DESC data set must be the same as that used to identify the same vertical control point in the companion VERT OBS (or VERT ELEV) data set.

*
*
*
*

DRC Code: This is a one-letter code which is used to identify the descriptive data as to its type. It is assigned as follows:

- D - Self-standing original description.
- R - Self-standing recovery description.
- C - Combined set consisting of one complete original description or recovery description followed by any number of subsequent recovery descriptions for the same vertical control point in which data items *10* through *22* have been omitted.

Position: The (approximate) geodetic latitude and longitude of the vertical control point must be specified so that (1) the appropriate Quad Identifier (see below) may be assigned to it, and (2) the appropriate gravity information may be obtained for use in the processing of the associated observations and/or in the determination of geopotential numbers and orthometric heights for network adjustment and vertical control data publication purposes.

If no other source is available, the vertical control point should be carefully plotted on the largest-scale topographic map available, and the respective latitude and longitude extracted therefrom (to the nearest second).

Junction Code: This is a one-letter code reserved to identify only the most important junction marks of the National network, the junction marks of Basic Net A. To identify such a mark, enter a J in column 45 of the *10* record. The J code is to be used only by NGS personnel, or after obtaining instruction from NGS.

*
*
*
*
*

Quad Identifier (QID): The primary indexing and identification system adopted by the National Geodetic Survey Data Base for all horizontal and vertical control points is based on $1^\circ \times 1^\circ$ "quads" defined by integer-degree latitude and longitude gridlines (parallels and meridians), and on the successive quadrantal sub-division of the basic $1^\circ \times 1^\circ$ quads into $30' \times 30'$ quads, $15' \times 15'$ quads, and $7\frac{1}{2}' \times 7\frac{1}{2}'$ quads accomplished by successive halving of the latitude and longitude gridline interval. The respective quad identifier (QID) is a nine-character symbol coded as HLLWWWWABC, where:

- H - Hemisphere (N or 0 for northern, S or 1 for southern)
- LL - Latitude of SE corner of the $1^\circ \times 1^\circ$ quad (0° - $89'N$, 01° - $90'S$)
- WWW - Longitude of SE corner of the $1^\circ \times 1^\circ$ quad (000° - $59'W$)
- A - $30'$ subdivision indicator (1-NE, 2-SE, 3-SW, 4-NW subquad)
- B - $15'$ subdivision indicator (1-NE, 2-SE, 3-SW, 4-NW subquad)
- C - $7\frac{1}{2}'$ subdivision indicator (1-NE, 2-SE, 3-SW, 4-NW subquad)
(A,B,C = 0 or blank indicates no further subdivision)

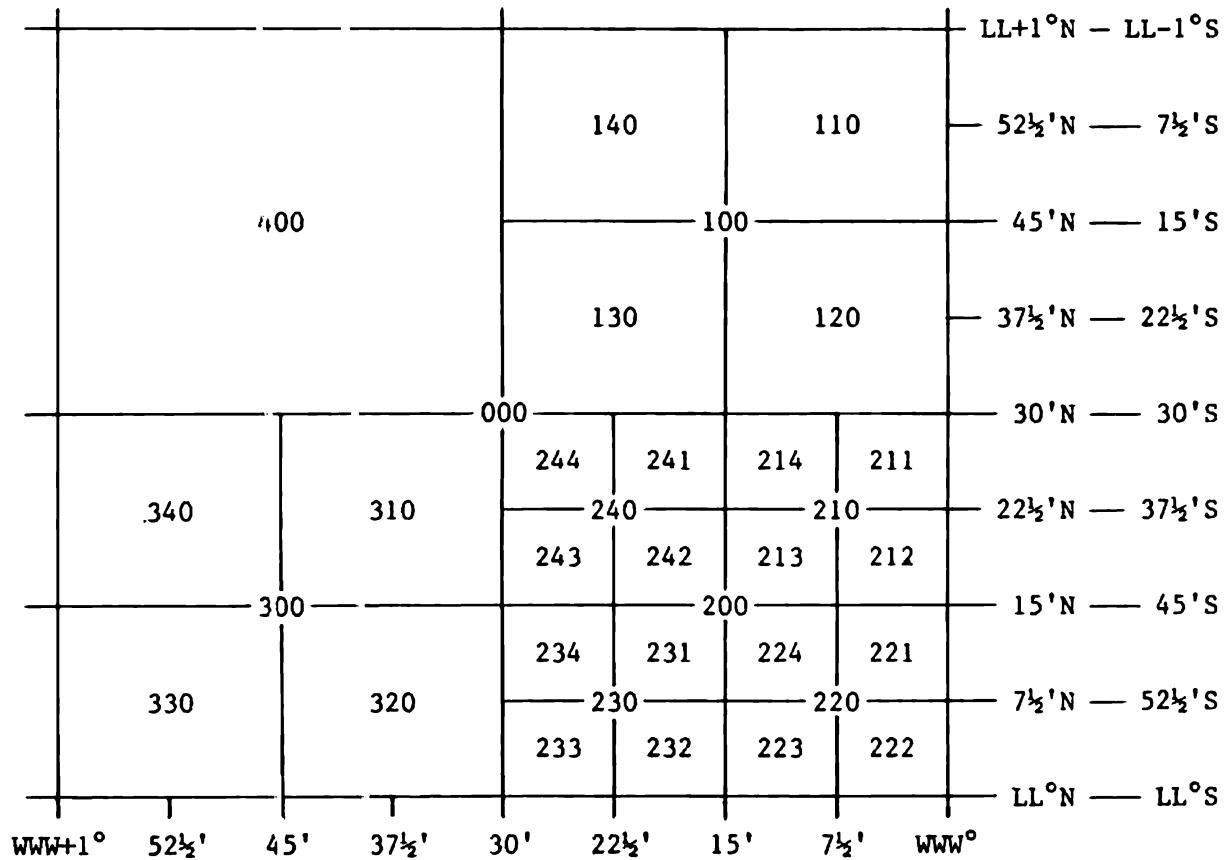


FIGURE 7-3 - Successive quadrantal subdivision of the $1^{\circ} \times 1^{\circ}$ quad.

On the Bench Mark Identification Record of a recovery description for a vertical control point whose QID has been published as part of the respective original description and/or previous recovery description, enter the quad identifier exactly as published. For a vertical control point without previously published quad identifier or whose quad identifier is unknown, determine the QID (at least to the nearest 30' x 30' subquad) from the (approximate) geodetic position - see Position.

Quad Station Number (QSN): To distinguish among horizontal and vertical control points which share the same quad identifier, every control point is assigned a sequential quad station number (QSN) which is unique within the respective quad. The National Geodetic Survey Data Base has been designed to index both horizontal and vertical control points at the 7-1/2' x 7-1/2' quad level, with four-digit quad station numbers starting with 0001 (i.e., 0001, 0002, 0003, etc.) assigned sequentially to the control points (both horizontal and vertical) which fall into the same 7-1/2' x 7-1/2' quad.

Since the QSN is assigned by NGS, it follows that this data item can be entered only on the Bench Mark Identification Record of a recovery description, and then only for a vertical control point whose QSN has been published by the NGS as part of the respective original description and/or previous recovery description. Whenever it is known, enter the 7-1/2' x 7-1/2' quad station number assigned by the National Geodetic Survey Data Base; otherwise leave the QSN field blank.

Line Identifier: A NGS-specific number of the leveling within each 30' x 30' quad to which the bench mark in question belongs (for NGS use only).

Designation: The bench mark or vertical control point designation is the primary identifier by means of which the vertical control point is known to the general public. A maximum of 25 characters (including all imbedded blanks) are allowed for a bench mark designation to be entered as the *13* data item in the *13*, *14* Bench Mark Designation Records.

A vertical control point or bench mark (BM) is normally identified by a number or by an alphanumeric symbol which is usually stamped on the respective disk marker (or otherwise inscribed on the bench mark monument) to which is appended the abbreviation or acronym (see Annex C) of the agency whose name is precast on the monument - if other than NGS, NOS, or CGS. For marks not having a precast agency name, append the acronym or abbreviation of the agency which set the mark. If the agency cannot be determined, do not append an agency acronym or abbreviation. Less frequently, a bench mark is assigned a concise, intelligible name (e.g., when a horizontal control point also becomes a bench mark); the appropriate agency acronym or abbreviation should be appended to these also.

In principle, the designation by means of which a vertical control point is identified for publication purposes should closely resemble the designation which actually appears on the respective marker; however, extraneous information is frequently present which is not desired to be included as part of the designation of the bench mark in question.

For example, the designation of a bench mark should not include the penalty warning, etc., which is normally precast on the respective survey marker (however, an abbreviation or acronym denoting the agency whose name is precast on the vertical control point - if other than the IGS, NGS, or C&GS - should be appended to the designation - see ANNEX C and ANNEX D). If an agency name is not precast on a mark, but the name of the agency which set the mark can be determined, append the agency's acronym or abbreviation to the designation. Also, the designation of a bench mark should not include the elevation which may have been stamped on the respective survey marker (except in the case of a bench mark for which the stamped elevation is the only identifier available), and it should not normally include the "year-mark-set" (except for bench marks which have been reset - see Reset Marks below and ANNEX D).

For automatic data processing purposes, the use of designations as primary bench mark identifiers poses some difficulty in that exactly the same spelling, editing, and/or abbreviation of the respective designation must be used whenever a reference is made to the same vertical control point in computer-readable media. To this end, a set of guidelines has been assembled in ANNEX D (GUIDELINES FOR SURVEY POINT NAMES AND DESIGNATIONS) for the purpose of standardizing the designations of vertical control points. Accordingly, every bench mark designation must be edited in conformity with the "VERTICAL CONTROL POINTS" section of ANNEX D at the time it is placed in computer-readable form, and special effort must be made to use the same edited version of the respective bench mark designation throughout the vertical control job, i.e., in the companion VERT OBS or VERT ELEV data set as well as in the VERT DESC data set.

Except for the abbreviation and/or editing which may be required, the designation of a vertical control point to be entered as data item *13* on the *13*, *14* Bench Mark Identification Record should be taken exactly as it appears on the original description and/or subsequent recovery descriptions, if any. However, awkward abbreviations, misspellings, or any other obvious defects detected in a previously published bench mark designation should be corrected. Parentheses are not permitted to appear in a bench mark designation, and other special characters such as periods, commas, etc. (see Chapter 5) should also be edited out whenever their omission can be tolerated (see ANNEX D).

In the same manner as the job-specific survey point serial number (SPSN) of a bench mark is unique within a job, it is required that its designation be unique within a job as well. If two or more vertical control points with identical designations occur in a job, they should be rendered unique by appending to the respective designations, in order of preference:

1. The "year-mark-set," provided it appears on the respective mark or monument. Example: 872 3918 TIDAL 1 1935 and 872 3918 TIDAL 1 1975.
*
*
*
2. The name of the county (parish, census division) in which the bench mark is located, followed by the symbol CO (PA,CD).
Examples: 18 MONTGOMERY CO and 18 FREDERICK CO, A 178
LA FOURCHE PA and A 178 JEFFERSON PA, X 115 UNEAL CD USGS and
X 115 ANGOON CD USGS.
*
*
*
*
3. The name of the locality (other than county, parish, or census division) in or near which the bench mark is located. Example: TBM 15 ALAMOGORDO and TBM 15 HOLLOWMAN AFB.

Whenever the designation of a vertical control point is modified in this manner for the purpose of making it unique within the respective job, the appended information becomes part of the bench mark designation, and care must be taken that exactly the same information is appended to the designation of that vertical control point wherever it appears, i.e., in the companion VERT OBS or VERT ELEV data set as well as in the VERT DESC data set.

Reset Marks: Frequently, a control point is in the path of construction and may be destroyed. If this situation is known before the construction project takes its toll, it is established practice to set another mark or monument a short distance away, outside the construction area, and to carry out appropriate connecting observations to transfer the horizontal or vertical control to the new survey point, thereby establishing it as a substitute or "reset" control point.

Although this new "reset" control point could be given an independent name or designation of its own, it has been found useful to follow a naming convention which, at a glance, identifies the control point as a "reset" and indicates which original control point it is replacing.

In connection with vertical control points which are normally assigned very short alphanumeric designations mostly numeric in character, the established practice is to identify a reset bench mark by the same designation as the bench mark it replaces to which is appended the word 'RESET' and the year in which the reset bench mark is set (e.g., U 135 RESET 1978 as opposed to U 135). Occasionally, when the designation of the replaced bench mark is lengthy, the word 'RESET' is omitted and

only the year is appended (e.g., LAKE WASHINGTON 3 1948 as opposed to LAKE WASHINGTON 3). For survey marks of organizations other than NGS, NOS, or C&GS, the word "RESET" and the year the mark was reset should be appended after the acronym or abbreviation of the agency. For example, a USGS survey mark reset in 1945 is designated 25 USGS RESET 1945, not 25 RESET 1945 USGS.

State or County Code: This is a two-letter code to indicate the political unit and/or geographic area in which the vertical control point is located. For points in the United States or in Canada, enter the appropriate code for the respective state, commonwealth, province, or territory. For points outside the United States and Canada, enter the appropriate code for the respective country, island group, or geographic area. A complete list of the two-letter codes is given in ANNEX A.

County: The name of the next lower political subdivision in which the vertical control point is located. For points in the United States and Canada, enter the name of the first-order political subdivision of the respective state, commonwealth, province, or territory (i.e., county, parish, census division, independent city, etc.). The name of an independent city must be preceded by the symbol 'C OF' (e.g., C OF RICHMOND for RICHMOND, VA). For points in other countries, enter the name of the primary political subdivision of the respective country, such as state, province, district, etc. Up to 20 characters are allowed; use standard abbreviations if necessary.

Alias: An alternate form (i.e., alternate spelling, editing, and/or abbreviation of the bench mark designation, or an entirely different designation assigned to the same bench mark by an agency other than the one which originally set the vertical control point. The same specifications, guidelines, and comments given for the primary bench mark designation also apply to an alias (see Designation above); however, note that an alias is not normally stamped (or otherwise inscribed) on the respective survey mark or monument.

In general, the proliferation of aliases is to be discouraged. Submit a *15* Alias Record for each known alias; however, not more than three *15* Alias Records are allowed in any one original or recovery description.

Designated Area Name: A bench mark, by its nature, is a member of a leveling line. Leveling lines are normally run along prominent transportation or communication arteries to form large loops. In areas of known or anticipated crustal uplift, subsidence, or seismic activity, level lines are often run as a special project to form dense area networks of vertical control which are usually relevelled at frequent time intervals to monitor vertical movement of the Earth's crust in those areas.

The purpose of the optional *16* Area Record is to allow for the identification of such an area network or special leveling project of which the bench mark in question is a member. The *16* Area Record may also be used to provide any other location-related information (suitable for printing next to the "AREA--" caption of the published description) to be associated with the bench mark. Up to 32 characters (including all imbedded blanks) are allowed. Examples:

SOUTH OGDEN IRRIGATION SURVEY
NCS LOOPS 139 AND 205A
HOUSTON-GALVESTON SUBSIDENCE NETWORK

Nearest City or Town: The name of the locality within the confines of which the vertical control point is located, or else the name of the locality from which a distance and direction is given (see below). The localities used for this purpose should have a post office or railroad station and should appear on state highway maps. Append the standard two-letter state code (see ANNEX A) to the name of the locality if the locality given is not in the same state as the respective bench mark, or if the state must be specified to avoid confusion (e.g., KANSAS CITY KS as opposed to KANSAS CITY MO).

Distance and Direction: Leave this field blank if the vertical control point is located within the confines of the locality given under Nearest City or Town. Otherwise, enter the distance and direction from the locality given under Nearest City or Town to the bench mark in question.

The entry consists of the distance in miles (or kilometers followed by miles in parenthesis) to the nearest unit, nearest 0.1, or nearest 0.01, as appropriate, followed by one blank and by the units symbol ('MI' or 'KM'), followed by one blank and the direction expressed as a cardinal or intercardinal point of compass. Spell out NORTH, EAST, SOUTH, and WEST; use standard two- or three-letter symbols for the intercardinal points of the compass. When distance estimates or measurements are given in metric units, English equivalencies are to follow in parentheses. Examples: 8.7 MI NNE, 1.1 KM (.8 MI) WEST, 2.3 KM (1.4 MI) NW.

MONUMENTATION, RECOVERY, AND STAMPING DATA RECORD:

- *20*, *21*, *22* Setting-by-Agency Record
- *23*, *24*, *25* Recovery-by-Agency Record
- *26*, *27* Setting and Monumentation Record
- *28* Stamping Record

The monumentation, recovery, and stamping data records bearing the *20*-series data codes, are listed above; the block diagrams

illustrating the respective formats are found under FORMAT DIAGRAMS. The *20*, *21*, *22* Setting-by-Agency Record is required in every original description and is optional in a recovery description; the *23*, *24*, *25* Recovery-by-Agency Record is required in every recovery description. The *26* Record is required in an original description and optional in a recovery description. The *27* Record is required in both original and recovery descriptions. The *28* Record is required in both original and recovery descriptions if the *27* Monumentation Code is C, D, F, or P. An (optional) monumentation quality code (A, B, C, or D) may be entered in column 53 of the *27* record to override the codes which are softwared into the descriptions for publication. The softwared codes are functions of the setting classification codes (see ANNEX J). The codes are:

- A - Monuments of the most reliable nature which may be expected to hold their elevations very well.
- B - Monuments which probably hold their elevations well.
- C - Monuments which may hold their elevations but which are commonly subject to surface ground movements.
- D - Monuments of questionable or unknown reliability.

Caution: Do not use the override feature indiscriminately; monumentation quality refers to the ability of a monument to hold its elevation, not the skill with which it was constructed.

Analogously to the bench mark identification data records treated in the preceding section, more than one data code appears in the monumentation, recovery, and stamping data records (see the respective format diagrams) to serve as labels for important data items and thereby to facilitate the extracting and coding of these data items from the source documents. The data items to be entered on these records are largely self-explanatory; however, the following data items will be explained in greater detail.

Agency Code: This is a one-digit code designed to indicate the organization or type of organization which physically set the vertical control point (*20*, *21*, *22* Setting-by-Agency Record) or the organization or type of organization which recovered the vertical control point (*23*, *24*, *25* Recovery-by-Agency Record). A complete list of the specific agency codes is given below; this list is also given in ANNEX J where all codes peculiar to the VERT DESC data set are collected.

- 0 - unknown
- 1 - NGS or CGS (USC&GS)
- 2 - U.S. Geological Survey (USGS)
- 3 - U.S. Department of Defense (DOD)
- 4 - other federal or interstate agency

- 5 - state agency
- 6 - county, city, or regional agency
- 7 - commercial organization or private firm
- 8 - National Ocean Survey (NOS)
- 9 - foreign governmental agency

Other Control: This is a one-letter code which indicates the survey mark or monument in question fulfills other geodetic or geophysical function(s) aside from being a vertical control point. A code is also provided for an occasional bench mark which was set but has not been leveled to, and hence possesses no vertical control. As many as four codes may be entered (in any order, left-justified, no imbedded blanks). A complete list of the specific Other Control codes is given below; this list is also in ANNEX J where all codes peculiar to the VERT DESC data set are collected.

- A - astronomic observation(s) for the mark resides in the NGS Data Base.
- F - fault monitoring site
- G - gravity observation(s) for the mark resides in the NGS Data Base.
- H - horizontal geodetic coordinates of the mark reside in the NGS Data Base.
- M - magnetic station
- N - no vertical control (i.e., not connected to the national vertical geodetic control network)
- O - other (see descriptive text)
- T - tidal bench mark
- X - recovery description written for this survey point during current project, but first leveling tie to the NGS Vertical Network was made in this current project
- Z - survey point previously tied to the NGS Vertical Network and recovery description written in this current project, but survey point was not leveled in this current project.

Condition Code: This is a one-letter code to indicate the condition of the respective mark or monument as determined by the recovery of the vertical control point. A complete list of the specific condition codes is given below; this list is also in ANNEX J where all codes peculiar to the VERT DESC data set are collected.

- G - good, fair
- N - not recovered, not found, lost
- O - other (see descriptive text)
- P - poor, disturbed, mutilated
- X - destroyed

Setting Classification Code: This is a two-digit code to indicate the type of setting (shallow or deep), the type of design and material used for the respective monument, and/or the natural or man-made object which serves as the setting for the respective bench mark disk (or other type of marker - see Monumentation Code). A complete list of the specific setting codes is given below; this list is also found in ANNEX J where all codes peculiar to the VERT DESC data set are collected.

00 - unspecified

Shallow Settings (less than 10 ft.):

- 10 - unspecified shallow
- 11 - metal rod with base plate
- 12 - concrete post
- 13 - shallow-set pipe
- 14 - shallow-set metal rod (without base plate)

Unsleeved Deep Settings (10 ft. or more):

- 20 - unspecified deep
- 21 - copper-clad steel rod
- 22 - galvanized steel pipe
- 23 - galvanized steel rod
- 24 - stainless steel rod
- 25 - aluminum alloy rod

Rocks and Boulders:

- 30 - unspecified rock
- 31 - rock outcrop, rock ledge, rock cut, or bedrock
- 32 - boulder

Structures - must be specified (see Setting below):

- 40 - light structures (other than listed below)
- 41 - pavements (street, sidewalk, curb, apron, etc.)
- 42 - retaining walls (e.g., culverts and small bridges)
- 43 - piles and poles (e.g., spike in utility pole)
- 44 - footings and foundation walls of small/medium structures
- 45 - mat foundations (landings, platforms, steps, etc.)

- 50 - massive structures (other than listed below)
- 51 - massive retaining walls
- 52 - abutments and piers of large bridges
- 53 - tunnels
- 54 - massive structures with deep foundations
- 55 - large structures with foundations on bedrock

Sleeved Deep Settings (10 ft. or more):

- 60 - unspecified rod/pipe in sleeve
- 61 - copper-clad steel rod in sleeve
- 62 - galvanized steel pipe in sleeve
- 63 - galvanized steel rod in sleeve
- 64 - stainless steel rod in sleeve
- 65 - aluminum alloy rod in sleeve

Setting: A short phrase describing the setting which corresponds to the respective setting code (see Setting Classification Code above) suitable for printing next to the "SETTING—" caption of the published description. As many as 32 characters (including all embedded blanks) are allowed. This entry is required if the setting code is 40,41,42,43,44,45 (light structure) or 50,51,52,53,54,55 (massive structure); optional otherwise.

Monumentation Code: This is a one-letter code to indicate the type of marker used. A complete list of the specific monumentation codes is given below; this list is also found in ANNEX J where all codes peculiar to the VERT DESC data set are collected.

| | | |
|-------------------------------|---------------------|----------------------------------|
| B - bolt | I - metal rod | S - spike |
| C - cap-and-bolt | N - nail | T - chiseled triangle |
| D - survey disk (any type) | O - chiseled circle | V - stone monument |
| F - flange-encased rod | P - pipe cap | X - chiseled cross |
| H - drill hole | Q - chiseled square | Z - other (see descriptive text) |
| | R - rivet | |

Disk Type: This is a two-digit code to indicate the type of survey disk which marks the vertical control point. Enter the appropriate disk type only if the monumentation code is "D" (survey disk); leave the field blank otherwise. A complete list of the specific disk types is given below; this list is also found in ANNEX J where all codes peculiar to the VERT DESC data set are collected.

- 00 - unspecified
- 01 - bench mark disk
- 02 - tidal bench mark disk
- 03 - triangulation station disk
- 04 - traverse station disk
- 05 - topographic station disk
- 06 - survey disk (not listed)
- 07 - reference mark (RM) disk
- 08 - azimuth mark (Az Mk) disk
- 09 - gravity station disk
- 10 - gravity reference mark disk
- 11 - magnetic station disk

Monumentation Quality Code: This is a one-character code that may be entered to override the default codes which are softwareed into the descriptions for publication. The default codes are listed with the Setting Classification Codes in Annex J.

- A - monuments of the most reliable nature which may be expected to hold their elevations very well.
- B - monuments which probably hold their elevations well.
- C - monuments which may hold their elevations but which are commonly subject to surface ground movements.
- D - monuments of questionable or unknown reliability.

Origin of the Vertical Control Point: Enter the acronym or abbreviation of the agency whose name is precast on the monument (see Annex C). If nothing is precast, leave this field blank.

Stamping: Enter the exact stamping or inscription which is peculiar to the vertical control point in question (do not include any information which is precast into the survey marker). A stamping normally appears on a bench mark whose monumentation code is "C" (cap-and-bolt), "D" (survey disk), "F" (flange-encased rod), or "P" (pipe cap). In addition to the respective survey point name or designation, a stamping usually includes a four-digit "year-mark-set" and may include an elevation value with or without the corresponding units symbol appended. Example: H 325 1965 320.695 FT. Do not submit a *28* Stamping Record if no stamping or inscription identifies the bench mark.

GENERAL DESCRIPTIVE TEXT RECORDS

30 Descriptive Text Record

The purpose of the *30* record is to provide the space for the recording of one "line" of descriptive text. A line of descriptive text is assumed to contain at most 70 characters (including all imbedded blanks). Accordingly, aside from the Sequence Number and Data Code fields which are common to all records, the *30* Descriptive Text Record contains a 70-character Descriptive Text field (see FORMAT DIAGRAMS).

