CMU and Brick Masonry Walls NDT Methods of Examining As-Built Construction and General Condition

International Concrete Repair Institute Spring Conference 2011

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Applications for NDT in CMU and Masonry Walls

- As-built construction:
  - •Modifications: New openings, Adding loads, etc.
  - •Failure Investigations
  - •Deterioration
  - •Blast Upgrades
  - •Flood Upgrades

Examination Methods

- Visual
- Ground Penetrating Radar
- Infrared Surveys
- Pachometer Survey (Ferroscan)
- Ultrasonic Pulse Velocity

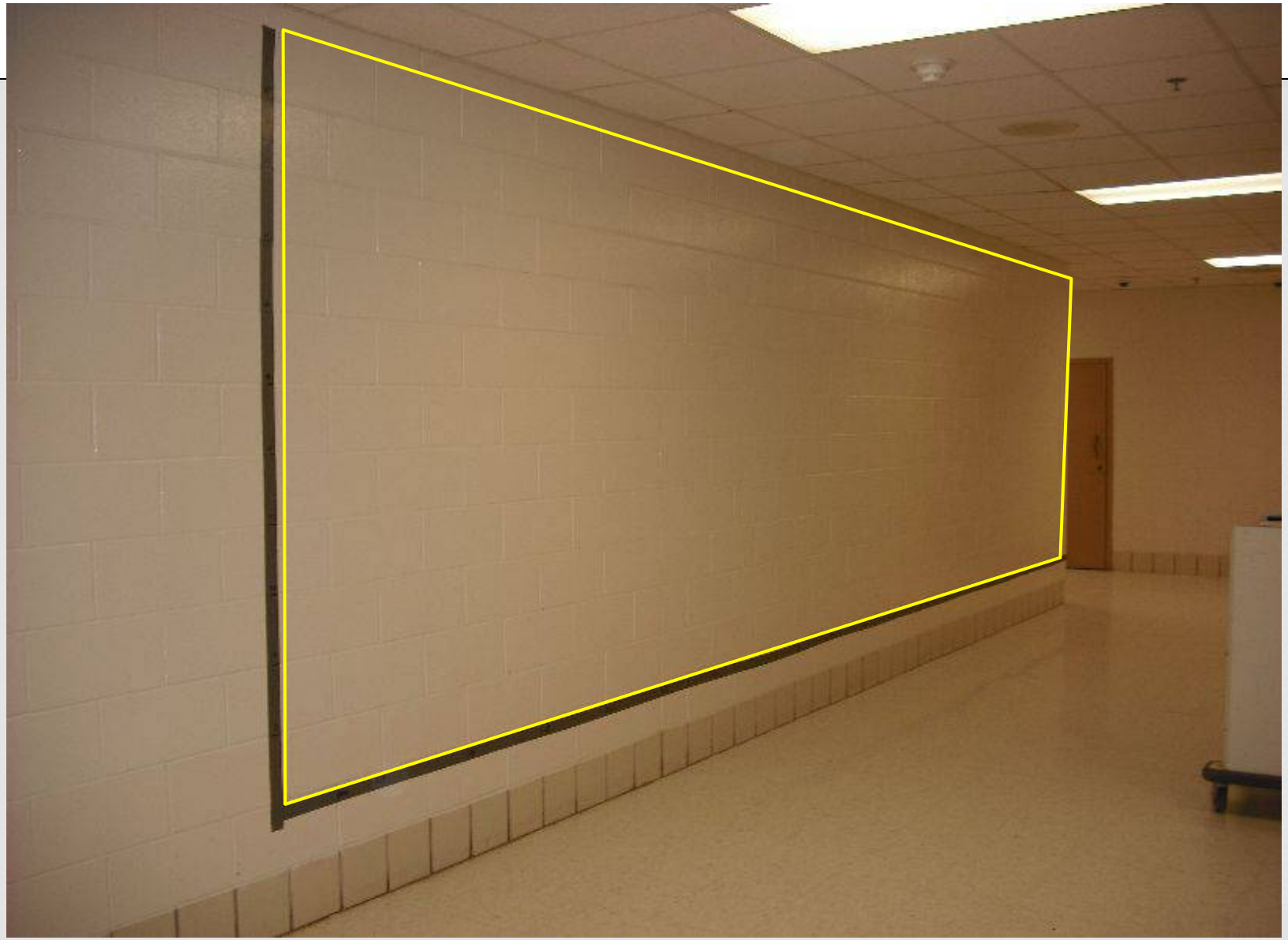
What can be detected?

- CMU
  - Grout or Voids
  - Reinforcement
  - Electrical Conduit
- Brick Masonry
  - Wall Tie Location
  - Wall Tie Installation (certain cases)
  - Wall Tie Condition

