

STANDARDS FOR TOPOGRAPHIC SURVEYS
UNIVERSITY OF NOTRE DAME
FACILITIES DESIGN & OPERATIONS

SUMMARY

Provide a topographic **DESIGN/AS-BUILT** survey to obtain all topographic features, site furniture, utility (above- and below-ground), and vegetation information within the area shown per Owner Provided Information. Work shall be performed based on State of Indiana surveying practices and by the requirements within this document. The Surveyor's services shall be in accordance with the Reference to Professional Surveyor Practice Act of Indiana (IC 25-21.5), Uniform Standards of Practice (IC 25-1-11), and Title 865 State Board of Registration for Land Surveyors (865 Indiana Administrative Code).

DEFINITIONS

1. **OWNER:** University of Notre Dame – Utilities Department - Facilities Design & Operations
2. **SURVEYOR:** The company/individuals performing the survey as designated by the Owner
3. **TOPOGRAPHIC FEATURES:** Topographic features include, but are not limited to, any surface or structural feature of the land including land relief, water and drainage features, roads, curbs, gutters, sidewalks, retaining or structural walls, planters, and buildings. Surveyor should ask for clarification when in doubt.
4. **UTILITIES:** Utilities include above- and below-grade structures normally associated with communication, electric, irrigation, natural gas, steam, sanitary, storm, site lighting, traffic signals, tunnel, chilled water, soft water, and water distribution systems.
5. **SITE FURNITURE:** Site furniture includes, but is not limited to, any feature not already defined as a Topographic Feature and includes affixed benches, tables, bike loops, bollards, art monuments including statues and sculptures, fences, and signs. Surveyor should ask for clarification when in doubt.
6. **VEGETATION:** Vegetation includes deciduous and coniferous trees, shrubs, or shrub masses.
7. **CONFINED SPACES:** A confined space is a space with limited or restricted means of entry or exit, which is large enough for a person to enter, and is not designed or configured for continuous occupancy.
8. **DIAMETER AT BREAST HEIGHT (DBH):** Diameter at Breast Height (DBH) indicates the diameter of a tree measured at 4.5 feet above ground on the uphill side of the tree.

OWNER PROVIDED INFORMATION

The Owner will provide an AutoCAD drawing of the project area to the Surveyor for informational purposes only. The Owner takes no responsibility for the accuracy of these drawings.

EXECUTION AND REQUIREMENTS

1. STANDARD REQUIREMENTS

- A. All work shall be performed under supervision of a Registered Land Surveyor, State of Indiana.
- B. Surveyor must reference a minimum of two University benchmarks in the survey and shall establish two temporary site benchmark locations per site and additional temporary site benchmarks every 500 feet throughout the site (or per owner requirements). *Notre Dame shall make a determination on the University Datum with respect to NGVD 29, NAVD 88 or as Separate Datum.* University Benchmark records can be made available at 100 Facilities Bldg. - Utilities Department - Facilities Design & Operations, (574) 631-0141.
- C. Submitted survey shall match the coordinate system utilized by UND (Indiana State Plane East Zone, NAD83).
- D. Submitted survey shall be in accordance with UND CAD Standards attached to this document.
- E. Utilities shall be based on locations determined by on-site investigation and measurement by Indiana's 811 service and UND Utilities Department, Information Technology, Landscape Services, and Athletic Department staffs. Every possible effort needs to be taken to verify the accuracy of Indiana's 811 service staking.

NOTE: Any topographic feature, site furniture, vegetation, or utility not field measured may be incorporated in the final drawings if it is clearly labeled as 'REFERENCE ONLY'. Items included as 'REFERENCE ONLY' shall be approved by UND Utilities and clearly indicated in the drawing and on plan.

2. TOPOGRAPHIC DATA REQUIREMENTS *

- A. All topographic features, site furniture, and vegetation shall be field measured.
- B. All existing utilities within the subject area(s) shall be field verified and measured. Measurements shall be taken on all portions of the utility at the surface.
- C. Provide dimensions of buildings, structures, path ramps, pavement widths (use back of curb for roads), special features, and where specifically requested.
- D. Provide the location and dimensions of barrier free parking spaces and quantity of spaces within painted zones.
- E. Bike loops, at a minimum, shall be surveyed with four outer corner points of each row, indicating geometry and quantity.
- F. Provide the following grading information:

