

PART II – CSU FACILITIES PLANNING, DESIGN AND CONSTRUCTION STANDARDS

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800.1 – General Requirements:

A. General:

1. This Chapter covers the Project Team procedures and accuracy requirements for survey services for site and/or Project layout and field measurement quantities determined by surveys.
2. Prior to beginning any field survey Work, the Project Team shall meet with the Project Representative to coordinate survey and reporting requirements.

B. Notice of Survey:

1. Before commencing any site and/or Project layout and surveys, the Project Team shall give the Project Representative 48 hours written advance notice so the Project Representative and/or GIS Services may witness such Work.
 - a. Refer to Part IV – Regulatory Requirements for utility locate requirements.

C. Field Measurements:

1. The Consultant is responsible for performing Field Measurements to verify existing conditions unless this activity is specifically excluded from the Consultant's Scope of Work by the Project Representative.

D. Field Measurements typically require but are not limited to the following:

1. As-Built Measurements of Vertical Work:
 - a. Provide field verification of measurements and elevations of existing facilities to verify and or create accurate As-Built Drawings to be used for Project base data.
 - b. These measurements may be completed using modern technological equipment of the time to acquire the most accurate data for the survey.
2. Field Verification of Horizontal Work:
 - a. As-built measurement for items that shall be hidden or visible including all civil, mechanical, electrical, control Work and all utilities that are placed in concrete, earth or behind walls shall be made by and under the direction of a Colorado licensed surveyor while the Work is exposed and the measurements submitted to the Project Representative.
 - b. Unless noted otherwise the measurements shall show the final location within +/- 1 inch (or as close to as possible based on a specific situation that would limit the Project Team due to safety issues of the Project and/or site) of their actual vertical and horizontal location based upon NAD83 Colorado State Planes – North Zone – US Foot and NGVD 29 elevation.
 - c. Items located within 5 feet of a building shall be referenced to edge building foundation and building column lines and finish floor elevations and noted as such.
 - d. Special attention shall be paid to items requiring service, sensors, items with moving parts, access points and locations of junctions, elevation changes and directional changes.
 - e. Survey notes must be supplied to the Project Representative prior to covering up the Work or the Work shall be considered defective.
3. Data Format:
 - a. All data for the survey shall be provided in both digital form (current version of AutoCAD) and hardcopies to the Project Representative, GIS Services contact, the Facilities Management (FM) Survey Tech and FM Utility personnel.

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- b. Consultant must contact the Project Representative for a list for these persons.
- c. Work shall be considered incomplete if data is not provided to all the required personnel.

800.2 – Site Work Surveys:

A. Control Points:

1. The Project Team shall locate at the Project/Work site all control points shown on the Construction Drawings by coordinates and/or elevation.
2. The Project Team must accurately survey control information to the points of application to ensure that all elements of the Work are correctly located.

B. Reference Location:

1. Requests by the Project Team to relocate survey reference/control points must be made 96 hours to the Project Representative prior to when the point shall be disturbed.
2. The Project Team shall replace/relocate at no charge to the Project any survey reference point(s) disturbed by Project Team and/or other within three normal working days after request has been approved.
3. Any Work which the Project Team begins before reference points have been provided, may be rejected.
4. Should the original reference points be obliterated or dislodged by operations which the Project Team controls, the Project Team shall replace them at no charge to the Project for the re-survey.

800.3 – Project-Specific Control Markers:

A. General:

1. Throughout the Project site one or more project-specific land survey control markers shall be provided. If these Project-specific control markers, monuments or benchmarks must be moved to accommodate the Project Team's Work, the Project Representative must be notified with written notice 96 hours prior to when the benchmark or monument must be moved.
 - a. The Project Team shall do so at no expense to the Project.
2. If the Project Team destroys or obliterates any such monument or benchmark before contacting the Project Representative, the Project Team must notify the Project Representative immediately in writing and shall be required to pay the Project for all labor, materials, and equipment costs as assessed by the Project Representative for the replacement.

