Section 4

HORIZONTAL CONTROL FOR PRELIMINARY SURVEYS
Section 4.1

HORIZONTAL CONTROL FOR PRELIMINARY SURVEYS

4.1.1 General - The following section institutes uniform standards for the establishment of horizontal field survey control and monumentation. In many instances there is a substantial time lapse between completion of the preliminary field survey and the actual start of a project, it is critical that all horizontal survey control can be reestablished in the field. It is the responsibility of the Design Engineer to set, or cause to be set, survey control monumentation at locations herein described. There are two methods of survey control monumentation which will be accepted for projects:

1. Baseline or Centerline Alignment - Horizontal Control monumentation shall be set on the Centerline or Survey Baseline of the project;
2. Coordinate System Control Points - Horizontal Control monumentation shall be randomly set at locations easily accessed and occupied for survey.

All projects will have survey monumentation points which have been located into the NAD 83 North Kansas Zone Grid System. The coordinates shall be shown on the plans and be located by “grid” and not “ground” coordinates. The number of monuments located into the state plane coordinate system shall vary by size of project. One shall be located near each end of a project and additional monuments shall be located approximately each half mile along the project route. The state plane system coordinates shall be used primarily for mapping control and final measurement locations.

4.1.2 Baseline or Centerline Alignment - Alignment for baseline and/or project centerline shall be established by setting monumented points at the following locations:

1. Points on Tangent (P.O.T.) on baseline shall be monumented at a maximum distance of 1200 feet apart, and closer when necessary because of sight restrictions.
2. P.O.T.'s on baseline for trafficway improvement projects shall be monumented where all centerline of side streets intersect the project baseline. On plans, said points shall also show the angle Right (Rt.) or Left (Lt.) of baseline to the centerline of street.
3. All baseline or centerline points of Intersection (P.I.) shall be monumented. Plans will show project Station (Sta.) and deflection angle Rt. or Lt.

4.1.3 Coordinate System Control Points - The coordinate system used for project survey control other than for mapping and final measurement locations shall be “ground” based and the initial origin chosen to vary significantly from the state plane coordinate system. In situations where a coordinate system is used in lieu of a baseline, the Control Point Monuments shall meet the following criteria:
1. There shall be line of sight to a minimum of two other Control Point Monuments;
2. Control Point Monuments shall be ideally placed in locations which will be undisturbed during construction activity.
3. Control Point Monuments shall be set within the project site, at no more than 500 feet apart, in locations that facilitate survey work by Total Station equipment.

4.1.4 Physical Control Point Monuments – Monuments shall be of a durable nature, such as reinforcing bars (pins), chisel cuts in concrete, P.K. or MAG nails in pavement, etc. Points set in areas other than pavement shall be magnetically locatable; pins shall be minimum #4 reinforcing bars; wooden hubs shall not be used as Control Points Monumentation. Final Plans shall show all survey monumentation which has been set on a project, with reference ties.

4.1.5 Reference Ties – A minimum of four plumb references ties shall be taken for all Monumented Control Points. The following information shall be shown on final plans for these points:

1. Type of referenced point (P.I., P.O.T., Control Point, Center of Manhole, Etc.)
2. A description of the referenced point (1/2" rebar, nail & tab, cross cut, etc.)
3. Project Station of the referenced point;
4. A description of the reference point;
5. Cardinal direction from the referenced point to the reference;
6. Distance in hundredths from the referenced point to the reference.

Example: P.O.T. Baseline Sta. 5+64.65
1. Set 1/2" rebar at Sta.
2. P.K. nail in E. face P.P. 27.74 N.E.
3. Chiseled cross in T/C 24.32 S.W.
4. Chiseled cross in top Ret. Wall 43.77 N.N.W.

See City of Topeka Design Criteria and Drafting Standards, Section 2.1.2.4.1, for plan presentation detail.

4.1.6 Section Lines and Corners – Whenever any Public Land System corner falls within the scope of a proposed project, said corners shall be located and referenced ties shall be taken and shown on the plans. In addition, the corner shall be located into the state plane coordinate system and the project survey control coordinate system if used.

Example: N.W. Cor. Sec. 5-12-16, 5+75.25 8.52 Rt.
1. Fd. 1" Rd. Bar in Monument Box at Cor.
2. 20d spike in E. face 42" Tree 42.31 N.W.
3. Nail & Tab in S. face P.P. 36.27 S.E.
4. Chiseled Cross in W. end Ret. Wall 26.70 N.

Grid Coordinate NAD 83 KS N Zone N 267429.93
E 1974206.62

Project Coordinates
N 5000.00
E 5000.00
Section 4.2

VERTICAL CONTROL POINTS (BENCH MARKS) FOR PRELIMINARY SURVEYS

4.2.1 General - The following section institutes uniform standards for establishing vertical field survey control and monumentation. In many instances there is a substantial time lapse between completion of the preliminary field survey and the actual start of a project and it is critical that all vertical survey control can be recovered or reestablished in the field. It is the responsibility of the Design Engineer to set, or cause to be set, survey control monumentation at locations herein described. The City of Topeka Engineering Division's vertical control system (Bench Marks), is based on NAVD 1929 datum. Records showing available local survey control monuments are available from the Office of the City of Topeka Engineering Division. The records for NAVD 29 survey monuments are also available on the City of Topeka website at www.topeka.org/department/public_works/benchmarks/.

