

## Chapter 5

### VERTICAL CONTROL (VERT) DATA

#### INTRODUCTION

For coding and processing, the data required for geodetic vertical control (VERT data) have been divided into two sets. These are (1) observational data of elevation differences between survey points (OBS data) and (2) descriptive data including original and recovery descriptions (DESC data). Detailed instructions and formats for the coding and keying of the OBS and DESC vertical control data sets are contained in Chapter 6 and Annex P, respectively. The two data sets of each vertical control job must be submitted at the same time.

#### 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 consists of data for a maximum of 9999 survey points, as "survey point" is defined 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 co-located geodetic projects intended for inclusion in the National Geodetic Survey Data Base, such as two leveling projects in the same area done at different epochs or simultaneous leveling and GPS projects.

A two-character alphanumeric code must be assigned to each vertical control job. This job code occurs in the first record of each data set (see Chapter 6 and Annex P) along with the data set type, the name of the submitting agency, and the data set creation date. These elements uniquely identify and positively correlate the respective data sets.

The first character of the job code must be a letter; the second character may be either a letter or a number (1 through 9). The characters chosen may then be arbitrary, or they may instead be cryptically meaningful, such as suggesting the location or nature of a project or a succession of projects accomplished by an agency.

A *vertical control point* is defined in this publication as a survey point which is described and monumented (or otherwise permanently marked) and 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 described temporary bench mark (TBM), a non-described TBM (occurring primarily in older data), or a permanent bench mark (monumented and described).

Each survey point in a vertical control job must be assigned a unique four-digit serial number (not necessarily consecutive) 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 station serial numbers (SSNs). This numbering system provides a unique identifier for every survey point in a vertical control job. The same SSN must be used consistently to refer to the same point in the OBS and DESC data sets of a vertical control job.

Descriptive data should be submitted for all survey points, including temporary bench marks (TBMs). The text "No description available" is acceptable for TBMs as long as other elements of the description such as the position, state and county have been entered.

#### MEDIA FOR SUBMITTING DATA

In principle, any computer-industry standard data-recording medium can be handled. The two media presently acceptable to NGS on a routine basis are compact disk (CD) and floppy disk. Changes with technology are expected.

The following information must be given for each data set:

1. Name and address of the submitting agency.
2. Project title and intended accuracy.
3. Name and telephone number of person to be contacted in case of difficulty with the data.

A letter of transmittal, in which the data are described and itemized and which provides the above information, must be prepared for each data shipment. One copy is to be enclosed with the shipment, one sent by separate mail to NGS, and a third retained by the sender. See ANNEX K for 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.

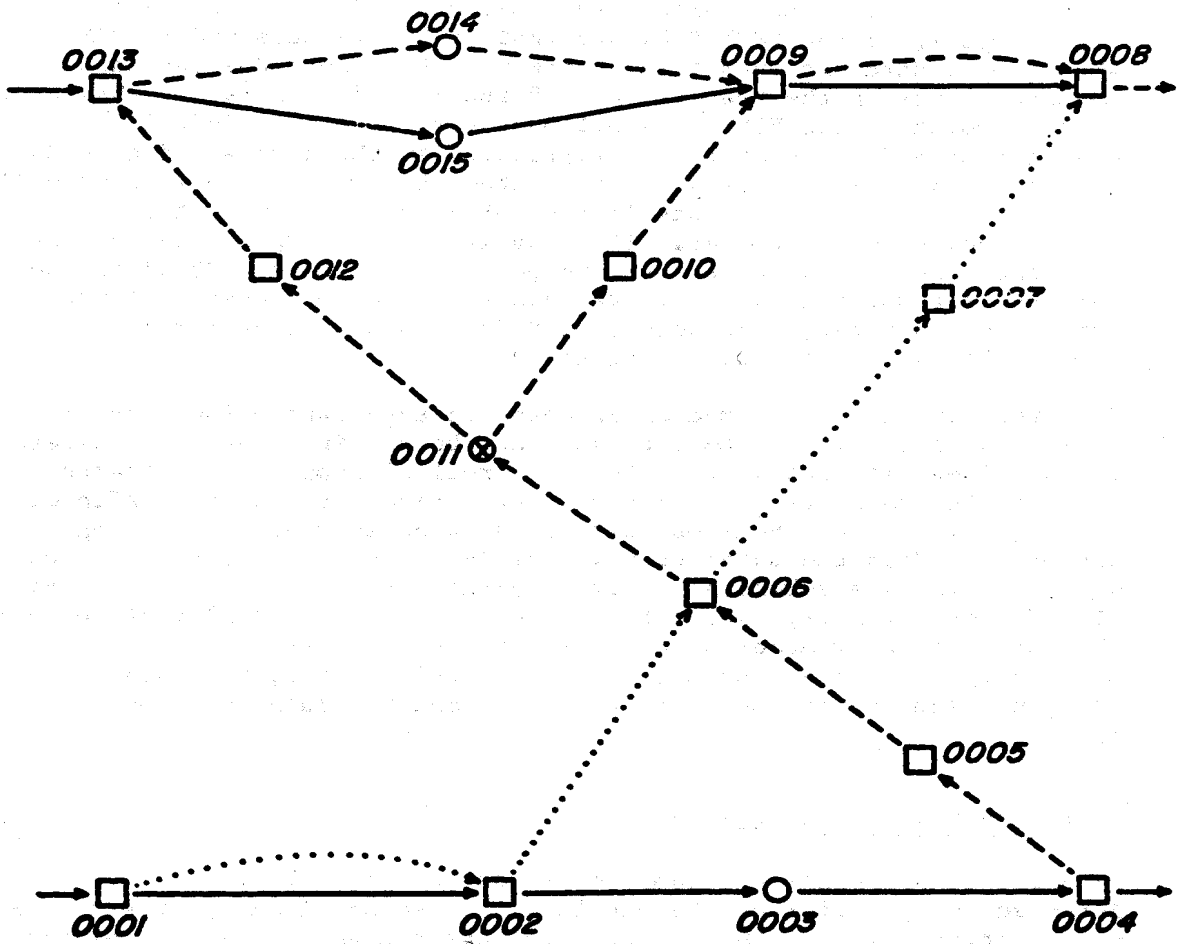
#### CODING, KEYING, AND DATA VERIFICATION

All data submitted to NGS for inclusion in the National Geodetic Survey Data Base must be coded and keyed in 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 submission of vertical control jobs are contained in Chapter 6 (VERT OBS data) and Annex P (D-FILE data). The structure of an 80-character record is used for VERT OBS data.

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

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

#### SPECIAL CHARACTERS

In addition to upper-case alphabetic characters (letters A through Z) and numeric characters (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 nominally reserved for a record sequence number. This number remains useful, but it has become optional; the respective columns may be blank.

The historical purpose of numbering the records was to ensure that the proper sequence of the cards representing individual records in a data set could be verified and, if necessary, restored. The record sequence numbers were intended to be continuous throughout each data set, starting with the first record (the \*aa\* Data Set Identification Record) and ending with the last record (the \*aa\* Data Set Termination Record).

The sequence numbers, if used, should begin with 000010 on the first record of the data set 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.

Discounting any after-the-fact inclusions, the sequential numbering system described above will permit a maximum of 99,999 uniquely numbered records in any one data set. Should there be a need for a greater number of records in a data set, start over with 000010, 000020, ... etc.