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An **AEIS** Case Study

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Identifying the amount of Steel present in a Slab for Structural Analysis

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Introduction

Ground Penetrating Radar (GPR) safely locates embedment within concrete structures prior to drilling, cutting or coring up to a depth of 18 inches. With the high-resolution antennae, even small targets are located within minutes. Only single sided access is required to perform surveys, and a large area can be inspected in one day. The compact data acquisition system provides clear and reliable data, while remaining user-friendly at the same time.

Our techniques locate subsurface object and its depth on the job-site. The Structure Scan handcart is first rolled over the desired survey area (wall, floor or ceiling) and when an object is spotted on the data screen; we simply back up the hand cart and mark the target. Structure Scan provides immediate results when timing is crucial, with no need to close off work areas. Multiple antenna options (1.5 GHz and 900 MHz) also ensure that appropriate depth results are acquired.

GPR as a three-dimensional mapping technique

GPR produces three-dimensional images by creating pulses of radar energy at a surface antenna, transmitting those pulses into the ground and measuring the elapsed time between when they were sent, reflected off buried targets, and received back at a surface antenna. As the antenna is pulled over the ground surface, a two-dimensional vertical slice showing the significant reflections in the ground is obtained. Approximate depth in the ground for each of the reflections can be determined when radar travel times are converted to depth. When many transects are collected in a closely spaced grid, a three-dimensional cube of reflection data are available for processing and image production



Figure 1: Grid lines were laid out in order to collect the data at closely spaced intervals in both directions.

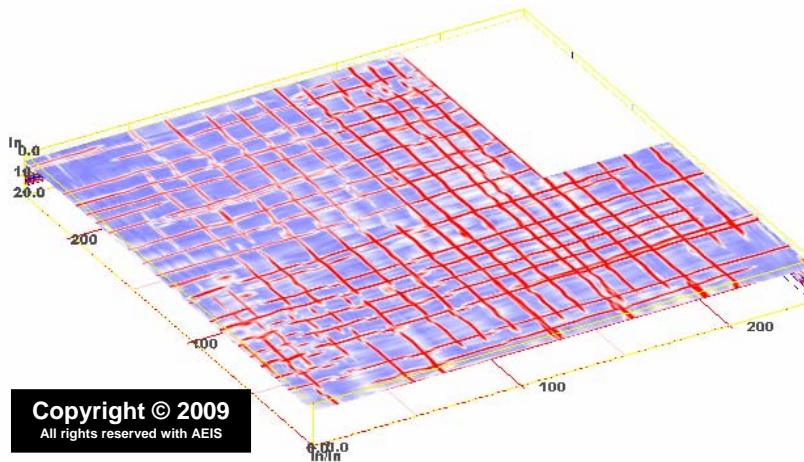


Figure 2: 3D image of the slab

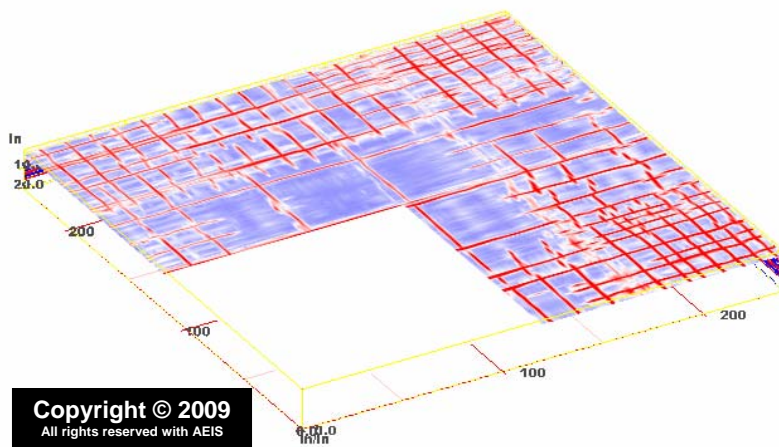


Figure 3: Different side view of 3D image of the slab.

Scenario

Client wanted to expand the facility, but before doing so needed a thorough engineering and structural analysis. The structural engineer wanted to know the amount of the steel present in the slab. It was also important to find the slab thickness, concrete cover over rebar and the sizing of the rebars. AEIS GPR survey team was requested to perform a structural survey of the slab.

Solution

Structure scan should be performed to determine the steel spacing, concrete cover and slab thickness present in the slab. Structure scan should be supplemented with Magnetic rebar sizing instrument (covermeter) to determine rebar size.

Procedure

After setting up equipment, a 20 ft X 20 ft grid was drawn on the slab. Scan was run at the interval of every 1ft in both X and Y direction. After scanning the area, the data was processed in radan software.

Findings

As shown in Figure 2 & 3, 3D image shows that a whole pattern of rebar present in the slab. 3D image (fig 2) from 2.5 in to 4.5 in from top of the slab indicates presence of rebar in both directions. The missing data on the top of the grid is due to inaccessibility. GPR technique allows mapping the structure at accessible areas within the grid. 3D image (fig 3) from 2.5 in to 4.5 in from top of the slab at a different location indicates presence of rebar in both directions. At certain location, abrupt termination of rebar can be readily seen.