CONCRETE SCANNING AND 3D RADAR IMAGING WITH HIGH FREQUENCY RADAR METHODS

Produced by Gabor Enekes, MS.
2/22/2022
Houston, TX

OmniVueNDT
GPR, BIM & Non Destructive Testing

Conducting Structure Scan with geophysical methods -

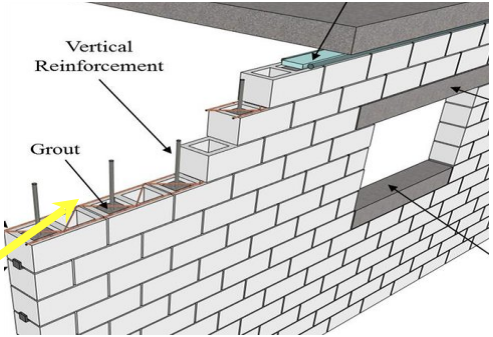
- CMU
- Concrete Slab
- Beam
- Girder
- Column
- Metal Pan decking
- Others…

OmniVueNDT
GPR, BIM & Non Destructive Testing

CMU Wall Inspection - GPR

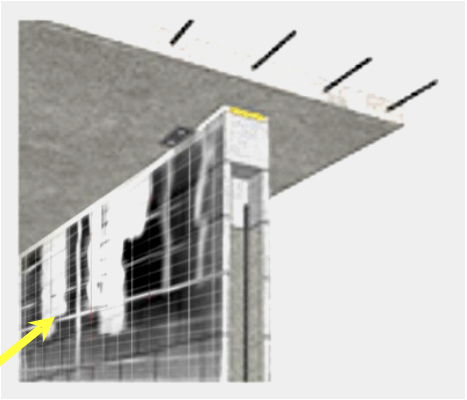
CMU Construction Site

Design Plan



Construction

Scanned Radar Image

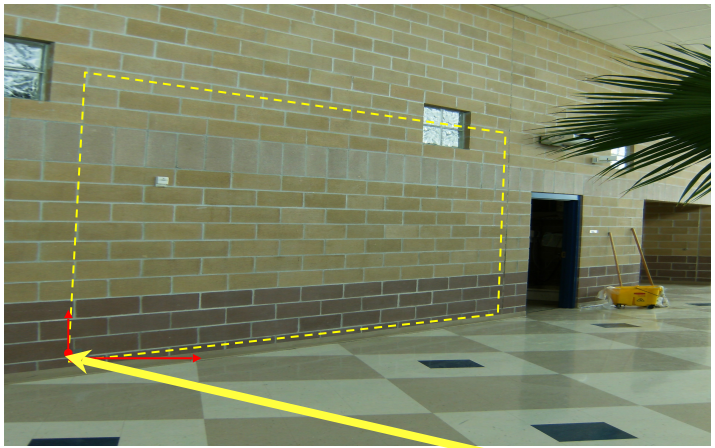


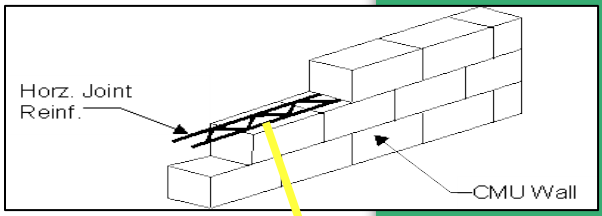
3D radar image time slice, indicating reinforcement pattern and possible structural issues inside the wall.

