PURPOSE: To Standardize the Taking and Preparation of Cross Section Notes for Determining Pay Quantities.

GENERAL:

Cross sections are to be taken at 100 foot intervals and at other locations such as drainage ditches or other abrupt changes in terrain, bridge ends, etc., for accurate measurement of quantities and are to be recorded in a bound cross section book/data collector to prevent loss of information.

1. PREPARATION OF FIELD NOTE BOOKS : (Similar care should be used for information stored in a data collector)

   It has been observed from prior experience that the least handling or manipulation of actual source documents by field personnel, results in the least chance of error; therefore, except in special cases where confusion exists without the aid of plotted cross sections, notes should be retained in prescribed field note books. The following procedures are suggested:

   1.1. Rod readings or elevations may be used in the field books, but it usually is desirable to leave all shots in rod readings since this is the data used for making computations.

   1.2. On final templates that cannot be closed manually, make the notation "tie at" giving the distance right or left of the control line.

   1.3. All notes of a single location, i.e., ramps, pits or roadways, should be grouped together in sequence. Do not mix types and locations, i.e., originals and finals, roadways and ramps.

   1.4. All cross section notes should be labeled as to type, location, and termini.

   1.5. Encircle in red pencil and mark "omit" any cross section or extraneous data that are not to be included in the earthwork computations. Pipe, culvert, skew and partial sections and any other extraneous data should be easily distinguishable from other notes.

   1.6. Reference original and final cross section to the same centerline or base line.

1.7. Check reference elevations before the cross section notes are processed for computation. Check the addition and subtraction of all rod readings used to compute reference elevations. If cross sections are taken as directly read from the level, then heights of instruments, bench marks, and turning points are considered as reference elevations.

1.8. The reference elevations should be repeated at the top of each page in the note books even though it may not have changed for several cross sections.

1.9. If more than one height of instrument (reference elevation) is required for a section, the proper shot sequence should be maintained across the station in the notes. Do not scatter data about in the notes.

1.10. All points must be labeled as to station and must appear on the proper side of the centerline. Where there is insufficient room on one line, shots may be continued on the next line.

1.11. When recording rod readings or elevations, it is recommended that decimal points not be used to represent decimals of a foot. Instead, use a superscript digit and underline it, e.g., $11^{\underline{27}}$. The same procedure should be used to list distances, when it becomes necessary to record them to a tenth of a foot.

1.12. Rod readings are normally considered to be negative. Where plus (+) readings are required, bracket the plus shot, e.g., $(+1^{\underline{0}})$.

1.13. To avoid confusion, never use a zero ($0^{\underline{0}}$) rod or elevation with the centerline or base line distance of ($0^{\underline{0}}$). Use at least $0^{\underline{1}}$ of a foot. At distances other than zero, a zero rod reading or elevation is permissible.

1.14. Never substitute NG (natural ground), TB (top of bank), TS (top of a slope) for rod readings. If a rod reading cannot be obtained at such points follow the instructions given in Subsection 1.2 in this S.O.P.

1.15. Record rod reading, elevations, and horizontal distances as shown in the following table:

Measurement Item (for all roadways)	**Criteria Feet**
Horizontal distance, except cross sections	0.005
Elevations: Benchmarks	0.005
Elevations: Centerline, Pavements	0.01
Elevations: Centerline, Subgrades	0.01
Cross sections: Distances:	0.5
Cross sections: Elevations on ground:	0.1
Cross sections: Elevations on pavement	0.01
Centerline: Elevations on Nat. Ground	0.1
Centerline: Distances on Nat. Ground	0.5

1.16. In the computation of the area between cross sections, the last shots left or right of the control line are considered to be the tie points. Original cross section points may extend beyond the tie points, but are disregarded in the computation. Vertical ties at the end points are usually handled by having a point on the original and final cross sections at the same distance with an elevation difference greater than one-half (0.5) of a foot. It is not necessary to have a final shot at the original elevation to force a tie. Within a cross section, two shots at the same distance to indicate a cliff or sheer section are permissible. Three shots at the same distance have no meaning and should not be taken.

1.17. A job may begin with, end with, or, have intermediate grade sections which will be indicated by "grade point" accompanied with the appropriate station number and, if possible, an original cross section at the proper location.

2. PREPARATION OF PLOTTED CROSS SECTIONS:

Plotted cross sections should be used for special cases where an error of intent could occur without a "Picture" of what is desired. The following procedures are provided:

2.1. All lettering must be readily legible.

2.2. Where possible, the lettered figures that represent a point should be directly above or below the point represented and about one-half inch from the line.

2.3. Separate the lettered elevation from the lettered distance by one to two tenths of an inch.

2.4. When lettering elevations and distances, do not use decimal points to represent decimals of a foot. Instead, use an underlined superscript digit.

2.5. Black ink should be used for plotting and lettering original cross sections. Green or red ink should be used for plotting and lettering final cross sections. Preferably, green on red sheets, and vice versa.

2.6. Do not interpolate individual tie shots between cut and fill areas. (See Subsection 1.17, this S.O.P.)

2.7. Whenever a final and an original point coincide, letter both points in the proper manner and in the appropriate ink.

2.8. All interpolated sections should be plotted in the normal manner and placed in the proper sequence according to station number.

2.9. Vertical ties are handled as described in, Subsection 1.16, this S.O.P.