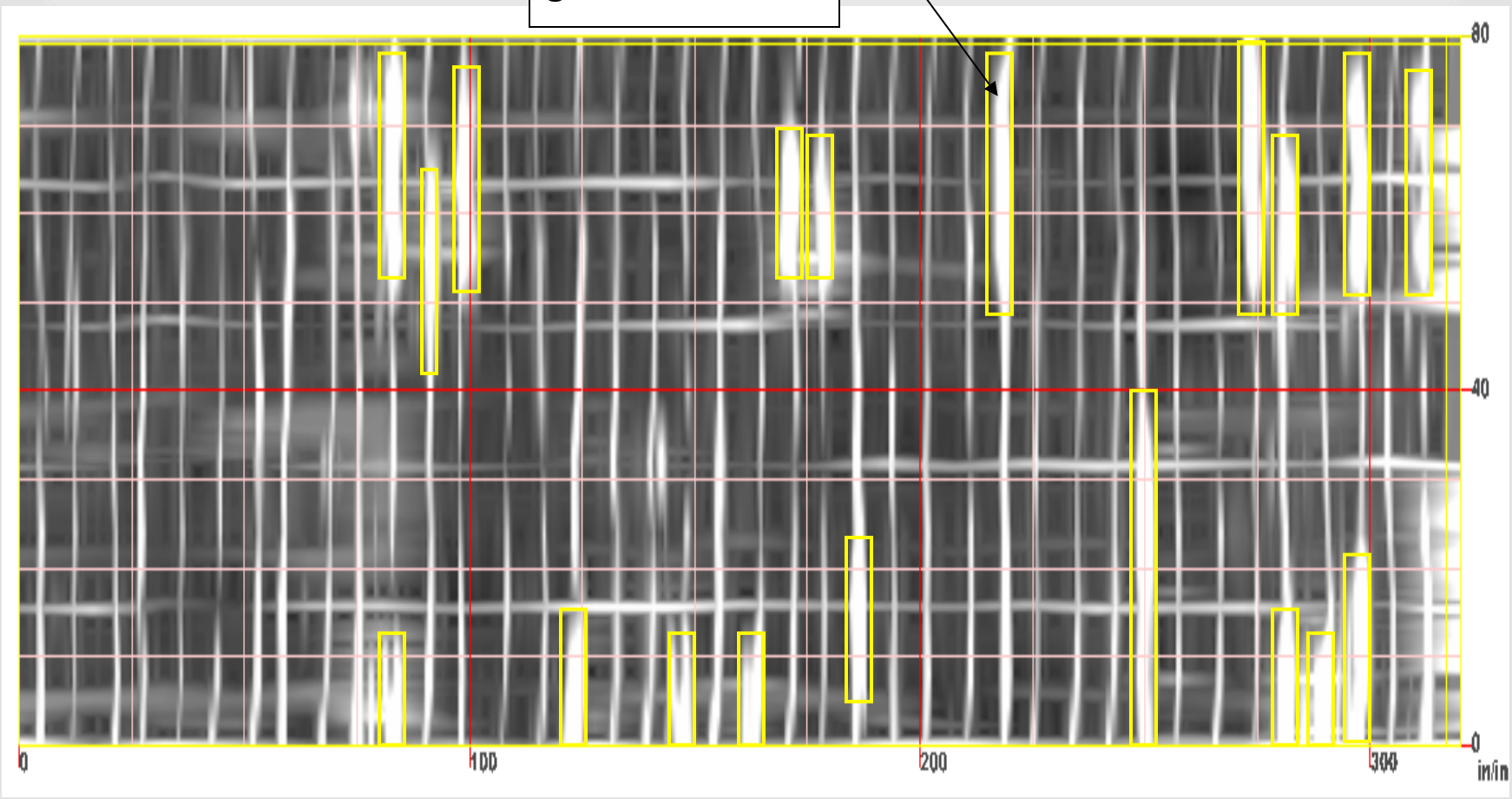
CMU Grout

- CMU Grout:
  - Grout location
  - Grout void detection