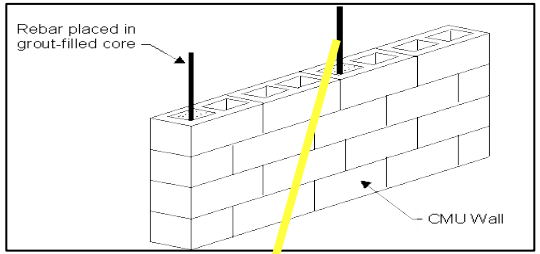
OmniVueNDT
GPR, BIM & Non Destructive Testing

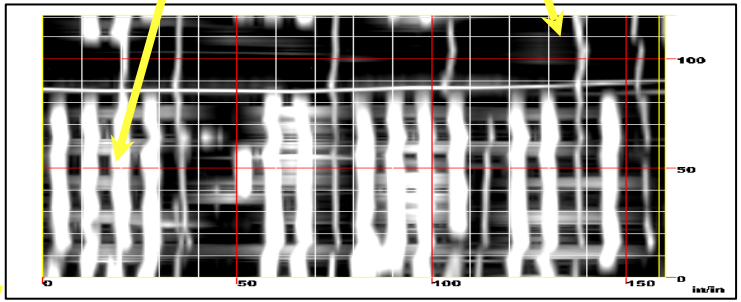
CMU Scan Result Example

Scan location inside a building







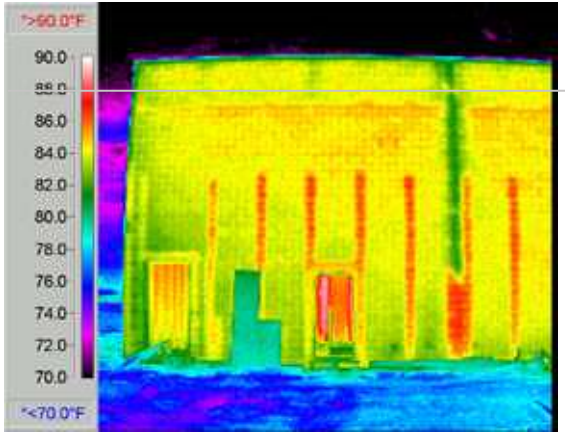


OmniVueNDT
GPR, BIM & Non Destructive Testing

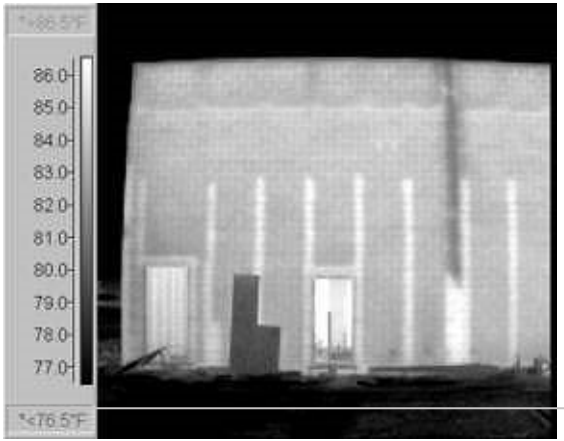
CMU Wall Inspection - Thermal Camera Imaging

Thermal camera is capable to produce image of any hidden internal air pockets inside the CMU cell (Higher Thermal Intensity – RED) that could be an indication of void or hollow section in the CMU wall (See sample images below).

This work procedure can also be used on façade, roof and slab as well.



Thermal intensity – Color view



Thermal intensity – Grayscale

OmniVueNDT
GPR, BIM & Non Destructive Testing

Scanning on a concrete slab

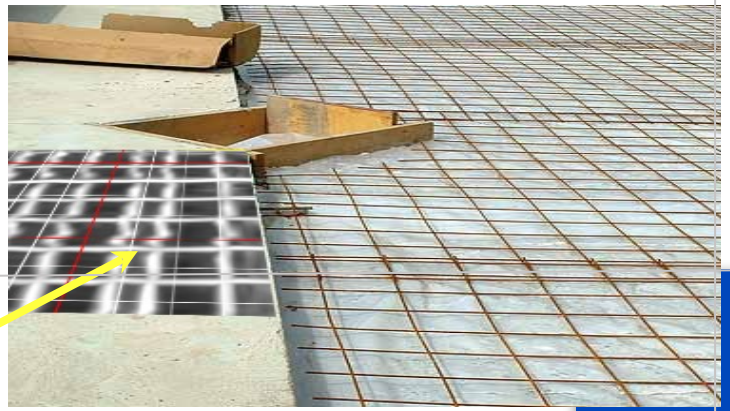
The procedure of concrete scanning always starts with the scope of work and assessing the scan location.