800.4 – Permanent Control Markers:

A. General:

1. Throughout the Project site there exists a System of monuments, benchmarks, reference and control points.
 - a. The Project Team is required to protect and preserve all of these survey references within the Colorado State University (CSU) Grid Control System.
2. Coordinates shown on the Drawings are based upon the CSU Coordinate System unless noted otherwise.

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3. If any element of the University Land Survey Control System must be moved to accommodate the Project Team's Work, the Project Representative must be notified with written notice 96 hours prior to when the reference or coordinate points must be moved.

B. Damaged or Destroyed Points:

1. Report damaged or destroyed reference points, CSU grid coordinate points and benchmarks to the Project Representative, GIS Services and FM Survey Tech.
2. The Project Representative shall reestablish damaged, moved, altered, or destroyed reference bench marks and coordinate points.
3. If reference, coordinate points, or benchmarks are damaged, moved, altered, or destroyed by Project Team, the Project's cost of reestablishing such points shall be borne by the Project Team.
4. The Project Representative shall not be responsible for any increased costs or delays to the Project Team relating to reference points, CSU grid control points, or benchmarks which are damaged, moved, altered, or destroyed by Project Team or Project Subcontractors, suppliers, agents, or employees or other Project Teams working on the site.

C. Errors:

1. Report promptly alleged errors in reference points, CSU grid control points, or benchmarks to the Project Representative, GIS Service Tech and FM Survey Tech.
2. Discontinue use of reference points, CSU grid control points, or benchmarks alleged to be in error until accuracy of points can be verified or as directed.
3. Claims for extra compensation for alteration or reconstruction allegedly due to errors in reference points, CSU grid control points, or benchmarks shall not be allowed unless original reference points CSU grid points and bench marks still exist or substantiating evidence proving error is furnished by Project Team, and unless Project Team has reported such errors to the Project Representative as specified herein before.

D. The following are limitations and additional information on reference point, CSU grid control points, and benchmarks.

1. The use of Control Monuments for construction surveying, other than those shown on the Construction Drawings or furnished by or accepted by the Project Representative is prohibited. Use of other monuments is at the Project Team's sole risk and not recommended.
2. Elevations for main campus and surrounding areas are based upon mean sea level datum from NOAA-NGS benchmark "CSU2" elevation 5271.518 feet and must be verified by the Project Team prior to survey.
3. The CSU benchmark and coordinate point data as listed on the Construction Drawings or listed in the specification are the only approved coordinate points and benchmarks for construction surveying.
4. The basis of bearing of the Grid System is NGS control points geo-referenced per the North American Datum of 1983, Colorado State Plane, North Zone, US Foot Datum.

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800.5 – Construction Lines and Grades:

A. Reference Points:

1. CSU Reference Drawings with benchmarks shall be provided by CSU for reference only.
2. Other control points and benchmarks may be provided to the Project Team at the discretion of the Project Representative.

B. Preservation of Points:

1. The Project Team shall carefully preserve such points and shall be held responsible therefor.
 - a. If it becomes necessary for the Project Team to remove or disturb a reference point or benchmark the Project Team shall notify the Project Representative before removing or disturbing said point.
2. If, in the opinion of the Project Representative, stakes, monuments, marks or points are carelessly or willfully disturbed by the Project Team, the cost of replacing such stakes, monuments, marks or points shall be charged to the Project Team and shall be deducted from payment for the Work.

C. Project Team Surveys:

1. The Project Team shall make surveys and layouts, as necessary, to delineate the Work.
 - a. The Project Team shall make the surveys for the proper performance of the Work.
2. As a part of such surveys, the Project Team shall furnish, establish and maintain in good order survey control points which may be required for the completion of the Project Team's Work, subject to the acceptance of the Project Representative as to their location, sufficiency and adequacy.
 - a. Such acceptance by the Project Representative shall not relieve the Project Team of his responsibility for the accuracy of his survey Work.
3. The Project Team shall be responsible for any lines, grades, or measurements which do not comply with specified or proper tolerances, or which are otherwise defective, and for any resultant defects in the Work.
4. The Project Team shall be required to conduct re-surveys or check surveys to correct errors indicated by review of the field notebooks.