Descriptive Text - Original Description: The descriptive text of an original description consists of any number of *30* general descriptive text records forming one paragraph of narrative text. Optionally, a set of *30* records may be supplemented by one or more *40*-series partially coded descriptive text records used in lieu of standard phrases at the end of the descriptive paragraph - see OPTIONAL PARTIALLY CODED DESCRIPTIVE TEXT RECORDS.

In general, the descriptive text paragraph should give (1) specific directions to reach the vertical control point in question from a readily locatable landmark such as a public building in a nearby town or the crossroads of prominent highways, (2) pinpoint its location in terms of distance and direction (point of compass) from one or more reference objects in the immediate vicinity, (3) describe in sufficient detail the mark or monument itself including the setting thereof, (4) provide vertical reference by stating that it is a certain distance above, below, or about level with a nearby reference object (if applicable), and (5) give the distance and direction (point of compass) from a witness post, if one has been set in the immediate vicinity.

Example:

10.7 MILES SOUTH ALONG U.S. HIGHWAY 101 FROM THE INTERSECTION WITH FRONT STREET AT CRESCENT CITY, THENCE 0.3 MILE NORTHWEST ALONG FORMER U.S. HIGHWAY 101, ACROSS THE HIGHWAY FROM A 72-INCH REDWOOD TREE, 16 FEET NORTHEAST OF THE CENTERLINE OF THE HIGHWAY, 12 FEET SOUTHEAST OF AN 8-INCH BIRCH TREE, A STANDARD DINK SET IN THE TOP OF THE NORTHWEST END OF THE NORTHEAST CONCRETE HEAD WALL OF A CULVERT, ABOUT LEVEL WITH THE HIGHWAY, AND 0.6 FOOT EAST OF A WITNESS POST.

Descriptive Text - Recovery Description: The descriptive text of a recovery description is similar to that of the original description treated above, i.e., any number of *30* general descriptive text records, possibly followed by one or more *40*-series optional partially coded descriptive text records, forming one paragraph of descriptive text.

In general, the descriptive text paragraph of a recovery description should indicate whether or not the vertical control point in question was recovered (i.e., found), and the condition of the respective mark or monument, and it should also contain a statement reflecting the adequacy of the respective original description and/or previous recovery descriptions, if any, followed by corrections and/or additions to prior descriptions, as appropriate. Alternatively, an entirely new narrative description in the mold of the descriptive text paragraph of an original description (see above) may be given. Examples:

1. RECOVERED IN GOOD CONDITION. THE 1935 DESCRIPTION IS ADEQUATE EXCEPT THAT THE SIGN REFERRED TO THEREIN NO LONGER EXISTS.
2. RECOVERED IN GOOD CONDITION. NEW DESCRIPTION FOLLOWS. 15.2 MILES EAST ALONG THE WIMER ROAD FROM THE SMITH RIVER POST OFFICE, 0.3 MILE WEST OF INDIAN SPRINGS, 60 FEET EAST OF A CREST IN THE ROAD, 19 FEET SOUTH OF THE CENTER OF THE ROAD, A U.S. GENERAL LAND OFFICE STANDARD SECTION-CORNER CAP RIVETED TO THE TOP OF AN IRON PIPE ENCASED IN CONCRETE, 2.5 FEET BELOW THE HIGHWAY.
3. AFTER PROLONGED SEARCH, EVIDENCE WAS FOUND THAT THE BENCH MARK HAS BEEN DESTROYED.

Since the condition code entered as data item *25* on the *23*, *24*, *25* Recovery-by-Agency Record (see MONUMENTATION, RECOVERY, AND STAMPING DATA RECORDS) normally conveys sufficient information as to whether or not the vertical control point in question was recovered and as to the condition of the respective mark or monument, the descriptive text of a recovery description may be limited to just the statement "RECOVERED AS DESCRIBED." - or it may be omitted altogether - whenever the latest prior narrative description on record is still adequate.

Rules for the Keying of Descriptive Text: As was stated above, the descriptive text paragraph of an original or recovery description consists of any number of *30* general descriptive text records possibly followed by one or more *40*-series records (see OPTIONAL PARTIALLY CODED DESCRIPTIVE TEXT RECORDS). In keying general descriptive text, note that only the following special characters are allowed in addition to the usual alphabetic (A-Z) and numeric (0-9) characters (see Chapter 5):

| | |
|--------------------------------|---|
| (*) asterisk | (+) plus sign |
| () blank or space | (-) minus sign |
| (,) comma | (=) equal sign |
| (.) period or decimal point | (/) slash or solidus |
| (\\$) dollar sign | (()) left parenthesis (()) right parenthesis |

Care must be exercised to avoid miskeying the following characters:

0 - number "zero" 1 - number "one" 2 - number "two"
0 - letter "O" L - letter "L" Z - letter "Z"

In addition, the following rules apply:

1. Do not divide words (or other character groups) between successive records (however, a character string containing the separator '-' or '--' may be divided at either end of such a separator).
2. Key two spaces (blanks) following the period before the start of a new sentence.
3. Substitute period (.) or comma (,) for semicolon (;), as appropriate.
4. Substitute 'AND' (in text) or plus sign (+) (in abbreviation or acronym) for ampersand (&).
5. Substitute two consecutive hyphens (--) without any preceding or following blanks for a colon (:), i.e., key XXXXXX: YYYY as XXXXXX--YYYY.
6. Key a dash as space-hyphen-space, i.e., as XXXX - YYYY.
7. Key a hyphen (instead of a blank) in an improper (mixed) fraction (e.g., 5-1/2, etc.).
8. Omit (i.e., do not key) any special characters other than those listed above (i.e., ', ", _, etc.).

9. All distance measurements or estimates that are given in metric units must be followed by their English equivalency in parentheses.
- *
*
*

OPTIONAL PARTIALLY CODED DESCRIPTIVE TEXT RECORDS

- *40* Concrete Post Record (Optional)
- *41* Rod/Pipe Record (Optional)
- *42* Vertical Reference Record (Optional)
- *43* Witness Post Record (Optional)

The optional partially coded descriptive text records, identified by *40*-series data codes, are listed above; the block diagrams illustrating the respective formats will be found under FORMAT DIAGRAMS. The purpose of the *40*-series records, which are individually optional, is to provide an abbreviated means of coding several often-used standard phrases at the end of the descriptive text paragraph (i.e., following specific directions how to reach the benchmark and distance-and-direction ties from local reference objects given by *30* records - see GENERAL DESCRIPTIVE TEXT RECORDS).

If applicable, at most one of each *40*-series records may appear in an original or recovery description (but note that the use of the *40* Concrete Post Record precludes the use of the *41* Rod/Pipe Record). The *40*-series records must follow as a group (in order of their increasing data codes) after the last *30* Descriptive Text Record of the respective descriptive text paragraph (i.e., they may not appear imbedded among the *30* records). The data items to be entered on these records are self-explanatory - see Figures 7-1 and 7-2 and the respective format diagrams.

40 Concrete Post Record: Use this record in lieu of the phrase - A DISK SET INTO THE TOP OF A CONCRETE POST FLUSH WITH THE GROUND (or PROJECTING (or RECESSED) INCHES (or CENTIMETERS depending on Units Code)) - see the respective format diagram.

41 Rod/Pipe Record: Use this record in lieu of the phrase - STAINLESS STEEL (or other material as per Setting Code) ROD (or PIPE) SET TO THE DEPTH OF FEET (or METERS depending on Units Code), IN A SLEEVE EXTENDING TO THE DEPTH OF FEET (or METERS), ENCASED IN A PIPE FLUSH WITH THE GROUND (or PROJECTING (or RECESSED) INCHES (or CENTIMETERS)) - or, for an unsleeved rod mark, in lieu of the same phrase without reference to sleeve depth (if the sleeve Depth field is left blank) - see the respective format diagram.

42 Vertical Reference Record: Use this record in lieu of the phrase - ABOUT LEVEL WITH ... (object specified), or else FEET (or METERS depending on Units Code) ABOVE (or BELOW) ... (object specified) - see the respective format diagram.

***43* Witness Post Record:** Use this record in lieu of the phrase -
FEET (or METERS depending on Units Code) (point of compass)
FROM A WITNESS POST (or FROM ... (object specified) if other than a
witness post) - see the respective format diagram.

EXAMPLE

An example of a coded bench mark description is given in Figure 7-4. It is the same bench mark description as the one given as an example of an original description in Figure 7-1 with two abridged subsequent recovery descriptions added, thus making it a combined set (DRC Code C - see Combined Set). The same bench mark description, formatted for publication, appears in Figure 7-5.

FORMAT DIAGRAMS

For each record which may appear in a VERT DESC data set (see Table 7-1), a block diagram has been prepared to illustrate the respective format. These "format diagrams" have been designed to fulfill the following objectives:

1. Each record is 80 characters long (standard punched card image).
2. Each record has a fixed format, i.e., every data field has a specific length and specific position within the record.
3. Each format diagram is a graphical image of the respective record.
4. Within the limits of available space, information and instructions concerning the data item to be entered in each data field are provided on the format diagrams to render them self-explanatory.
5. Whenever appropriate, sample entries are shown in the data entry line of each format diagram.
6. Each data field is characterized as to its type by a string of lower-case characters which appear immediately below the data entry line.

Data Field Types:

1. Alpha Field (aa...a) - intended for a data item which is coded as a string of alphabetic, numeric, and/or special characters, with or without imbedded blanks, to be entered into the respective data field left-justified and blank-filled on the right. See Chapter 5 (or "Rules for the Keying of Descriptive Text" (this chapter)) for a list of special characters which are allowed.

000010*B5*VERTDESCNGS NATIONAL GEODETIC SURVEY

19780501

:::::::::::::::::::
004560*10*0031C340747N1162448W *11*N341162 *12*102
004570*13*Y 1268 *14*CA/SAN BERNARDINO
004580*16*SCARP TEST PROJECT
004590*17*YUCCA VALLEY *18*0.4 MI NORTH
004600*20*1/NGS *21*1976JWP *22*G
004610*26*63/ *27*F NGS
004620*28*Y 1268 1976
004630*30*0.45 MILE NORTH ALONG OLD WOMAN SPRINGS ROAD FROM THE JUNCTION OF STATE HIGHWAY 62 AT YUCCA VALLEY, AT THE JUNCTION OF CRESCENT DRIVE, 65 FEET NORTHWEST OF THE CENTER OF THE T JUNCTION, 56 FEET WEST OF THE CENTERLINE OF THE ROAD, 37 FEET NORTH OF THE CENTERLINE OF THE DRIVE, 4.5 FEET NORTH OF POWER POLE 242924 WITH GUY WIRE AND A TRANSFORMER.
004690*41*E63113 50 P6
004700*42* LCRESTVIEW DRIVE
004710*43*E3.5 NNW
004720*23*5/CADT *24*1976JPK *25*G
004730*23*2/USGS *24*1978FS *25*G
004740*30*RECOVERED AS PREVIOUSLY DESCRIBED, EXCEPT FOR THE WITNESS POST WHICH
004750*30*IS MISSING.
:::::::::::::::::::

009870*B5*

Figure 7-4 - Coded and keyed bench mark description.

***** B E N C H M A R K D E S C R I P T I O N *****
DESIGNATION--Y 1268 STATE--CA COUNTY--SAN BERNARDINO QUAD--N34116234 QSN--0084
***** MONUMENT BY--NGS ***** YR--1976 COP--JWT MARK TYPE--FLANGE-ENCASED ROD *****
STAMPING--Y 1268 1976 OTHER CONTROL--G
SETTING--GALVANIZED STEEL ROD IN SLEEVE AREA--SCARP TEST PROJECT
LOCATED--0.4 MI NORTH FROM THE CITY OR TOWN OF--YUCCA VALLEY

0.45 MILE NORTH ALONG OLD WOMAN SPRINGS ROAD FROM THE JUNCTION OF STATE HIGHWAY 62 AT YUCCA VALLEY, AT THE JUNCTION OF CRESCENT DRIVE, 65 FEET NORTHWEST OF THE CENTER OF THE T JUNCTION, 56 FEET WEST OF THE CENTERLINE OF THE ROAD, 37 FEET NORTH OF THE CENTERLINE OF THE DRIVE, 4.5 FEET NORTH OF POWER POLE 242924 WITH GUY WIRE AND A TRANSFORMER. GALVANIZED STEEL ROD DRIVEN TO THE DEPTH OF 113 FEET, IN A SLEEVE EXTENDING TO THE DEPTH OF 50 FEET, ENCASED IN A PIPE PROJECTING 6 INCHES, ABOUT LEVEL WITH CRESTVIEW DRIVE, 3.5 FEET NORTH-NORTHWEST FROM A WITNESS POST.
***** RECOVERY BY--CADT ***** YR--1976 COP--JPK CONDITION--GOOD *****
***** RECOVERY BY--USGS ***** YR--1978 COP--FS CONDITION--GOOD *****
RECOVERED AS PREVIOUSLY DESCRIBED, EXCEPT FOR THE WITNESS POST WHICH IS MISSING.

Figure 7-5 - Bench mark description in publishable format.

2. Blank Field (bb...b) - to be blank-filled. Data fields which are designated as blank fields must be left blank, i.e., no data items may be entered in these fields.

3. Constant (Numeric) Field (cc...c) - intended for a data item which is a number (i.e., an integer, a proper or improper fraction, or a decimal fraction) coded as a string of numeric characters (prefixed with minus sign if the number is negative) which may contain one leading or imbedded (but not trailing) decimal point if it is a decimal fraction, or an imbedded hyphen and/or slash if it is a proper or improper (mixed) fraction such as 3/4, 5-1/2, etc., to be entered into the respective data field left-justified and blank-filled on the right.

4. Integer Field (ii...i) - intended for a data item which is coded as a string of numeric characters representing a positive or negative integer number, to be entered into the respective data field right-justified. In the case of a positive integer number, zero-fill any unused columns to the left. In the case of a negative integer number, code the minus sign immediately preceding the left most nonzero digit, and blank-fill any unused columns to the left of the minus sign.

5. Specific Character Field (ss...s) - intended to contain a specific alphabetic, numeric, or special character or a specific group of characters. Every "s" column of a specific character field must contain the character shown in that position in the data entry line of the respective format diagram.

Required Data: In general, only those records which are applicable to the original or recovery description at hand should be submitted for that original or recovery description in the VERT DESC data set. The required record sequence is shown in Table 7-3. The character fields intended for data items which are deemed essential have been shaded on the format diagrams; if applicable to the original or recovery description being coded, these character fields must be filled out in accordance with the instructions given on the respective format diagrams or in the text of this chapter.

BENCHMARK DESCRIPTION

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卷之三

the initials of Englishmen will be seen on the top of a separate page, or placed in the margin of the first page. Setting time. Under as in the Radiant Period in the name of the paper preceding page, there is no space. Placed in a page, it must begin with a blank line. A separate section of the paper under the heading of "Editorial Department," etc., contains the names of the persons who have written articles, and the date of publication.

13, *14* Bench Mark Designation Record. This record contains the primary designation of the vertical control point, a code for the U.S. state, Canadian province, or foreign country (see ANNEX A), and the name of the next lower political subdivision in which the BM is located.

| | | |
|--|--|--|
| | <u>County</u> - or county-equivalent. Enter the name of the next lower political subdivision in which the BM is located; abbreviate if necessary. For points in the U.S. and in Canada, enter the name of the first-order political subdivision of the state, commonwealth, province, or territory (i.e., county, parish, census division, independent city, etc.) The name of an independent city must be prefixed by the symbol C OF (e.g. C OF BALTIMORE for the city of Baltimore, MD). For points in other countries, enter the name of the primary political subdivision such as state, province, district, etc. | |
| | <u>State or Country Code</u> - see footnote and ANNEX A. <u>Data Code</u> - preceded and followed by asterisk. (*14* - State or Country Code and County Name) | |
| | <u>Designation</u> - must not exceed 25 characters. This is the primary designation which will be associated with the vertical control point for publication purposes. In every case, the designation must be edited in conformity with <u>Guidelines for Survey Point Names and Designations</u> (ANNEX D). The designation entered in this field must be identical (character for character) with the designation given for the same point in the corresponding VERT OBS (or VERT ELEV) data set. | |
| | <u>Data Code</u> - preceded and followed by asterisk. (*13* - Bench Mark Designation) | |
| | <u>Sequence Number</u> Increment by 10 on successive records to allow for insertions. | |

State or Country Code: Enter the two-letter state, commonwealth, or territory code for Points in the U.S., the province or territory code in Canada, or the respective country code elsewhere.

***15* Alias Record.** Use this record if and only if there exist one or more aliases by which the vertical control point is known in addition to its primary designation given on the *13*, *14* record. At most three *15* records are allowed in any original or recovery description.

***16* Area Record.** Use this record to indicate that the bench mark is a member of a designated area network, or to provide other location-related information to be associated with the vertical control point. At most one *16* record is allowed in any original or recovery description.

Designated Area Name or other location-related information, not to exceed 32 characters.

Examples:

SOUTH OGDEN IRRIGATION SURVEY
NGS LOOPS 139 AND 205A
HOUSTON SUBSIDENCE NETWORK
etc.

Data Code - preceded and followed by asterisk.

Sequence Number

Increment by 10 on successive records to allow for insertions.

17, *18* Nearest-City-or-Town Record. Use this record to indicate the nearest city or town and to give the distance and direction from the nearest city or town to the bench mark. Omit the distance-and-direction entry for bench marks within the immediate confines of a locality.

000000000000111111112222222223333333344444444555555556666666677777778
1234567890123456789012345678901234567890123456789012345678901234567890

NOTE - Points of Compass:

| | | | |
|-------|-----|----|-----|
| NORTH | NNE | NE | ENE |
| EAST | ESE | SE | SSE |
| SOUTH | SSW | SW | WSW |
| WEST | WNW | NW | NNW |

Distance and Direction from the nearest city or town. Enter the distance in miles or kilometers (to nearest 0.1) followed by units (MI or KM) and by the direction expressed as a cardinal or intercardinal point of compass. Spell out NORTH, EAST, SOUTH, and WEST; use standard two- or three-letter symbols for intercardinal points of compass.

Data Code - optional when no information follows.
(*18* .. Distance and Direction)

Nearest City or Town - enter the name of the nearest locality from which a distance and direction can be given, or else the name of the locality within the confines of which the bench mark is located. The localities used for this purpose should appear on ordinary state highway maps.

Append the standard two-letter state code (ANNEX A) to the name of the locality only if the locality is not in the same state as the bench mark or if the state must be specified to avoid confusion (e.g. KWSAS CITY KS as opposed to KANSAS CITY MO).

NOTE - Omit the distance-and-direction entry for bench marks located within the confines of the locality given herein.

Data Code - preceded and followed by asterisk.
(*17* - Nearest City or Town)

Sequence Number

Sequence Name: Increment by .0 on successive records to allow for insertions.

12.7 KM (7.9 MI) NW
12.7 KM (7.9 MI) NW

* 20*, * 21*, * 22*, Setting-by-Agency Record. Use to indicate the agency which physically set the vertical control point and to give other data pertaining to the setting of the mark.

* * * * *

* * * * *

23, *24*, *25* Recovery-by-Agency Record. Use this record to indicate the agency which recovered the vertical control point and to give other data pertaining to the recovery of the bench mark. This record is required in recovery descriptions only.

| | |
|--|---|
| 0000000001111111222222223333333444444445555555555666666677777778 123456789012345678901234567890123456789012345678901234567890 | Condition Code = see NOTE above and ANNEX J. Data Code - preceded and followed by asterisk. (*25* - Condition Code) |
| | <p><u>NOTE - Condition Code:</u> G - good, fair N - not recovered, not found, lost O - other (see recovery text) P - poor, disturbed, mutilated X - destroyed</p> |
| | <p><u>Chief of Party</u> - initials of the person in charge of the survey operation resulting in the recovery.</p> |
| | <p><u>Year of Recovery</u> of the vertical control point.</p> |
| | <p>Data Code .. preceded and followed by asterisk. (*24* - Year and Chief of Party)</p> |
| | <p><u>Recovery by Agency</u> - name of the agency or firm which recovered the vertical control point.</p> <p>For agencies or firms listed in ANNEX C, enter the respective six-character abbreviation. For others, enter the full or abbreviated name (up to 20 characters) - see ANNEX C for examples.</p> |
| | <p>Agency Code = see footnote and ANNEX J. Data Code - preceded and followed by asterisk. (*23* - Agency Code and Agency Name)</p> |
| | <p><u>Sequence Number</u> Increment by 10 on successive records to allow for insertions</p> |

Agency Code: 0-Unknown, 1-NGS/CGS, 2-USGS, 3-DOD, 4-Other Federal, 5-State, 6-County/City or Public Regional, 7-Commercial/Private, 8-NOS, 9-Foreign Government - see ANNEX J.

***26*, *27* Setting and Monumentation Record.** Use this record to indicate the setting or the type of the bench mark and to specify the type of mark or monument used. Few commonly occurring setting classification codes are given in the footnote; refer to ANNEX J for a complete list.

NOTE - Monumentation Code (see ANNEX J):

| | |
|-------------------------------|--------------------------------|
| B - bolt | P - pipe cap |
| C - cap-and-bolt | Q - chiseled square |
| D - survey disk (any type) | R - rivet |
| | S - spike |
| F - flange-encased rod | T - chiseled triangle |
| H - drill hole | V - stone monumen: |
| I - metal rod | X - chiseled cross |
| N - nail | Z - other (see description) |
| O - chiseled circle | |

Origin of the Vertical Control Point: Enter the acronym or abbreviation of the agency whose name is precast on the monument. Leave blank for marks not having a precast agency name. _____

Monumentation Quality Code - enter only if monumentation quality is not standard.

Disk Type - enter only if Monumentation Code is D.

Monumentation Code - see NOTE above.

Data Code - preceded and followed by asterisk.

(*27* - Monumentation)

NOTE - Disk Type (see ANNEX J):

- 00 - unspecified
- 01 - bench mark disk
- 02 - tidal bench mark disk
- 03 - triangulation station disk
- 04 - traverse station disk
- 05 - topographic station disk
- 06 - survey disk (not listed)
- 07 - reference mark (RM) disk
- 08 - azimuth mark (Az Mk) disk
- 09 - gravity station disk
- 10 - gravity reference mark (RM) disk
- 11 - magnetic station disk

Setting - specific setting entry is required if the Setting Classification Code is 40,41,42,43,44, 45 (light structure) or 50,51,52,53,54,55 (massive structure); it is optional otherwise.

Getting Classification Code = see footnote.

Data Code - preceded and followed by asterisk (*26* - Setting Classification)

Sequence Number

Increment by 10 on successive records to allow for insertions.

#263 BRIDGE ASSESSMENT #27#01 308

Setting Classification Code: 11-metal rod with base plate, 12-concrete post, 21-25 deep rods, 31-rock outcrop, 32-boulder, 40-light structure, 50-massive structure - see ANNEX J for others.

***28* Stamping Record.** Use this record to indicate the stamping or inscription which is peculiar to the bench mark (i.e., exclusive of agency name and other data normally precast on the survey disk). Do not submit this record if no stamping or inscription identifies the BM - see footnote.

Stamping or inscription which identifies the benchmark - must not exceed 50 characters. Do not include agency name or other data which normally appear precisely on a survey disk.

Data (ode - preceded and followed by asterisk.
(*28* - Stamping)

Sequence Number

Increment by 10 on successive records to allow for insertions.

NOTE - This record is required if the *27* Monumentation Code is C,D,F, or P; optional otherwise.

***30* Descriptive Text Record.** Use this record for each line of text of 70 characters or less.

Do not divide words between successive records. The entire original or recovery description

text must be given as a set of consecutive *30* records constituting a single paragraph of text.

0000000001111111122222222333333334444444455555555666666677777778
1234567890123456789012345678901234567890123456789012345678901234567890

Descriptive Text - enter the full original or recovery description text as a set of consecutive *30* records constituting a single paragraph of text.

In addition to the usual alphabetic (A-Z) and numeric (0-9) characters, only the following special characters are allowed (see Chapter 5):

| | |
|-----------------------------|--------------------------|
| (*) asterisk | (+) plus sign |
| () blank or space | (-) minus sign or hyphen |
| (,) comma | (=) equal sign |
| (.) period or decimal point | (/) slash or solidus |
| (\\$) dollar sign | (()) left parenthesis |
| | (()) right parenthesis |

Care must be exercised to avoid miskeying the following characters:

0-number "zero" 1-number "one" 2-number "two"
0-letter "O" L-letter "L" Z-letter "Z"

In addition, the following rules apply:

1. Do not divide words (or other character groups) between successive records.
2. Key two spaces (blanks) following the period before the start of a new sentence.
3. Substitute period (.) or comma (,) for semi-colon (;), as appropriate.
4. Substitute 'AND' (in text) or plus sign (+) (in abbreviation or acronym) for ampersand (&).
5. Substitute two consecutive hyphens (--) without any preceding or following blanks for a colon (:), i.e., key XXXXX: YYYY as XXXXX--YYY'.
6. Key dash as space-hyphen-space, i.e., as XXXX - YYYYYY.
7. Key a hyphen (instead of a blank) in an improper (mixed) fraction (e.g. 5-1/2, etc.).
8. Omit (i.e., do not key) any special characters other than those listed above (',",_, etc.).
9. All distance measurements or estimates that are given in metric units must be followed by their English equivalency in parentheses.