CMU Grout /Voids - GPR



CMU Grout / Voids - GPR



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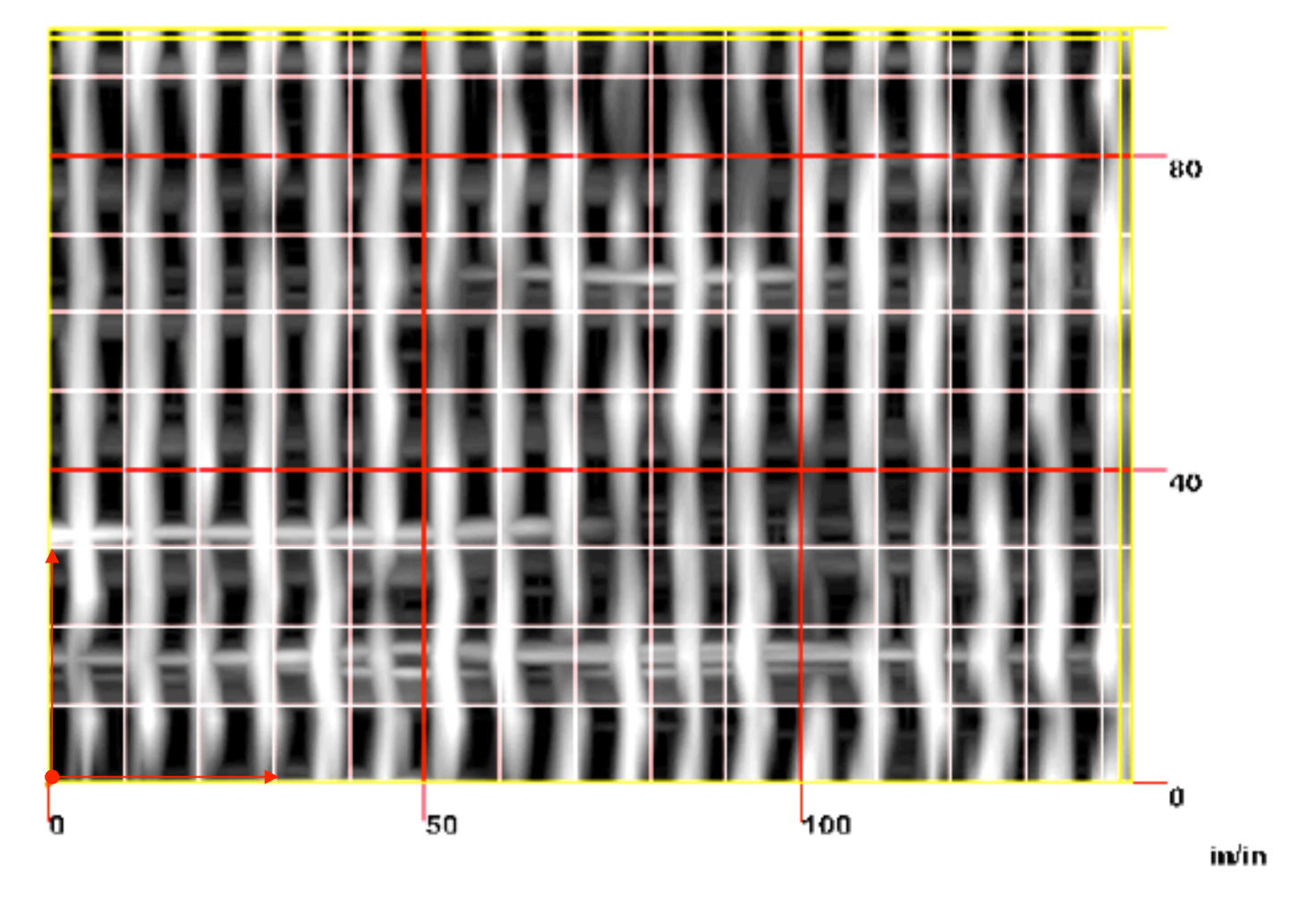
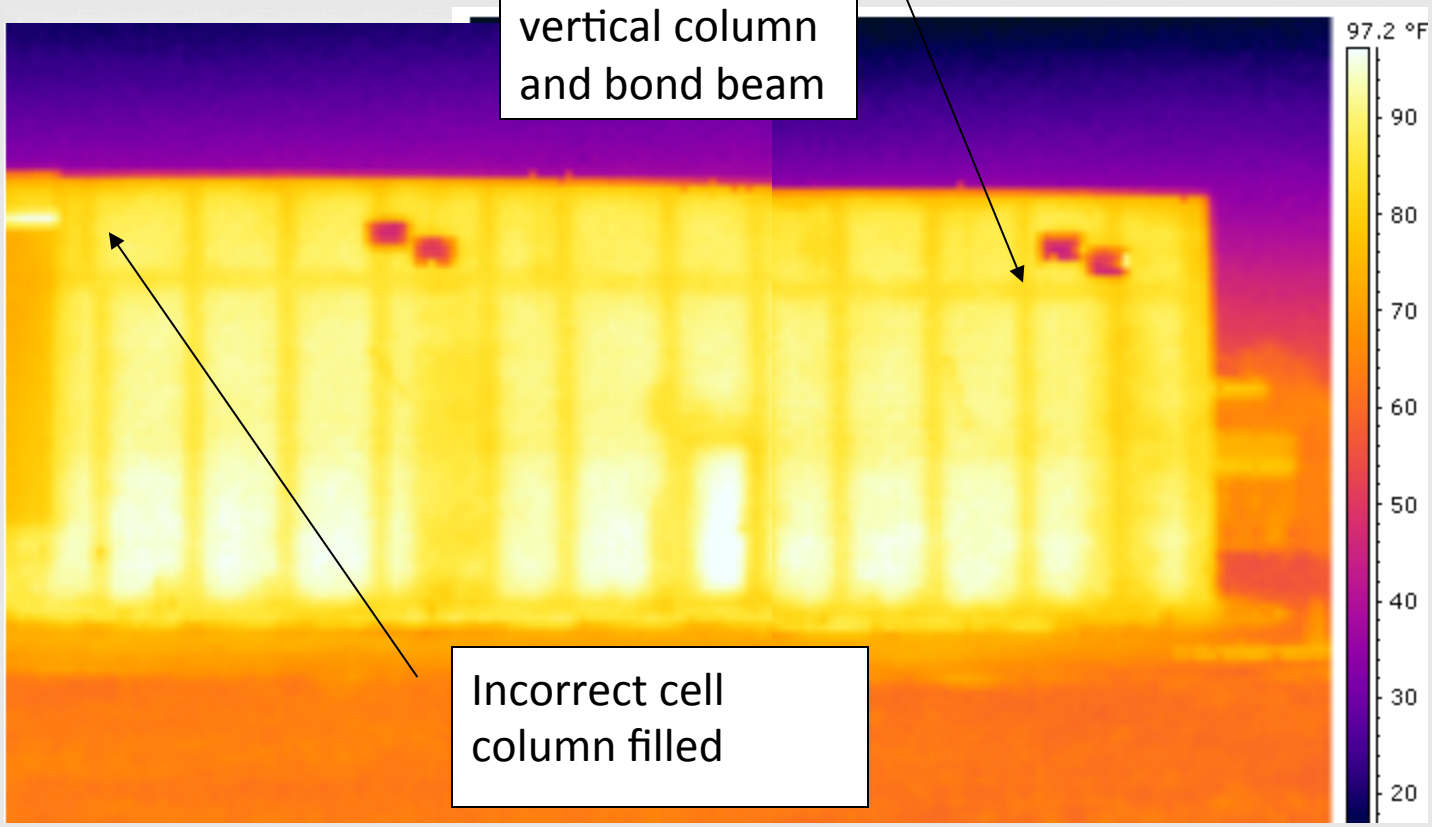
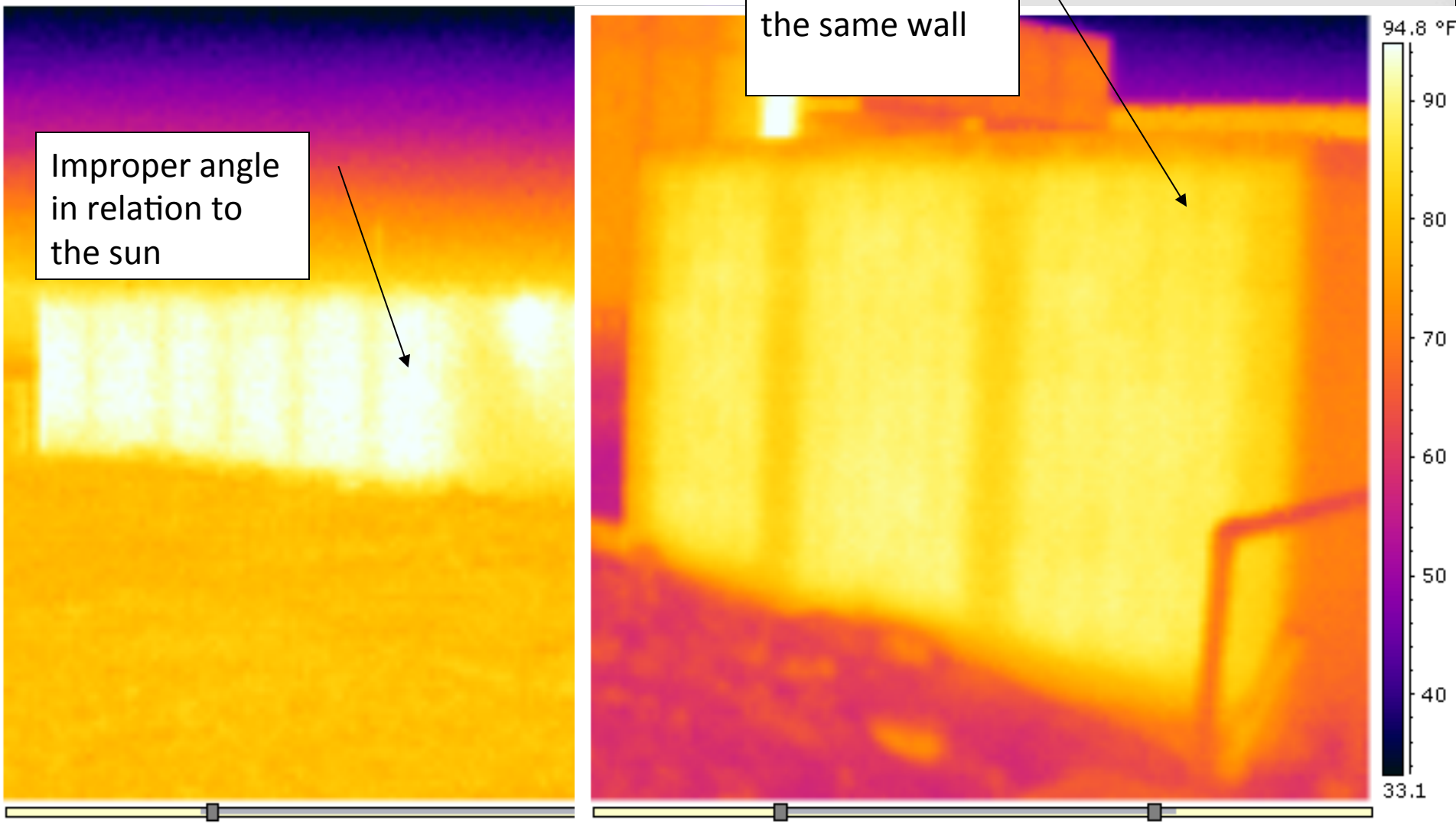