D. Quality Assurance:

1. The Project Representative shall have the right to check surveys and layouts made by the Project Team prior to accepting any of the Work.
2. The Project Team shall give advance notice of not less than 48 hours to the Project Representative to enable such checking prior to placing any Work.
3. The Project Team shall furnish assistance as may be required for checking purposes when so requested by the Project Representative.
4. The Project Representative may draw the Project Team's attention to errors or omissions in lines or grades, but the failure to point out such errors or omissions shall not give the Project Team any

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right or claim nor shall in any way relieve the Project Team of their obligations according to the terms of the Project Team's Agreement.

E. Quality Control:

1. The Project Team shall furnish skilled labor, instrument platforms, ladders and such other temporary structures, as may be necessary for making and maintaining points and lines in connection with the surveys required.
2. The Project Team's instruments and other survey equipment shall be accurate, suitable for the surveys required in accordance with recognized professional standards, and in proper condition and adjustment at all times.
3. Surveys shall be performed under the direct supervision of a Colorado licensed surveyor.

F. Field Notes:

1. The Project Team shall record surveys in field notebooks.
2. Copies of the original pages of such records shall be furnished to the Project Representative at intervals required by the Project Representative.
3. Each field notebook shall be furnished to the Project Representative when filled or completed.
4. Field notes shall be kept in the form and style shown of current and approved surveying theory and practices and based on per highest accuracy of understanding and professionalism of most current surveying procedures.
5. All electronic data collection and field notes and AutoCAD files of the survey must be provided to the Project Representative, GIS Service Tech and FM Survey Tech on CD or DVD.
 - a. The data shall be in MS Word and/or similar format and may be used to supplement field books.
6. Whichever method of note taking the Project Team starts with, it must use the same method throughout the Agreement duration.
7. If the Project Representative finds errors in the field notes they shall return them to the Project Team for correction and resubmission.
 - a. This review does not relieve the Project Team from the responsibility of maintaining accurate survey data.

800.6 – Larimer County Control Monuments:

A. General:

1. Verify control monument values with CSU Facilities GIS Services prior to survey.
<https://apps.larimer.org/survey-control-network/>

STATION DESIGNATION	NAD 83/92 LATITUDE	NAD 83/92 LONGITUDE	ORTHO HEIGHT (M)	ELLIPS. HEIGHT (M)	ORDER
30508	40°24'54.24463" N	105°15'01.72114" W	1691.16	1676.25	B
31503	40°25'55.16667" N	105°20'23.85075" W	1878.353	1864.436	C1

