

CZECH TECHNICAL UNIVERSITY IN PRAGUE

FACULTY OF CIVIL ENGINEERING
DEPARTMENT OF SPECIAL GEODESY

Course title

FIELDWORK SURVEYING (FS01)

Task number

1

Task name

Situation

School year

2022/2023

Day of class

Mon

Time of class

13 - 16

Name

John Smith

Date

22.09.2022

Classification

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Measurement report

1. Text task

The task is measuring of situation of surrounding the AirHouse in front of the FCI CTU building. Previously determined and stabilized points of the traverse can be used for connecting.

The obtained coordinates of the detailed points will be appropriately displayed into the map at a scale of 1:250 using the standard CSN 01 3411 (Large-scale maps. Drawing and markers).

2. Measurement information

Location of measurement:	Surroundings of the AirHouse building, Thákurova Street, Prague
Date of measurement:	15. 9. 2022
Weather conditions:	partly cloudy, temperature 16 °C, pressure 940 hPa, moderate breeze
Surveying group:	John Smith (group leader) Peter Fox Lucky Luke
Coordinate system:	S-JTSK
Height system:	--
Devices and tools:	Trimble M3 total station (s.n. 10013), tripod, reflecting prism with rod, measuring tape, barometer, thermometer

3. Description of the measurement process

For the purpose of the measurements, the coordinates of points 4001 to 4006 of the local measurement network (see Appendix 1, traverse adjustment task) were taken with the standard deviation determined by the adjustment $\sigma_Y = 15 \text{ mm}$ and $\sigma_X = 8 \text{ mm}$. The points are stabilized in the field by survey marks in the paved road.

- After reconnaissance, additional measuring points 5001 and 5002 were placed and stabilized for later use.
- The internal software of the total station was used for the measurements with the setting of the stations and automatic calculation of the free stations.
- The achieved coordinate accuracy for the free stations:

Tab 1 Accuracy of free stations

PN	σ_Y [mm]	σ_X [mm]
5001	8	6
5002	11	5

- A total of 113 detailed points were measured using the polar method from stations 4002, 4004, 5001 and 5002.
- At each station, two orientations to the known points in one set were taken.
- A checking survey of a pair of suitable detailed points between stands was carried out.
- Special features of the polar method such as angle offsets (lamps, corners of houses, trees...) and length offsets (corners of buildings) were also used for the measurements.
- Points 94 and 110 were measured as a function of the polar normal with a length of normal not exceeding 1.5 m.
- The perimeter (all side measures) of the AirHouse was independently double-checked by the measuring tape.
- An export of the raw measurements in "mapa2" format was made.

4. Processing procedure

The following calculations were carried out:

- The file of measurements (mapa2) was imported into software Groma 11 with automatic length reduction (scale 0.999981).
- The imported data was manually edited (removing errors and duplicates).
- Automatic data processing was carried out (calculation of two positions within orientations, calculation of free stations).
- The polar method by batch was used to calculate the detailed points and checking of twice measured points were carried out. The biggest difference was found out at point 56, it was $\Delta X = 18 \text{ mm}$. The required accuracy was fulfilled.

Tab 2 Comparison of twice measured points

PN	1. measurement		2. measurement		Differences	
	Y [m]	X [m]	Y [m]	X [m]	ΔY [mm]	ΔX [mm]
9	744884.970	1040896.033	744884.965	1040896.021	5	12
11	744892.310	1040896.169	744892.293	1040896.154	17	15
22	744874.236	1040919.013	744874.241	1040919.004	5	9
56	744906.354	1040912.932	744906.342	1040912.914	12	18
77	744870.538	1040923.736	744870.525	1040923.738	13	2
79	744906.373	1040918.488	744906.372	1040918.473	1	15

- A comparison of check distance of building sides was made. The biggest difference occurred at the connection of points 16 and 17 $\Delta hd = 21 \text{ mm}$.

Tab 3 Comparison of check distances

Between points	Length [m]		Differences
PN - PN	from coordinates	from check distances	Δ [mm]
16 - 17	2.512	2.491	21
17 - 18	4.102	4.113	-11
18 - 19	8.689	8.681	8
19 - 25	5.483	5.487	-4
25 - 53	11.149	11.135	14
53 - 16	9.376	9.358	18

- During the measurement of point 55, the signal reflection was probably wrong, and the point was measured incorrectly. The point was excluded from the list.

The overall calculation protocol can be found in Appendix 5.

Processing of the drawing was done in the Kokeš software

- The resulting coordinates of the points were exported in text format (".txt") and loaded in Kokeš 10 (".stx" format).
- The internal drawing technology "wkokes" was used in Kokeš and the planimetry was drawn in prepared layers.
- Point and line markers were used in accordance with the drawing technology and the prescribed standard CSN 01 3411 for large-scale maps.
- The drawing was supplemented with elements (label field, north, network of cross marks, etc.).
- The drawing at a scale of 1:250 was printed on A3 format.