Data Code - preceded and followed by asterisks.

Sequence Number

Increment by 10 on successive records to allow for insertions.

000000000111111112222222333333344444444555555566666667777778
1234567890123456789012345678901234567890123456789012345678901234567890
1111111111122222223333333444444445555555666666677777778
000000000111111112222222333333344444444555555566666667777778
1234567890123456789012345678901234567890123456789012345678901234567890

***40* Concrete Post Record (Optional).** Use this record in lieu of the phrase A DISK SET INTO THE GROUND (or PROJECTING/RECESSED x IN (or xx CM depending on Units Code)); this record applies only when Setting Classification Code (data item *26*) is '12'.

NOTE - Enter the height by which the concrete post projects above the ground (FPR Code P) or the depth to which it is recessed below the ground (FPR Code R) to the nearest inch (Units Code E) or to the nearest centimeter (Units Code M). Leave blank if the FPR Code is F.

Projection or Recess - see NOTE above.

EPR Code - F-flush, P-projecting, R-recessed.

-Units Cole - E-English, M-metric - see footnote

Data Code - preceded and followed by asterisk.

(*40* - Concrete Post Record)

Sequence Number

Incremen: by 10 on successive records to allow for insertions.

NOTE - Leave Units Code blank if the FPR Code is 'F'.

41 Rod/Pipe Record (Optional). Use this record in lieu of the phrase STAINLESS STEEL (or other material as per Setting Code) ROD (or PIPE) SET TO THE DEPTH OF xx FT (or xx.x M depending on Units Code) ENCASED IN A PIPE FLUSH WITH THE GROUND (or PROJECTING/RECESSED x IN (or xx CM)).

NOTE 1 - Enter the height by which the surface pipe casing of the rod projects above the ground (FPR Code P) or the depth to which it is recessed below the ground (FPR Code R) to the nearest inch (Units Code E) or to the nearest centimeter (Units Code M).

NOTE 2 - Setting Classification Code specifies the type of rod (or pipe) installation and the material used; it must be same as the Setting Code entered in Data Group *26*. Only the following Setting Codes apply (see ANNEX J):

- 11 - metal rod with base plate
 - 13 - shallow-set pipe
 - 14 - shallow-set metal rod (without base plate)

 - 21 - copper-clad steel rod
 - 22 - galvanized steel pipe
 - 23 - galvanized steel rod
 - 24 - stainless steel rod
 - 25 - aluminum alloy rod

 - 61 - copper-clad steel rod in sleeve
 - 62 - galvanized steel pipe in sleeve
 - 63 - galvanized steel rod in sleeve
 - 64 - stainless steel rod in sleeve
 - 65 - aluminum alloy rod in sleeve

Projection or Recess of casing - see NOTE 1 above.

FPB Code - F-flush, P-projecting, R-recessed.

Sleeve Depth - in feet (Units Code E) or in meters (Units Code M); leave blank if no sleeve.

Rod/Pipe Depth - in feet (Units Code E) or in meters (Units Code M).

Setting Classification Code - see NOTE 2 above.

Units Code - E-English, M-metric:

Data Code - preceded and followed by asterisk.

(*41* - Rod/Pipe Record)

Sequence Number

Increment by 10 on successive records to allow for insertions.

NOTE - The phrase "... IN A SLEEVE EXTENDING TO THE DEPTH OF xx FT (or xx.x M depending on Units Code), is inserted before ENCASED ... (see header) whenever the Sleeve Depth field is nonblank.

42 Vertical Reference Record (Optional). Use this record in lieu of the phrase ABOUT LEVEL WITH ... (object specified), or else x FT (or x.x M depending on Units Code) ABOVE (or BELOW) (object specified).

43 Witness Post Record (Optional). Use this record in lieu of the phrase x.x FT (or x.x M depending on Units Code) xxx (point of compass) FROM A WITNESS POST (or FROM ... (object specified) if other than a witness post).

Data Set Termination Record. This must be the last record of every data set submitted.

| | | | | |
|---|---------------------------------------|---|---|--|
| <u>Data Set Structure:</u> The VERT DESC Data Set is made up of bench mark (BM) data blocks, each containing original description and/or recovery description(s) arranged in sequence by current point serial number. | <u>Data Set Identification Record</u> | Original or Recovery Description Subsequent Recovery Description ::: Subsequent Recovery Description | (if any) Original or Recovery Description Subsequent Recovery Description ::: Subsequent Recovery Description | FIRST BM SECOND BM LAST BM |
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ANNEX A

NGS STATE AND COUNTRY CODES

NORTH AMERICA AND GREENLAND

GREENLAND GL

CANADA CD

Provinces and Territories:

| | | |
|----------------------|---------------------|---------------------|
| Alberta AB | Newfoundland . . NF | Prince Edward Is PE |
| British Columbia BC | Northwest Terr's NW | Quebec PQ |
| Manitoba MB | Nova Scotia . . NS | Saskatchewan . . SK |
| New Brunswick . NB | Ontario ON | Yukon Territory YK |

UNITED STATES US

States and District of Columbia:

| | | |
|----------------------|---------------------|---------------------|
| Alabama AL | Kentucky KY | North Dakota . . ND |
| Alaska AK | Louisiana . . . LA | Ohio OH |
| Arizona AZ | Maine ME | Oklahoma . . . OK |
| Arkansas AR | Maryland . . . MD | Oregon . . . OR |
| California . . . CA | Massachusetts . MA | Pennsylvania . PA |
| Colorado . . . CO | Michigan . . . MI | Rhode Island . RI |
| Connecticut . . CT | Minnesota . . MN | South Carolina . SC |
| Delaware . . . DE | Mississippi . MS | South Dakota . SD |
| Dist of Columbia DC | Missouri . . MO | Tennessee . . TN |
| Florida . . . FL | Montana . . . MT | Texas . . . TX |
| Georgia . . . GA | Nebraska . . NE | Utah . . . UT |
| Hawaii . . . HI | Nevada . . . NV | Vermont . . . VT |
| Idaho . . . ID | New Hampshire . NH | Virginia . . . VA |
| Illinois . . . IL | New Jersey . . NJ | Washington . . WA |
| Indiana . . . IN | New Mexico . . NM | West Virginia . WV |
| Iowa . . . IA | New York . . NY | Wisconsin . . WI |
| Kansas . . . KS | North Carolina . NC | Wyoming . . . WY |

Other Political Units and Territories:

| | |
|--|--------------------------------|
| American Samoa AS | Misc U.S. Caribbean Islands BQ |
| Canal Zone CZ | Phoenix Islands (Canton Is) CQ |
| Guam GU | Johnston Atoll JQ |
| Puerto Rico PR | Midway Islands MQ |
| Virgin Islands VI | Wake Island WQ |
| Trust Terr of Pacific Islands (Marianas, Carolines, Marshalls) | TQ |

BERMUDA BD

MEXICO MX

CENTRAL AMERICA AND THE CARIBBEAN AREA

| | | | |
|-------------------------------|----|----------------------------|----|
| BAHAMA ISLANDS | BM | FRENCH ANTILLES | FA |
| BARBADOS | BB | GUATEMALA | GT |
| BELIZE (British Honduras) . . | BH | HONDURAS | HO |
| BRITISH VIRGIN ISLANDS . . . | BV | HAITI | HA |
| BRITISH WEST INDIES | BI | JAMAICA | JM |
| CAYMAN ISLANDS | CJ | NETHERLANDS ANTILLES . . . | NA |
| COLOMBIA | CB | NICARAGUA | NI |
| COSTA RICA | CR | PANAMA | PN |
| CUBA | CU | TRINIDAD AND TOBAGO . . . | TD |
| DOMINICAN REPUBLIC | DR | TURKS AND CAICOS ISLANDS . | TC |
| EL SALVADOR | ES | VENEZUELA | VE |

OTHER COUNTRIES OR AREAS OF INTEREST TO NGS

| | | | |
|-------------------------------|----|---|----|
| ANTARCTICA | AY | LINE ISLANDS (Christmas Is) | XI |
| ARGENTINA | AJ | NORWAY | NO |
| ASCENSION/ST HELENA ISLANDS . | SH | PARAGUAY | PY |
| BOLIVIA | BL | PERU | PW |
| BRAZIL | BR | PHILIPPINE ISLANDS . . . | PI |
| CENTRAL AFRICAN REPUBLIC . . | CP | SAUDI ARABIA | SA |
| CHILE | CI | SOUTH AFRICA | SF |
| ECUADOR | EC | SOVIET UNION | UR |
| ETHIOPIA | ET | SUDAN | SU |
| FRENCH GUIANA | FG | SURINAM (Dutch Guiana) . | DG |
| FRENCH SOUTHERN LILAND . . . | FS | TANZANIA | TZ |
| GILBERT AND ELLICE ISLANDS . | GE | TRISTAN DA CUNHA ISLANDS . | TR |
| GUYANA (British Guiana) . . . | BG | UGANDA | UG |
| ICELAND | IC | UNITED ARAB REPUBLIC (Egypt) | EG |
| ITALY | IT | URUGUAY | UY |
| JAPAN | JA | ZAMBIA | ZA |

ANNEX C

CONTRIBUTORS OF GEODETIC CONTROL DATA

This ANNEX contains a list of organizations which have contributed (or are expected to contribute) data resulting from geodetic control established to extend and/or densify the national horizontal and vertical geodetic control networks.

A unique six-character identification symbol has been assigned to each organization listed. As far as possible, this symbol is identical to the commonly used abbreviation or acronym of the respective organization. However, to insure uniqueness, modifications of the commonly used abbreviations and acronyms, as well as arbitrary symbols, had to be assigned in many cases. Organizations not listed in this ANNEX may contact the National Geodetic Survey (see ANNEX K) to have a unique identification symbol assigned.

The abbreviation or acronym of the organization whose name is precast in the monument should be included as part of the designation (except for NGS, NOS, or C&GS). For marks not having a precast agency name: if the agency that set the mark is known, append that agency's acronym or abbreviation. The abbreviation or acronym to be used for this purpose should be:

- a. The identification symbols listed in this ANNEX, except for county and city agencies.
- b. For county and city agencies, an appropriate and intelligible acronym or abbreviation (e.g., K CO for King County, C of R for the City of Richmond, etc.).

Note: For organizations not listed in this ANNEX, append the acronym or abbreviation commonly used to refer to the organization, or as specified by the organization itself. For state, commonwealth, or territorial organizations, the first two letters of the acronym or abbreviation must be the standard two-letter abbreviations listed in ANNEX A.

In addition to the six-character unique identification symbol, a 20-character standard abbreviated name is also given for each organization listed. The respective organizations are grouped under 13 categories, and within each category they are listed in the alphabetic order of their identification symbols. The 13 categories are given in an index which appears on the following page.

| <u>CATEGORIES OF CONTRIBUTORS OF GEODETIC CONTROL DATA</u> | <u>PAGE</u> |
|--|-------------|
| a. International and Foreign Government Agencies | C-3 |
| b. Federal and Interstate Agencies | C-3 |
| c. State, Commonwealth, and Territorial Agencies | C-4 |
| d. County Agencies | C-7 |
| e. City Agencies | C-10 |
| f. Public Inter-City and Regional Agencies | C-14 |
| g. Railroads | C-14 |
| h. Petroleum and Pipeline Companies | C-16 |
| i. Gas and Electric Utility Companies | C-17 |
| j. Surveying and Construction Industry | C-17 |
| k. Miscellaneous Commercial Organizations and Private Firms | C-19 |
| l. Academic Institutions and Amateur Organizations | C-20 |
| m. General Non-Specific Designators | C-21 |

CONVENTIONS USED IN THE FORMATION OF IDENTIFICATION SYMBOLS

- a. State, Commonwealth, and Territorial Agencies: The six-character identification symbol of a state, commonwealth, or territorial agency consists of the respective two-character state code (see ANNEX A) to which up to four letters (e.g. the initials of the agency's name) may be appended. In general, "S" for "state" and "O" for "of" should be omitted.
- b. County Agencies: The six-character identification symbol of a county agency consists of the two-character code denoting the state in which the county is located (see ANNEX A) followed by a hyphen and by a three-digit number which has been assigned to the respective county in Worldwide Geographic Location Codes prepared by the Office of Finance, General Services Administration (GSA), November 1976. Agencies which do not have access to this publication may contact the National Geodetic Survey (see ANNEX K) to obtain the appropriate county code.
- c. City Agencies: The six-character identification symbol of a city agency consists of the two-character code denoting the state in which the city is located (see ANNEX A) followed by a four-digit number which has been assigned to the respective city in Worldwide Geographic Location Codes prepared by the Office of Finance, General Services Administration (GSA), November 1976. Agencies which do not have access to this publication may contact the National Geodetic Survey (see ANNEX K) to obtain the appropriate city code.

NOTE: For the purposes of this ANNEX, agencies of independent cities which are also counties or county-equivalents should be considered to be city (rather than county) agencies and assigned identification symbol accordingly.

CONTRIBUTORS OF GEODETIC CONTROL DATA

AS OF 800801

NOTE - AGENCY SYMBOLS LISTED HEREIN ARE FOR NGS INTERNAL USE ONLY
 AGENCY ABBREVIATIONS IN STATION NAMES SHOULD BE RETAINED AS GIVEN

INTERNATIONAL AND FOREIGN GOVERNMENT AGENCIES

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|---|
| ***** | ***** | ***** |
| DTENAL | DETENAL DE MEXICO | ESTUDIOS DEL TERRITORIO NACIONAL DE MEXICO |
| GSC | GEOD SURV OF CANADA | GEODETIC SURVEY OF CANADA |
| LAGS | INTER AMER GEOD SURV | INTER AMERICAN GEODETIC SURVEY |
| IBC | INT BOUNDARY COMM | INTERNATIONAL BOUNDARY COMMISSION |
| IBWC | INT BDRY WTR COMM | INTERNATIONAL BOUNDARY AND WATER COMMISSION |
| ONCADH | ONTARIO DEPT OF HIGH | ONTARIO CANADA DEPARTMENT OF HIGHWAYS |
| PICGS | PI C AND G SURVEY | PHILIPPINE COAST AND GEODETIC SURVEY |
| ***** | ***** | ***** |

FEDERAL AND INTERSTATE AGENCIES

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|-------------------------|---|
| ***** | ***** | ***** |
| AEC | ATOMIC ENERGY COMM | ATOMIC ENERGY COMMISSION (NOW ERDA) |
| AMS | ARMY MAP SERVICE | US ARMY MAP SERVICE (NOW DMA) |
| BLM | BUR OF LAND MGT | US BUREAU OF LAND MANAGEMENT |
| BOF | BUR OF FISHERIES | US BUREAU OF COMMERCIAL FISHERIES |
| BOM | BUR OF MINES | US BUREAU OF MINES |
| BOR | BUR OF RECLAMATION | US BUREAU OF RECLAMATION (NOW WPRS) |
| BPA | BONNEVILLE PWR ADMIN | BONNEVILLE POWER ADMINISTRATION |
| BPR | BUR OF PUBLIC ROADS | US BUREAU OF PUBLIC ROADS |
| CAB | CIVIL AERONAUT BOARD | CIVIL AERONAUTICS BOARD |
| CGS | COAST AND GEOD SURV | US COAST AND GEODETIC SURVEY (NOW NOS) |
| DI | DEPT OF INTERIOR | US DEPARTMENT OF INTERIOR |
| DMA | DEFENSE MAP AGENCY | DEFENSE MAPPING AGENCY |
| DOD | DEPT OF DEFENSE | US DEPARTMENT OF DEFENSE |
| FAA | FDRL AVIATION ADMIN | FEDERAL AVIATION ADMINISTRATION |
| IRC | ILLINOIS RIVER COMM | ILLINOIS RIVER COMMISSION |
| MORC | MISSOURI RIVER COMM | MISSOURI RIVER COMMISSION |
| MRC | MISS RIVER COMM | MISSISSIPPI RIVER COMMISSION |
| NASA | NAT AERO SPACE ADMIN | NATIONAL AERONAUTICS AND SPACE ADMIN |
| NBS | NAT BUR OF STANDARDS | NATIONAL BUREAU OF STANDARDS |
| NGS | NAT GEODETIC SURVEY | NATIONAL GEODETIC SURVEY |
| NIH | NAT INST OF HEALTH | NATIONAL INSTITUTES OF HEALTH |
| NMTXBC | NM TX BOUNDARY COMM | NEW MEXICO AND TEXAS BOUNDARY COMMISSION |
| NOS | NAT OCEAN SURVEY | NATIONAL OCEAN SURVEY |
| NOSAMC | NOS ATLANTIC MARINE CTR | NOS ATLANTIC MARINE CENTER |
| NOSPMC | NOS PACIF MARINE CTR | NOS PACIFIC MARINE CENTER |
| NPS | NAT PARK SERVICE | NATIONAL PARK SERVICE |
| NSL | NAVY STANDARDS LAB | US NAVY STANDARDS LABORATORY AT POMONA |
| PBPP | PUB BLDGS AND PARKS | OFFICE OF PUBLIC BUILDINGS AND PUBLIC PARKS |
| SCS | SOIL CONSERV SERVICE | SOIL CONSERVATION SERVICE |
| TPC | USATOPOCOM | US ARMY TOPOGRAPHIC COMMAND (NOW DMA) |
| TVA | TENN VALLEY AUTH | TENNESSEE VALLEY AUTHORITY |
| USA | US ARMY | US ARMY |
| ***** | ***** | ***** |

FEDERAL AND INTERSTATE AGENCIES - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|-----------------------|--------------------------------------|
| ***** | ***** | ***** |
| USAF | US AIR FORCE | US AIR FORCE |
| USCG | US COAST GUARD | US COAST GUARD |
| USDA | DEPT OF AGRICULTURE | US DEPARTMENT OF AGRICULTURE |
| USDWC | US DEEP WATERWAY COMM | US DEEP WATERWAY COMMISSION |
| USE | US ENGINEERS | US ARMY CORPS OF ENGINEERS |
| USFS | US FOREST SERVICE | US FOREST SERVICE |
| USFWA | FEDERAL WORKS AGENCY | US FEDERAL WORKS AGENCY |
| USFWS | FISH AND WILDLIFE | US FISH AND WILDLIFE SERVICE |
| USGLO | US GOVT LAND OFFICE | US GOVERNMENT LAND OFFICE |
| USGS | US GEOLOGICAL SURVEY | US GEOLOGICAL SURVEY |
| USGS-E | USGS EASTERN MAP CTR | USGS EASTERN MAPPING CENTER |
| USGS-M | USGS MIDCONT MAP CTR | USGS MID-CONTINENT MAPPING CENTER |
| USGS-R | USGS ROCKYMT MAP CTR | USGS ROCKY MOUNTAIN MAPPING CENTER |
| USGS-W | USGS WESTERN MAP CTR | USGS WESTERN MAPPING CENTER |
| USLHS | US LIGHTHSE : SERVICE | US LIGHTHOUSE SERVICE (NOW USCG) |
| USLS | US LAKE SURVY | US LAKE SURVEY |
| USMC | US MARINE CORPS | US MARINE CORPS |
| USN | US NAVY | US NAVY |
| USPS | US POSTAL SERVICE | US POSTAL SERVICE |
| USSC | US SUPREME COURT | US SUPREME COURT |
| USTD | US TREASURY DEPT | US TREASURY DEPARTMENT |
| USWB | US WEATHER BUREAU | US WEATHER BUREAU (NOW NWS) |
| WPRS | WATER AND POWER RES | US WATER AND POWER RESOURCES SERVICE |
| ***** | ***** | ***** |

STATE, COMMONWEALTH, AND TERRITORIAL AGENCIES

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|--|
| ***** | ***** | ***** |
| AKDAVI | AK DIV OF AVIATION | ALASKA DIVISION OF AVIATION |
| AKHD | AK HIGHWAY DEPT | ALASKA HIGHWAY DEPARTMENT |
| AKPWR | AK POWER ADMIN | ALASKA POWER ADMINISTRATION |
| ALGS | AL GEODETIC SURVEY | ALABAMA GEODETIC SURVEY |
| ALHD | AL HIGHWAY DEPT | STATE OF ALABAMA HIGHWAY DEPARTMENT |
| ARGLS | AR GEOLOGICAL SURVEY | ARKANSAS GEOLOGICAL SURVEY |
| ARGS | AR GEODETIC SURVEY | ARKANSAS GEODETIC SURVEY |
| ARHD | AR HIGHWAY DEPT | ARKANSAS STATE HIGHWAY DEPARTMENT |
| AZDT | AZ DEPT OF TRANSP | ARIZONA DEPARTMENT OF TRANSPORTATION |
| AZHD | AZ HIGHWAY DEPT | ARIZONA HIGHWAY DEPARTMENT (NOW AZDT) |
| CADH | CA DIV OF HIGHWAYS | CALIFORNIA DIVISION OF HIGHWAYS (NOW CADT) |
| CADPW | CA DEPT OF PUB WORKS | CALIFORNIA DEPARTMENT OF PUBLIC WORKS |
| CADT | CA DEPT OF TRANSP | CALIFORNIA DEPARTMENT OF TRANSPORTATION |
| CADWR | CA DEPT OF WATER RES | CALIFORNIA DEPARTMENT OF WATER RESOURCES |
| CAEC | CA EARTHQUAKE COMM | CALIFORNIA EARTHQUAKE COMMISSION |
| CAGS | CA GEODETIC SURVEY | CALIFORNIA GEODETIC SURVEY |
| CASLC | CA STATE LANDS COMM | CALIFORNIA STATE LANDS COMMISSION |
| CASPC | CA STATE PARKS COMM | CALIFORNIA STATE PARKS COMMISSION |
| CODH | CO DEPT OF HIGHWAYS | COLORADO STATE DEPARTMENT OF HIGHWAYS |
| COGS | CO GEODETIC SURVEY | COLORADO GEODETIC SURVEY |
| CTCSF | CT COMM SHELL FISH | CONNECTICUT COMMISSION OF SHELL FISHERIES |
| CTDT | CT DEPT OF TRANSP | CONNECTICUT DEPARTMENT OF TRANSPORTATION |
| CTGS | CT GEODETIC SURVEY | CONNECTICUT GEODETIC SURVEY |
| ***** | ***** | ***** |