CMU Grout / Voids - Infrared

CMU Grout / Voids - Infrared



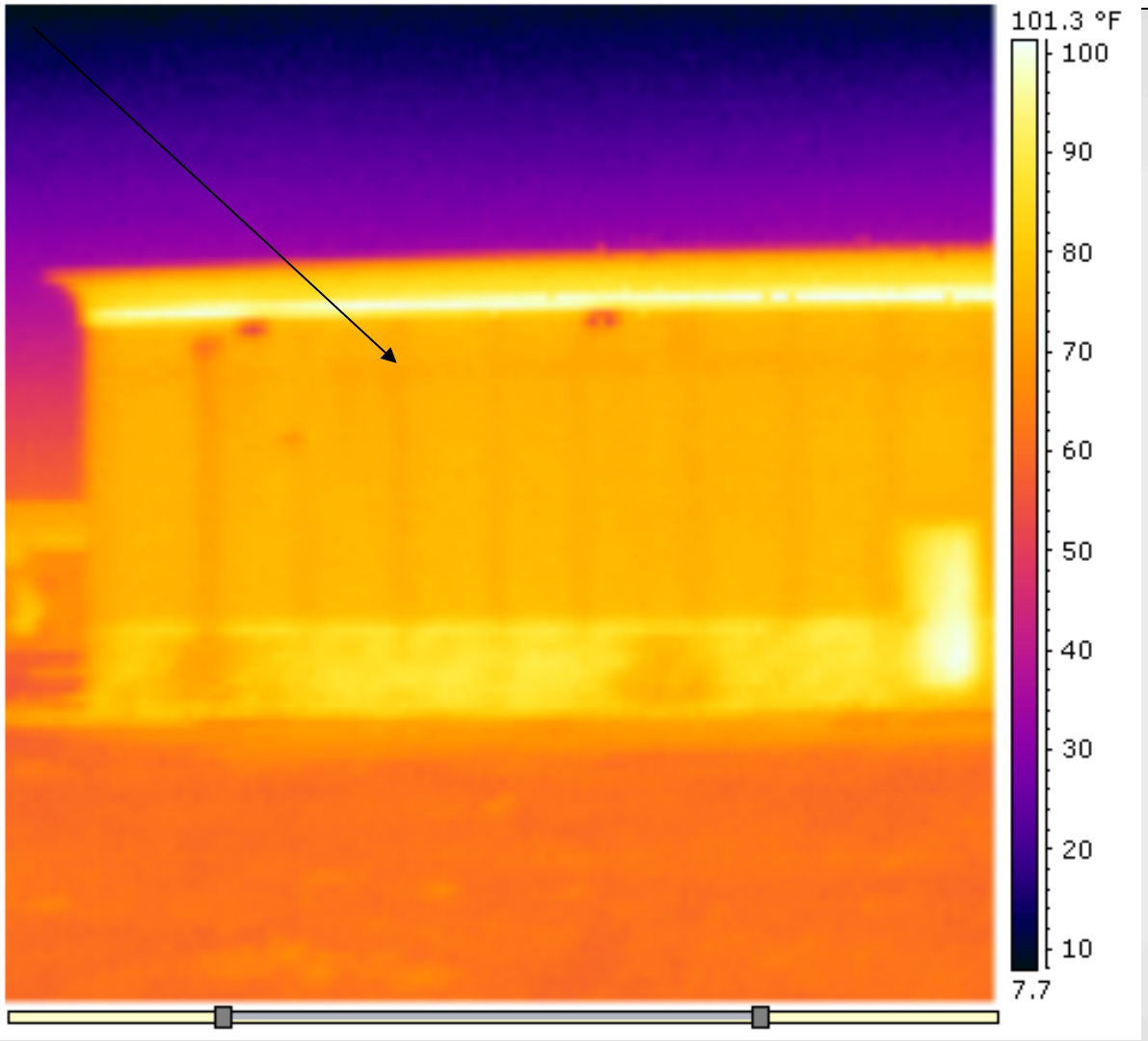
CMU Grout / Voids - Infrared



CMU Grout / Voids – Infrared through stucco

CMU Grout / Voids - Infrared

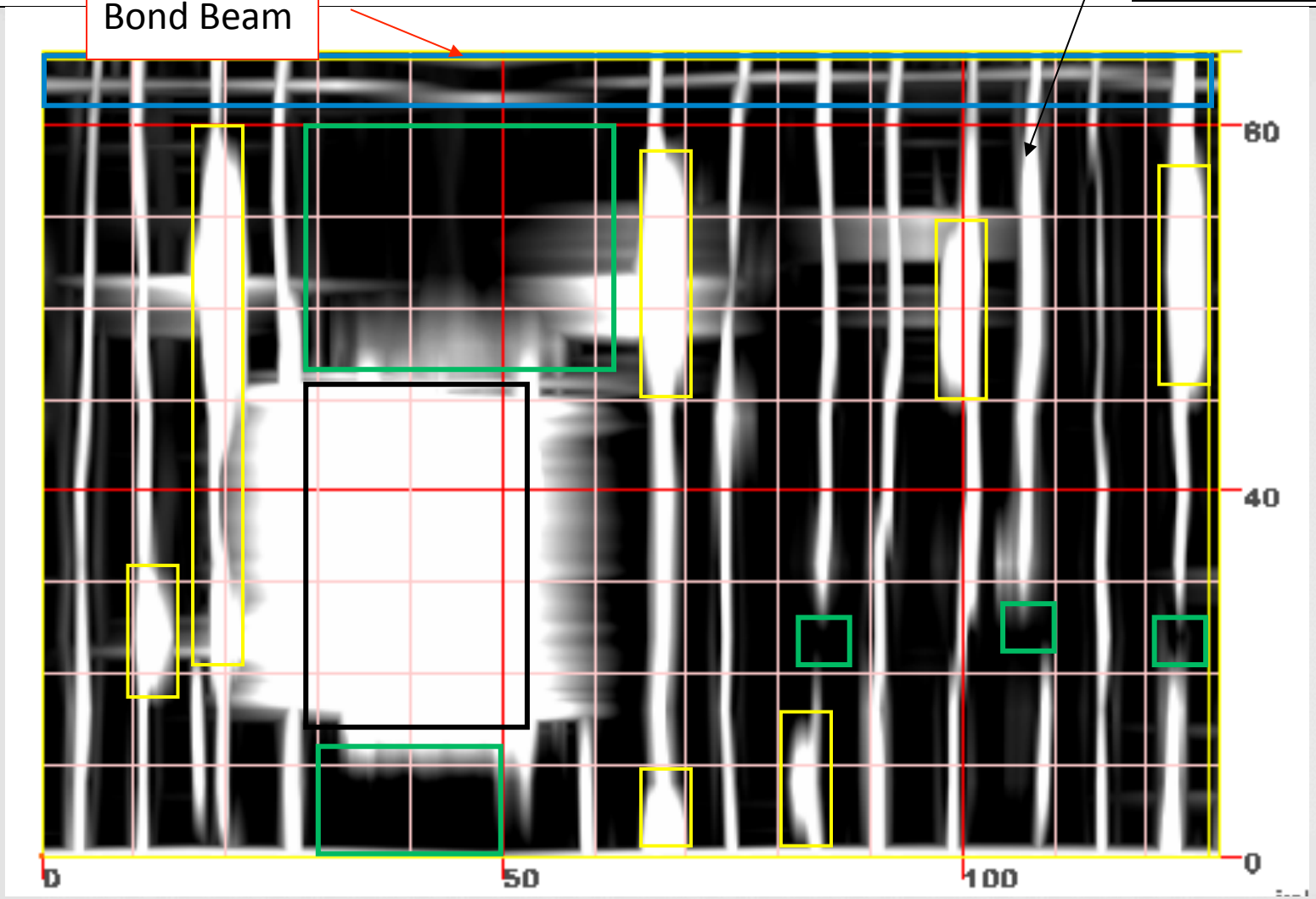
Column/bond beam intersection



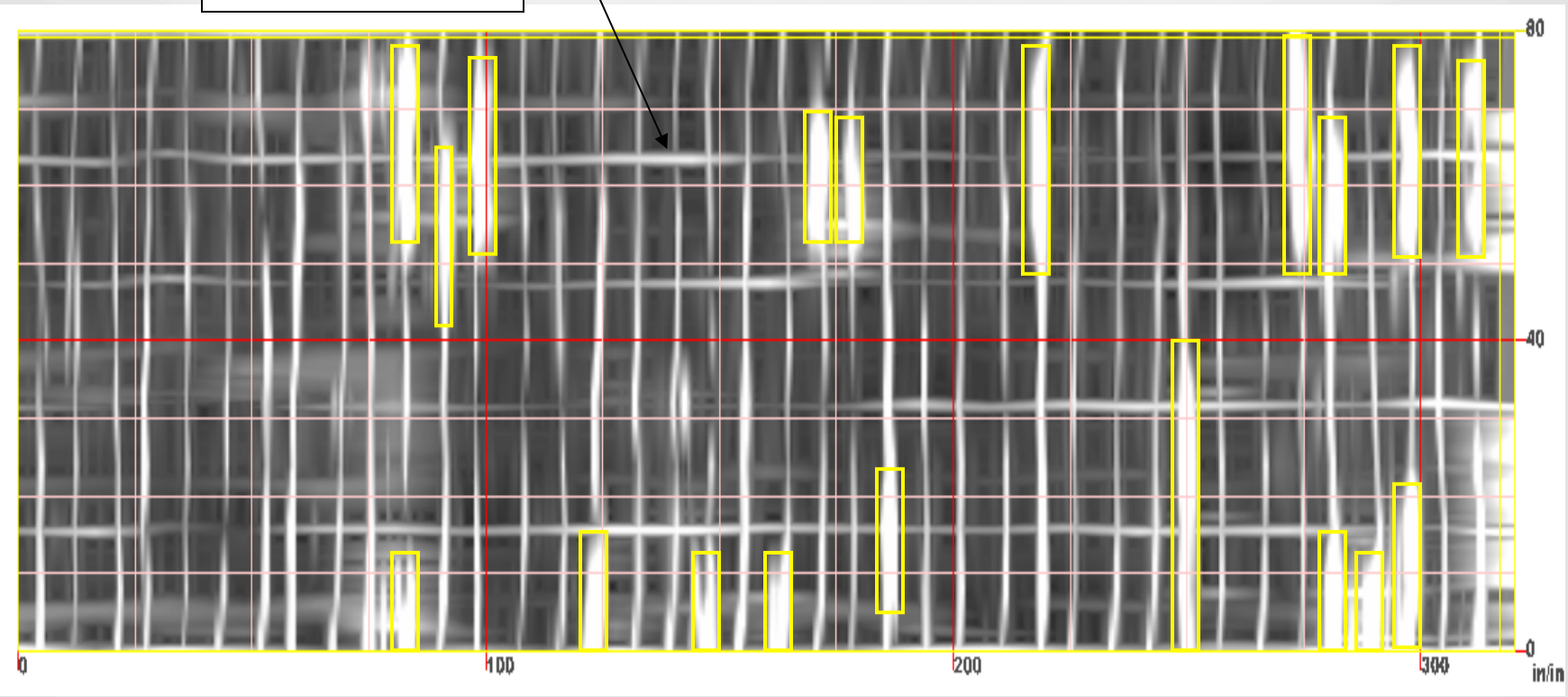
CMU Reinforcement

- CMU Reinforcement
  - Joint Reinforcement (Joint wire, joint steel, etc)
  - Vertical reinforcement:
    - Dowels location and height above slab
    - Spacing
    - Lap length
  - Horizontal Reinforcement (Bond Beams)
    - Location of bond beam
    - Number of bars in bond beam
  - Reinforcement around Openings

