SURVEYING ENGINEERING
FERRIS STATE UNIVERSITY

SURE 452 - Geodesy 1 **Winter 2003/04**

Lab #3

PURPOSE: The purpose of this lab is to introduce the student to the use of the Wild T-3 and its application in a conventional geodetic network. The student will also adjust the observations using least squares.

PROCEDURE:

1. Find a suitable area where you can set up at least 5 control points. Try to set the minimum length of each line of 500'. Control points will be monumented and ties made to each point. The lab report will contain an AutoCAD drawing showing the ties for each monument. One monument per AutoCAD drawing will be included in the report.

2. Observe the horizontal angles using the Wild T-3. Use 8 sets of observations at each point. Use a criterion of 4" from the mean to determine whether a particular set of observations is to be rejected. Include a copy of the observations with the report. Also include a table showing the reduced angle for each set, the standard error for the angle (or if the angle was rejected). Show the final adjusted angle.

3. Observe all distances, both forward and back, using EDM. The two observations, corrected to horizontal distances, must agree to within 0.03'. Include a copy of the field observations. Include a table showing the measured slope distance, corrections for each measurement and the final horizontal distance over each leg of the traverse.

4. Observe the azimuth of one of the lines by observing both Polaris and the sun. Use the hour angle method for the observations. Compare the azimuths obtained by both methods and discuss why there are differences. Make sure that the astronomic observations are made on a point where there will be no illumination for the Polaris observations. Include a copy of the field notes and a table showing the reduced azimuth for each set and the standard error for each azimuth (or if the direction is rejected).

5. Adjust the observations and compute the coordinates of the unknown points using least squares. Include a printout of the results from the adjustment. Also include a table showing the

traverse leg, preliminary distances and azimuths, adjusted coordinates, adjusted distances and azimuths, and basic statistics.

6. Assess the accuracy of the results by examining the standard errors and error ellipses.

7. Submit a graphical plot of the results. The drawings should be done at an appropriate scale. The plot should show some (limited) planimetric detail in their relatively correct position. This data could be digitized from a map or included in a campus drawing that may have been generated in another class. Submit a summary table for the survey to show:

    - Angles measured at each point, number of acceptable values, and standard error
    - Distances of lengths, standard error
    - Astronomical azimuths, acceptable azimuths and standard error
    - Traverse results including preliminary azimuths and distances, adjusted coordinates, adjusted azimuths and distances, and statistics.

Students will work in groups that will be selected during the first lab. Field work should be completed as soon as possible and the data should be retained for possible further analysis. Use metric measurements for distances and coordinates. Each group will submit a combined lab report.

Grading will be based on weights given to each task as follows:

Task 1:15 points
Task 2:25 points
Task 3:10 points
Task 4:30 points
Task 5:20 points
Task 6:15 points
Task 7:10 points