GPR data acquisition must be in a 3D mode in order to produce appropriate details of the as-built.

The following slides are showing examples of this procedure.

Wire Mesh

Image below is showing a typical wire mesh concrete slab. A 3D GPR scanning was performed on the finished side (left side). The produced radar image is virtually overlayed on the concrete floor showing the pattern of reinforcement. As-built information can be obtained.



3D radar image – depth slice

OmniVueNDT
GPR, BIM & Non Destructive Testing

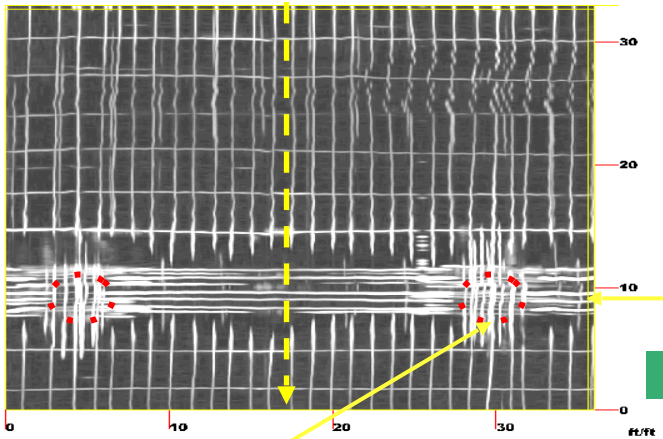
Port Tension Cable As-built Surveys with GPR

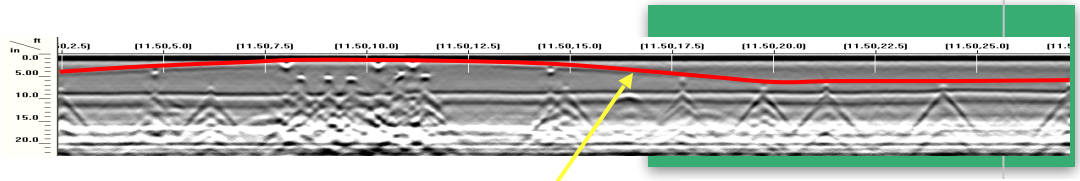
3D Area marked with pink dash line indicates scanning are around the TWO cylinder shape columns.

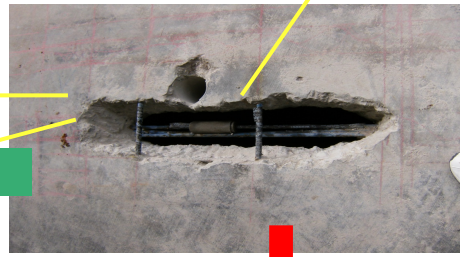
GPR Scan Location

GPR scan was carried out with a 1.5GHz GSSI antenna unit. Grid was collected on a 6” scan line increment in both lat/long directions.

