## Section B-28 Utility As-Built Survey Standard

### Section B-28.1 Preface

**A. Purpose**

1. The purpose of this standard is to ensure that the University receives survey quality data for the surface and subsurface utility infrastructure installed, modified, or uncovered during construction projects. The data will be utilized to update the University's GIS system to reflect actual, as installed, conditions and will serve as a reference for future utility or construction work. This data is critical for the University's maintenance, operation, and future campus planning and projects.

**B. Summary**

1. Contractors shall perform field location surveys, as defined in this document, of the utilities installed during the construction phase of the project prior to covering the trenches of the sub-surface utilities. The survey documents shall be sealed and signed by a NC licensed Land Surveyor. Additionally, the contractor shall provide any point cloud files (.las), BIM files, photographs, videos, or aerial imagery of the site acquired during the utility construction phase of the project as well as any PDF maps or diagrams created.
2. The required data must be submitted to the University's project manager for verification prior to acceptance.
3. The following standard lists the utilities to be surveyed and the data to be collected during the utility construction phase of the project.

**C. Applicability**

1. For general contractors performing work that impacts utility systems on UNC's campus.

### Section B-28.2 General Requirements

**A. Coordinate System**

1. All surveys of the utility locations shall be tied to the North Carolina State Plane Coordinate System NAD83 (2011), horizontal and NAVD88, vertical. For a map of Campus Control Points: https://uncadmin.maps.arcgis.com/apps/webappviewer/index.html?id=f7b15875d6f94aa1857000a40fedcd6c or contact UNC's Campus Surveyor at 919-962-3039 or by email Scott.Rodgers@facilities.unc.edu.

**B. Disclosure of Contacts**

1. Contractors shall provide a list of designers and sub-contractors responsible for each of the system information elements listed below. Contact information, including telephone numbers and email addresses, shall be provided for individuals responsible for each of the utility items listed under Required System Information.

**C. Required System Information**

1. All horizontal and vertical locations performed should fall within 0.1' accuracy. All measurements of structures (depth, inverts, etc.) should be expressed to the nearest 0.01'.

**Section B-28.3 Individual Utility Requirements**

**A. Steam Tunnels and related surface infrastructure**

1. Take survey shots at all corners of tunnels and vaults such that dimensions and all directional changes in X, Y, and Z planes are captured, including expansion loops. Take survey shots of all related surface features such as vents, access points, and manholes in the top center of the structure.
2. For direct buried Steam and Condensate pipes, located the tops of the pipes. Also include sizes of pipes and the distance between the pipes.
3. Clearly identify any connections to the existing system.

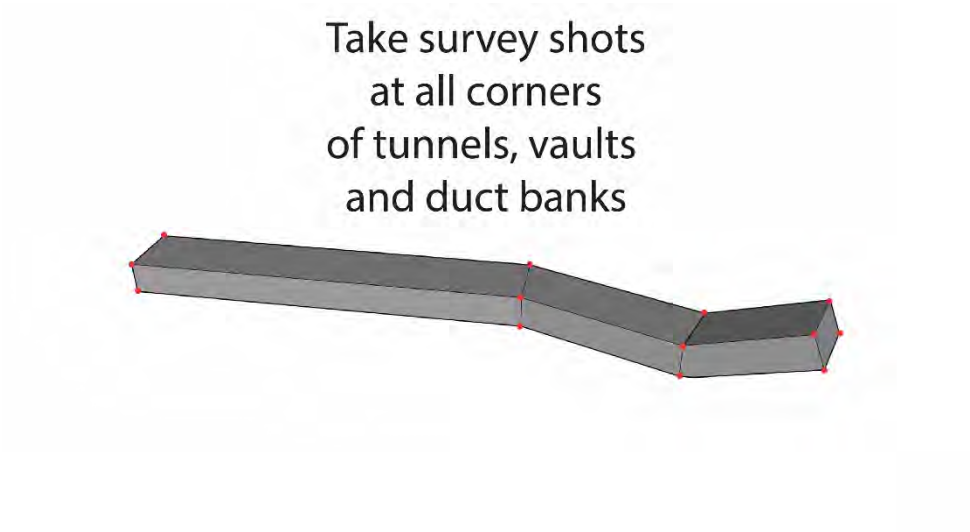



*Figure 1-Image of underground structure*

**B. Electric and Communication Duct Banks**

1. Take survey shots at all corners of duct banks, trenches, and vaults for primary and secondary electric, telecom, and emergency. such that dimensions and all directional