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32908	40°45'54.43897" N	105°29'12.31258" W	2411.084	2398.675	C1
36 RMB	40°52'12.77927" N	105°01'09.98237" W	1736.318	1720.711	C1
56 RMB	40°46'20.04060" N	105°20'26.89750" W	1925.279	1911.800	C1
"A"	40°33'40.24373" N	105°09'05.97681" W	1757.646	1742.346	C1
A 409	40°29'30.80498" N	105°04'37.72739" W	1536.021	1519.930	C1
A 77	40°59'52.39735" N	105°24'43.22543" W	2298.816	2286.41	B
Allen	40°16'41.59290" N	105°21'40.20722" W	2021.76	2007.47	B
Azari	40°29'38.87965" N	105°06'57.95290" W	1566.014	1550.221	C1
B 135	40°42'03.75660" N	105°33'45.56353" W	2164.74	2152.64	B
B 137 Reset	40°43'11.40012" N	105°10'19.94409" W	1671.87	1656.98	B
B 357	40°40'07.24660" N	105°04'09.71538" W	1583.23	1567.52	B
Bartling	40°19'42.26304" N	105°34'40.59657" W	2516.596	2504.402	C1
Biggi	40°44'49.29418" N	105°22'14.94338" W	2053.22	2039.81	B
Blue	40°17'05.93092" N	105°16'50.64647" W	1742.512	1727.512	C1
BNSF	40°25'48.38728" N	105°04'54.98186" W	1531.01	1514.75	B
Bradshaw	40°35'04.09139" N	105°02'08.32027" W	1500.4	1484.12	B
Bud	40°37'22.72303" N	105°00'06.36473" W	1529.39	1513.16	B
C 409	40°33'10.07976" N	105°04'46.93017" W	1532.569	1516.664	C1
Campton	40°25'19.46764" N	105°27'53.79807" W	2440.161	2427.284	C1
Clarke (DESTROYED)	40°50'20.44402" N	105°18'58.63021" W	2014.393	2000.823	C1
Collinson Az Mk	40°22'23.84547" N	105°29'29.77941" W	2285.49	2272.62	B
Comstock	40°51'00.20677" N	104°56'45.84399" W	1785.419	1769.341	C1
Cook	40°18'18.15752" N	105°03'35.96292" W	1520.340	1503.603	C1
CSU (DESTROYED)	40°34'33.45418" N	105°05'08.66359" W	1525.73	1509.89	B
CSU 2	40°34'32.69809" N	105°05'08.83804" W	1525.926	1510.141	B
Dailey	40°41'05.74350" N	105°14'14.85657" W	1622.16	1607.73	B
Demosthenes	40°24'07.53685" N	105°25'05.55820" W	2135.36	2121.96	B
Disney	40°20'37.64477" N	105°31'48.04537" W	2454.547	2442.024	C1
Duvall	40°37'59.13607" N	105°11'53.63851" W	1644.521	1629.792	C1
E 137 Reset	40°47'19.36020" N	105°11'29.06979" W	1838.80	1824.14	B
E 20	40°23'09.47418" N	105°11'32.50084" W	1592.792	1577.280	C1
E 27	40°17'20.01111" N	105°11'50.33028" W	1664.922	1649.183	C1
E 357	40°33'58.65840" N	105°02'25.75188" W	1499.452	1483.308	C1
E 53	40°46'18.78304" N	105°08'00.68772" W	1654.983	1639.918	C1
E 7	40°25'05.46075" N	105°11'18.66272" W	1573.14	1557.67	B
Farren	40°18'16.41176" N	105°09'00.60406" W	1573.446	1557.355	C1
FC 1394	40°31'24.85370" N	105°01'12.08510" W	1503.303	1486.909	C1
FC 2694	40°30'06.92556" N	105°03'29.34852" W	1502.186	1485.987	C1
FC 923	40°36'07.30657" N	105°01'45.08342" W	1520.592	1504.470	C1
Feather RM 1	40°47'22.39411" N	105°34'22.52649" W	2515.60	2503.62	B