CMU Reinforcement



CMU Reinforcement



CMU Reinforcement

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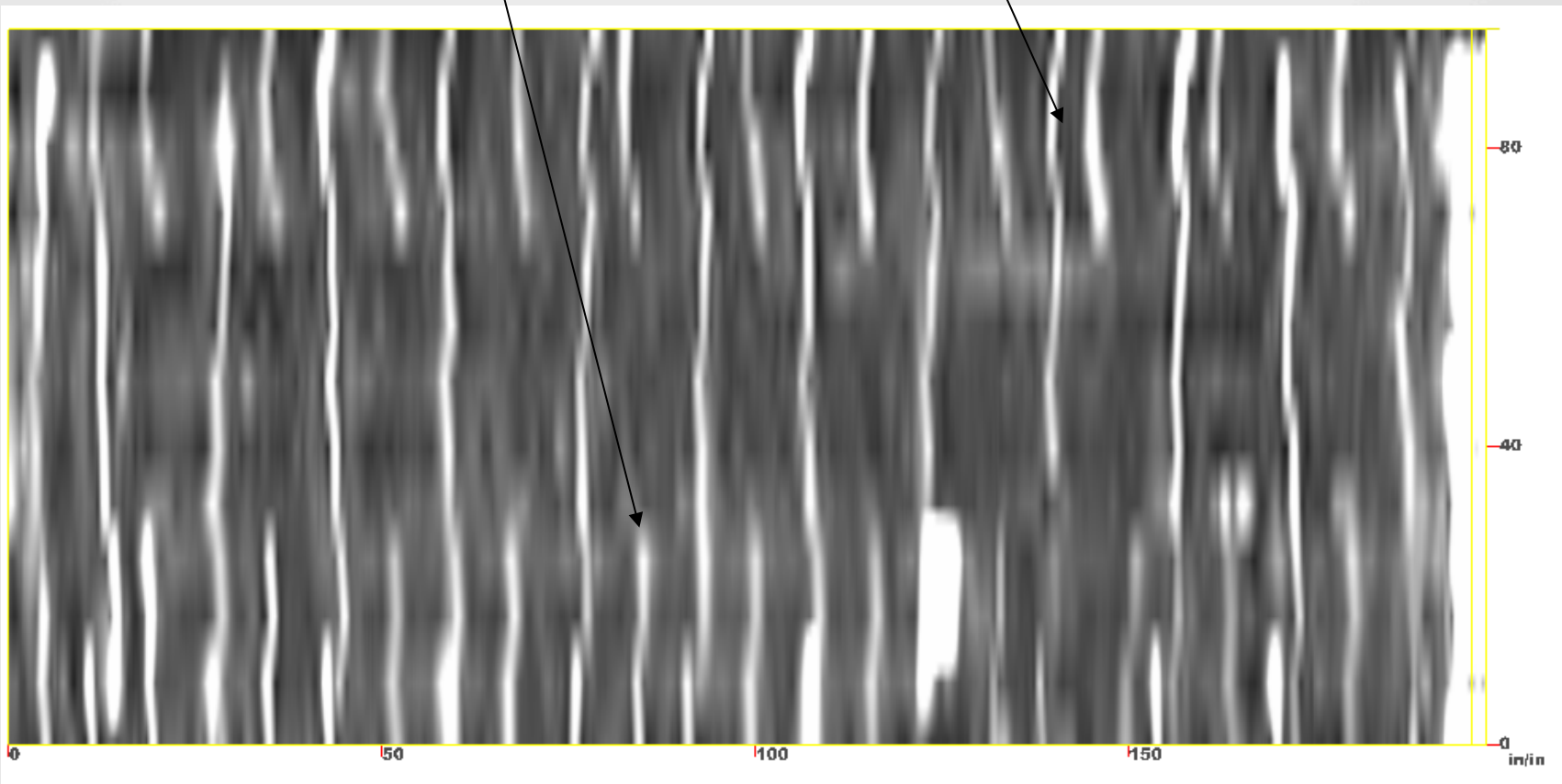