changes in X, Y, and Z planes are captured. Take survey shots of all related surface features such as access points and manholes in the top center of the structure.
2. Clearly identify any connections to the existing system.
3. Mark all portions of the existing system that have been demolished.

**C. Water Lines (Domestic, Chilled, Hot Water, Non-Potable, Direct-buried steam, Reclaimed)**

1. Locations, size and elevations at the top of the installed water lines at each joint where direction changes in X, Y or Z plane.
2. Fittings such as bends, tees, and reducers.
3. Valves: Location at top of operating nut, provide diameter of valve and valve type (gate, butterfly, ball, check, etc.).
4. Meters: center of meter box cover
5. Thrust blocks: Include point at top center, and size.
6. For chilled water lines, include distance between supply and return lines.
7. Clearly identify any connections to the existing system.

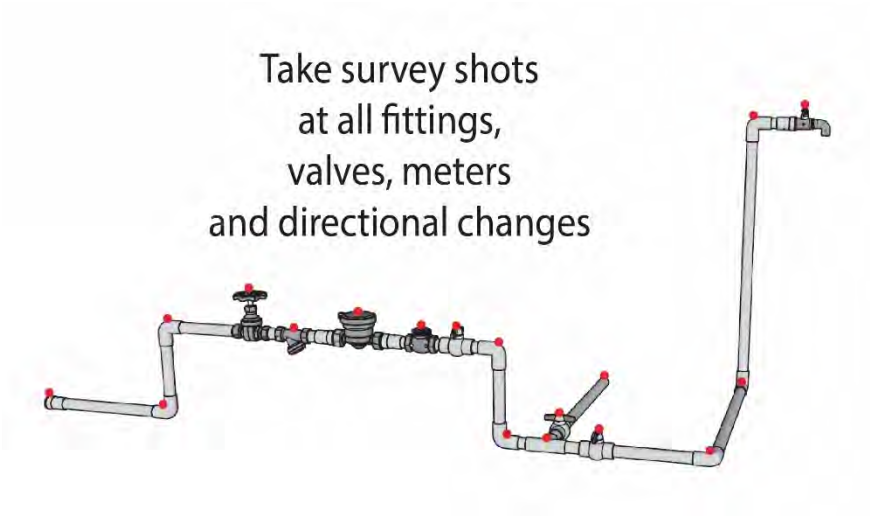
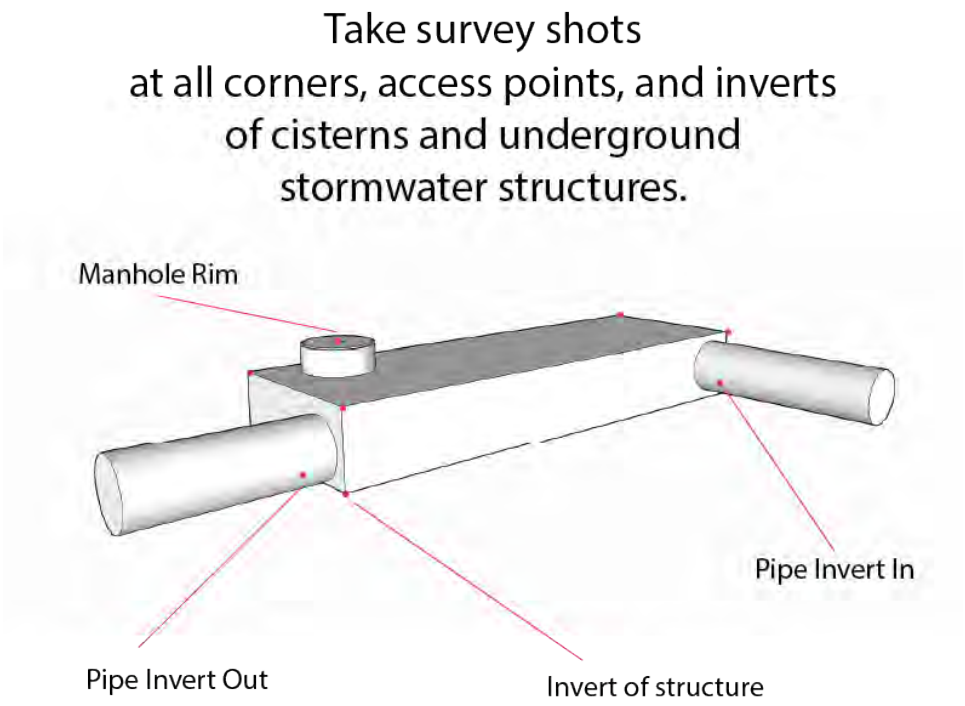