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Finley	40°35'54.68774" N	105°10'26.71076" W	1660.804	1645.787	C1
FNL C	40°26'55.68980" N	105°00'31.30126" W	1525.8	1509.18	B
G 308	40°54'57.28480" N	104°59'57.22037" W	1817.587	1802.002	C1
G 402	40°23'34.42310" N	105°04'34.34159" W	1515.464	1499.08	B
Goering	40°41'01.37955" N	105°07'58.11480" W	1569.984	1554.772	C1
Greer	40°50'14.64088" N	105°09'48.23512" W	1814.42	1799.69	B
Guerrero	40°32'22.62735" N	104°59'45.09076" W	1492.8	1476.32	B
Harding	40°37'09.73323" N	105°49'08.45011" W	2640.90	2629.66	B
HAVEN 2014	40°27'4.91168" N	105°27' 2.60862" W	2211.188	2198.348	C1
Heiden	40°47'54.46886" N	105°04'33.61801" W	1684.595	1669.169	C1
Hipp	40°41'47.88019" N	105°26'40.04767" W	1990.68	1977.79	B
Hoff	40°31'55.59036" N	105°08'27.58732" W	1666.241	1650.763	C1
I-25 MP 281.96	40°45'45.66118" N	104°59'31.87692" W	1646.23	1630.26	B
Inghram	40°57'28.13567" N	104°58'35.06740" W	1869.190	1853.596	C1
Johnson	40°21'33.11482" N	104°58'57.64299" W	1524.1	1507.11	B
K 324	40°53'02.21695" N	105°55'53.01503" W	2449.87	2438.78	B
Keister	40°29'14.53682" N	105°12'21.43185" W	1641.643	1626.576	C1
Kerr	40°29'00.98063" N	105°01'39.84114" W	1490.410	1473.955	C1
Kirkpatrick	40°19'20.65116" N	105°24'54.40357" W	2298.55	2284.93	B
L 135	40°41'01.80005" N	105°22'48.48352" W	1833.70	1820.35	B
L 410	40°17'26.17357" N	105°06'11.16976" W	1542.566	1526.09	B
Lancaster	40°33'51.05869" N	105°13'41.01061" W	1806.305	1791.699	C1
Lily Lake	40°18'22.99905" N	105°32'16.95183" W	2724.02	2711.38	B
M 356	40°42'41.01036" N	104°56'29.71381" W	1621.998	1605.653	C1
Macfarlane	40°21'35.05112" N	105°16'14.57157" W	2067.474	2052.624	C1
Miller	40°15'42.08708" N	105°03'30.97896" W	1522.420	1505.571	C1
Muscott	40°37'18.68997" N	105°08'22.83527" W	1541.966	1526.698	C1
Myhre	40°33'51.04850" N	105°18'37.43705" W	1903.57	1889.60	B
N 311	40°53'05.55921" N	105°16'50.63011" W	1990.999	1977.33	B
Nelson	40°40'06.68405" N	105°01'11.99022" W	1571.062	1555.041	C1
Olson	40°37'11.85668" N	105°21'04.27031" W	2243.985	2230.550	C1
P 135	40°41'12.92478" N	105°18'27.64116" W	1731.26	1717.38	B
P 137 Reset	40°57'11.96641" N	105°20'58.13751" W	2146.08	2133.05	B
Purdy	40°25'55.15608" N	105°20'24.67100" W	1878.25	1864.23	B
R 308	40°51'23.05409" N	105°04'51.63595" W	1728.03	1712.80	B
Ragsdale	40°52'53.17608" N	105°08'48.31283" W	1799.181	1784.509	C1
Railroad ET	40°48'54.99784" N	104°58'32.69280" W	1700.93	1684.97	B
Ranger	40°34'51.65621" N	105°28'06.39119" W	2522.95	2510.31	B
Roach	40°59'10.52745" N	106°08'23.59741" W	2699.75	2688.84	B
Rodenberger	40°39'56.35752" N	104°57'46.33612" W	1571.052	1554.716	C1

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RP 65	40°21'00.26195" N	105°12'31.22488" W	1765.309	1749.850	C1
Shockley	40°31'21.72421" N	105°15'29.10248" W	1731.156	1716.691	C1
Smith 97	40°45'16.26813" N	105°04'38.68448" W	1641.29	1625.79	B
Snell	40°43'32.92509" N	105°08'01.20866" W	1615.453	1600.319	C1
Spencer	40°20'58.11410" N	105°09'15.07822" W	1571.815	1555.884	C1
Sumpter	40°38'32.52593" N	105°17'37.13268" W	2124.695	2110.808	C1
Thompson	40°15'40.94129" N	105°07'57.11917" W	1556.084	1539.733	C1
Timm	40°19'10.45282" N	105°12'33.26228" W	1741.860	1726.318	C1
Touslee	40°42'14.52878" N	104°59'53.54639" W	1591.73	1575.68	B
U 134	40°40'55.99031" N	105°46'23.02366" W	2390.004	2378.93	B
U 287 MP 369.85	40°49'38.81389" N	105°14'37.19769" W	1816.19	1802.00	B
U 311	40°56'45.11231" N	105°15'03.96273" W	2218.153	2204.538	C1
U 356	40°42'41.02859" N	105°04'04.12339" W	1610.809	1595.179	C1
V 401	40°36'25.60489" N	105°04'32.77631" W	1517.239	1501.447	C1
Wall I	40°33'36.67837" N	105°52'17.91215" W	3043.55	3032.25	B
Warwick	40°39'31.00493" N	105°09'10.62370" W	1600.39	1585.25	B
X 134	40°41'46.57669" N	105°41'02.86245" W	2326.56	2315.09	B
X 402	40°34'00.21576" N	105°00'53.87659" W	1490.739	1474.433	C1
Y 401	40°30'41.00149" N	105°04'37.23253" W	1515.457	1499.42	B

END OF CHAPTER