STATE, COMMONWEALTH, AND TERRITORIAL AGENCIES - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|---------|----------------------|--|
| ***** | ***** | ***** |
| DCDHT | DC DEPT OF HIGHWAYS | DC DEPARTMENT OF HIGHWAYS AND TRAFFIC |
| DEDHT | DE DEPT OF HIGHWAYS | DELAWARE DEPARTMENT OF HIGHWAYS AND TRANSP |
| FLDNR | FL DEPT OF NAT RES | FLORIDA DEPARTMENT OF NATURAL RESOURCES |
| FLDPW | FL DEPT OF PUB WORKS | FLORIDA DEPARTMENT OF PUBLIC WORKS |
| FLDT | FL DEPT OF TRANSP | FLORIDA DEPARTMENT OF TRANSPORTATION |
| FLGS | FL GEODETIC SURVEY | FLORIDA GEODETIC SURVEY |
| FLHD | FL HIGHWAY DEPT | FLORIDA HIGHWAY DEPARTMENT (NOW FLDT) |
| GADT | GA DEPT OF TRANSP | GEORGIA DEPARTMENT OF TRANSPORTATION |
| GAGS | GA GEODETIC SURVEY | GEORGIA GEODETIC SURVEY |
| GAHD | GA HIGHWAY DEPT | GEORGIA HIGHWAY DEPARTMENT (NOW GADT) |
| HIDT | HI DEPT OF TRANSP | HAWAII DEPARTMENT OF TRANSPORTATION |
| HIGS | HI GEODETIC SURVEY | HAWAII GEODETIC SURVEY |
| HITS | HI TERRIT SURVEY | HAWAII TERRITORIAL SURVEY |
| IAHD | IA HIGHWAY DEPT | IOWA HIGHWAY DEPARTMENT |
| IDDH | ID DEPT OF HIGHWAYS | IDAHO DEPARTMENT OF HIGHWAY (NOW IDDT) |
| IDDT | ID DEPT OF TRANSP | IDAHO DEPARTMENT OF TRANSPORTATION |
| IDGS | ID GEODETIC SURVEY | IDAHO GEODETIC SURVEY |
| IDPWD | ID DEPT OF PUB WORKS | IDAHO DEPARTMENT OF PUBLIC WORKS |
| ILD PW | IL DEPT OF PUB WORKS | ILLINOIS DEPARTMENT OF PUBLIC WORKS |
| ILD T | IL DEPT OF TRANSP | ILLINOIS DEPARTMENT OF TRANSPORTATION |
| ILD W | IL DIV OF WATERWAYS | ILLINOIS DIVISION OF WATERWAYS |
| ILGS | IL GEODETIC SURVEY | ILLINOIS GEODETIC SURVEY |
| ILHD | IL HIGHWAY DEPT | ILLINOIS HIGHWAY DEPARTMENT (NOW ILDT) |
| ILSC | IL SANITARY COMM | ILLINOIS SANITARY COMMISSION |
| INDNR | IN DEPT OF NAT RES | INDIANA DEPARTMENT OF NATURAL RESOURCES |
| INFCC | IN FLOOD CONTR COMM | INDIANA FLOOD CONTROL AND WATER RES COMM |
| INGS | IN GEODETIC SURVEY | INDIANA GEODETIC SURVEY |
| INHD | IN HIGHWAY DEPT | INDIANA HIGHWAY DEPARTMENT |
| IOWAGS | IA GEODETIC SURVEY | IOWA GEODETIC SURVEY |
| KSDT | KS DEPT OF TRANSP | KANSAS DEPARTMENT OF TRANSPORTATION |
| KSGS | KS GEODETIC SURVEY | KANSAS GEODETIC SURVEY |
| KSHC | KS HIGHWAY COMM | STATE HIGHWAY COMM OF KANSAS (NOW KSDT) |
| KSWRB | KS WATER RES BOARD | KANSAS WATER RESOURCE BOARD |
| KYDT | KY DEPT OF TRANSP | KENTUCKY DEPARTMENT OF TRANSPORTATION |
| KYGS | KY GEODETIC SURVEY | KENTUCKY GEODETIC SURVEY |
| KYHD | KY HIGHWAY DEPT | KENTUCKY STATE HIGHWAY DEPARTMENT (NOW KYDT) |
| LADH | LA DEPT OF HIGHWAYS | LOUISIANA DEPARTMENT OF HIGHWAYS (NOW LADTD) |
| LADTD | LA TRANSP AND DEV | LOUISIANA DEPT OF TRANSP AND DEVELOPMENT |
| LAGS | LA GEODETIC SURVEY | LOUISIANA GEODETIC SURVEY |
| LASCC | LA CONSERVATION COMM | LOUISIANA STATE CONSERVATION COMMISSION |
| LAWRRI | LA WATER RES INST | LOUISIANA WATER RESOURCE RESEARCH INSTITUTE |
| MADLH | MA DEPT LAND-HARBORS | MASSACHUSETTS DEPARTMENT OF LAND AND HARBORS |
| MADPW | MA DEPT OF PUB WORKS | MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS |
| MAGS | MA GEODETIC SURVEY | MASSACHUSETTS GEODETIC SURVEY |
| MDBC SM | MD BUR SURV AND MAPS | MARYLAND BUREAU OF CONTROL SURVEYS AND MAPS |
| MDDT | MD DEPT OF TRANSP | MARYLAND DEPARTMENT OF TRANSPORTATION |
| MDGS | MD GEODETIC SURVEY | MARYLAND GEODETIC SURVEY |
| MDSFC | MD SHELL FISH COMM | MARYLAND SHELL FISHERIES COMMISSION |
| MDSRC | MD STATE ROADS COMM | MARYLAND STATE ROADS COMMISSION (NOW MDDT) |
| MEDT | ME DEPT OF TRANSP | MAINE DEPARTMENT OF TRANSPORTATION |
| MEGS | ME GEODETIC SURVEY | MAINE GEODETIC SURVEY |
| MEHD | ME HIGHWAY DEPT | MAINE HIGHWAY DEPARTMENT (NOW MEDT) |
| MEPUC | ME PUB UTIL COMM | MAINE PUBLIC UTILITIES COMMISSION |
| ***** | ***** | ***** |

STATE, COMMONWEALTH, AND TERRITORIAL AGENCIES - CONTINUED

| SYMBOL | STANDARD ABBEV NAME | FULL NAME |
|--------|-----------------------|--|
| ***** | ***** | ***** |
| MIDH | MI DEPT OF HIGHWAYS | MICHIGAN DEPT OF STATE HIGHWAYS AND TRANSP |
| MIDNR | MI DEPT OF NAT RES | MICHIGAN DEPARTMENT OF NATURAL RESOURCES |
| MIGS | MI GEODETIC SURVEY | MICHIGAN GEODETIC SURVEY |
| MNDT | MN DEPT OF TRANSP | MINNESOTA DEPARTMENT OF TRANSPORTATION |
| MNGS | MN GEODETIC SURVEY | MINNESOTA GEODETIC SURVEY |
| MNHHD | MN HIGHWAY DEPT | MINNESOTA HIGHWAY DEPARTMENT (NOW MNDT) |
| MOGS | MO GEODETIC SURVEY | MISSOURI GEODETIC SURVEY |
| MOHC | MO HIGHWAY COMM | MISSOURI STATE HIGHWAY COMMISSION |
| MSGGS | MS GEODETIC SURVEY | MISSISSIPPI GEODETIC SURVEY |
| MSHD | MS HIGHWAY DEPT | MISSISSIPPI STATE HIGHWAY DEPARTMENT |
| MTBOR | MT BUR OF PUB ROADS | MONTANA BUREAU OF PUBLIC ROADS |
| MTDH | MT DEPT OF HIGHWAYS | MONTANA DEPARTMENT OF HIGHWAYS |
| MTGS | MT GEODETIC SURVEY | MONTANA GEODETIC SURVEY |
| MTSHC | MT HIGHWAY COMM | MONTANA STATE HIGHWAY COMMISSION |
| NCDF | NC DIV OF FORESTRY | NORTH CAROLINA DIVISION OF FORESTRY |
| NCDOT | NC DOT DIV OF HWYS | NORTH CAROLINA DEPT OF TRANS DIV OF HWYS |
| NCGS | NC GEODETIC SURVEY | NORTH CAROLINA GEODETIC SURVEY |
| NCHPWC | NC HWY AND P & COMM | NORTH CAROLINA HIGHWAY AND PUBLIC WORKS COMM |
| NDGS | ND GEODETIC SURVEY | NORTH DAKOTA GEODETIC SURVEY |
| NDHD | ND HIGHWAY DEPT | NORTH DAKOTA HIGHWAY DEPARTMENT |
| NDWC | ND WATER COMMISSION | NORTH DAKOTA WATER COMMISSION |
| NEDR | NE DEPT OF ROADS | NEBRASKA DEPARTMENT OF ROADS |
| NEGS | NE GEODETIC SURVEY | NEBRASKA GEODETIC SURVEY |
| NHDPW | NH DEPT OF PUB WORKS | NEW HAMPSHIRE DEPARTMENT OF PUBLIC WORKS |
| NHGS | NH GEODETIC SURVEY | NEW HAMPSHIRE GEODETIC SURVEY |
| NHHHD | NH HIGHWAY DEPT | NEW HAMPSHIRE HIGHWAY DEPARTMENT |
| NJBCN | NJ BOARD OF COMMERCE | NEW JERSEY BOARD OF COMMERCE AND NAVIGATION |
| NJDCED | NJ CONS AND ECON DEV | NEW JERSEY DEPT OF CONSERVATION AND ECON DEV |
| NJDT | NJ DEPT OF TRANSP | NEW JERSEY DEPARTMENT OF TRANSPORTATION |
| NJGS | NJ GEODETIC SURVEY | NEW JERSEY GEODETIC SURVEY |
| NMGS | NM GEODETIC SURVEY | NEW MEXICO GEODETIC SURVEY |
| NMHHD | NM HIGHWAY DEPT | NEW MEXICO STATE HIGHWAY DEPARTMENT |
| NVDH | NV DEPT OF HIGHWAYS | NEVADA DEPARTMENT OF HIGHWAYS |
| NVGS | NV GEODETIC SURVEY | NEVADA GEODETIC SURVEY |
| NYDPW | NY DEPT OF PUB WORKS | NEW YORK STATE DEPARTMENT OF PUBLIC WORKS |
| NYDT | NY DEPT OF TRANSP | NEW YORK STATE DEPARTMENT OF TRANSPORTATION |
| NYGS | NY GEODETIC SURVEY | NEW YORK GEODETIC SURVEY |
| NYHD | NY DEPT OF HIGHWAYS | NEW YORK DEPARTMENT OF HIGHWAYS (NOW NYDT) |
| NYLISP | NY LONG ISLAND SPA | NEW YORK LONG ISLAND STATE PARK AUTHORITY |
| YNPNA | NY NIAGARA PWR AUTH | NEW YORK NIAGARA POWER AUTHORITY |
| NYSS | NY STATE SURVEY | NEW YORK STATE SURVEY |
| OHDT | OH DEPT OF TRANSP | OHIO DEPARTMENT OF TRANSPORTATION |
| OHGS | OH GEODETIC SURVEY | OHIO GEODETIC SURVEY |
| OHHD | OH HIGHWAY DEPT | OHIO HIGHWAY DEPARTMENT (NOW OHDT) |
| OKCC | OK CONSERVATION COMM | OKLAHOMA CONSERVATION COMMISSION |
| OKDH | OK DEPT OF HIGHWAYS | OKLAHOMA DEPARTMENT OF HIGHWAYS |
| OKGS | OK GEODETIC SURVEY | OKLAHOMA GEODETIC SURVEY |
| ORDT | OR DEPT OF TRANSP | OREGON DEPARTMENT OF TRANSPORTATION |
| ORGs | OR GEODETIC SURVEY | OREGON GEODETIC SURVEY |
| ORHD | OR HIGHWAY DEPT | OREGON STATE HIGHWAY DEPARTMENT (NOW ORDT) |
| ORSLB | OR STATE LAND BOARD | OREGON STATE LAND BOARD |
| PADFW | PA DEPT FOREST'S WTRS | PENNSYLVANIA DEPT OF FORESTS AND WATERS |
| PADH | PA DEPT OF HIGHWAYS | PENNSYLVANIA DEPT OF HIGHWAYS (NOW PADT) |
| ***** | ***** | ***** |

STATE, COMMONWEALTH, AND TERRITORIAL AGENCIES - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|---|
| ***** | ***** | ***** |
| PADT | PA DEPT OF TRANSP | PENNSYLVANIA DEPARTMENT OF TRANSPORTATION |
| PAGS | PA GEODETIC SURVEY | PENNSYLVANIA GEODETIC SURVEY |
| RIBPR | RI BUR OF PUB ROADS | RHODE ISLAND BUREAU OF PUBLIC ROADS |
| RIGS | RI GEODETIC SURVEY | RHODE ISLAND GEODETIC SURVEY |
| SCGS | SC GEODETIC SURVEY | SOUTH CAROLINA GEODETIC SURVEY |
| SCHD | SC HIGHWAY DEPT | SOUTH CAROLINA STATE HIGHWAY DEPARTMENT |
| SDDT | SD DEPT OF TRANSP | SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION |
| SDHD | SD HIGHWAY DEPT | SOUTH DAKOTA HIGHWAY DEPARTMENT (NOW SDDT) |
| TNDG | TN DIV OF GEOLOGY | TENNESSEE DIVISION OF GEOLOGY |
| TNDT | TN DEPT OF TRANSP | TENNESSEE DEPARTMENT OF TRANSPORTATION |
| TNGS | TN GEODETIC SURVEY | TENNESSEE GEODETIC SURVEY |
| TNHD | TN HIGHWAY DEPT | TENNESSEE HIGHWAY DEPARTMENT (NOW TNDT) |
| TXGS | TX GEODETIC SURVEY | TEXAS GEODETIC SURVEY |
| TXHD | TX HIGHWAY DEPT | TEXAS HIGHWAY DEPARTMENT |
| TXRD | TX RECLAMATION DEPT | TEXAS RECLAMATION DEPARTMENT |
| UTDH | UT DEPT OF HIGHWAYS | UTAH STATE DEPARTMENT OF HIGHWAYS |
| VACF | VA COMM OF FISHERIES | VIRGINIA COMMISSION OF FISHERIES |
| VADH | VA DEPT OF HIGHWAYS | VIRGINIA DEPARTMENT OF HIGHWAYS |
| VAGS | VA GEODETIC SURVEY | VIRGINIA GEODETIC SURVEY |
| VTAT | VT AGENCY OF TRANSP | VERMONT AGENCY OF TRANSPORTATION |
| VTDH | VT DEPT OF HIGHWAYS | VERMONT DEPARTMENT OF HIGHWAYS (NOW VTAT) |
| VTFS | VT FOREST SERVICE | VERMONT FOREST SERVICE |
| VTGS | VT GEODETIC SURVEY | VERMONT GEODETIC SURVEY |
| WADNR | WA DEPT OF NAT RES | WASHINGTON DEPARTMENT OF NATURAL RESOURCES |
| WADPL | WA DEPT OF PUB LANDS | WASHINGTON STATE DEPARTMENT OF PUBLIC LANDS |
| WAGS | WA GEODETIC SURVEY | WASHINGTON GEODETIC SURVEY |
| WAHC | WA HIGHWAY COMM | WASHINGTON STATE HIGHWAY COMMISSION |
| WATBA | WA TOLL BRIDGE AUTH | WASHINGTON STATE TOLL BRIDGE AUTHORITY |
| WIDNR | WI DEPT OF NAT RES | WISCONSIN DEPARTMENT OF NATURAL RESOURCES |
| WIDT | WI DEPT OF TRANSP | WISCONSIN DEPARTMENT OF TRANSPORTATION |
| WIGS | WI GEODETIC SURVEY | WISCONSIN GEODETIC SURVEY |
| WIHD | WI HIGHWAY DEPT | WISCONSIN HIGHWAY DEPARTMENT (NOW WIDT) |
| WIPSC | WI PUB SERVICE COMM | WISCONSIN PUBLIC SERVICE COMMISSION |
| WIRRC | WI RAILROAD COMM | WISCONSIN RAILROAD COMMISSION |
| WVGS | WV GEODETIC SURVEY | WEST VIRGINIA GEODETIC SURVEY |
| WVHD | WV HIGHWAY DEPT | WEST VIRGINIA HIGHWAY DEPARTMENT |
| WYHD | WY HIGHWAY DEPT | WYOMING HIGHWAY DEPARTMENT |
| ***** | ***** | ***** |

COUNTY AGENCIES

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|--------------------------------|
| ***** | ***** | ***** |
| AL-107 | PICKENS CO | PICKENS COUNTY ALABAMA |
| AL-119 | SUMTER CO | SUMTER COUNTY ALABAMA |
| CA-001 | ALAMEDA CO | ALAMEDA COUNTY CALIFORNIA |
| CA-013 | CONTRA COSTA CO | CONTRA COSTA COUNTY CALIFORNIA |
| CA-019 | FRESNO CO | FRESNO COUNTY CALIFORNIA |
| CA-023 | HUMBOLDT CO | HUMBOLDT COUNTY CALIFORNIA |
| CA-025 | IMPERIAL CO | IMPERIAL COUNTY CALIFORNIA |
| CA-027 | INYO CO | INYO COUNTY CALIFORNIA |
| CA-029 | KERN CO | KERN COUNTY CALIFORNIA |
| ***** | ***** | ***** |

COUNTY AGENCIES - CONTINUED

| SYMBOL | STANDARD ABBEV NAME | FULL NAME |
|--------|---------------------|-----------------------------------|
| ***** | ***** | ***** |
| CA-031 | KINGS CO | KINGS COUNTY CALIFORNIA |
| CA-033 | LAKE CO | LAKE COUNTY CALIFORNIA |
| CA-037 | LOS ANGELES CO | LOS ANGELES COUNTY CALIFORNIA |
| CA-041 | MARIN CO | MARIN COUNTY CALIFORNIA |
| CA-043 | MARIPOSA CO | MARIPOSA COUNTY CALIFORNIA |
| CA-045 | MENDOCINO CO | MENDOCINO COUNTY CALIFORNIA |
| CA-051 | MONO CO | MONO COUNTY CALIFORNIA |
| CA-053 | MONTEREY CO | MONTEREY COUNTY CALIFORNIA |
| CA-055 | NAPA CO | NAPA COUNTY CALIFORNIA |
| CA-059 | ORANGE CO | ORANGE COUNTY CALIFORNIA |
| CA-063 | PLUMAS CO | PLUMAS COUNTY CALIFORNIA |
| CA-065 | RIVERSIDE CO | RIVERSIDE COUNTY CALIFORNIA |
| CA-067 | SACRAMENTO CO | SACRAMENTO COUNTY CALIFORNIA |
| CA-069 | SAN BENITO CO | SAN BENITO COUNTY CALIFORNIA |
| CA-071 | SAN BERNARDINO CO | SAN BERNARDINO COUNTY CALIFORNIA |
| CA-073 | SAN DIEGO CO | SAN DIEGO COUNTY CALIFORNIA |
| CA-075 | SAN FRANCISCO CO | SAN FRANCISCO COUNTY CALIFORNIA |
| CA-077 | SAN JOAQUIN CO | SAN JOAQUIN COUNTY CALIFORNIA |
| CA-079 | SAN LUIS OBISPO CO | SAN LUIS OBISPO COUNTY CALIFORNIA |
| CA-081 | SAN MATEO CO | SAN MATEO COUNTY CALIFORNIA |
| CA-083 | SANTA BARBARA CO | SANTA BARBARA COUNTY CALIFORNIA |
| CA-087 | SANTA CRUZ CO | SANTA CRUZ COUNTY CALIFORNIA |
| CA-089 | SHASTA CO | SHASTA COUNTY CALIFORNIA |
| CA-091 | SIERRA CO | SIERRA COUNTY CALIFORNIA |
| CA-093 | SISKIYOU CO | SISKIYOU COUNTY CALIFORNIA |
| CA-097 | SONOMA CO | SONOMA COUNTY CALIFORNIA |
| CA-099 | STANISLAUS CO | STANISLAUS COUNTY CALIFORNIA |
| CA-103 | TEHAMA CO | TEHAMA COUNTY CALIFORNIA |
| CA-105 | TRINITY CO | TRINITY COUNTY CALIFORNIA |
| CA-107 | TULARE CO | TULARE COUNTY CALIFORNIA |
| CA-109 | TUOLUMNE CO | TUOLUMNE COUNTY CALIFORNIA |
| CA-111 | VENTURA CO | VENTURA COUNTY CALIFORNIA |
| CA-113 | YOLO CO | YOLO COUNTY CALIFORNIA |
| CO-017 | CHEYENNE CO | CHEYENNE COUNTY COLORADO |
| CO-061 | KIOWA CO | KIOWA COUNTY COLORADO |
| FL-011 | BROWARD CO | BROWARD COUNTY FLORIDA |
| FL-025 | DADE CO | DADE COUNTY FLORIDA |
| FL-053 | HERNANDO CO | HERNANDO COUNTY FLORIDA |
| FL-057 | HILLSBOROUGH CO | HILLSBOROUGH COUNTY FLORIDA |
| FL-071 | LEE CO | LEE COUNTY FLORIDA |
| FL-081 | MANATEE CO | MANATEE COUNTY FLORIDA |
| FL-099 | PALM BEACH CO | PALM BEACH COUNTY FLORIDA |
| FL-101 | PASCO CO | PASCO COUNTY FLORIDA |
| FL-103 | PINELLAS CO | PINELLAS COUNTY FLORIDA |
| FL-131 | WALTON CO | WALTON COUNTY FLORIDA |
| IA-105 | JONES CO | JONES COUNTY IOWA |
| IA-113 | LINN CO | LINN COUNTY IOWA |
| IA-159 | RINGGOLD CO | RINGGOLD COUNTY IOWA |
| IA-165 | SHELBY CO | SHELBY COUNTY IOWA |
| IL-031 | COOK CO | COOK COUNTY ILLINOIS |
| IL-051 | FAYETTE CO | FAYETTE COUNTY ILLINOIS |
| IL-103 | LEE CO | LEE COUNTY ILLINOIS |
| IL-163 | ST CLAIR CO | ST CLAIR COUNTY ILLINOIS |
| ***** | ***** | ***** |

COUNTY AGENCIES - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|-----------------------------------|
| ***** | ***** | ***** |
| IL-195 | WHITESIDE CO | WHITESIDE COUNTY ILLINOIS |
| IN-003 | ALLEN CO | ALLEN COUNTY INDIANA |
| IN-039 | ELKHART CO | ELKHART COUNTY INDIANA |
| IN-085 | KOSCIUSKO CO | KOSCIUSKO COUNTY INDIANA |
| IN-127 | PORTER CO | PORTER COUNTY INDIANA |
| IN-131 | PULASKI CO | PULASKI COUNTY INDIANA |
| IN-141 | ST JOSEPH CO | ST JOSEPH COUNTY INDIANA |
| KS-189 | STEVENS CO | STEVENS COUNTY KANSAS |
| KS-203 | WICHITA CO | WICHITA COUNTY KANSAS |
| LA-033 | EAST BATON ROUGE PAR | EAST BATON ROUGE PARISH LOUISIANA |
| MD-021 | FREDERICK CO | FREDERICK COUNTY MARYLAND |
| MD-043 | WASHINGTON CO | WASHINGTON COUNTY MARYLAND |
| ME-007 | FRANKLIN CO | FRANKLIN COUNTY MAINE |
| MI-005 | ALLEGAN CO | ALLEGAN COUNTY MICHIGAN |
| MI-011 | ARENAC CO | ARENAC COUNTY MICHIGAN |
| MI-033 | CHIPPEWA CO | CHIPPEWA COUNTY MICHIGAN |
| MI-053 | GOGEVIC CO | GOGEVIC COUNTY MICHIGAN |
| MI-061 | HOUGHTON CO | HOUGHTON COUNTY MICHIGAN |
| MI-063 | HURON CO | HURON COUNTY MICHIGAN |
| MI-075 | JACKSON CO | JACKSON COUNTY MICHIGAN |
| MI-081 | KENT CO | KENT COUNTY MICHIGAN |
| MI-125 | OAKLAND CO | OAKLAND COUNTY MICHIGAN |
| MI-163 | WAYNE CO | WAYNE COUNTY MICHIGAN |
| MN-061 | ITASCA CO | ITASCA COUNTY MINNESOTA |
| MS-135 | TALLAHATCHIE CO | TALLAHATCHIE COUNTY MISSISSIPPI |
| MS-145 | UNION CO | UNION COUNTY MISSISSIPPI |
| ND-057 | MERCER CO | MERCER COUNTY NORTH DAKOTA |
| NJ-017 | HUDSON CO | HUDSON COUNTY NEW JERSEY |
| NV-027 | PERSHING CO | PERSHING COUNTY NEVADA |
| NY-023 | CORTLAND CO | CORTLAND COUNTY NEW YORK |
| NY-025 | DELAWARE CO | DELAWARE COUNTY NEW YORK |
| NY-055 | MONROE CO | MONROE COUNTY NEW YORK |
| NY-057 | MONTGOMERY CO | MONTGOMERY COUNTY NEW YORK |
| NY-059 | NASSAU CO | NASSAU COUNTY NEW YORK |
| NY-065 | ONEIDA CO | ONEIDA COUNTY NEW YORK |
| NY-069 | ONTARIO CO | ONTARIO COUNTY NEW YORK |
| NY-091 | SARATOGA CO | SARATOGA COUNTY NEW YORK |
| NY-103 | SUFFOLK CO | SUFFOLK COUNTY NEW YORK |
| NY-111 | ULSTER CO | ULSTER COUNTY NEW YORK |
| NY-119 | WESTCHESTER CO | WESTCHESTER COUNTY NEW YORK |
| OH-051 | FULTON CO | FULTON COUNTY OHIO |
| OH-095 | LUCAS CO | LUCAS COUNTY OHIO |
| OH-099 | MAHONING CO | MAHONING COUNTY OHIO |
| OH-113 | MONTGOMERY CO | MONTGOMERY COUNTY OHIO |
| OH-133 | PORTAGE CO | PORTAGE COUNTY OHIO |
| OH-151 | STARK CO | STARK COUNTY OHIO |
| OK-133 | SEMINOLE CO | SEMINOLE COUNTY OKLAHOMA |
| OR-017 | DESCHUTES CO | DESCHUTES COUNTY OREGON |
| OR-019 | DOUGLAS CO | DOUGLAS COUNTY OREGON |
| OR-029 | JACKSON CO | JACKSON COUNTY OREGON |
| OR-039 | LANE CO | LANE COUNTY OREGON |
| PA-003 | ALLEGHENY CO | ALLEGHENY COUNTY PENNSYLVANIA |
| PA-085 | MERCER CO | MERCER COUNTY PENNSYLVANIA |
| ***** | ***** | ***** |

COUNTY AGENCIES - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|------------------------------|
| ***** | ***** | ***** |
| PA-133 | YORK CO | YORK COUNTY PENNSYLVANIA |
| TN-069 | HARDEMAN CO | HARDEMAN COUNTY TENNESSEE |
| TX-049 | BROWN CO | BROWN COUNTY TEXAS |
| TX-141 | EL PASO CO | EL PASO COUNTY TEXAS |
| UT-035 | SALT LAKE CO | SALT LAKE COUNTY UTAH |
| VA-059 | FAIRFAX CO | FAIRFAX COUNTY VIRGINIA |
| VA-085 | HANOVER CO | HANOVER COUNTY VIRGINIA |
| VA-087 | HENRICO CO | HENRICO COUNTY VIRGINIA |
| WA-033 | KING CO | KING COUNTY WASHINGTON |
| WA-049 | PACIFIC CO | PACIFIC CO WASHINGTON |
| WI-027 | DODGE C | DODGE COUNTY WISCONSIN |
| WI-101 | RACINE CO | RACINE COUNTY WISCONSIN |
| WV-069 | OHIO CO | OHIO COUNTY WEST VIRGINIA |
| WV-085 | RITCHIE CO | RITCHIE COUNTY WEST VIRGINIA |
| ***** | ***** | ***** |