*Figure 2-Image of underground pipe assembly*

**D. Storm Drainage System**

1. Locate manhole rims or inlet and surface elevations.
2. For stormwater structures include size (or diameter) and material.
3. Provide location, size, material and invert elevations of installed storm drain pipes.
4. For buried storm water infrastructure such as cisterns, capture location and elevation of structure corners in addition to surface features such as manholes or vault lids.




5. For surface stormwater control measures such as bioretention cells and stormwater wetlands, provide a survey of the facility to ensure that correct sizes and depth were met. Also, provide a survey of the outlet structures with the size and invert elevation of all pipes, orifices, weirs and tops of structures.
6. Clearly identify any connections to the existing system.

**E. Outdoor Lighting**

1. Locations of all outdoor lighting equipment including light poles, lighting control centers, photo controls, time clocks, junction boxes, pedestals, splice boxes, hand holes, and contactors.
2. Path of all electrical feeds with wire size, depth buried, and conduit size or direct buried status.
3. Clearly identify any connections to the existing system.

**F. UNC-owned Sanitary Sewer**

1. Locations and elevations of manholes with inverts of all pipes entering and leaving the structure. Locate center of cleanout caps or lids if covered, and all wyes and bends on service lines and cleanout assemblies. For services, locate top of pipe at exit point of building.
2. Clearly identify any connections to the existing system.

**G. Existing Utilities**

1. Locate any existing utilities exposed during excavation of trenches for new utilities. Provide the locations and elevations of these utilities along with a digital photograph of the crossing.

**H. Abandoned or Removed Utilities**

1. Locate any utilities abandoned during excavation of trenches for new utilities. Provide the locations and elevations of these utilities along with a digital photograph. Document any utilities removed on demolition plans.

## Section B-28.4 Project Deliverables

A. **Provide the following deliverables to the University Construction or Design project managers according to the project manual.**

1. **CAD File(s)** Submit one or more AutoCAD (DWG, or DXF format) drawing files that contain the entire utility infrastructure that was constructed during the project. The infrastructure shall be drawn in the file at the as-built locations as surveyed and certified by a NC Professional Land Surveyor. The file(s) shall be placed into a folder named "CAD". Please note: the delivered CAD files should not be of the Plan/Profile sheets but shall be the overall working drawing in "model space" that is registered to the required datum.
2. **PDF Files** Submit one PDF file for each as-built drawing according to specifications in item 1 above. The PDF file(s) shall be placed into a folder named "PDF". The PDF must include the signature and seal of the registered land surveyor. All submitted PDF files shall be optimized (using, for instance, Adobe's PDF Optimizer) to reduce file size and improve performance.
3. **BIM Files**
4. **Summary Information File** The summary information file is to be a text file that contains the following items: the project's name, name of the firm that prepared the data, date the data package was prepared.
5. **Data files** with simple pipe and point feature tables. This data shall consist of files in an ASCII Comma Separated Value (CSV or TXT) file format. The horizontal coordinate system for the digitally submitted data as described below shall be georegistered to the required datum. All these file(s) shall be placed into a folder named "DATA".