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MAGNETIC FIELD MEASUREMENTS NEAR STEEL STRUCTURES

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Measurements of the vertical and horizontal magnetic field were made with a portable fluxgate magnetometer (Scintrex Model MF-2-100) around a large steel frame, deck building, under construction, and close to a large mild steel plate, to look for the size of variations from the earth's field in the vicinity of randomly-magnetized steel - similar in some ways to the SNO deck.

BUILDING MEASUREMENTS

Fields were measured near the floor (concrete on Q deck support) of a one storey structure with 10" vertical I beam supports, and 8" I beam roof girders (on a 4' by 8' grid). Earth's field measurements at a distance of 15 m from the building, gave B(vert) = 53 kgamma (where 1 gamma = 1 nanoT), and B(horiz) = 15 k gamma in the magnetic north direction.

For some vertical beams, measurements at 10 cm from the beam showed vertical field values from 0 to 100 kgamma, with some points on the beam having horizontal fields of up to 80 kgamma (presumably near a magnetic pole). Vertical field measurements made at various places on the floor at 0, 1, 2 m heights, showed considerable uniformity at some sites (40,40,40 and 40,20 20) and variability at others (0,44,50 and 75,30,38). It appears as if variations from the earth's field up to +/- 50 kgamma are common, but average out over a large floor area. At distances greater than 4 m from the structure, essentially the earth's field values were observed.

STEEL PLATE MEASUREMENTS

50		60		45
47		60		50

Fig. 3: Vertical fields at 1.8 m above plate.

20	10	10	-10	10	30	30	40
20	10	10	-20	10		30	40
20	10	10	0	10	20	20	30

Fig. 4: Horizontal fields (direction of mag. north) at 0.8 m above plate. At a distance of 1 m out from the plate edges, the horizontal field was 15 +/- 5 kgamma.

CONCLUSIONS:

Evidently, random magnetizations are present in ordinary mild steel structures, with variations close to the structural components of +/- 50 kgamma. In all cases, fields measured at a distance from the structure equal to the dimension of the steel components in the structure are within about 10% of the earth's field value. If the deck structural components are 3 m in their maximum dimension, little magnetic field effects should be visible at 3 m below the deck. If a non random magnetization was detected in some deck components prior to assembly, these components could be demagnetized. I'd suggest that we measure the magnetization on delivery, and have a demagnetizer available if needed.

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A steel plate (#44W plate steel) measuring 8' x 20' x 1/2" in the yard of Nickel City Steel (Kelly Lake Rd.) was moved 3 m from the other plates it had been stored with, and laid horizontally. The earth's field at this location was measured to be B(vert) = 53 kgamma +/- 2 kgamma, prior to the plate positioning. Measurements of the vertical field on top of the pile of 4 plates showed random deviations from the earth's field of +/- 30 kgamma, with no obvious pattern, except that the largest variations occurred near the plate pile edges.

Measurements made above the single horizontal plate are summarized in the diagrams below, giving vertical field values in kgamma at the indicated height above the plate.

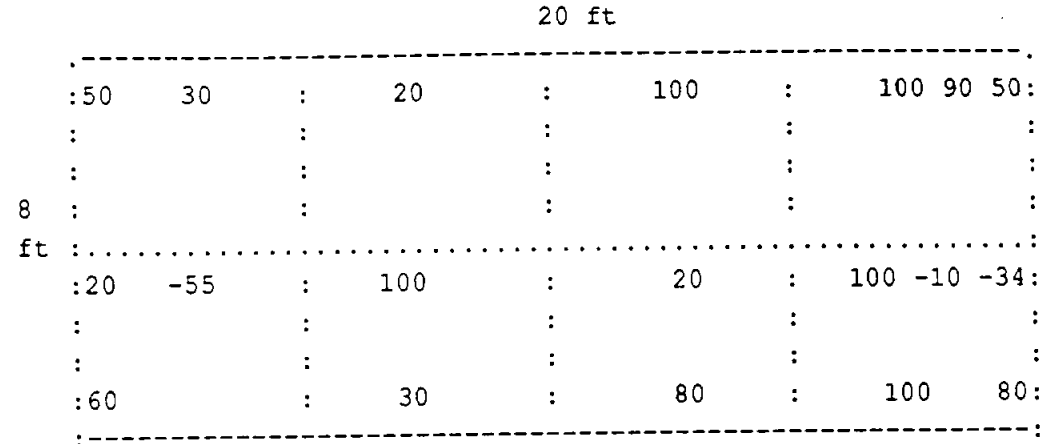

Fig 1: Vertical fields 15 cm above plate.

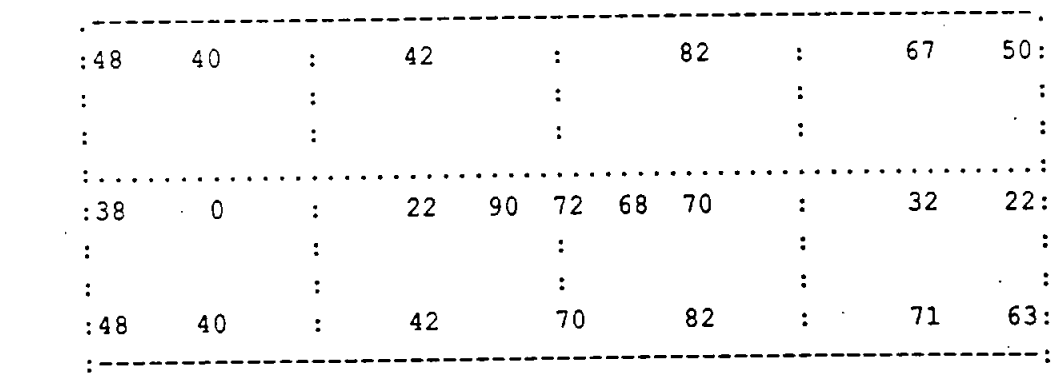

Fig. 2: Vertical fields at 1.0 m above plate. At a distance of 1 m out from the plate edges, the vertical field was 53 +/- 4 k gamma.