CITY AGENCIES

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|---------------------------------|
| ***** | ***** | ***** |
| AL2130 | C OF MONTGOMERY | CITY OF MONTGOMERY ALABAMA |
| AR3880 | C OF TUPELO | CITY OF TUPELO ARKANSAS |
| AR4063 | C OF WELDON | CITY OF WELDON ARKANSAS |
| CA0010 | C OF ALAMEDA | CITY OF ALAMEDA CALIFORNIA |
| CA0340 | C OF BERKELEY | CITY OF BERKELEY CALIFORNIA |
| CA0470 | C OF BUENA PARK | CITY OF BUENA PARK CALIFORNIA |
| CA0480 | C OF BURBANK | CITY OF BURBANK CALIFORNIA |
| CA0537 | C OF CAMPBELL | CITY OF CAMPBELL CALIFORNIA |
| CA0710 | C OF CHULA VISTA | CITY OF CHULA VISTA CALIFORNIA |
| CA0790 | C OF COLTON | CITY OF COLTON CALIFORNIA |
| CA1182 | C OF ENCINITAS | CITY OF ENCINITAS CALIFORNIA |
| CA1220 | C OF EUREKA | CITY OF EUREKA CALIFORNIA |
| CA1364 | C OF FREMONT | CITY OF FREMONT CALIFORNIA |
| CA1370 | C OF FRESNO | CITY OF FRESNO CALIFORNIA |
| CA1430 | C OF GLENDALE | CITY OF GLENDALE CALIFORNIA |
| CA1520 | C OF GUSTINE | CITY OF GUSTINE CALIFORNIA |
| CA1540 | C OF HANFORD | CITY OF HANFORD CALIFORNIA |
| CA1580 | C OF HEMET | CITY OF HEMET CALIFORNIA |
| CA1560 | C OF HAYWARD | CITY OF HAYWARD CALIFORNIA |
| CA1970 | C OF LONG BEACH | CITY OF LONG BEACH CALIFORNIA |
| CA1980 | C OF LOS ANGELES | CITY OF LOS ANGELES CALIFORNIA |
| CA2090 | C OF MARTINEZ | CITY OF MARTINEZ CALIFORNIA |
| CA2290 | C OF MORRO BAY | CITY OF MORRO BAY CALIFORNIA |
| CA2390 | C OF NEWMAN | CITY OF NEWMAN CALIFORNIA |
| CA2480 | C OF OAKLAND | CITY OF OAKLAND CALIFORNIA |
| CA2550 | C OF ONTARIO | CITY OF ONTARIO CALIFORNIA |
| CA2650 | C OF PALM SPRINGS | CITY OF PALM SPRINGS CALIFORNIA |
| CA2700 | C OF PASADENA | CITY OF PASADENA CALIFORNIA |
| CA2780 | C OF PISMO BEACH | CITY OF PISMO BEACH CALIFORNIA |
| CA2840 | C OF PLEASANTON | CITY OF PLEASANTON CALIFORNIA |
| CA2880 | C OF PORTERVILLE | CITY OF PORTERVILLE CALIFORNIA |
| CA2940 | C OF RED BLUFF | CITY OF RED BLUFF CALIFORNIA |
| ***** | ***** | ***** |

CITY AGENCIES - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|------------------------------------|
| ***** | ***** | ***** |
| CA2970 | C OF REDONDO BEACH | CITY OF REDONDO BEACH CALIFORNIA |
| CA2980 | C OF REDWOOD CITY | CITY OF REDWOOD CITY CALIFORNIA |
| CA3210 | C OF SAN BERNARDINO | CITY OF SAN BERNARDINO CALIFORNIA |
| CA3260 | C OF SAN DIEGO | CITY OF SAN DIEGO CALIFORNIA |
| CA3280 | C OF SAN FERNANDO | CITY OF SAN FERNANDO CALIFORNIA |
| CA3290 | C OF SAN FRANCISCO | CITY OF SAN FRANCISCO CALIFORNIA |
| CA3340 | C OF SAN JOSE | CITY OF SAN JOSE CALIFORNIA |
| CA3370 | C OF SAN LUIS OBISPO | CITY OF SAN LUIS OBISPO CALIFORNIA |
| CA3380 | C OF SAN MARINO | CITY OF SAN MARINO CALIFORNIA |
| CA3390 | C OF SAN MATEO | CITY OF SAN MATEO CALIFORNIA |
| CA3410 | C OF SAN RAFAEL | CITY OF SAN RAFAEL CALIFORNIA |
| CA3420 | C OF SANTA ANA | CITY OF SANTA ANA CALIFORNIA |
| CA3460 | C OF SANTA MARIA | CITY OF SANTA MARIA CALIFORNIA |
| CA3480 | C OF SANTA PAULA | CITY OF SANTA PAULA CALIFORNIA |
| CA3490 | C OF SANTA ROSA | CITY OF SANTA ROSA CALIFORNIA |
| CA3590 | C OF SELMA | CITY OF SELMA CALIFORNIA |
| CA3660 | C OF SONOMA | CITY OF SONOMA CALIFORNIA |
| CA3800 | C OF SUSANVILLE | CITY OF SUSANVILLE CALIFORNIA |
| CA3920 | C OF TULARE | CITY OF TULARE CALIFORNIA |
| CA4020 | C OF VALLEJO | CITY OF VALLEJO CALIFORNIA |
| CA4027 | C OF VENTURA | CITY OF VENTURA CALIFORNIA |
| CA4070 | C OF WALNUT CREEK | CITY OF WALNUT CREEK CALIFORNIA |
| CA4100 | C OF WATSONVILLE | CITY OF WATSONVILLE CALIFORNIA |
| CO2150 | C OF ROCKY FORD | CITY OF ROCKY FORD COLORADO |
| CT0080 | C OF BRIDGEPORT | CITY OF BRIDGEPORT CONNECTICUT |
| CT0280 | C OF HARTFORD | CITY OF HARTFORD CONNECTICUT |
| CT0360 | C OF MADISON | CITY OF MADISON CONNECTICUT |
| CT0370 | C OF MERIDEN | CITY OF MERIDEN CONNECTICUT |
| CT0380 | C OF MIDDLETOWN | CITY OF MIDDLETOWN CONNECTICUT |
| CT0430 | C OF NEW HAVEN | CITY OF NEW HAVEN CONNECTICUT |
| CT0810 | C OF WATERBURY | CITY OF WATERBURY CONNECTICUT |
| FL0290 | C OF BOCA RATON | CITY OF BOCA RATON FLORIDA |
| FL0570 | C OF CLEARWATER | CITY OF CLEARWATER FLORIDA |
| FL0780 | C OF DAYTONA BEACH | CITY OF DAYTONA BEACH FLORIDA |
| FL1420 | C OF HOLLYWOOD | CITY OF HOLLYWOOD FLORIDA |
| FL1510 | C OF JACKSONVILLE | CITY OF JACKSONVILLE FLORIDA |
| FL2010 | C OF MIAMI | CITY OF MIAMI FLORIDA |
| FL2730 | C OF ST PETERSBURG | CITY OF ST PETERSBURG FLORIDA |
| FL2940 | C OF TALLAHASSEE | CITY OF TALLAHASSEE FLORIDA |
| GA0760 | C OF BRUNSWICK | CITY OF BRUNSWICK GEORGIA |
| GA3440 | C OF MARIETTA | CITY OF MARIETTA GEORGIA |
| HI2400 | C OF HONOLULU | CITY OF HONOLULU HAWAII |
| IA2520 | C OF DYSART | CITY OF DYSART IOWA |
| IA2530 | C OF EAGLE GROVE | CITY OF EAGLE GROVE IOWA |
| IA5240 | C OF MAQUOKETA | CITY OF MAQUOKETA IOWA |
| IA7490 | C OF SAC CITY | CITY OF SAC CITY IOWA |
| IA8880 | C OF WEBSTER CITY | CITY OF WEBSTER CITY IOWA |
| IL0840 | C OF BLOOMINGTON | CITY OF BLOOMINGTON ILLINOIS |
| IL1670 | C OF CHICAGO | CITY OF CHICAGO ILLINOIS |
| IL2380 | C OF DIXON | CITY OF DIXON ILLINOIS |
| IL3200 | C OF FREEBURG | CITY OF FREEBURG ILLINOIS |
| IL3910 | C OF HIGHLAND PARK | CITY OF HIGHLAND PARK ILLINOIS |
| IL4710 | C OF LAWRENCEVILLE | CITY OF LAWRENCEVILLE ILLINOIS |
| ***** | ***** | ***** |

CITY AGENCIES -- CONTINUED

| SYMBOL | STANDARD ABBEV NAME | FULL NAME |
|--------|----------------------|---------------------------------------|
| ***** | ***** | ***** |
| IL4910 | C OF LOCKPORT | CITY OF LOCKPORT ILLINOIS |
| IL5360 | C OF MASON CITY | CITY OF MASON CITY ILLINOIS |
| IL6850 | C OF PEORIA | CITY OF PEORIA ILLINOIS |
| IL7640 | C OF ST CHARLES | CITY OF ST CHARLES ILLINOIS |
| IL9210 | C OF WESTERN SPRINGS | CITY OF WESTERN SPRINGS ILLINOIS |
| IN1830 | C OF GOSHEN | CITY OF GOSHEN INDIANA |
| IN3480 | C OF NEW HAVEN | CITY OF NEW HAVEN INDIANA |
| KS5400 | C OF TOPEKA | CITY OF TOPEKA KANSAS |
| KY2090 | C OF LOUISVILLE | CITY OF LOUISVILLE KENTUCKY |
| LA0040 | C OF ALEXANDRIA | CITY OF ALEXANDRIA LOUISIANA |
| LA1150 | C OF JONESBORO | CITY OF JONESBORO LOUISIANA |
| LA1690 | C OF NEW ORLEANS | CITY OF NEW ORLEANS LOUISIANA |
| LA2410 | C OF WEST MONROE | CITY OF WEST MONROE LOUISIANA |
| MA0035 | C OF ANDOVER | CITY OF ANDOVER MASSACHUSETTS |
| MA0120 | C OF BOSTON | CITY OF BOSTON MASSACHUSETTS |
| MA0170 | C OF CAMBRIDG | CITY OF CAMBRIDGE MASSACHUSETTS |
| MA0660 | C OF MELDEN | CITY OF MELDEN MASSACHUSETTS |
| MD0050 | C OF BALTIMOR | CITY OF BALTIMORE MARYLAND |
| MD0580 | C OF FREDERICK | CITY OF FREDERICK MARYLAND |
| MD0730 | C OF HAGERSTOWN | CITY OF HAGERSTOWN MARYLAND |
| ME0250 | C OF BANGOR | CITY OF BANGOR MAINE |
| ME6400 | C OF PORTLAND | CITY OF PORTLAND MAINE |
| MI0490 | C OF BIRMINGHAM | CITY OF BIRMINGHAM MICHIGAN |
| MI0700 | C OF CADILLAC | CITY OF CADILLAC MICHIGAN |
| MI0890 | C OF CHARLOTT | CITY OF CHARLOTTE MICHIGAN |
| MI1150 | C OF CROSWELL | CITY OF CROSWELL MICHIGAN |
| MI1260 | C OF DETROIT | CITY OF DETROIT MICHIGAN |
| MI1730 | C OF FLINT | CITY OF FLINT MICHIGAN |
| MI1800 | C OF FRANKFOR | CITY OF FRANKFORT MICHIGAN |
| MI2010 | C OF GRAND RAPIDS | CITY OF GRAND RAPIDS MICHIGAN |
| MI2520 | C OF KALAMAZOO | CITY OF KALAMAZOO MICHIGAN |
| MI2990 | C OF MANTON | CITY OF MANTON MICHIGAN |
| MI3320 | C OF MONROE | CITY OF MONROE MICHIGAN |
| MI3740 | C OF OTSEGO | CITY OF OTSEGO MICHIGAN |
| MI4020 | C OF PONTIAC | CITY OF PONTIAC MICHIGAN |
| MI4760 | C OF STURGIS | CITY OF STURGIS MICHIGAN |
| MI5310 | C OF WYANDOTT | CITY OF WYANDOTTE MICHIGAN |
| MN4760 | C OF MINNEAPOLIS | CITY OF MINNEAPOLIS MINNESOTA |
| MO7070 | C OF ST JOSEP | CITY OF ST JOSEPH MISSOURI |
| MO7080 | C OF ST LOUIS | CITY OF ST LOUIS MISSOURI |
| NC1460 | C OF ELIZABETI CITY | CITY OF ELIZABETH CITY NORTH CAROLINA |
| NC1940 | C OF GREENSBORO | CITY OF GREENSBORO NORTH CAROLINA |
| NC4070 | C OF SALISBURY | CITY OF SALISBURY NORTH CAROLINA |
| NH0020 | C OF BERLIN | CITY OF BERLIN NEW HAMPSHIRE |
| NJ1775 | C OF LYNDHURST | CITY OF LYNDHURST NEW JERSEY |
| NJ2130 | C OF NEWARK | CITY OF NEWARK NEW JERSEY |
| NJ2510 | C OF PATERSON | CITY OF PATERSON NEW JERSEY |
| NJ2570 | C OF PERTH AMBOY | CITY OF PERTH AMBOY NEW JERSEY |
| NJ3705 | C OF WOODBRIDGE | CITY OF WOODBRIDGE NEW JERSEY |
| NM0030 | C OF ALBUQUERQUE | CITY OF ALBUQUERQUE NEW MEXICO |
| NV0139 | C OF MOUNTAIN CITY | CITY OF MOUNTAIN CITY NEVADA |
| NV0170 | C OF RENO | CITY OF RENO NEVADA |
| NY0750 | C OF BUFFALO | CITY OF BUFFALO NEW YORK |
| ***** | ***** | ***** |

CITY AGENCIES - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|---------------------------------------|
| ***** | ***** | ***** |
| NY3070 | C OF LACKAWANNA | CITY OF LACKAWANNA NEW YORK |
| NY3340 | C OF LOCKPORT | CITY OF LOCKPORT NEW YORK |
| NY3940 | C OF MOUNT VERNON | CITY OF MOUNT VERNON NEW YORK |
| NY4120 | C OF NEW ROCHELLE | CITY OF NEW ROCHELLE NEW YORK |
| NY4170 | C OF NEW YORK | CITY OF NEW YORK NEW YORK |
| NY4210 | C OF NIAGARA FALLS | CITY OF NIAGARA FALLS NEW YORK |
| NY5230 | C OF ROCHESTER | CITY OF ROCHESTER NEW YORK |
| NY6450 | C OF WATERTOWN | CITY OF WATERTOWN NEW YORK |
| NY6820 | C OF YONKERS | CITY OF YONKERS NEW YORK |
| OH0070 | C OF AKRON | CITY OF AKRON OHIO |
| OH1320 | C OF CANTON | CITY OF CANTON OHIO |
| OH1610 | C OF CINCINNATI | CITY OF CINCINNATI OHIO |
| OH1680 | C OF CLEVELAND | CITY OF CLEVELAND OHIO |
| OH1800 | C OF COLUMBUS | CITY OF COLUMBUS OHIO |
| OH2090 | C OF DAYTON | CITY OF DAYTON OHIO |
| OH3895 | C OF KETTERING | CITY OF KETTERING OHIO |
| OH4820 | C OF MASSILLION | CITY OF MASSILLION OHIO |
| OH8070 | C OF TIFFIN | CITY OF TIFFIN OHIO |
| OH8120 | C OF TOLEDO | CITY OF TOLEDO OHIO |
| OR1310 | C OF MEDFORD | CITY OF MEDFORD OREGON |
| OR1650 | C OF PORTLAND | CITY OF PORTLAND OREGON |
| OR1810 | C OF SALEM | CITY OF SALEM OREGON |
| PA0110 | C OF ALLENTOWN | CITY OF ALLENTOWN PENNSYLVANIA |
| PA1230 | C OF CHAMBERSBURG | CITY OF CHAMBERSBURG PENNSYLVANIA |
| PA1296 | C OF CHESTER TOWNSHP | CITY OF CHESTER TOWNSHIP PENNSYLVANIA |
| PA2270 | C OF EASTON | CITY OF EASTON PENNSYLVANIA |
| PA4010 | C OF JOHNSTOWN | CITY OF JOHNSTOWN PENNSYLVANIA |
| PA6600 | C OF PITTSBURGH | CITY OF PITTSBURGH PENNSYLVANIA |
| PA8880 | C OF WASHINGTON | CITY OF WASHINGTON PENNSYLVANIA |
| PA8920 | C OF WAYNESBORO | CITY OF WAYNESBORO PENNSYLVANIA |
| TX1730 | C OF DALLAS | CITY OF DALLAS TEXAS |
| TX2450 | C OF FORT WORTH | CITY OF FORT WORTH TEXAS |
| TX3280 | C OF HOUSTON | CITY OF HOUSTON TEXAS |
| TX6090 | C OF SAN ANTONIO | CITY OF SAN ANTONIO TEXAS |
| VA1720 | C OF NEWPORT NEWS | CITY OF NEWPORT NEWS VIRGINIA |
| VA1760 | C OF NORFOLK | CITY OF NORFOLK VIRGINIA |
| VA2060 | C OF RICHMOND | CITY OF RICHMOND VIRGINIA |
| VA2540 | C OF VIRGINIA BEACH | CITY OF VIRGINIA BEACH VIRGINIA |
| WA1960 | C OF SEATTLE | CITY OF SEATTLE WASHINGTON |
| WI1760 | C OF FORT ATKINSON | CITY OF FORT ATKINSON WISCONSIN |
| WI2320 | C OF JANESVILLE | CITY OF JANESVILLE WISCONSIN |
| WI3100 | C OF MILWAUKEE | CITY OF MILWAUKEE WISCONSIN |
| WI3810 | C OF PLYMOUTH | CITY OF PLYMOUTH WISCONSIN |
| WI4060 | C OF RHINELANDER | CITY OF RHINELANDER WISCONSIN |
| WI4330 | C OF SHEBOYGAN | CITY OF SHEBOYGAN WISCONSIN |
| WV0260 | C OF BLUEFIELD | CITY OF BLUEFIELD WEST VIRGINIA |
| ***** | ***** | ***** |

PUBLIC INTER-CITY AND REGIONAL AGENCIES

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|-----------------------|--|
| ***** | ***** | ***** |
| ACWD | ALAMEDA CO WTR DISTR | ALAMEDA COUNTY WATER DISTRICT |
| AEDW | ARVIN-EDISON DISTR | ARVIN-EDISON WATER DISTRICT |
| CID | CENTER IRRIG DISTR | CENTERVILLE IRRIGATION DISTRICT |
| CRGS | CLEVE R&G GEO SURV | CLEVELAND REGIONAL GEODETIC SURVEY |
| DMWW | DENVER MUN WATER WKS | DENVER MUNICIPAL WATER WORKS |
| EBDA | EAST BAY DISCH AUTH | EAST BAY SEWAGE DISCHARGE AUTHORITY |
| EBMUD | E BAY MUN UTIL DISTR | EAST BAY MUNICIPAL UTILITIES DISTRICT |
| HCFC | HARRIS CO FLOOD DIST | HARRIS COUNTY TEXAS FLOOD CONTROL DISTRICT |
| HHWS | HETCH HETCHY WTR SUP | HETCH HETCHY WATER SUPPLY DISTRICT |
| IID | IMPERIAL IRRIG DISTR | IMPERIAL IRRIGATION DISTRICT |
| LACFCD | LA FLOOD CONTROL DIST | LOS ANGELES FLOOD CONTROL DISTRICT |
| LAHRBR | LA HARBOR DEPARTMENT | LOS ANGELES HARBOR DEPARTMENT |
| LAWPC | LA WTR AND PWR COMM | LOS ANGELES WATER AND POWER COMMISSION |
| MARTA | METRO ATLANTA RTA | METROPOLITAN ATLANTA RAPID TRANSIT AUTHORITY |
| MID | MODESTO IRRIG DISTR | MODESTO IRRIGATION DISTRICT |
| MRGCD | MDL RIO GRAND DIST | MIDDLE RIO GRANDE CONSERVATION DISTRICT |
| MRMSC | MILWAUKEE-RACINE MSC | MILWAUKEE-RACINE METROPOLITAN SEWAGE COMM |
| MWDSC | METRO WTR DIS'R S CA | METROPOLITAN WATER DISTRICT OF SO CALIFORNIA |
| NOS+WB | NEW ORLEANS SWERAGE | NEW ORLEANS SEWERAGE AND WATER BOARD |
| NYPA | NY PORT AUTHORITY | NEW YORK PORT AUTHORITY |
| OID | OAKDALE IRRIG DISTR | OAKDALE IRRIGATION DISTRICT |
| OROW | OHIO RIVER ORD WORKS | OHIO RIVER ORDINANCE WORKS |
| RIRD | RYER IS RECLAM DISTR | RYER ISLAND RECLAMATION DISTRICT |
| SDWD | SAN DIEGO WTR DISTR | SAN DIEGO WATER DISTRICT |
| SEWRPC | SE WI R&G PLANN COMM | SE WISCONSIN REGIONAL PLANNING COMMISSION |
| SFLWMD | S FL WATER MG'T DISTR | SOUTH FLORIDA WATER MANAGEMENT DISTRICT |
| SFWD | S FRANCISCO WTR DEPT | SAN FRANCISCO WATER DEPARTMENT |
| SJID | SAN JOAQUIN IRR DIST | SAN JOAQUIN IRRIGATION DISTRICT |
| SVIP | SACRAMENTO IRRIG | SACRAMENTO VALLEY IRRIGATION PROJECT |
| SWFWMD | SW FL WTR MGMT DISTR | SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT |
| TID | TURLOCK IRRIG DISTR | TURLOCK IRRIGATION DISTRICT |
| TLAKE | TULARE LAKE IRRIG | TULARE LAKE IRRIGATION DISTRICT |
| WMATA | WASH METRO TRANSIT | WASHINGTON METROPOLITAN AREA TRANSIT AUTH |
| WSSC | WASH SUBURB SAN COMM | WASHINGTON SUBURBAN SANITARY COMMISSION |
| ***** | ***** | ***** |

RAILROADS

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|---|
| ***** | ***** | ***** |
| ACYRR | AKRON RAILROAD | AKRON CANTON AND YOUNGSTOWN RAILROAD |
| AGSRR | ALABAMA GREAT SO RR | ALABAMA GREAT SOUTHERN RAILROAD |
| ATNRR | ALABAMA NORTHERN RR | ALABAMA TENNESSEE AND NORTHERN RAILROAD |
| ATSFR | SANTA FE RAILROAD | ATCHISON TOPEKA AND SANTA FE RAILROAD |
| BARR | BANGOR AND AROOSTOOK | BANGOR AND AROOSTOK RAILROAD |
| BLERR | BESSEMER RAILROAD | BESSEMER AND LAKE ERIE RAILROAD |
| BMRR | BOSTON AND MAINE RR | BOSTON AND MAINE RAILROAD |
| BNRR | BURLINGTON NORTHERN | BURLINGTON NORTHERN RAILROAD |
| BORR | BALTIMORE AND OHIO | BALTIMORE AND OHIO RAILROAD |
| CBQRR | BURLINGTON RAILROAD | CHICAGO BURLINGTON AND QUINCY RAILROAD |
| CHWRR | CHESAPEAKE AND WEST | CHESAPEAKE AND WESTERN RAILROAD |
| CIMRR | ILLINOIS MIDLAND RR | CHICAGO AND ILLINOIS MIDLAND RAILROAD |
| ***** | ***** | ***** |