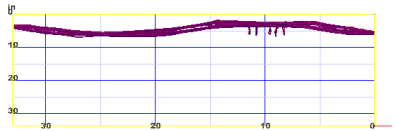
Results of a 3D As-built Survey

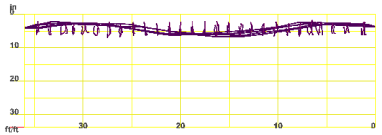




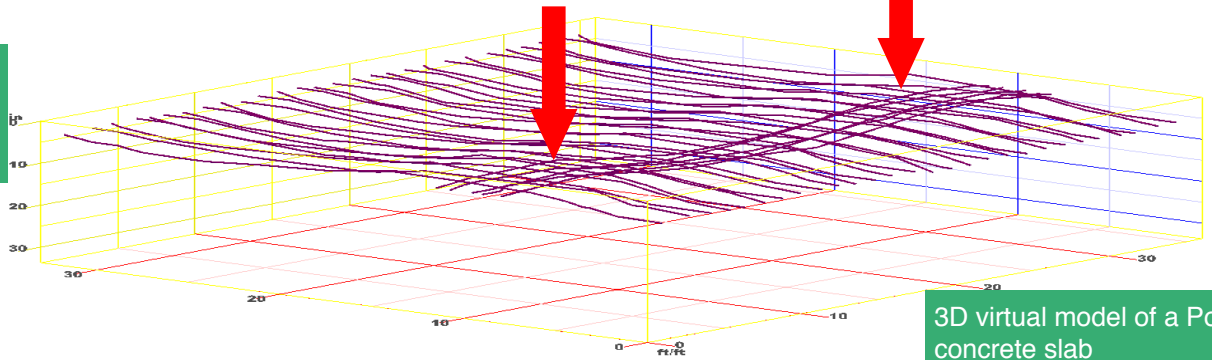


Exposed PT Cable



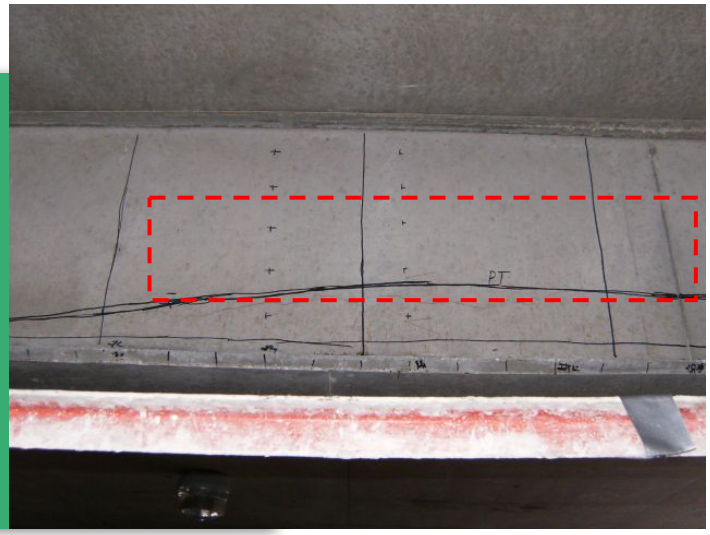


High position of the PT also column locations



3D virtual model of a Post Tension Cables in a concrete slab

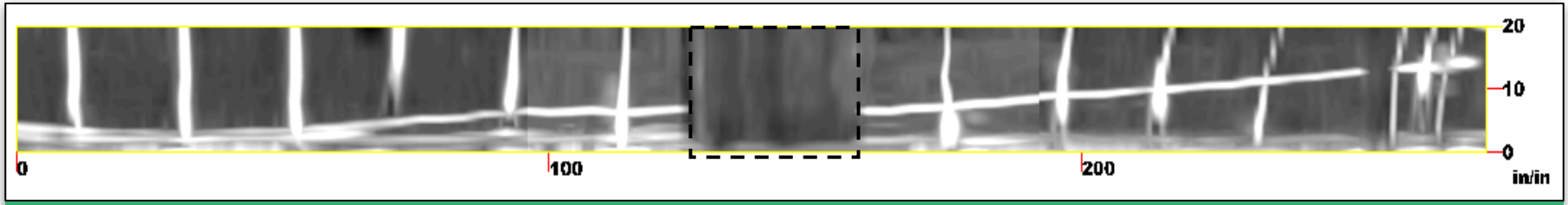
Beam Scan



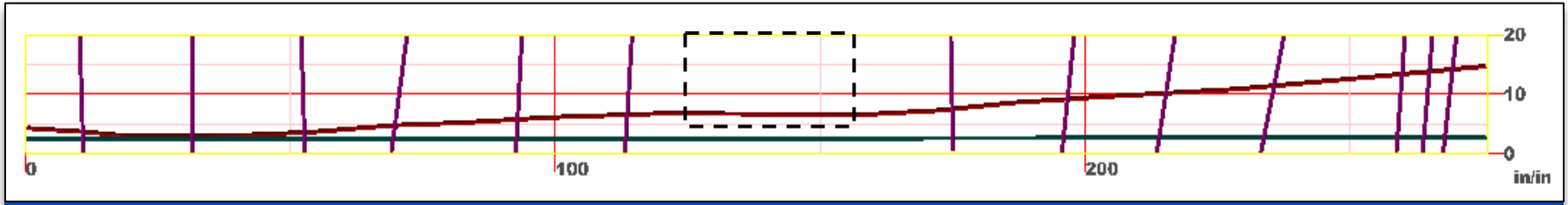
Post tension beam scan for producing comprehensive as-built details and conduct condition assessment.

OmniVueNDT
GPR, BIM & Non Destructive Testing

Result of Beam Scan



Result of a 2.5D radar inversion showing the virtual sideview image of the GPR scan. Vertical stirrups and PT cable are clearly visible on this image.



Result of a remodeled reinforcement image – Side view of the 3D model.

Column Scan