- 1) Contours at one foot intervals
- 2) All critical dimensions and spot elevations including, but not limited to, the following:
 - a. At points where general slope percentage changes
 - b. At high point and low points
 - c. At all building corners
 - d. Building finished floors and thresholds
 - e. Landings and at the top and bottom of step series (label riser heights)
 - f. PC's and PT's of curves at road centerlines and edges, including top and bottom of curbs
 - g. At top and bottom of curbs and curb corners
 - h. Front-side of grade, back-side of grade, and top of wall; especially at turns and ends
 - i. At the base of trees, tree canopies/ drip lines
 - j. At the base of hydrants, and light poles
 - k. Corners of terraces, walks, and path ramps
 - l. Catch basin and manhole rims, valve box covers, and other at-grade structures
 1. UND structure numbers are to be indicated on plan where appropriate
- G. Provide the precise location and dimensions of all vegetation as follows:
 - 1) Trees shall be identified as follows:
 - a. Record trunk DBH and canopy size for trees greater than 3" DBH.
 - Trees under 3" DBH, indicate canopy size to the nearest foot.
 - For multi-trunk trees, indicate number of trunks and canopy size.
 - b. Realistic canopy shape and size shall be surveyed appropriately for trees with canopies larger than 5' in radius.
 - 2) Shrubs and shrub masses will be accurately measured according to size and shape.
 - 3) Tree line designations are appropriate for heavily wooded areas as requested.

3. UNDERGROUND UTILITY DATA REQUIREMENTS *

- A. Existing Utilities information will be provided per Owner Provided Information
- B. All existing utilities within the subject area(s) shall be field verified and measured. Measurements shall be taken on depths of pipes, and floor and ceiling elevations of vaults and tunnels.
- C. Precisely locate and identify all UND Utilities as follows:
 - 1) Communication Distribution:
 - a. Manholes, hand holes, pedestals, emergency phones, utility poles, etc.
 - b. Quantity and physical size of conduits
 - 2) Electric Distribution:
 - a. Manholes, hand holes, pedestals, transformers, utility poles, etc.
 - b. Quantity and physical size of conduits
 - c. Vault rim, ceiling, and floor elevations (coordinate access with Owner)
 - 3) Sanitary Sewer
 - a. Manholes, valves, pump stations, clean-outs, drain fields, etc.
 - b. Pipe size and material; flow direction; invert elevations

- 4) Storm Sewer
 - a. Manholes, curb inlets, drop inlets, wing walls/outlets, etc.
 - b. Pipe size and material; flow direction; invert elevations
- 5) Direct Buried Steam, Condensate, and Domestic Hot Water
 - a. Vault locations
 - b. Pipe size and material
 - c. Vault rim, ceiling, and floor elevations
- 6) Domestic Water (including Soft Water)
 - a. Valves, hydrants, wells, etc.
 - b. Pipe size and material
- 7) Chilled Water
 - a. Valves, cathodic test stations, etc.
 - b. Pipe size and material
- 8) Irrigation Systems
 - a. Isolation valves, cross connection device, and quick couplers
 - b. Main line size and material
 - c. Control boxes
 - d. Irrigation stamps in concrete
- 9) Tunnel
 - a. Height and width of tunnel
 - b. Floor and ceiling elevation
 - c. Access hatches, etc.
- 10) Abandoned utilities that are identified by Owner or visually apparent; label as “abandoned” – provide relevant attributes.
- 11) Utilities Systems shown on owner provided AutoCAD document that cannot be verified shall be shown on survey and listed as such; “unconfirmed, for reference only”. Notify University Utilities Department of such instances.

C. Precisely locate and identify all public utilities, and owners, at the same level of detail included in the above section. This may include the following:

- Cable TV
- Electric (AEP)
- Natural Gas
- Telephone
- Metronet

4. UNDERGROUND UTILITY DETAIL REQUIREMENTS *

- A. Surveyor shall abide by all restrictions. Coordinate access with Owner.*
- B. Provide vault and tunnel length, width, and height measurements
- C. Provide vault and tunnel profile elevations and orientation
- D. Provide vault and tunnel utility entry/exit location and elevations

5. RESTRICTIONS

Confined Spaces: Surveyor shall comply with all Federal, State, Local, and UND requirements when entering confined spaces. Information regarding UND confined space requirements can be obtained by contacting UND Utilities Department 574-631-6594

6. OWNER REVIEW

The Owner reserves the right to review draft documents to determine if additional information is needed, which will then be provided by the Surveyor before the final documents are submitted for Owner approval.

UNIVERSITY OF NOTRE DAME CAD STANDARDS

1. OVERVIEW

These standards are issued to aid in the development of AutoCAD™ drawings suitable for use at University of Notre Dame (UND). By maintaining consistency and compatibility with existing documents, electronic drawings produced and submitted in accordance with these standards have a significantly greater value to the University, as well as other architects, engineers, consultants and contractors working with UND.

2. DRAWING FORMAT

All project drawings shall be created and submitted using AutoCAD (.dwg file extension) software only. AutoCAD version 2014 or newer is required.