RAILROADS - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|-----------------------|---|
| ***** | ***** | ***** |
| CLGRR | COLUMBUS-GREENVILLE | COLUMBUS AND GREENVILLE RAILROAD |
| CMPPRR | MILWAUKEE AND PACIFIC | CHICAGO MILWAUKEE ST PAUL AND PACIFIC RR |
| CNJRR | CENTRAL OF NJ RR | CENTRAL OF NEW JERSEY RAILROAD |
| CNWRR | CHICAGO AND NW RR | CHICAGO AND NORTH WESTERN RAILROAD |
| CORR | CHESAPEAKE AND OHIO | CHESAPEAKE AND OHIO RAILROAD |
| CPRR | CANADIAN PACIFIC RR | CANADIAN PACIFIC RAILROAD |
| CRNRR | CAROLINA AND NW RR | CAROLINA AND NORTHWESTERN RAILROAD |
| CVRR | CENTRAL VERMONT RR | CENTRAL VERMONT RAILROAD |
| DHRR | DELAWARE AND HUDSON | DELAWARE AND HUDSON RAILROAD |
| DLWRR | DELAWARE RAILROAD | DELAWARE LACKAWANNA AND WESTERN RAILROAD |
| DMIRRR | IRON RANGE RAILROAD | DULUTH MISSABE AND IRON RANGE RAILROAD |
| DMRK | DETROIT AND MACKINAW | DETROIT AND MACKINAW RAILROAD |
| DRGWRR | RIO GRANDE RAILROAD | DENVER AND RIO GRANDE WESTERN RAILROAD |
| DTSRR | TOLEDO SHORE LINE RR | DETROIT AND TOLEDO SHORE LINE RAILROAD |
| DWPRR | DULUTH AND PACIFIC | DULUTH-WINNIPEG AND PACIFIC RAILROAD |
| ELRR | LACKAWANNA RAILROAD | ERIE LACKAWANNA RAILROAD |
| ERIERR | ERIE RAILROAD | ERIE RAILROAD |
| FECRR | FL EAST COAST RR | FLORIDA EAST COAST RAILROAD |
| GCSFRC | GULF CO + SANTA FE | GULF COLORADO AND SANTA FE RAILWAY COMPANY |
| GMORR | GULF RAILROAD | GULF MOBILE AND OHIO RAILROAD |
| GNRR | GREAT NORTHERN RR | GREAT NORTHERN RAILROAD |
| GTWRR | GRAND TRUNK WESTERN | GRAND TRUNK WESTERN RAILROAD |
| GWRR | GREAT WESTERN RR | GREAT WESTERN RAILROAD |
| ICRR | ILLINOIS CENTRAL RR | ILLINOIS CENTRAL RAILROAD |
| INTRR | INTERSTATE RAILROAD | INTERSTATE RAILROAD |
| KCSRR | KC SOUTHERN RAILROAD | KANSAS CITY SOUTHERN RAILROAD |
| LARR | LOUISIANA-ARKANSAS | LOUISIANA AND ARKANSAS RAILROAD |
| LIRR | LONG ISLAND RAILROAD | LONG ISLAND RAILROAD |
| LNRR | LOUIS AND NASH RR | LOUISVILLE AND NASHVILLE RAILROAD |
| LVRR | LEHIGH VALLEY RR | LEHIGH VALLEY RAILROAD |
| MCRR | MICHIGAN CENTRAL RR | MICHIGAN CENTRAL RAILROAD |
| MKTRR | MKT RAILROAD | MISSOURI KANSAS TEXAS RAILROAD |
| MPRR | MISSOURI PACIFIC RR | MISSOURI PACIFIC RAILROAD |
| NCRR | NASHVILLE RAILROAD | NASHVILLE CHATTANOOGA AND ST LOUIS RAILROAD |
| NPRR | NORTHERN PACIFIC RR | NORTHERN PACIFIC RAILROAD |
| NSRR | NORFOLK SOUTHERN RR | NORFOLK SOUTHERN RAILROAD |
| NWPRR | NW PACIFIC RAILROAD | NORTHWESTERN PACIFIC RAILROAD |
| NWRR | NORFOLK AND WESTERN | NORFOLK AND WESTERN RAILROAD |
| NYCRR | NEW YORK CENTRAL RR | NEW YORK CENTRAL RAILROAD |
| NYSLRR | NEW YORK ST LOUIS RR | NEW YORK CHICAGO AND ST LOUIS RAILROAD |
| NYSWR | SUSQUEHANNA RAILROAD | NEW YORK SUSQUEHANNA AND WESTERN RAILROAD |
| PCRR | PENN CENTRAL RR | PENN CENTRAL RAILROAD |
| PLERR | PITTSBURGH RAILROAD | PITTSBURGH AND LAKE ERIE RAILROAD |
| PMRR | PERE MARQUETTE RR | PERE MARQUETTE RAILROAD |
| PRR | PENNSYLVANIA RR | PENNSYLVANIA RAILROAD |
| RDGRR | READING RAILROAD | READING RAILROAD |
| RIRR | ROCK ISLAND RAILROAD | CHICAGO ROCK ISLAND AND PACIFIC RAILROAD |
| SCLRR | SEABOARD RAILROAD | SEABOARD COAST LINE RAILROAD |
| SLSFRR | ST LOUIS SAN FRANC RR | ST LOUIS SAN FRANCISCO RAILROAD |
| SLSWRR | ST LOUIS SW RAILROAD | ST LOUIS SOUTHWESTERN RAILROAD |
| SNRR | SACRAMENTO NORTHERN | SACRAMENTO NORTHERN RAILROAD |
| SOORR | SOO LINE RAILROAD | SOO LINE RAILROAD |
| SOURR | SOUTHERN RAILROAD | SOUTHERN RAILROAD |
| ***** | ***** | ***** |

RAILROADS - CONTINUEI

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|------------------------------------|
| ***** | ***** | ***** |
| SPRR | SOUTHERN PACIFIC RR | SOUTHERN PACIFIC RAILROAD |
| TMRR | TEXAS MEXICAN RR | TEXAS MEXICAN RAILROAD |
| TPWRR | TOLEDO AND WESTERN | TOLEDO PEORIA AND WESTERN RAILROAD |
| UPRR | UNION PACIFIC RR | UNION PACIFIC RAILROAD |
| VTRR | VERMONT RAILROAD | VERMONT RAILROAD |
| WARR | WESTERN OF ALABAMA | WESTERN OF ALABAMA RAILROAD |
| WLERR | WHEELING RAILROAD | WHEELING AND LAKE ERIE RAILROAD |
| WMRR | WESTERN MARYLAND RR | WESTERN MARYLAND RAILROAD |
| WPRR | WESTERN PACIFIC RR | WESTERN PACIFIC RAILROAD |
| YVRR | YOSEMITT VALLEY RR | YOSEMITE VALLEY RAILROAD |
| ***** | ***** | ***** |

PETROLEUM AND PIPELINE COMPANIES

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|---|
| ***** | ***** | ***** |
| AMOCO | AMOCO | AMOCO OIL COMPANY |
| AOCO | ASSOCIATED OIL CO | ASSOCIATED OIL COMPANY |
| ARFUEL | AR FUEL OIL COMPANY | AR FUEL OIL COMPANY |
| ATRECO | ATLANTIC REFINING CO | ATLANTIC REFINING COMPANY |
| BOCO | BELRIDGE OIL COMPANY | BELRIDGE OIL COMPANY |
| CHOCO | CHEVRON OIL COMPANY | CHEVRON OIL COMPANY |
| CITGO | CITIES SERVICE CO | CITIES SERVICE COMPANY |
| CONOCO | CONTINENTAL OIL CO | CONTINENTAL OIL COMPANY |
| CREOLE | CREOLE PETROLEUM CO | CREOLE PETROLEUM COMPANY |
| GPCC | GENERAL PETROLEUM | GENERAL PETROLEUM CORPORATION OF CALIFORNIA |
| GULF | GULF REFINING CO | GULF REFINING COMPANY |
| HOCO | HONOLULU OIL COMPANY | HONOLULU OIL COMPANY |
| HUMBLE | HUMBLE OIL COMPANY | HUMBLE OIL AND REFINING COMPANY |
| LPCO | LAKEHEAD PIPELINE CO | LAKEHEAD PIPELINE COMPANY |
| MWPLC | MI-WI PIPELINE CO | MICHIGAN-WISCONSIN PIPELINE COMPANY |
| NGPCA | NATURAL GAS CO | NATURAL GAS PIPELINE COMPANY OF AMERICA |
| OHOCO | OHIO OIL COMPANY | OHIO OIL COMPANY |
| PHILIP | PHILLIPS PETROLEUM | PHILLIPS PETROLEUM COMPANY |
| ROCO | RICHFIELD OIL CO | RICHFIELD OIL COMPANY |
| SHELL | SHELL OIL COMPANY | SHELL OIL COMPANY |
| SOCO | STANDARD OIL COMPANY | STANDARD OIL COMPANY |
| SOGCO | SIGNAL OIL AND GAS | SIGNAL OIL AND GAS COMPANY |
| SUNOCO | SUN OIL COMPANY | SUN OIL COMPANY |
| SUPOCO | SUPERIOR OIL COMPANY | SUPERIOR OIL COMPANY |
| TENNEC | TENNECO | TENNESSEE GAS AND PIPELINE COMPANY |
| TWOCO | TIDEWATER OIL CO | TIDEWATER OIL COMPANY |
| UOCO | UNION OIL COMPANY | UNION OIL COMPANY |
| VOCO | VALVOLINE OIL CO | VALVOLINE OIL COMPANY |
| ***** | ***** | ***** |

GAS AND ELECTRIC UTILITY COMPANIES

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|---|
| ***** | ***** | ***** |
| AGASEL | ASSOCIATED G AND E | ASSOCIATED GAS AND ELECTRIC COMPANY |
| ALPCO | ALABAMA POWER CO | ALABAMA POWER COMPANY |
| APC | APPALACHIAN POWER CO | APPALACHIAN POWER COMPANY |
| ARLAGC | AR-LA GAS COMPANY | AR-LA GAS COMPANY |
| CONEC | CONSOLIDATED EDISON | CONSOLIDATED EDISON POWER COMPANY |
| CONSPC | CONSUMER POWER CO | CONSUMER POWER COMPANY OF MICHIGAN |
| CTP&L | CT POWER AND LIGHT | CONNECTICUT POWER AND LIGHT COMPANY |
| DECO | DETROIT EDISON CO | DETROIT EDISON COMPANY |
| FLPCO | FLORIDA POWER CO | FLORIDA POWER COMPANY |
| HLPCC | HOUSTON L AND P CO | HOUSTON LIGHTING AND POWER COMPANY |
| IMECO | IN-MI ELECTRIC CO | INDIANA-MICHIGAN ELECTRIC COMPANY |
| LONESR | LONE STAR GAS CO | LONE STAR GAS COMPANY |
| MINPCO | MI NORTHERN POWER CO | MICHIGAN NORTHERN POWER COMPANY |
| MSP+L | MS POWER AND LIGHT | MISSISSIPPI POWER AND LIGHT COMPANY |
| NJP+L | NJ POWER AND LIGHT | NEW JERSEY POWER AND LIGHT COMPANY |
| OHPCO | OHIO POWER COMPANY | OHIO POWER COMPANY |
| PEPCO | POTOMAC EDISON POWER | POTOMAC EDISON POWER COMPANY |
| PG+E | PACIFIC G AND E CO | PACIFIC GAS AND ELECTRIC COMPANY |
| PHELCO | PHILA ELECTRIC CO | PHILADELPHIA ELECTRIC COMPANY |
| PWPCO | PA WTR AND POWER CO | PENNSYLVANIA WATER AND POWER COMPANY |
| SCECO | SO CALIFORNIA EDISON | SOUTHERN CALIFORNIA EDISON COMPANY |
| SCE+G | SC ELECTRIC AND GAS | SOUTH CAROLINA ELECTRIC AND GAS COMPANY |
| SDG+E | SAN DIEGO G AND E CO | SAN DIEGO GAS AND ELECTRIC COMPANY |
| ***** | ***** | ***** |

SURVEYING AND CONSTRUCTION INDUSTRY

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|---|
| ***** | ***** | ***** |
| AAS | ATLANTIC AERIAL SURV | ATLANTIC AERIAL SURVEYS |
| ABRAMS | ABRAMS AERIAL SURV | ABRAMS AERIAL SURVEYS |
| ACFPS | ACF SURVEYS | ACF PRECISION SURVEYS INCORPORATED |
| AEROS | AERO SERVICE CORP | AERO SERVICE CORPORATION |
| AHI | ATWELL HICKS INC | ATWELL HICKS INC |
| AIRSUR | AIR SURVEY CORP | AIR SURVEY CORPORATION |
| AISS | A I SILANDER AND SON | A I SILANDER AND SON |
| ALSTER | ALSTER ASSOCIATES | ALSTER AND ASSOCIATES ENGINEERS |
| BAKER | M BAKER JR INC | M BAKER JR INC |
| BGAS | BRUCE + GUNN SURVEYS | BRUCE AND GUNN AERIAL SURVEYS |
| BMMS | BOUTELLE MACFARLANE | BOUTELLE MACFARLANE MAYER AND SELEE |
| BRADY | BRADY LAND SURVEYING | BRADY LAND SURVEYING INC |
| BRWE | BROCK AND WEYMOUTH | BROCK AND WEYMOUTH ENGINEERS |
| BWDCO | BERKELEY WTRF DEV CO | BERKELEY WATERFRONT DEVELOPMENT COMPANY |
| CEJA | C E JOHNSON ASSOC | C E JOHNSON AND ASSOCIATES INC |
| CFM | C F MERRIAM SURVEYOR | C F MERRIAM SURVEYOR |
| CHAMBA | CHAMBLIN ASSOCIATES | CHAMBLIN AND ASSOCIATES |
| CHIPPR | CHIPPERFIELD NAVIG | N R CHIPPERFIELD NAVIGATION SERVICES |
| CL | CLIFFORD LEISURE CE | CLIFFORD LEISURE CIVIL ENGINEER |
| COLGOV | COLBURN AND GOVE | COLBURN AND GOVE CONSULTING ENGINEERS |
| CTMALE | C T MALE ASSOCIATES | C T MALE ASSOCIATES |
| DARA | D A RATEKIN ASSOC | D A RATEKIN AND ASSOCIATES |
| DEC | DAHLING ENGINEER CO | DAHLING ENGINEERING COMPANY |
| ***** | ***** | ***** |

SURVEYING AND CONSTRUCTION INDUSTRY - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|--|
| ***** | ***** | ***** |
| DECKER | R L DECKER | R L DECKER |
| DELTA | DELTA ENGINEERS INC | DELTA ENGINEERS INC |
| DUNLAP | DUNLAP ASSOCIATES | DUNLAP ASSOCIATES |
| EESCC | E E STULLER CONST CO | E E STULLER CONSTRUCTION COMPANY |
| EWB | E W BRAASCH CONS ENG | E W BRAASCH CONSULTING ENGINEER |
| FAMC | FALCON AIR MAPS CO | FALCON AIR MAPS COMPANY |
| FAS | FAIRCHILD AEI SURV | FAIRCHILD AERIAL SURVEYS |
| GHA | G HENKENHOFF ASSC | G HENKENHOFF AND ASSOCIATES |
| HALSEY | HALSEY CIVIL ENG INC | W H HALSEY CIVIL ENGINEERS INC |
| HDA | HORTON DENNIS ASSOC | HORTON DENNIS ASSOCIATES |
| ISBELL | ISBELL CONST COMPANY | ISBELL CONSTRUCTION COMPANY |
| JBB | J B BLYDENBURGH SURV | J B BLYDENBURGH SURVEYOR |
| JKPLS | JEFF KERN PL | JEFF KERN PROFESSIONAL LAND SURVEYOR |
| KONSKI | KONSKI ENGINEERS | KONSKI ENGINEERS |
| LAFAVE | LAFAVE LAND SURVEYOR | A LAFAVE LAND SURVEYOR |
| LDA | L DICKERSON ASSOC | LEWIS DICKERSON AND ASSOCIATES CONS ENG |
| LEAS | LIMBAUGH ENGINEERING | LIMBAUGH ENGINEERING AND AERIAL SURVEY INC |
| LEGER | LEGER SURVEYS INC | LEGER SURVEYS INC |
| LEVITT | ITT LEVITT CORP | ITT LEVITT CORPORATION |
| LINDSY | F M LINDSEY ASSOC | F M LINDSEY AND ASSOCIATES |
| MADHOP | MADDOX AND HOPKINS | MADDOX AND HOPKINS SURVEYORS |
| MAI | MEYER AND ASSOCIATES | MEYER AND ASSOCIATES INCORPORATED |
| MATOTA | MATOTAN ASSOCIATES | WILLIAM MATOTAN AND ASSOCIATES |
| MCCENG | MCCLELLAND ENGINEERS | MCCLELLAND ENGINEERS |
| MCTUER | MCCARTER AND TULLER | MCCARTER AND TULLER INCORPORATED |
| MGA | MOORE GARDNER ASSC | MOORE GARDNER AND ASSOCIATES |
| MHAS | MARK HURD AEI SURV | MARK HURD AERIAL SURVEYS |
| MKWS | M K WELCH SURVEYS | M K WELCH SURVEYS |
| MLI | MILLER AND LUX INC | MILLER AND LUX INC |
| MME | MYERS-MACOMBER ENG | MYERS-MACOMBER ENGINEERS |
| MPS | MCNAMEE PORTER AND S | MCNAMEE PORTER AND SEELEY |
| NAVSER | NAVIGATION SERVICES | NAVIGATION SERVICES INCORPORATED |
| OMAN | OMAN CONSTRUCTION CO | OMAN CONSTRUCTION COMPANY |
| PAS | PARK AERIAL SURVEYS | PARK AERIAL SURVEYS INC |
| PCEG | PETTY GEOPHYSICAL CO | PETTY GEOPHYSICAL ENGINEERING COMPANY |
| PHELPS | B E PHELPS INC | B E PHELPS INC |
| PORTER | NORMAN PORTER ASSOC | NORMAN PORTER ASSOCIATES |
| SBI | SHERWOOD BROS INC | SHERWOOD BROTHERS INC |
| SCAN | SCANLON ASSOCIATES | SCANLON AND ASSOCIATES |
| SECO | SOUTHERN ENGINEERING | SOUTHERN ENGINEERING COMPANY |
| SELLS | SELLS INC CONS ENG | CHAS H SELLS INC CONSULTING ENGINEERS |
| SPAN | SPAN INTERNATIONAL | SPAN INTERNATIONAL INCORPORATED |
| SWECO | STONE WEBSTER ENG | STONE WEBSTER ENGINEERING CORPORATION |
| THOMAS | THOMAS ENG AND SURV | THOMAS ENGINEERING AND SURVEYING COMPANY |
| TURNER | A E TURNER ARCHITECT | A E TURNER ARCHITECT |
| TSI | TOBIN SURVEYS | TOBIN SURVEYS INCORPORATED |
| URS | URS COMPANY | URS COMPANY |
| VJV | V J VANLINT CONS ENG | V J VANLINT CONSULTING ENGINEER |
| VOGI | VOGI IVERS AND ASSOC | VOGI IVERS AND ASSOCIATES |
| WAA | WALKER - ASSOCIATES | WALKER AND ASSOCIATES INCORPORATED |
| WARD | E J WARD | E J WARD |
| WAWHI | WALKER - WHITFORD | WALKER AND WHITEFORD INCORPORATED |
| WBCC | WARREN BROS CONST CO | WARREN BROTHERS CONSTRUCTION COMPANY |
| ***** | ***** | ***** |

SURVEYING AND CONSTRUCTION INDUSTRY - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|--|
| ***** | ***** | ***** |
| WFTA | W F TURNER ASSC | W F TURNER AND ASSOCIATES |
| WRA | WHIGMAN-REQUARDT | WHIGMAN AND REQUARDT ASSOCIATES |
| WESGEO | WESTERN GEOPHYSICAL | WESTERN GEOPHYSICAL COMPANY OF AMERICA |
| WSA | WILLIAMS-STACKHOUSE | WILLIAMS AND STACKHOUSE ASSOCIATES |
| ***** | ***** | ***** |

MISCELLANEOUS COMMERCIAL ORGANIZATIONS AND PRIVATE FIRMS

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|--|
| ***** | ***** | ***** |
| AKGEO | ALASKAN GEOPHYSICAL | ALASKAN GEOPHYSICAL |
| AKLPCO | AK LUMBER AND PULP | ALASKA LUMBER AND PULP COMPANY |
| ATCO | ASSOC TRACTION CO | ASSOCIATED TRACTION COMPANY |
| ATT | AMERICAN T AND T CO | AMERICAN TELEPHONE AND TELEGRAPH COMPANY |
| BGCO | BROWN GEOPHYSICAL CO | BROWN GEOPHYSICAL COMPANY |
| BW | BRADFORD WASHBURN | BRADFORD WASHBURN |
| BWCO | BONO-WILLIAMS CO | BONO-WILLIAMS COMPANY |
| BULE | BULE AND ASSOCIATES | BULE AND ASSOCIATES |
| CCCC | CARBIDE AND CARBON | CARBIDE AND CARBON CHEMICALS CORPORATION |
| CCICO | CLEVE CLIFFS IRON CO | CLEVELAND CLIFFS IRON COMPANY |
| CH2M | CH2M HILL INC | CH2M HILL INCORPORATED |
| CLA | CROZER LAND ASSOC | CROZER LAND ASSOCIATION |
| CPFC | CHAMPION PAPER CO | CHAMPION PAPER AND FIBER COMPANY |
| CROSET | CROSSETT LUMBER CO | CROSSETT LUMBER COMPANY |
| DBA | DBA SYSTEMS INC | DBA SYSTEMS INCORPORATED |
| DOWCO | DOW CHEMICAL COMPANY | DOW CHEMICAL COMPANY |
| DSI | DESIGN SCIENCES INC | DESIGN SCIENCES INC |
| DVLCO | D VARDEN LUMBER CO | DOLLY VARDEN LUMBER COMPANY |
| ENVENG | ENVIRONMENT ENG INC | ENVIRONMENTAL ENGINEERING INC |
| FMCO | FORD MOTOR COMPANY | FORD MOTOR COMPANY |
| GCC | GLOGORA COAL COMPANY | GLOGORA COAL COMPANY |
| GE | GENERAL ELECTRIC | GENERAL ELECTRIC CORPORATION |
| GEON | GEONAUTICS INC | GEONAUTICS INC |
| GRDC | GULF RESEARCH CO | GULF RESEARCH AND DEVELOPMENT COMPANY |
| HAPT | HUGHES AIRPORT | HUGHES AIRPORT |
| HMCO | HANNA MINING CO | HANNA MINING COMPANY |
| KETCH | KETCHIKAN PULP CO | KETCHIKAN PULP COMPANY |
| LAICO | LA INVESTMENT CO | LOS ANGELES INVESTMENT COMPANY |
| MACCO | MACCO CORPORATION | MACCO CORPORATION |
| MCAM | MOLYBDENUM CORP | MOLYBDENUM CORPORATION OF AMERICA |
| MCLCO | MI-CA LUMBER COMPANY | MICHIGAN-CALIFORNIA LUMBER COMPANY |
| NAAV | NORTH AMERICAN | NORTH AMERICAN AVIATION |
| NJZINC | NEW JERSEY ZINC CO | NEW JERSEY ZINC COMPANY |
| PECO | POHLY EXPLORATION CO | POHLY EXPLORATION COMPANY |
| PACTT | PACIFIC T AND T CO | PACIFIC TELEPHONE AND TELEGRAPH COMPANY |
| PANAM | PAN AMERICAN | PAN AMERICAN AIRLINES |
| PCC | PEABODY COAL CO | PEABODY COAL COMPANY |
| PHILCM | PHILLIPS CHEMICAL CO | PHILLIPS CHEMICAL COMPANY |
| PPCC | PACIFIC PORT CEMENT | PACIFIC PORTLAND CEMENT CORPORATION |
| PVE | PALOS VERDES ESTATES | PALOS VERDES ESTATES |
| REGIS | ST REGIS PAPER CO | ST REGIS PAPER COMPANY |
| KRLC | RED RIVER LUMBER CO | RED RIVER LUMBER COMPANY |
| ***** | ***** | ***** |

MISCELLANEOUS COMMERCIAL ORGANIZATIONS AND PRIVATE FIRMS - CONTINUED

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|--------------------------------------|
| ***** | ***** | ***** |
| SANDIA | SANDIA CORPORATION | SANDIA CORPORATION |
| SSC | SEISMOGRAPH SERVICE | SEISMOGRAPH SERVICE CORPORATION |
| SWBELL | SW BELL TELEPHONE CO | SOUTH WESTERN BELL TELEPHONE COMPANY |
| TLDYNE | TELEDYNE INC | TELEDYNE INCORPORATED |
| VAILCO | VAIL COMPANY | VAIL COMPANY |
| VITRO | VITRO CORPORATION | VITRO CORPORATION |
| WHITE | WHITE PIGMENT CO | WHITE PIGMENT COMPANY |
| WE | WESTERN ELECTRIC | WESTERN ELECTRIC COMPANY |
| ***** | ***** | ***** |

ACADEMIC INSTITUTIONS AND AMATEUR ORGANIZATIONS

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|---------------------------------------|
| ***** | ***** | ***** |
| BMS | BOSTON MUSEUM OF SCI | BOSTON MUSEUM OF SCIENCE |
| BSA | BOY SCOUTS | BOY SCOUTS OF AMERICA |
| CORUNI | CORNELL UNIVERSITY | CORNELL UNIVERSITY |
| CU | COLUMBIA UNIVERSITY | COLUMBIA UNIVERSITY |
| ECM | ENG CLUB OF MEMPHIS | ENGINEERS CLUB OF MEMPHIS |
| FSNSCH | FARMINGTON STATE | FARMINGTON STATE NORMAL SCHOOL |
| IASUNI | IOWA STATE UNIV | IOWA STATE UNIVERSITY |
| JPL | JET PROPULSION LAB | JET PROPULSION LABORATORY |
| KSU | KANSAS STATE UNIV | KANSAS STATE UNIVERSITY |
| LAFCOL | LAFAYETTE COLLEGE | LAFAYETTE COLLEGE |
| LAHSCH | LOS ALTOS HIGH SCH | LOS ALTOS HIGH SCHOOL |
| LASU | LOUISIANA STATE UNIV | LOUISIANA STATE UNIVERSITY |
| LEHIGH | LEHIGH UNIVERSITY | LEHIGH UNIVERSITY |
| MISCOL | MICHIGAN ST COLLEGE | MICHIGAN STATE COLLEGE |
| MIT | MASS INST OF TECH | MASSACHUSETTS INSTITUTE OF TECHNOLOGY |
| MITU | MICHIGAN TECH UNIV | MICHIGAN TECHNICAL UNIVERSITY |
| MSSU | MISSISSIPPI STATE | MISSISSIPPI STATE UNIVERSITY |
| MUNIV | MARQUETTE UNIVERSITY | MARQUETTE UNIVERSITY |
| NDSU | NORTH DAKOTA STATE U | NORTH DAKOTA STATE UNIVERSITY |
| ORTI | OREGON TECH INST | OREGON TECHNICAL INSTITUTE |
| SUNIV | STANFORD UNIVERSITY | STANFORD UNIVERSITY |
| TCU | TEXAS CHRISTIAN UNIV | TEXAS CHRISTIAN UNIVERSITY |
| UC | UNIV OF CALIFORNIA | UNIVERSITY OF CALIFORNIA |
| UFL | UNIV OF FLORIDA | UNIVERSITY OF FLORIDA |
| UHI | UNIV OF HAWAII | UNIVERSITY OF HAWAII |
| UNM | UNIVERSITY OF NM | UNIVERSITY OF NEW MEXICO |
| UTU | UNIVERSITY OF UTAH | UNIVERSITY OF UTAH |
| UTX | UNIVERSITY OF TEXAS | UNIVERSITY OF TEXAS |
| UVA | UNIV OF VIRGINIA | UNIVERSITY OF VIRGINIA |
| UWI | UNIV OF WISCONSIN | UNIVERSITY OF WISCONSIN |
| WILCOL | WILLIAMS COLLEGE | WILLIAMS COLLEGE AT WILLIAMSTOWN MA |
| WVUNIV | WEST VIRGINIA UNIV | WEST VIRGINIA UNIVERSITY |
| ***** | ***** | ***** |

GENERAL NON-SPECIFIC DESIGNATORS

| SYMBOL | STANDARD ABBREV NAME | FULL NAME |
|--------|----------------------|-------------------------------------|
| ***** | ***** | ***** |
| LOCENG | LOCAL ENGINEER | LOCAL ENGINEER (INDIVIDUAL OR FIRM) |
| LOCSUR | LOCAL SURVEYOR | LOCAL SURVEYOR (INDIVIDUAL OR FIRM) |
| UNK | UNKNOWN | UNKNOWN PERSON OR FIRM |
| ***** | ***** | ***** |

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ANNEX D

GUIDELINES FOR SURVEY POINT NAMES AND DESIGNATIONS

VERTICAL CONTROL POINTS

A vertical control point, commonly referred to as a "bench mark" (BM), is a monumented (or otherwise marked) survey point established for the purpose of providing elevation reference for mapping and charting activities and for a wide variety of engineering and scientific applications.