The procedure for scanning a column or any other type of concrete structures are similar to what we had seen in the previous slides above.

The results will be a reinforcement layout to be drawn to the surface along with the digital 3D radar image.

Other Applications

- Condition Assessments
- Volumetric Surveys
- Indoor and Outdoor Void scan and Mapping - AutoCAD drawing or GIS map is provided as a deliverable

Concrete Storage Tank Scan

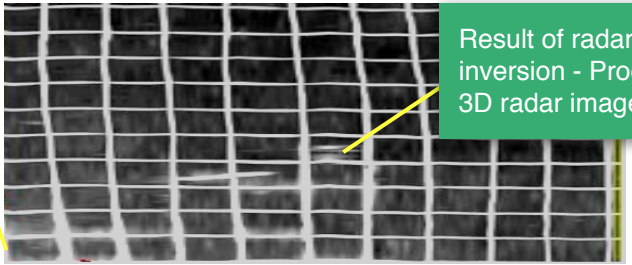
Green dash line indicates outline of GPR scan area

3D GPR radar image

High frequency GPR scan is capable to determine as-built information non-destructively in the concrete structure.

Applications:

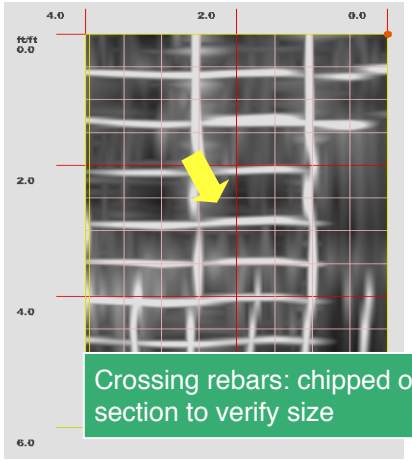
- Prior to any cutting, drilling and coring
- As-built



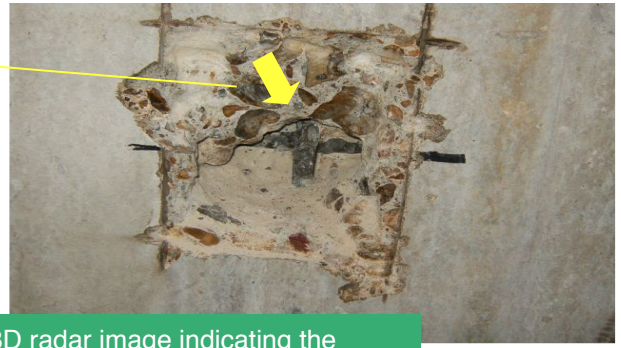
Result of radar inversion - Produced 3D radar image