4.2.2 Placement of Bench Marks (B.M.) - Bench marks shall be established to enable coverage of the entire scope of the proposed project site. They shall be set on structures or objects which prohibit vertical movement, where they can be used conveniently and will not be disturbed during the construction process. They shall be permanent enough to last the duration of the project, e.g. for conducting the preliminary design survey, for establishing grades during the construction process, determining elevations for final measurement. Following are some examples of suitable bench mark locations:

1. Chiseled square cuts on concrete structures extending below the frost line;
2. Rebars a minimum of 5/8 inch diameter extending below the frost line and isolated from pavements, (exercise care in areas where underground utilities may exist);
3. Railroad spikes in power poles which fall outside the limits of the construction area.

Bench marks on fire hydrants are discouraged because of possible utility relocations, and should only be used when more feasible locations are unavailable. Paint should not be used to mark bench marks on private property.

Project Bench Marks shall be set at the beginning and end of the project location, and at a maximum of 500 foot intervals along the project route. They shall be placed closer in cases of extreme vertical variations of terrain, or due to other limited sight restrictions.

Each Bench Mark shall be listed by a number consisting of the project number and B.M. number, and shall have an adequate description which shall include project Sta., departure from centerline or baseline, elevation, and for sewer projects North and East coordinate pairs, (See Sec. 2.1.2.4.1)
Example: B.M. 70172-15, City of Topeka Engineering Division Std. Bench Mark Monument No. 78 Sta. 101+35.92, 28.95 Left Elevation = 928.95
Example: B.M. 40857-2, Chiseled square on C/L storm sewer inlet at T/C Sta. 26+12.85, 42.65 Right Elevation = 986.42 North-5143.35, East-2685.12

4.2.3 Establishing Elevations - When all Bench Marks have been set, a level circuit shall be run which originates at a bench mark in the C.T.B.M. system or the U.S.G.S. system, NAVD 1929 datum, and ends on another B.M. in the same system. Small site improvement projects may have level circuits which originate and end at the same origin. All Bench Marks shall be used as turning points to establish elevations. In determining elevations for the Bench Marks, the level circuit shall be done by method of differential leveling, adjusted, with elevations determined to an accuracy of one one-hundredth of a foot. If a project requires high precision, such as for settlement control, the three wire leveling method shall be utilized. Deviations from this criteria shall be approved by the City Engineer or his/her designated representative.
Section 4.3

RIGHT OF WAY CONTROL CRITERIA

4.3.1 General - The purpose of this section is to establish uniform procedures for location and measurement of existing boundaries, the reporting of these locations, and placement of stakes for property appraisal and acquisition.

4.3.2 Right of Way Survey - Preliminary design surveys shall include a diligent search for controlling survey monumentation. All existing monumentation at section, tract, subdivision, block and lot corners shall be located accurately relative to the project survey control by either station and distance left or right, or coordinate pair. The purpose of accurate measurement is to present evidence for equitable acquisition of property rights and correct replacement of disturbed or obliterated monuments after construction. In addition to monumentation that is likely to be directly affected by construction, other monumentation shall be located that defines the directions of intersecting or nearby property lines, for example, two monuments on a property line crossing a proposed sewer line location, or two monuments on a side street location for an adjacent street improvement. A survey report shall be prepared and submitted with field check plans which show locations of existing monumentation. The report shall be in survey note form with appropriate sketch drawings, and shall include detailed information as to type of monumentation found, for example, shapes and sizes of pins and pipes, names and registration numbers shown on identification caps, conclusions as to locations, and if required by the City Engineer or his/her designee, shall contain a certification that the right of way survey has been conducted under the supervision of a Registered Land Surveyor.

4.3.3 Property Acquisition Survey - Existing property and property to be acquired shall be staked and marked for acquisition by appraisal and negotiation or acquisition by condemnation. Existing monumentation, if in the correct position shall be marked for existing property, and untacked wooden hubs shall be set at all other corners of existing property or property to be acquired. Each hub set shall be marked by a lath or guard stake (depending on visibility) showing type of property acquisition and parcel number e.g., "Temporary construction easement, Parcel 6".

Lath shall have color-coded survey ribbon. The color code is as follows: red for right of way, existing or proposed; blue for permanent easements, existing and proposed; green for temporary construction easements. Where different types of acquisition adjoin, dual ribbons shall be used. Points that fall on pavement, such as parking lots, will be marked with a paint mark with a short one foot long line from the corner towards the next corner. Paint marks shall be pink as per APWA code.