A vertical control point is normally identified by a number or by an alphanumeric symbol which is usually stamped on the respective disk marker (or otherwise inscribed on the bench mark monument). Less frequently, a bench mark is assigned a concise, intelligible name. In principle, the designation by means of which a vertical control point is identified for publication purposes should closely resemble the designation which actually appears on the respective marker; however, extraneous information is frequently present which is not desired to be included as a part of the designation. For example, the designation of a bench mark should not include the elevation which may also be stamped on the respective disk marker (unless the stamped elevation is the only means of identifying the mark - see below), and it does not generally include the "year mark set" (except for bench marks which have been reset - see below).

In every case, the designation assigned to a bench mark for automatic data processing purposes must be identical to the designation which appears in the heading of the respective bench mark descriptions.

1. A bench mark designation must not exceed 25 alphanumeric characters (including all imbedded blanks). Abbreviate and/or edit an existing designation as necessary to conform to this limit.

2. A designation should include the acronym or abbreviation of the agency or organization whose name is precast in the survey marker (if other than NGS, C&GS, or NOS) - see ANNEX C. When a name is not precast in the survey mark, include the acronym or abbreviation of the agency which set the mark. If the agency cannot be determined, do not include an acronym or abbreviation.

Example:

2903 (USGS)
GAGING STA MORC
RV 16 (RIRR)

Designation:

2903 UGS
GAGING STA MORC
RV 16 RIRR

3. The only special characters permitted in a bench mark designation are the blank (), plus (+), minus or hyphen (-), equals (=), slash (/), and decimal point (.); when used, these special characters must not be

separated from adjacent characters by any blanks. Commas and parentheses are not allowed to appear in a bench mark designation. The minus or hyphen (-) is allowed only when indicating a negative elevation stamped in a mark. An elevation stamped in a mark is used in the designation only when there is no other means to identify the mark (also see Section 9 below). When a minus or hyphen (-) is used, it must be the first character of the designation.

Example:

CH 1174, USGS = 297+00 (A)
ELEV -7.325 FT (USGS)
H 23 -8.623 FT BOR

Designation:

CH 1174=297+00 A USGS
-7.325 USGS
H 23 BOR

4. All alpha and numeric character groupings in a designation must be separated by a blank. Care should be taken that only one blank is used for this purpose two blanks in a row will be interpreted as end of the designation.

Example:

TT17B USGS
TT-17B USGS
TT-1 7B USGS

Designation:

TT 17 B USGS
TT 17 B USGS
TT 1 7 B USGS

5. The characters "NO" or "No." when used as the abbreviation for the word "number" are not to be included in the designation even when stamped in the disk.

Example:

MONROE NO 1 1944
(reference mark)
BENCH MARK NO. 6 USGS
STA NO II 90 TIDAL 23

Designation:

MONROE RM 1
6 USGS
872 4580 TIDAL 23

6. A period may not appear imbedded in or adjacent to a grouping of alpha characters; however, a decimal point may appear imbedded in (but not adjacent to) a grouping of numeric characters.

Example:

MI. 14.2 ICRR
4419. BOR
PALMER N.E. ASE

Designation:

MI 14.2 ICRR
4419 BOR
PALMER NE BASE

7. For bench marks which carry multiple stamped designation, the designations involved should be concatenated with the equal sign (=) used as separator, subject to the 25-character total length limit.

| <u>Example:</u> | <u>Designation:</u> | |
|--|-----------------------|---|
| H13 and No 3 1934 | H 13=872 2621 TIDAL 3 | * |
| STA. NO. 3 and MI. 182.5 | STA 3=MI 182.5 SPRR | * |
| (SPRR) | | * |
| LEE NO 1 1932 (reference mark) and R 13 | LEE RM 1 R 13 | * |

Tidal and water level bench mark designations
must conform to standard designations adopted by the National
Ocean Survey; see page D-6.

NOTE: Other multiple designations which are not concatenated as indicated in the preceding paragraph (either because they do not appear stamped on the respective disk marker or because they had to be left out in order to meet the 25-character total length limit) must be given as separate data items to be carried as "aliases" in the descriptive data.

8. Non-specific descriptive terms are not to be treated as "double designations" and hence are not to be carried as aliases.

| <u>Example:</u> | <u>Designation:</u> | |
|-------------------------------|---------------------|---|
| BENCH MARK 2 USE | 2 USE | * |
| 114.3, CHISELED SQUARE (USLS) | 114.3 USLS | * |
| C 1, Bolt | C 1 | * |

9. The elevation stamped on the disk marker (or otherwise inscribed on the bench mark monument) is not to be carried as a part of the respective bench mark designation, unless the elevation is the only means of identifying the survey mark.

| <u>Example:</u> | <u>Designation:</u> | |
|--------------------------|---------------------|---|
| H 325 230.695FT | H 325 | * |
| 140B (MORC) ELEV 95.3 FT | 140 B MORC | * |
| -9.825 FT (USGS) | -9.825 USGS | * |
| ELEV. 101.6 BOR | 101.6 BOR | * |

10. The "year mark set" is to be carried as a part of a bench mark designation only for those bench marks whose designation has not been altered after they were reset. In such a case, the word RESET and the respective year (e.g. RESET 1975) must be appended to the original bench mark designation; however, if the original designation exceeds 18 characters in length, the word RESET is to be omitted and only the "year mark set" appended. In the case of a bench mark which has been reset more than once, only the most recent "year mark set" is to be indicated. Note: When determining the designation of horizontal control marks which have been reset, different guidelines are used. For this case, the word "RESET" is to be appended only when it is actually stamped in the marker. When this occurs, follow the guideline for reset bench marks.

| <u>Example:</u> | <u>Designation:</u> | |
|--|----------------------|---|
| 203 FLGS, reset in 1950 and 1967 | 203 FLGS RESET 1967 | * |
| TT 8 USGS, reset in 1965 | TT 8 USGS RESET 1965 | * |
| LAKE WASHINGTON, horizontal control station reset in 1970 | LAKE WASHINGTON 1970 | * |

11. Occasionally, a horizontal control point is included as a bench mark in a vertical control network. In such a case, the published name of the horizontal control point in question (i.e., the name which appears in the heading of the respective station description and/or subsequent recovery notes), modified as necessary to conform to the guidelines contained herein, should be used as the bench mark designation. For horizontal control stations or azimuth marks that have more than one year as part of their stampings, each year should be appended to the designation. Occasionally a horizontal control station may have the same designation as a nearby vertical control point. To distinguish between the two, append the letters BM to the vertical control point designation.

| <u>Example:</u> | <u>Designation:</u> | |
|---|---------------------|---|
| CHARLOTTE (USGS) | CHARLOTTE USGS | * |
| BOULDER 1935 | BOULDER | * |
| CHICO 1948 19'1 | CHICO 1948 1971 | * |
| SMITH 2 1961 | SMITH 2 | * |
| CHARLOTTSVILLE 1930 (horizontal control station) | CHARLOTTSVILLE | * |
| CHARLOTTSVILLE 1930 (nearby vertical control station) | CHARLOTTSVILLE BM | * |

12. When the reference mark of a horizontal control point is included as a bench mark in a vertical control network, the name or designation of the reference mark in question, modified as necessary to conform to the guidelines contained herein, should be used as the bench mark designation. The name of a reference mark is normally formed by appending the symbols RM 1, RM 2, ..., RM 13, etc. to the name of the respective horizontal control point for reference marks stamped NO 1, NO 2, ..., NO 13, etc. Note: The * designations of reference marks are not to include the year set (or stamped* in the disk) unless the word "RESET" is part of the stamping.

| <u>Example:</u> | <u>Designation:</u> | |
|----------------------------|-----------------------|---|
| CHARLOTTE NO. 1 | CHARLOTTE RM 1 | |
| BOULDER 1935 NO 6 1968 | BOULDER RM 6 | * |
| CHICO 1948 NO 3 RESET 1971 | CHICO RM 3 RESET 1971 | * |

13. When the azimuth mark of a horizontal control point is included as a bench mark in a vertical control network, the name or designation of the azimuth mark in question, modified as necessary to conform to the guidelines contained herein, should be used as the bench mark designation. The name of an azimuth mark is normally formed by appending to the name of the respective horizontal control point the symbol AZ MK if only one azimuth mark is involved (as is the usual case), or else the symbols AZ MK 2, AZ MK 3, etc. for the azimuth marks stamped NO 2, NO 3, etc.

| <u>Example:</u> | <u>Designation:</u> | |
|--------------------------|-----------------------|---|
| CHARLOTTE (azimuth mark) | CHARLOTTE AZ MK | |
| BOULDER 1935 NO.3 | BOULDER AZ MK 3 | |
| CHICO 1948 1971 | CHICO AZ MK 1948 1971 | * |
| N WASH AZI | N WASH AZ MK | |
| PARK AZ RESET 1965 | PARK AZ MK RESET 1965 | * |

14. A temporary bench mark (TBM) must carry the letters "TBM" as the first three characters of the designation.

| <u>Example:</u> | <u>Designation:</u> | |
|-----------------|---------------------|--|
| TBM 1A | TBM 1 A | |
| 14 | TBM 14 | |

Note: The characters "BM", even when stamped in a disk, are not to be included in a vertical control point's designation unless: *

- a. There is a need to distinguish between a horizontal control point and a nearby vertical control point (see Section 11). *
- b. A vertical control point has no other stamping (e.g. BM USGS). *
- c. The characters "BM" do not represent the words "Bench Mark." *

Whenever the need arises for a guideline to deal with a situation not covered herein, the user is encouraged to communicate with the Director, National Geodetic Information Center (NGIC), to have the proposed guideline confirmed and incorporated in this ANNEX. *

The address and telephone number are: *

Director, NGIC
National Geodetic Survey, OA/C18
Rockville, MD 20852
Telephone: 301-443-8281

15. The National Ocean Survey has instituted a system of standard designations for all Tide and Water Level stations operated by NOS. The system provides for the unique identification of all disks, staffs, etc., located at such stations.

For information concerning the proper designation of Tide Gage Bench Marks, Water Level Bench Marks, etc., communicate with:

National Geodetic Survey
Vertical Network Branch, OA/C132
Rockville, MD 20852
Telephone: 301-443-8567

For information concerning specific Tide Gage Bench Marks, etc., communicate with:

National Ocean Survey
Tides and Water Levels Division, OA/C23
Rockville, MD 20852
Telephone: 301-443-8487

HORIZONTAL CONTROL POINTS - TO BE COMPILED. Guidelines concerning the names and/or designations of horizontal control points, reference marks, and azimuth marks will be found in Volume I, Chapter 2, of this publication.

ANNEX F
NGS SURVEY EQUIPMENT CODES

000-099 - Special Instrumentation
100-199 - Theodolites and Transists
200-299 - Leveling Instruments
300-399 - Leveling Rods and Staves
400-499 - Steel and Invar Tapes
500-599 - Lightwave Distance-Measuring Equipment
600-699 - Infrared Distance-Measuring Equipment
700-799 - Retro-Reflectors
800-899 - Microwave Distance-Measuring Equipment
900-999 - Unassigned

The purpose of the National Geodetic Survey (NGS) Survey Equipment Code is to provide a three-digit identifier for each item of survey equipment commonly used in connection with horizontal and vertical control surveys in the United States. The code has been devised in such a manner that the first digit of the three-digit identifier would indicate a specific category of survey equipment. Accordingly, there are ten broad survey equipment categories, the first of which (000-099) is reserved for special instrumentation, and the last (900-999) is yet unassigned. The ten survey equipment categories are listed above.

Within each category, specific items and/or classes of survey equipment have been grouped into subcategories and assigned unique three-digit code numbers. The grouping of survey equipment into subcategories is intended to reflect the level of accuracy attained in common usage of the specific items or classes of survey equipment in question and not necessarily their intrinsic or potential accuracy. In each category and subcategory, a code is provided for items of survey equipment which do not appear among the items listed or which are not specifically identified. The respective lists of survey equipment are not all-inclusive, and series of numbers have been skipped in each category and/or subcategory to allow for additions.

| CODE | MANUFACTURER | INSTRUMENT MODEL OR TYPE |
|------|--------------|--------------------------|
|------|--------------|--------------------------|

000-099 - SPECIAL INSTRUMENTATION

000 Unspecified Unknown Instrument or System

001-099 - Reserved for Absolute Gravity Devices

010-029 - Gravimeters

| | | |
|-----|-----------------|-------------------------------|
| 010 | Unspecified | Gravimeter |
| 011 | Frost | Frost Gravimeter |
| 012 | North American | North American Gravimeter |
| 013 | LaCoste-Romberg | Early Models |
| 014 | LaCoste-Romberg | G-Meter |
| 015 | LaCoste-Romberg | D-Meter |
| 016 | Worden | Unspecified |
| 017 | Worden | Uncompensated Model |
| 018 | Worden | Temperature-Compensated Model |
| 019 | Scintrex | CG-2 |

030-049 - Doppler Satellite Tracking Systems

| | | |
|-----|------------------|-----------------------------------|
| 030 | Unspecified | Doppler Satellite Tracking System |
| 031 | Magnavox | Geoceiver or Geoceiver II |
| 032 | JMR | JMR-1 |
| 033 | ITT | ITT 5500 |
| 034 | Magnavox | MX-702A |
| 035 | APL | Tranet |
| 036 | Canadian Marconi | CMA 722A |
| 037 | Canadian Marconi | CMA 722B |
| 038 | Magnavox | MX-1502 |

100-199 - THEODOLITES AND TRANSITS

100 Unspecified Theodolite or Transit

101-199 - Instruments of Geodetic Astronomy

| | | |
|-----|---------------|--|
| 101 | Various | Zenith Telescope |
| 102 | Various | Meridian Telescope, Transit, or Circle |
| 103 | Various | Bamberg-Type Astronomic Transit |
| 104 | Wild | T-4 |
| 105 | Kern | DKM3-A |
| 106 | Gigas-Askania | TPR |
| 107 | Zeiss/Jena | Theo-002 |

| CODE | MANUFACTURER | INSTRUMENT MODEL OR TYPE |
|------|--------------|--------------------------|
|------|--------------|--------------------------|

120-139 - First-Order (Geodetic) Theodolites

| | | |
|-----|--------------|---|
| 120 | Unspecified | 0"1, 0"2, 0"5 Direct-Reading Theodolite |
| 121 | Various | Ramsden-Type 30, 24, 12-inch Theodolite |
| 122 | Various | USC&GS Parkhurst |
| 123 | Wild | T-3 |
| 124 | Kern | DKM3 |
| 125 | CTS/Vickers | Geodetic Tavistock |
| 126 | Hilger-Watts | Microptic No. 3 |

140-159 - Second-Order (Universal) Theodolites

| | | |
|-----|------------------|--------------------------------------|
| 140 | Unspecified | 1", 2", 5" Direct-Reading Theodolite |
| 141 | Various | USC&GS 7-inch Repeating Theodolite |
| 142 | Wild | T-2 or T-2E |
| 143 | Kern | DKM2 or DKM2-A |
| 144 | CTS/Vickers | V-400 Series |
| 145 | Hilger-Watts | Microptic No. 2 |
| 146 | Dietzgen/Askania | A2 or A2E |
| 147 | Zeiss/Oberkochen | Th2 |
| 148 | Zeiss/Jena | Theo-010 or Theo-010A |
| 149 | Nikon | NT-3 or NT-5 |
| 150 | Sokkisha | TM-1A |
| 151 | Geotec | TH-01 |

160-169 - Third-Order (Construction) Theodolites

| | | |
|-----|-------------|--|
| 160 | Unspecified | Construction Theodolite or Transit |
| 161 | Various | 10" Direct-Reading Theodolite or Transit |
| 162 | Various | 20" Direct-Reading Theodolite or Transit |
| 163 | Various | 30" Direct-Reading Theodolite or Transit |
| 164 | Various | 1' Direct-Reading Theodolite or Transit |

170-179 - 30' or Coarser Angulation Devices

| | | |
|-----|-------------|--------------------------------------|
| 170 | Unspecified | 30' or Coarser Angulation Device |
| 171 | Various | 30' or Coarser Theodolite or Transit |
| 172 | Various | 30' or Coarser Compass Device |
| 173 | Various | 30' or Coarser Protractor |

180-199 - Gyroscopic Theodolites

| | | |
|-----|-------------|-----------------|
| 180 | Unspecified | Gyro-Theodolite |
|-----|-------------|-----------------|

| CODE | MANUFACTURER | INSTRUMENT MODEL OR TYPE |
|------|--------------|--------------------------|
|------|--------------|--------------------------|

200-299 - LEVELING INSTRUMENTS

200 Unspecified Leveling Instrument

210-249 - Precise (Geodetic) Levels

210 Unspecified Precise Level

211-230 - Precise Spirit (Bubble-Vial) Levels

| | | |
|-----|-----------------|---------------------------|
| 211 | Various | USC&GS Fischer |
| 212 | USC&GS | Stampfer-Type (1877-1899) |
| 213 | Buff & Berger | Van Orden or Mendenhall |
| 214 | Various | Kern-Type (US Engineers) |
| 215 | Zeiss | Ni-III or Ni-A |
| 216 | Zeiss/Jena | Ni-004 |
| 217 | Wild | N-3 |
| 218 | Kern | NK3-M |
| 219 | Breithaupt | NABON |
| 220 | Fennel | Precise Level |
| 221 | Hilger-Watts | Precise Level |
| 222 | CTS/Vicke's | Geodetic Level |
| 223 | Sokkisha | PL-5 |
| 224 | Keuffel & Esser | Precise Level |

231-249 - Precise Compensator (Self-Aligning) Levels

| | | |
|-----|------------------|---------------|
| 231 | Zeiss/Oberkochen | Ni1 |
| 232 | Zeiss/Oberkochen | Ni2 |
| 233 | Zeiss/Jena | Ni-002 |
| 234 | Zeiss/Jena | Ni-007 |
| 235 | Wild | NA-2 or NAK-2 |
| 236 | Salvaviragli | 5190 |
| 237 | MOM | Ni-A31 |
| 238 | Sokkisha | B-1 |

250-289 - Engineer's (Universal) Levels

250 Unspecified Engineer's Level

251-270 - Engineer's Spirit (Bubble-Vial) Levels

| | | |
|-----|------------|--------------------------|
| 251 | Various | 18-inch Dumpy-Type Level |
| 252 | Various | 18-inch Wye-Type Level |
| 253 | Zeiss | Ni-II or Ni-B |
| 254 | Zeiss/Jena | Ni-030 |

| CODE | MANUFACTURER | INSTRUMENT MODEL OR TYPE |
|------|--------------|--------------------------|
|------|--------------|--------------------------|

251-270 - Engineer's Spirit Levels - Continued

| | | |
|-----|--------------|------------------|
| 255 | Wild | N-2 or NK-2 |
| 256 | Kern | NK3 |
| 257 | Kern | NK2 |
| 258 | Kern | GK23 |
| 259 | Breithaupt | NAKRE |
| 260 | Fennel | Engineer's Level |
| 261 | Hilger-Watts | Engineer's Level |
| 262 | CTS/Vickers | Engineer's Level |
| 263 | Salmoiraghi | 5160 Series |
| 264 | Nikon | S2 |
| 265 | Sokkisha | TTL-5 or TTL-6 |
| 266 | Geotec | L-11 or L-21 |

271-289 - Engineer's Compensator (Self-Aligning) Levels

| | | |
|-----|------------------|---------------------|
| 271 | Zeiss/Oberkochen | N122 |
| 272 | Zeiss/Jena | Ni-025 |
| 273 | Kern | GK1-A |
| 274 | Breithaupt | AUTOM or AUCIR |
| 275 | Fennel | AUING |
| 276 | Hilger-Watts | AUTOSET |
| 277 | Salmoiraghi | 5173, 5175, or 5180 |
| 278 | Ertel | INA |
| 279 | Nikon | AE Series |
| 280 | Sokkisha | B-2 |
| 281 | Geotec | AL-2 or AL-23 |

290-299 - Builder's (Construction) Levels

| | | |
|-----|-------------|-----------------------------------|
| 290 | Unspecified | Builder's Level |
| 291 | Various | Builder's Dumpy-Type Spirit Level |
| 292 | Various | Builder's Tilting Spirit Level |
| 293 | Various | Builder's Compensator Level |

300-399 - LEVELING RODS AND STAVES

| | | |
|-----|-------------|-----------------------|
| 300 | Unspecified | Leveling Rod or Stave |
|-----|-------------|-----------------------|

310-349 - Precise (Geodetic) Metal-Scale Rods

| | | |
|-----|-------------|-------------------------|
| 310 | Unspecified | Precise Metal-Scale Rod |
|-----|-------------|-------------------------|

| CODE | MANUFACTURER | INSTRUMENT MODEL OR TYPE |
|------|--------------|--------------------------|
|------|--------------|--------------------------|

310-349 - Precise Metal-Scale Rods - Continued

| | | |
|-----|------------------|----------------------------|
| 311 | USC&GS | USC&GS Pre-Invar Rods |
| 312 | USC&GS | Invar (Introduced in 1916) |
| 313 | Zeiss/Oberkochen | Invar |
| 314 | Zeiss/Jena | Invar |
| 315 | Wild | Invar |
| 316 | Kern | Invar |
| 317 | Breithaupt | Invar |
| 318 | Fennel | Invar |
| 319 | Hilger-Watts | Invar |
| 320 | CTS/Ticker | Nilex |
| 321 | Salmoniragh | Invar |
| 322 | Keuffel & Esser | Lovar |
| 323 | Gurley | Invar |

350-389 - Engineer's Wooden Rods and Staves

| | | |
|-----|-------------|--|
| 350 | Unspecified | Engineer's Wooden Rod or Stave |
| 351 | Various | US Engineers 12-foot Rigid Rod |
| 352 | Various | US Geological Survey 12-foot Rigid Rod |