3. DRAWING COMPOSITION

- AutoCAD files containing multiple drawing sheets shall be broken down into separate drawings containing single sheets.
- AutoCAD drawings should not contain any XREF's prior to submittal. Externally referenced (x-ref) drawings will be bound to the appropriate drawing.
- The drawing may reference the provided UND electronic maps, as reference only, through an xref. The items shall be clearly labeled and "greyed" out in the background of submitted drawings.
- All CAD drawings shall be purged of empty, unused, or non-essential drawing data.
- All attributes (if any) will be created on layer "0", with color white and continuous line type.
- Use standard AutoCAD fonts and linetypes or provide the font and linetype files used in the submitted drawings.
- Provide any Plot Styles used in producing the hard copies.
- AutoCAD file shall be submitted with a layer state used in producing hard copies.
- Entities will be identified by layer, not by color.
- All base blocks shall be created on layer 0, with color white and line-type continuous.
- All entities will have a Z coordinate of zero, unless requested otherwise
- All line features shall use polylines.
 - Polyline width shall be zero
 - Polylines shall have no unnatural breaks (i.e. from exploded linetypes, alternate to mtext masks)

4. MODEL AND PAPER SPACE USAGE

- The primary drawing(s) shall be created in model space drawn to full size (1:1 scale).
- Any additional items such as details, dimensions, elevations, or sections should be drawn to full scale in model spaces.
- General project graphic elements such as title blocks, legends, schematics, key plans, diagrams and notes should be drawn in paper space.
- Scale objects using paper space viewports – zoom viewports to the appropriate scale. Label scale of each viewport in paper space.

5. DRAWING UNITS

Civil Engineering CAD files should use the engineering units (feet and tenths) report format. Other CAD files should use the architectural units (feet and inches) report format.

6. COORDINATE SYSTEM

Any drawing utilizing a coordinate system shall correspond to the coordinate system utilized by UND. Indiana State Plane, East Zone, NAD83.

7. LAYERING STANDARDS

UND has adopted the American Institute of Architects (AIA) layering standards. These layering standards should always be followed:

- Use only AIA recommended layer names.
- Use the minimum number of layers necessary to adequately separate entities in each drawing. The number of layers contained in each drawing will vary depending on the scope and complexity; however drawings should not contain extraneous, redundant or overly detailed layer names.
- Purge each drawing of unused and/or unnecessary layers prior to submittal. The drawing file should contain only those layers necessary for displaying and plotting the information and drawing entities contained within each drawing.

8. DATA REQUIREMENTS

Underground Utility Data Requirements

- a. Utility rim elevations, invert elevations, and vault dimensions shall be listed in a table and reference both UND number designation (where provided) and survey point designation.
- b. Utilities shall be placed into individual layers by distribution type (See “Execution – Underground Utility Data Requirements”).

Topographic Data Requirements*

- a. Major and minor contours will be in separate layers; Major contours are at 5 foot and 10 foot intervals, minor contours are at 1 foot intervals
- b. Vegetation shall be drawn as follows:
 - Designate deciduous trees with a solid donut, and coniferous trees with a solid triangle
 - Trunk diameter and notes will be provided next to symbol
 - Canopy will be drawn to shape and scale, indicate as linetype dashed.
 - Shrubs and shrub masses shall utilize a revcloud, arc length = 4

- Deciduous shrubs: Reverse Direction = No
 - Coniferous shrubs: Reverse Direction = Yes
 - Coniferous or deciduous labels on shrub masses are desired
- c. Provide the following surface features as follows:
- Provide contours as indicated above, as a polyline, and at true elevation
 - Provide the generated TIN in LandXML (Linear Unit: USSurveyFoot) or 3d lines in drawing
 - TIN network is to include all features to the edge of building, including any walls or steps that may be part of the surrounding landscape
- d. Bike loop quantities shall be indicated in the drawing. Bike racks shall be labeled separately.
- e. Provide all surveyed points in the drawing, but only show those specified under “Execution – Topographic Data Requirements – Section F”. If points are not legible use discretion to provide critical spot elevations.
- f. Temporary Control Point information shall be listed on all drawings.

9. DRAWING SUBMITTALS

All electronic and hard copy drawings shall be submitted to UND in a timely fashion, coinciding with the requirements of the contract and the needs of the Project Manager or CAD Manager.

All electronic drawings shall be submitted by eTransmit or on a CD and labeled with project name, type of drawing package (i.e. bid set, construction drawings, record drawings), and date created.

All electronic CAD record (as-built) drawings must be accompanied with a complete matching set of Adobe PDF drawings.

In addition to the electronic CAD record drawings, hardcopy as-built or record drawing submittals shall be on bond paper to scale for reproducibility. Each final submitted drawing sheet shall have “As-Built” or “Record Drawing” clearly marked on every electronic and printed sheet and should contain Surveyor’s name, Surveyor’s seal, State of Indiana Registration Number, north arrow, drawing scale, survey date, and date drawing was completed. Surveyor’s seal and signature must be reproducible for document scanning.

All hard copies and PDFs will be either ARCH D Size (24” x 36”), ARCH E (36” x 48”) or ARCH E1 (30” x 42”) landscape sheet(s), unless specifically requested.

END OF SPECIFICATION

***Cross out section if not required**