5. List of Appendixes

Printed appendixes:

1. List of coordinates of the points of the traverse
2. List of coordinates of detailed points
3. A3 drawing 1:250
4. Field sketch

Digital appendixes:

5. Calculation protocol from Gorma (prot_groma.txt)
6. List of coordinates of detailed points (coordinates.txt)
7. Drawing 1:250 (AirHouse_drawing.vyk)
(AirHouse_drawing_A3.pdf)

6. Conclusion and results

The objectives of the task were fulfilled. The AirHouse building and its nearest surroundings were surveyed. During the measurements, the accuracy of the detailed points was checked by double surveying of the selected points. The requested maximum difference $\Delta Y_{MAX} = \Delta X_{MAX} = 30 \text{ mm}$ was not exceeded (point 56 $\Delta X = 18 \text{ mm} < 30$). A total of 113 points were determined of which point 55 were discarded due to an apparent aiming error.

The dimension of the surveyed AirHouse building was checked with check distances with the requested maximum difference $\Delta hd_{MAX} = 30 \text{ mm}$ – the accuracy was maintained (connecting points 16 and 17 $\Delta hd = 21 \text{ mm} < 30$).

The requested criteria for measurement accuracy were **fulfilled**.

A planimetry map of the surveyed area was created at a scale of 1:250 using a marker key compliant with CSN 01 3411 (Large-scale maps - Drawing and markers).

The resulting map was submitted in printed and digital form.

Prague, 22. 9. 2022

John Smith

Peter Fox

Lucky Luke

Appendix 1 – List of the traverse points coordinates

PN	Y [m]	X [m]	PN	Y [m]	X [m]
4001	744947.489	1040942.689	4004	744881.537	1040898.536
4002	744894.203	1040932.121	4005	744902.196	1040909.620
4003	744868.949	1040911.565	4006	744838.770	1040872.249

Points calculated by free stationing

PN	Y [m]	X [m]	PN	Y [m]	X [m]
5001	744913.045	1040907.150	5002	744853.670	1040888.403

Appendix 2 – List of detailed points coordinates

PN	Y [m]	X [m]	PN	Y [m]	X [m]
1	744875.035	1040879.458	48	744879.196	1040894.767
2	744874.401	1040880.178	49	744885.083	1040899.884
3	744871.198	1040883.758	50	744879.017	1040902.302
4	744859.755	1040895.648	51	744895.539	1040892.748
5	744858.197	1040896.215	52	744873.797	1040881.692
6	744859.903	1040906.209	53	744896.792	1040913.040
7	744888.151	1040892.411	54	744899.460	1040912.851
8	744886.057	1040894.813	56	744906.354	1040912.932
9	744884.970	1040896.033	57	744903.935	1040910.793
10	744890.191	1040898.516	58	744906.129	1040908.336
11	744892.310	1040896.169	59	744906.139	1040907.151
12	744892.969	1040895.387	60	744895.708	1040905.587
13	744888.834	1040891.715	61	744905.577	1040910.752
14	744888.231	1040903.140	62	744906.670	1040910.590
15	744890.606	1040905.160	63	744902.311	1040915.371
16	744889.794	1040906.800	64	744902.862	1040911.977
17	744888.112	1040908.666	65	744906.736	1040907.684
18	744891.192	1040911.375	66	744896.771	1040904.397
19	744885.269	1040917.732	67	744898.544	1040906.013
20	744880.575	1040913.996	68	744897.497	1040907.185
21	744875.288	1040919.946	69	744891.237	1040888.975
22	744874.236	1040919.013	70	744898.005	1040929.572
23	744881.914	1040915.115	71	744897.307	1040931.583
24	744888.279	1040905.343	72	744896.771	1040933.741
25	744889.376	1040921.365	73	744896.449	1040936.194
26	744889.099	1040921.621	74	744896.556	1040938.695
27	744890.561	1040922.889	75	744892.372	1040943.109
28	744883.934	1040927.615	76	744879.926	1040932.123
29	744884.977	1040928.544	77	744870.538	1040923.736
30	744886.282	1040928.761	78	744864.530	1040918.193
31	744887.593	1040930.867	79	744906.373	1040918.488
32	744890.540	1040930.807	80	744912.754	1040909.942
33	744893.729	1040929.324	81	744917.389	1040904.895
34	744894.789	1040928.248	82	744913.744	1040903.037
35	744892.157	1040927.443	83	744908.848	1040909.561
36	744891.585	1040927.996	84	744859.264	1040888.609
37	744890.419	1040926.896	85	744857.389	1040888.609
38	744890.974	1040926.337	86	744859.004	1040879.276
39	744890.862	1040926.732	87	744857.389	1040879.323
40	744891.167	1040927.058	88	744870.462	1040880.847
41	744891.331	1040927.293	89	744869.317	1040882.085
42	744891.756	1040927.437	90	744860.306	1040872.037
43	744866.409	1040910.994	91	744859.160	1040873.180
44	744865.183	1040910.924	92	744857.910	1040872.371
45	744866.925	1040895.781	93	744859.264	1040870.990
46	744871.755	1040888.151	94	744876.817	1040877.657
47	744875.409	1040891.371	95	744912.289	1040900.787

96	744845.292	1040901.323	105	744843.960	1040904.907
97	744850.173	1040897.469	106	744846.771	1040902.202
98	744863.042	1040920.865	107	744854.315	1040919.107
99	744860.231	1040917.146	108	744851.504	1040915.117
100	744877.611	1040934.186	109	744909.857	1040914.452
101	744869.550	1040927.559	110	744914.871	1040918.923
102	744871.769	1040925.192	111	744910.864	1040922.523
103	744854.758	1040909.572	112	744906.645	1040923.230
104	744852.318	1040911.872	113	744914.871	1040915.452