390-399 - Builder's Rods and Staves

| | | |
|-----|-------------|------------------------|
| 390 | Unspecified | Builder's Rod or Stave |
| 391 | Varicus | Philadelphia Rod |
| 392 | Varicus | Chicago Rod |
| 393 | Varicus | California Rod |
| 394 | Varicus | 12-foot Folding Rod |

400-449 - STEEL AND INVAR TAPES

| | | |
|-----|-------------|---------------------|
| 400 | Unspecified | Steel or Invar Tape |
|-----|-------------|---------------------|

420-439 - Calibrated Invar Tapes

| | | |
|-----|-------------|--------------------------------|
| 420 | Unspecified | Calibrated Invar Tape |
| 421 | Varicus | 25-meter Calibrated Invar Tape |
| 422 | Various | 50-meter Calibrated Invar Tape |

| CODE | MANUFACTURER | INSTRUMENT MODEL OR TYPE |
|------|--------------|--------------------------|
|------|--------------|--------------------------|

440-459 - Calibrated Steel Tapes

| | | |
|-----|-------------|--------------------------------|
| 440 | Unspecified | Calibrated Steel Tape |
| 441 | Various | 30-meter Calibrated Steel Tape |
| 442 | Various | 100-foot Calibrated Steel Tape |
| 443 | Various | 300-foot Calibrated Steel Tape |

460-479 - Uncalibrated Steel Tapes

| | | |
|-----|-------------|----------------------------------|
| 460 | Unspecified | Uncalibrated Steel Tape or Ruler |
| 461 | Various | 30-meter Uncalibrated Steel Tape |
| 462 | Various | 100-foot Uncalibrated Steel Tape |
| 463 | Various | 300-foot Uncalibrated Steel Tape |

500-599 - LIGHTWAVE DISTANCE-MEASURING EQUIPMENT

| | | |
|-----|-----------------|----------------------------------|
| 500 | Unspecified | Lightwave Electro-Optical Device |
| 501 | AGA | Geodimeter Model 1 |
| 502 | AGA | Geodimeter Model 2 or 2A |
| 503 | AGA | Geodimeter Model 3 |
| 504 | AGA | Geodimeter Model 4A, 4B, or 4D |
| 505 | AGA | Geodimeter Model 4L |
| 506 | AGA | Geodimeter Model 6 |
| 507 | AGA | Geodimeter Model 6A |
| 508 | AGA | Geodimeter Model 6B |
| 509 | AGA | Geodimeter Model 6BL |
| 510 | AGA | Geodimeter Model 7T |
| 511 | AGA | Geodimeter Model 700 or 710 |
| 512 | AGA | Geodimeter Model 76 or 78 |
| 513 | AGA | Geodimeter Model 8 |
| 531 | Keuffel & Esser | LSE Ranger I, II, or III |
| 532 | Keuffel & Esser | LSE Ranger IV |
| 533 | Keuffel & Esser | LSE Ranger V |
| 534 | Keuffel & Esser | LSE Rangemaster |
| 541 | Spectra-Physics | Geodolite 3G |
| 542 | Spectra-Physics | Transitlite LT-3 |
| 551 | Kern | ME-3000 Mekometer |

| CODE | MANUFACTURER | INSTRUMENT MODEL OR TYPE |
|------|--------------|--------------------------|
|------|--------------|--------------------------|

600-699 - INFRARED DISTANCE-MEASURING EQUIPMENT

| | | |
|-----|------------------|-----------------------------------|
| 600 | Unspecified | Infrared Electro-Optical DME |
| 601 | AGA | Geodimeter Model 12 |
| 611 | Plessey | Tellurometer CD-6 |
| 612 | Plessey | Tellurometer MA-100 |
| 621 | Wild | Distomat DI-3 Series |
| 622 | Wild | Distomat DI-10 Series |
| 631 | Kern | DM-500 |
| 632 | Kern | DM-1000 or DM-2000 |
| 641 | Zeiss/Oberkochen | SM 11 or RegElta 14 |
| 642 | Zeiss/Oberkochen | Eldi Series |
| 643 | Zeiss/Oberkochen | SM 4 |
| 651 | Keuffel & Esser | LSE Microranger or Microranger II |
| 652 | Keuffel & Esser | LSE Autoranger |
| 661 | Hewlett-Packard | 3800 |
| 662 | Hewlett-Packard | 3805 or 3810 |
| 671 | Cubic | Cubitape DM-60 |
| 672 | Cubic | HDM-70 |
| 681 | Carroll & Reed | Akkuranger Mark I |
| 691 | Nikor | Beetle 500 or 500S |
| 692 | Nikor | Beetle 1000 or 1000S |

700-799 - RETRO-REFLECTORS

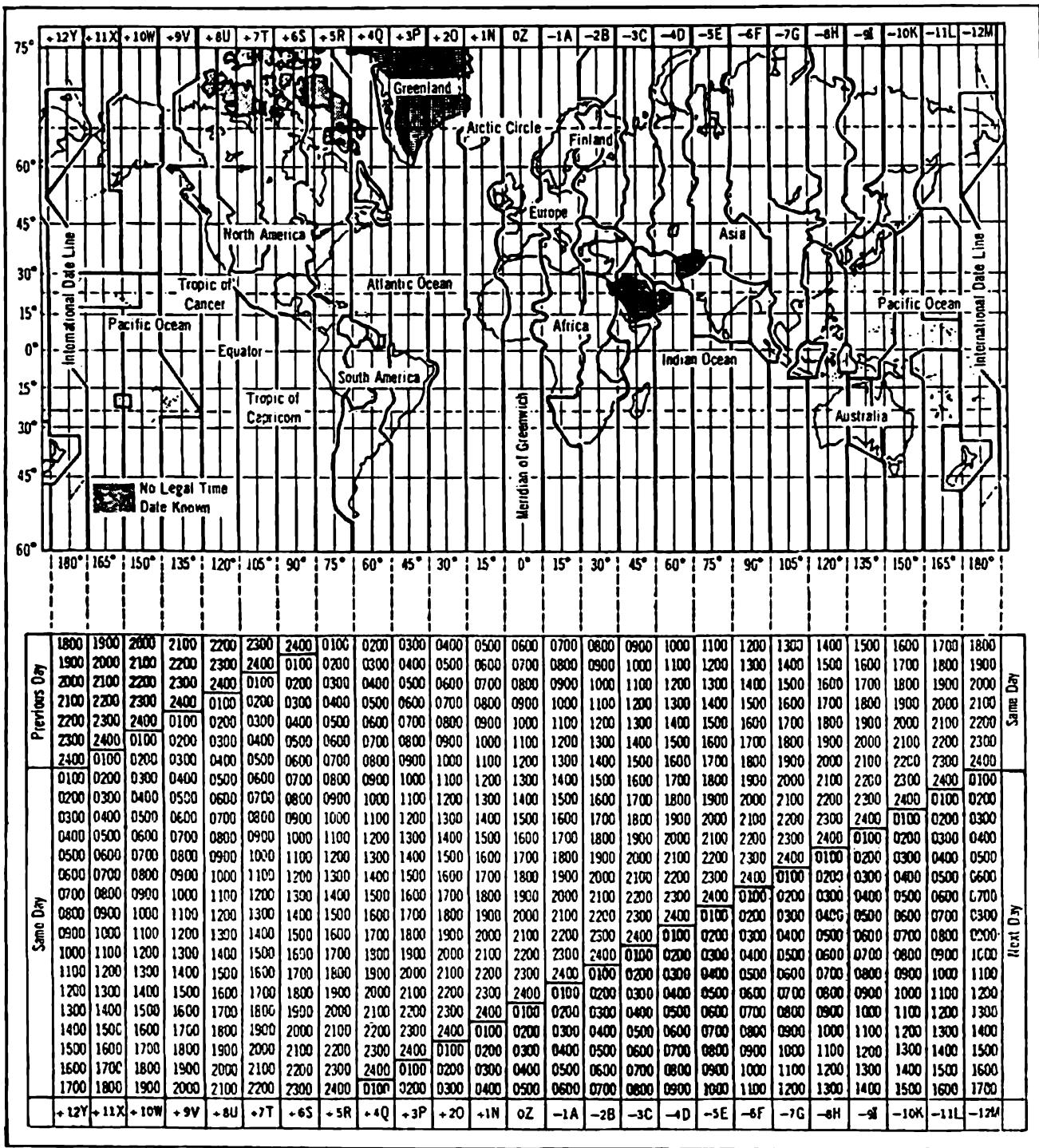
| | | |
|-----|-------------|-----------------|
| 700 | Unspecified | Retro-Reflector |
|-----|-------------|-----------------|

800-899 - MICROWAVE DISTANCE-MEASURING EQUIPMENT

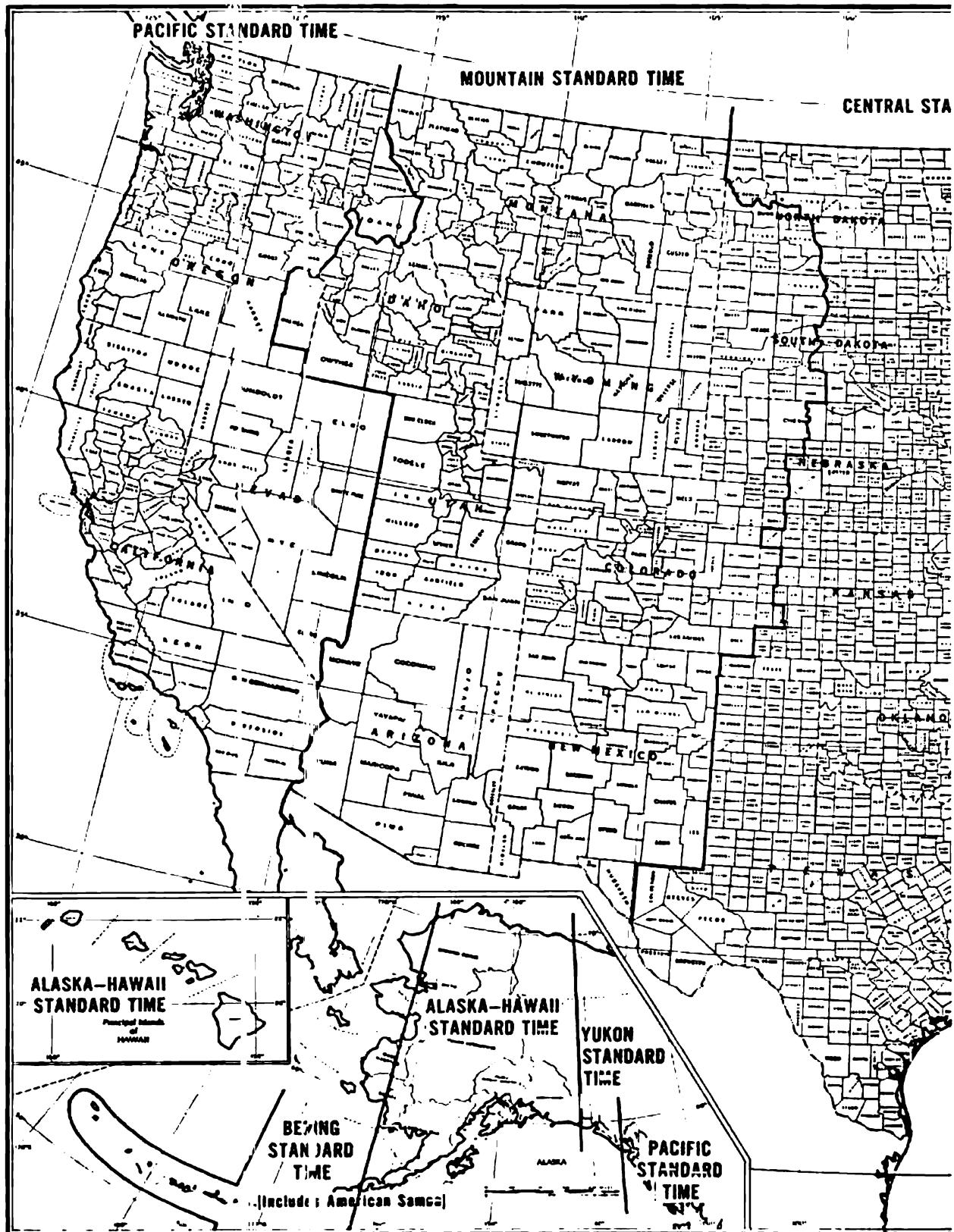
| | | |
|-----|-------------|--------------------------------|
| 800 | Unspecified | Microwave Electro-Magnetic DME |
| 801 | Plessey | Tellurometer MRA-1 |
| 802 | Plessey | Tellurometer MRA-2 |
| 803 | Plessey | Tellurometer MRA-3 |
| 804 | Plessey | Tellurometer MRA-4 |
| 805 | Plessey | Tellurometer MRA-5 |
| 809 | Plessey | Tellurometer CA-1000 |
| 831 | Wild | Distomat DI-50 |
| 832 | Wild | Distomat DI-60 |
| 841 | Cubic | Electrotape DM-20 |
| 851 | Fairchild | Microchain |

ANNEX H

STANDARD TIME ZONES

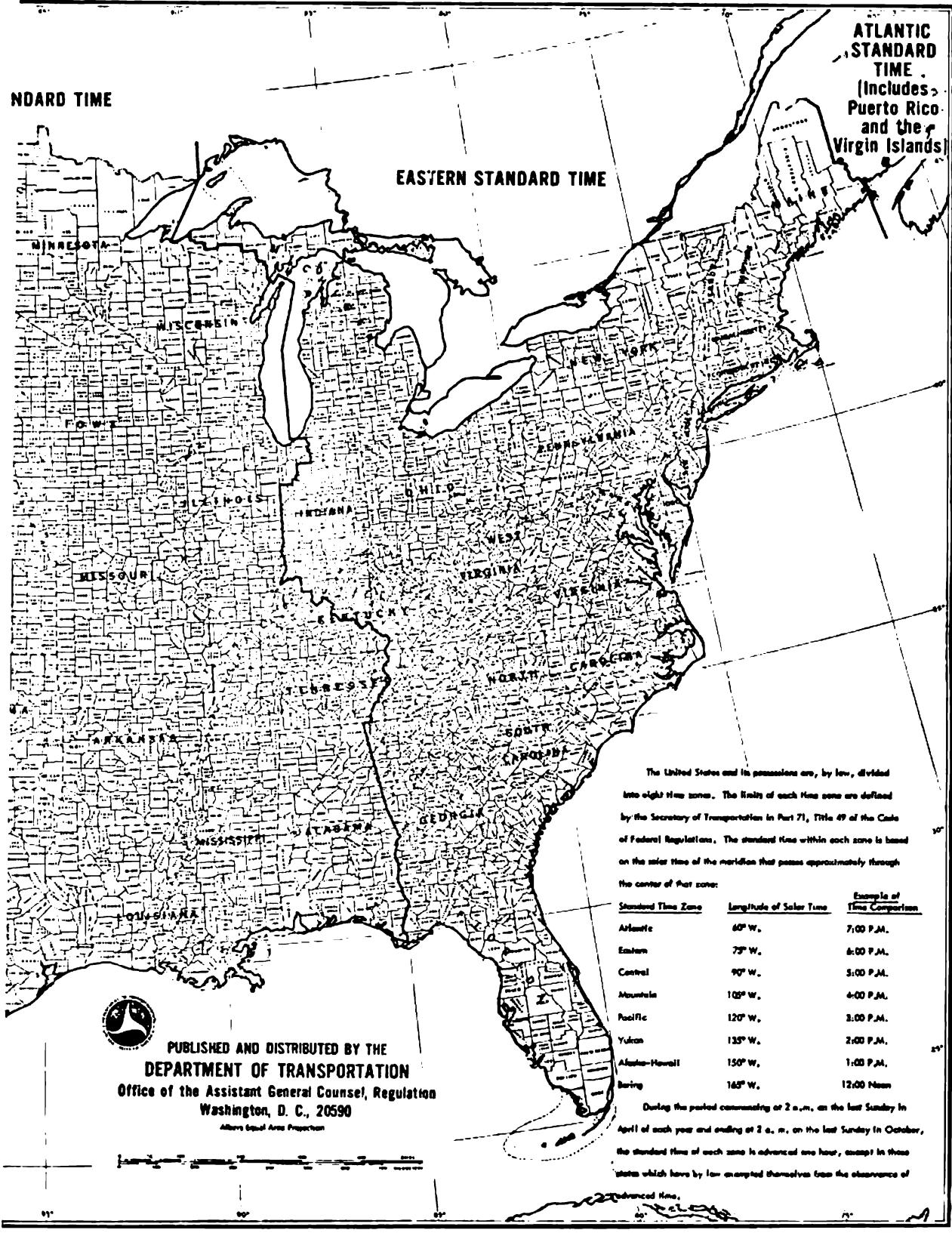


STANDARD TIME ZONES



OF THE UNITED STATES

STANDARD TIME



PUBLISHED AND DISTRIBUTED BY THE
DEPARTMENT OF TRANSPORTATION
Office of the Assistant General Counsel, Regulation
Washington, D. C., 20590

Alluvium Equal Areas Proportion

The United States and its possessions are, by law, divided into eight time zones. The limits of each time zone are defined by the Secretary of Transportation in Part 71, Title 49 of the Code of Federal Regulations. The standard time within each zone is based on the solar time of the meridian that passes approximately through the center of that zone.

| <u>Standard Time Zone</u> | <u>Longitude of Solar Time</u> | <u>Example of Time Comparison</u> |
|---------------------------|--------------------------------|-----------------------------------|
| Atlantic | 60° W. | 7:00 P.M. |
| Eastern | 75° W. | 6:00 P.M. |
| Central | 90° W. | 5:00 P.M. |
| Mountain | 105° W. | 4:00 P.M. |
| Pacific | 120° W. | 3:00 P.M. |
| Yukon | 135° W. | 2:00 P.M. |
| Alaska-Hawaii | 150° W. | 1:00 P.M. |
| Bering | 165° W. | 12:00 Noon |

During the period commencing at 2 a.m., on the last Sunday in April of each year and ending at 2 a.m., on the last Sunday in October, the standard time of each zone is advanced one hour, except in those states which have by law exempted themselves from the observance of

INTENTIONALLY BLANK

ANNEX J

SUMMARY OF CODES USED IN BENCH MARK DESCRIPTIONS

This ANNEX contains lists of codes which are used in the preparation of original and recovery descriptions pertaining to vertical control points (bench marks). The use of these codes is explained in Chapter 7, entitled VERTICAL DESCRIPTIVE (VERT DESC) DATA. See ANNEX J for a summary of codes used in connection with station descriptions and recovery notes pertaining to horizontal control points.

DRC CODE - used to identify the descriptive data as to its type;

- D - self-standing original description
- R - self-standing recovery description
- C - combined set consisting of one
 - complete original or recovery
 - description followed by abridged
 - subsequent recovery description(s)
 - for the same bench mark.

AGENCY CODE - used to indicate the organization or type of organization which physically set the vertical control point, or in the case of a recovery of an existing vertical control point, the organization or type of organization which recovered the vertical control point.

- 0 - unknown
- 1 - NGS or CGS (USC&GS)
- 2 - U.S. Geological Survey (USGS)
- 3 - U.S. Department of Defense (DOD)
- 4 - other federal or interstate agency
- 5 - state agency
- 6 - county, city, or regional agency
- 7 - commercial organization or private firm
- 8 - National Ocean Survey (NOS)
- 9 - foreign government agency

OTHER CONTROL CODE - used to indicate the existence of other geodetic control or a special characteristic of the vertical control point.

- A - astronomic observation(s) for the mark resides in
 - the NGS Data Base
- F - fault site
- G - gravity observation(s) for the mark resides in the
 - NGS Data Base
- H - horizontal geodetic coordinates of the mark reside in the NGS Data Base.
- M - magnetic station
- N - no vertical control (not connected to the national vertical geodetic control network)
- O - other (see descriptive text)
- T - tidal bench mark

| | |
|---|---|
| X - recovery description written for this survey point during current project, but first leveling tie to the NGS Vertical Network was made in this current project | * |
| Z - survey point previously tied to the NGS Vertical Network and recovery description written in this current project, but survey point was not leveled in this current project | * |

CONDITION CODE .. used to indicate the condition of the monument or mark as determined upon the recovery of the vertical control point.

| | |
|------------------------------------|--|
| G - good, fair | |
| N - not recovered, not found, lost | |
| O - other (see recovery text) | |
| P - poor, disturbed, mutilated | |
| X - destroyed | |

SETTING CLASSIFICATION CODE - used to indicate the setting characteristics of the monument or mark.

| Default Monumentation | * |
|-----------------------|---|
| Quality Code | * |

| | |
|-----------------------|---|
| 00 - unspecified..... | D |
|-----------------------|---|

Shallow Settings (less than 10ft):

| | |
|--|---|
| 10 - unspecified shallow..... | D |
| 11 - metal rod with base plate..... | C |
| 12 - concrete post..... | C |
| 13 - shallow-set pipe..... | D |
| 14 - shallow-set metal rod (without base plate)..... | D |

Unspecified Deep Settings (10ft or more):

| | |
|---------------------------------|---|
| 20 - unspecified deep..... | C |
| 21 - copper-clad steel rod..... | B |
| 22 - galvanized steel pipe..... | B |
| 23 - galvanized steel rod..... | B |
| 24 - stainless steel rod..... | B |
| 25 - aluminum alloy rod..... | B |

Rocks and Boulders:

| | |
|---|---|
| 30 - unspecified rock..... | B |
| 31 - rock outcrop, rock ledge, rock cut, or bedrock.. | A |
| 32 - boulder..... | C |

Structures:

| | |
|---|---|
| 40 - light structures (other than listed below)..... | D |
| 41 - pavements (street, sidewalk, curb, apron, etc.). | D |
| 42 - retaining walls (e.g. culverts and small bridges)..... | C |
| 43 - poles and poles (e.g. spike in utility pole).... | D |

| | |
|--|---|
| 44 - footings/foundation walls of small/medium structures..... | C |
| 45 - mat foundations (landings, platforms, steps, etc.)..... | C |
| 50 - massive structures (other than listed below)..... | B |
| 51 - massive retaining walls..... | B |
| 52 - abutments and piers of large bridges..... | B |
| 53 - tunnels..... | B |
| 54 - massive structures with deep foundations..... | A |
| 55 - large structures with foundation on bedrock..... | A |

Sleeved Deep Settings (10ft or more):

| | |
|---|---|
| 60 - unspecified rod/pipe in sleeve..... | B |
| 61 - copper-clad steel rod in sleeve..... | B |
| 62 - galvanized steel pipe in sleeve..... | A |
| 63 - galvanized steel rod in sleeve..... | A |
| 64 - stainless steel rod in sleeve..... | A |
| 65 - aluminum alloy rod in sleeve..... | A |

MONUMENTATION QUALITY CODE - may be entered in column 53 of the *27* record to override the above default codes which are softwareed into the descriptions for publication.

- A - monuments of the most reliable nature which may be expected to hold their elevations very well.
- B - monuments which probably hold their elevations well.
- C - monuments which may hold their elevations but which are commonly subject to surface ground movements.
- D - monuments of questionable or unknown reliability.

MONUMENTATION CODE - used to identify the type of monument or mark.

| | | |
|-------------------------------|---------------------|--------------------------------|
| B - bolt | I - metal rod | S - spike |
| C - cap-and-bolt | N - nail | T - chiseled triangle |
| D - survey disk (any type) | O - chiseled circle | V - stone monument |
| F - flange-encased rod | P - pipe cap | X - chiseled cross |
| H - drill hole | Q - chiseled square | Z - other (see description) |
| | R - rivet | |

DISK TYPE - used with MONUMENTATION CODE D (survey disk) only.

| |
|----------------------------------|
| 00 - unspecified |
| 01 - bench mark disk |
| 02 - tidal bench mark disk |
| 03 - triangulation station disk |
| 04 - traverse station disk |
| 05 - topographic station disk |
| 06 - survey disk (not listed) |
| 07 - reference mark (RM) disk |
| 08 - azimuth mark (Az Mk) disk |
| 09 - gravity station disk |
| 10 - gravity reference mark disk |
| 11 - magnetic station disk |

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ANNEX K

DATA TRANSMITTAL INSTRUCTIONS

Information concerning data preparation and transmittal to NGS is found in Chapter 1, HORIZONTAL CONTROL (HZTL) DATA, and in Chapter 5, VERTICAL CONTROL (VERT) DATA. The point of contact at NGS for questions concerning the User's Guide to the "Formats and Specifications of the National Geodetic Survey Data Base" is Mr. James E. Stem. His address and telephone number are:

James E. Stem
National Geodetic Survey, OA/C1x4
Rockville, Maryland 20852
Telephone: (301) 443-8749

Data sent to NGS via U.S. Postal Service should be addressed:

Director, National Geodetic Survey
Attn: OA/C17x4
Rockville, Maryland 20852

Data sent to NGS via United Parcel Service or similar commercial carrier should be addressed:

Director, National Geodetic Survey
Attn: OA/C17x4
Rockwall Building, Room 26
11400 Rockville Pike
Rockville, Maryland 20852

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