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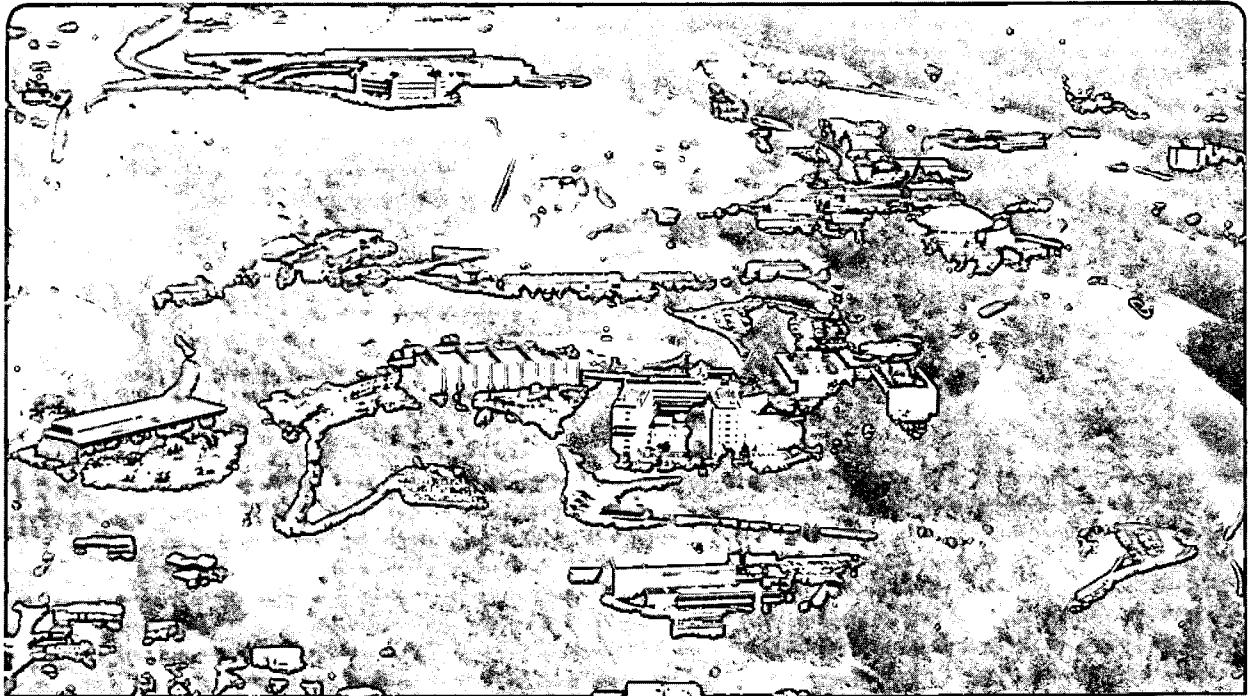
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ENGINEERING NOTE		PE01-07	M4882	1 of 5
AUTHOR	DEPARTMENT	LOCATION	DATE	
Jack Gunn	Mechanical Engineering	Berkeley	December 5, 1975	
PROGRAM - PROJECT - JOB				
PEP - INITIAL DESIGN				
FINAL, PRECISE, ALIGNMENT				
TITLE				
REQUIRED STEPS FOR VARIOUS METHODS				
<p>Assumes:</p> <ul style="list-style-type: none"> A. Magnets have been placed $\pm 1/2"$ per the techniques of EN M4881. B. Instrument stations have been located and surveyed. C. Liquid level datum is installed and debugged. D. Tooling points (balls) have been placed on magnets $\pm .03$ mm during magnetic measurement. <p>There are several permutations and combinations to be considered:</p> <ul style="list-style-type: none"> A. Traditional optical tooling or lasers and other new technology methods. B. Conventional support structures of ten adjustments (x-y translations in a vertically adjustable and tilt tableplane) or 3 point supports of six adjustments. C. Continuously monitored, continuously variable adjustments (screws) or calculated step adjustments (shim stacks). <p>Consequently we distinguish 8 cases (2 x 2 x 2):</p> <p>Case 00</p> <p style="padding-left: 40px;">Optical tooling, continuous adjustments, 3 point support (not considered due to high degree of interaction of adjustments).</p> <p>Case 0</p> <p style="padding-left: 40px;">Lasers, continuous adjustments, 3 point support (not considered due to high degree of interaction of adjustments).</p> <p>Case 1</p> <p style="padding-left: 40px;">Optical tooling, continuous adjustments, conventional supports.</p> <p>Case 2</p> <p style="padding-left: 40px;">Lasers, continuous adjustments, conventional supports.</p>				

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Berkeley

December 5, 1975

Case 3

Optical tooling, calculated step adjustments, conventional supports.