OmniVueNDT
GPR, BIM & Non Destructive Testing

Concrete Storage Tank Condition Assessment



Crossing rebars: chipped out section to verify size



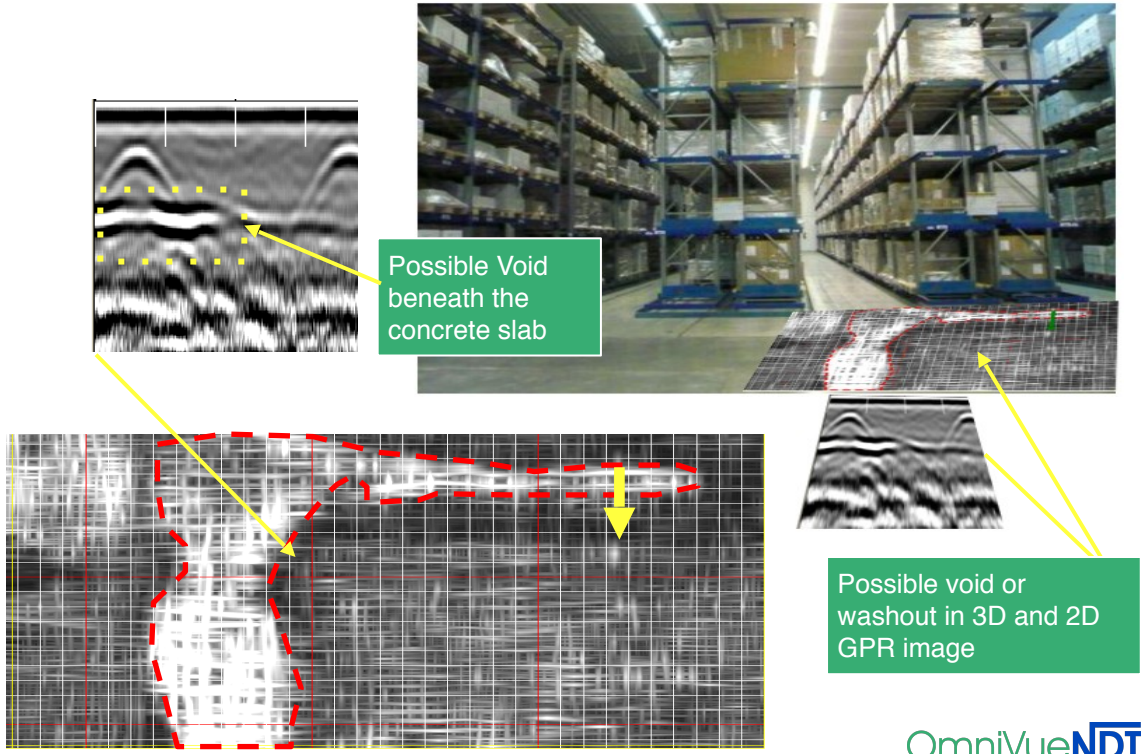
3D radar image indicating the pattern of rebar

OmniVueNDT
GPR, BIM & Non Destructive Testing

Shallow ground void surveys - Indoor

High- and mid-frequency GPR unit is capable of producing information about shallow ground anomalies such as a void, sinkhole or washouts. Project is always carried out in 3D mode in order to obtain essential information about the near field. Location of possible underground issues can easily be determined, and this procedure can perform inside a warehouse or an office building to check and verify the possible voids underground.

The result is always a 3D radar image with essential information to be obtained by client's request.



OmniVueNDT
GPR, BIM & Non Destructive Testing

A. Outdoor Void Survey – Combined in GIS

Click on link to view 3D map in Google Earth

EXT. link: Area 2 FCC Void Survey Plant 89 Marathon South 1500 GIS

OmniVueNDT
GPR, BIM & Non Destructive Testing

B. Outdoor Void Survey – AutoCAD

Advantages

OmniVueNDT
GPR, BIM & Non Destructive Testing

- Large data set acquisition within short period of time
- Non-destructive testing
- High accuracy procedure
- Affordable Service

Contact Us

OmniVueNDT
GPR, BIM & Non Destructive Testing

281-702-7648

omnivuendt.com

Gabe.Enekes@omnivuendt.com

210 Derrick Drive, Humble, TX 77338