Case 4

Lasers, calculated step adjustments, conventional supports.

Case 5

Optical tooling, calculated step adjustments, 3 point supports.

Case 6

Lasers, calculated step adjustments, 3 point supports.

Techniques will be outlined herein for each case so as to serve as a basis for subsequent study, comparison, and cost estimation.

Case 1

Described in detail in EN M4801A.

Case 3

Same as Case 1 (EN M4801A) except:

- a. Calculation of adjustment required after steps 4h and 5e.
- b. Reduce time required to adjust to half.
- c. Reduce number of iterations from 3 to 2.

Case 5

Same as Case 3 above except:

- a. Reduce time required to adjust to one third.

Case 6

Step 6-F-1 (setup laser L.O.S. over I.S.)

Step 6-F-2 (setup Penta prism over I.S.)

Step 6-F-3 (buck in L.O.S. over I.S.)

Step 6-F-4 (measure from L.O.S. above I.S. to tooling point number 1 of magnet number 1)

- a. Use Distance Measuring Stick (DMS).
- b. Replace laser target with spherical button.
- c. Calibrate length against gage.
- d. "Swing" distance measurement.
- e. Record distance.

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Step 6-F-5 (measure perpendicular offset from L.O.S. to tooling point number 1 on magnet number 1)

- a. Affix laser target and "flip" mirror to DMS.
- b. Select appropriate DMS extension.
- c. Calibrate length against gage.
- d. Measure offset distance.
- e. Record distance.

Step 6-F-6 (measure distance between T.P.s of adjacent magnets)

- a. Affix sockets to both ends of DMS.
- b. Select appropriate length extension for DMS.
- c. Calibrate DMS against gage.
- d. Measure distance and record.

Step 6-F-7 (measure elevation of tooling point above datum)

- a. Establish datum by use of hook gage and liquid level reference surface, or by other appropriate method from Instrument Station.
- b. Rotate laser L.O.S. about its vertical axis so as to intersect laser targeted rod at datum.
- c. Read "backsight" elevation above datum to establish height of instrument (H.I.).
- d. Set up laser targeted rod (K&E) on magnet TP.
- e. Read "foresight" elevation of TP below H.I.
- f. Calculate and enter elevation of TP above datum.

Step 6-F-8 (measure balance of magnets in cell)

- a. Repeat steps 6-F-5, 6-F-6, and 6-F-7 for each magnet.

Step 6-F-9 (compute required adjustments)

- a. Remove cassette from recorder and transport to computer (or remote terminal).
- b. Compute - usually over coffee break or during mealtime.

Step 6-F-10 (adjust)

- a. Insert or remove calculated shim thickness. Six shims for 3 point support and typically 9 shims for conventional supports.

Case 4

Same as Case 6 preceding except for number of adjustments in Step 6-F-10a.

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Case 2

Step 2-F-1

Same as 6-F-1.

Step 2-F-2

Same as 6-F-2.

Step 2-F-3

Same as 6-F-3.

Step 2-F-4 (establish H.I. above datum)

Same as 6-F-7 a, b, c.

Step 2-F-5 (adjust elevation of magnet number 1)

- a. Set up laser targeted DMS and calibrate against gage.
- b. Calculate desired elevation of magnet TP's below H.I.
- c. Adjust elevation screws to give desired elevation of TP number 1.
- d. Set up DMS on TP number 2 of magnet number 1.
- e. Adjust elevation screws.
- f. Repeat c thru e until elevations are correct.
- g. Check "roll" with electronic level.
- h. Adjust "roll" to tolerance.
- i. Repeat c thru e until both "roll" and elevations are correct.

Step 2-F-6 (adjust distance from L.O.S. between instrument stations to TP number 1 of magnet number 1)

- a. Same as 6-F-4.
- b. Adjust screws to obtain proper reading.

Step 2-F-7 (adjust perpendicular offset distance of TP number 1 of magnet number 1)

- a. Same as 6-F-5.
- b. Adjust screws to obtain proper distance.
- c. Repeat 2-F-6.
- d. Repeat 2-F-7.

Step 2-F-8 (adjust perpendicular offset distance of TP number 2 of magnet number 1)

- a. Same as 2-F-7.

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Step 2-F-9 (recheck elevation and roll)

a. Repeat Step 2-F-5.

Step 2-F-10 (adjust downbeam distance of TP number 1 of magnet number 2)

a. Same as 6-F-6.

b. Adjust screws to obtain proper reading.

Step 2-F-11

a. Repeat Steps 2-F-4 thru 2-F-9 for each magnet.

JG:gme

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