CMU Reinforcement

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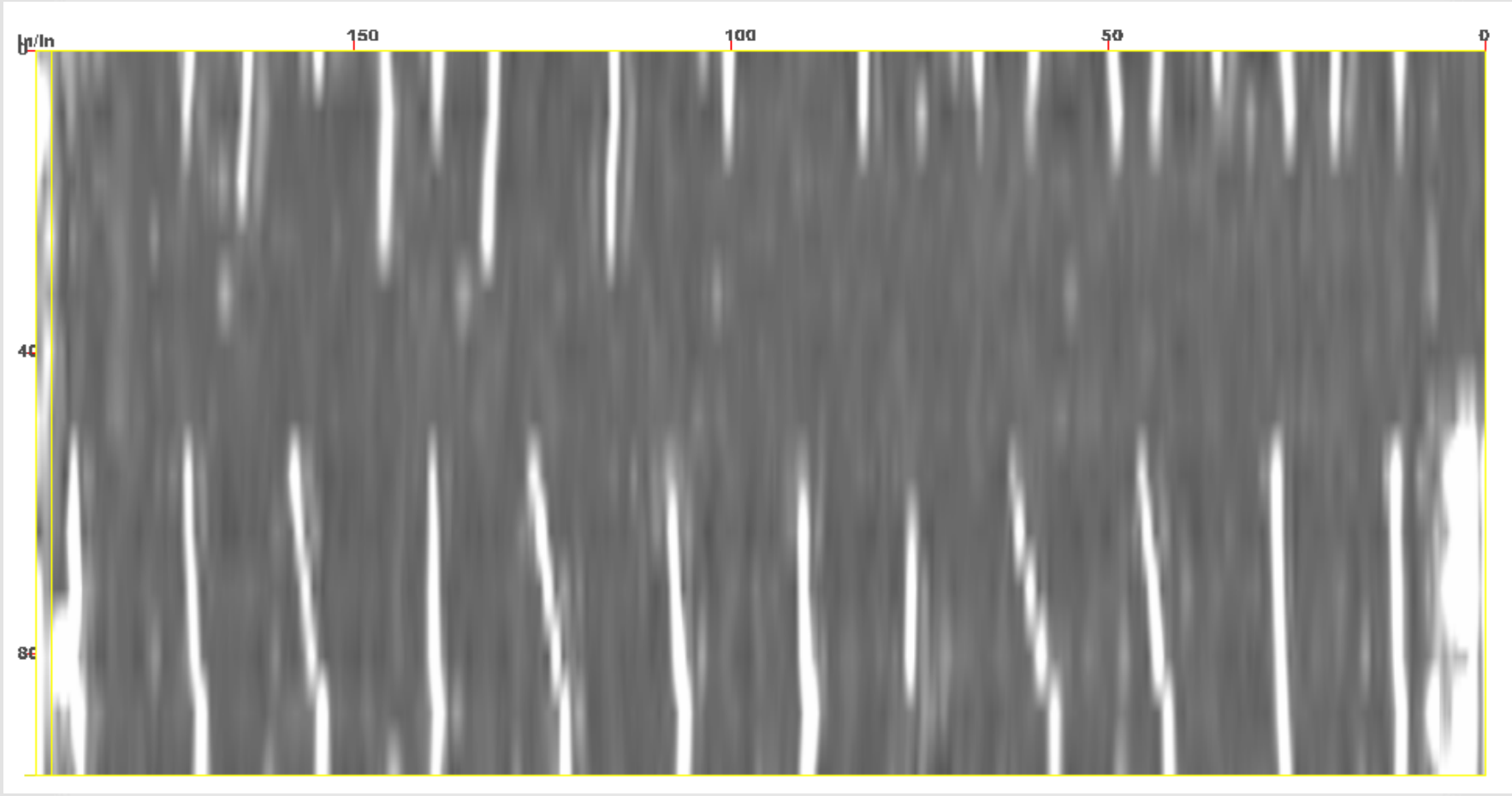
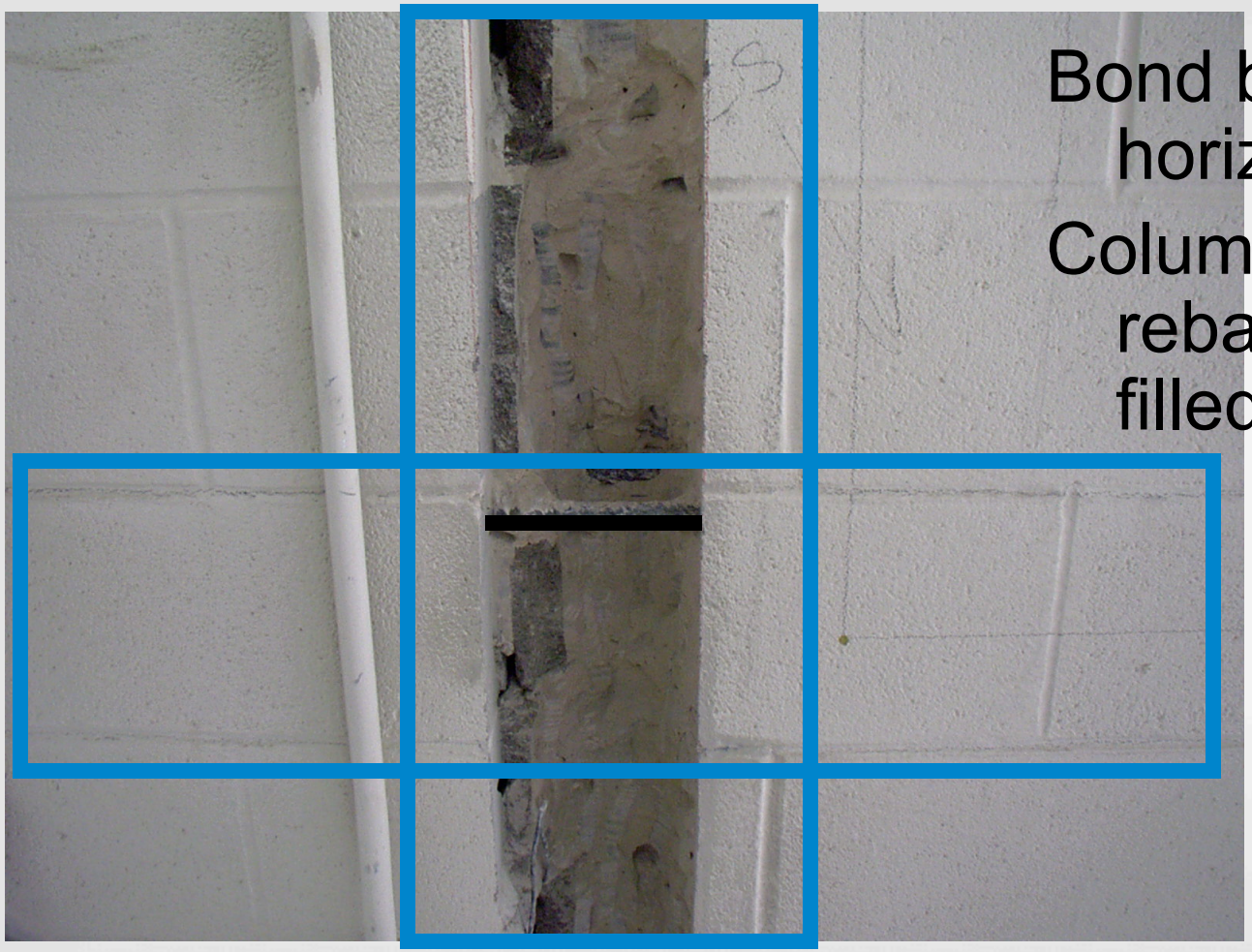


CMU Reinforcement/Grout Verification



Bond beam has horizontal bar.

Column had no rebar but was filled with grout

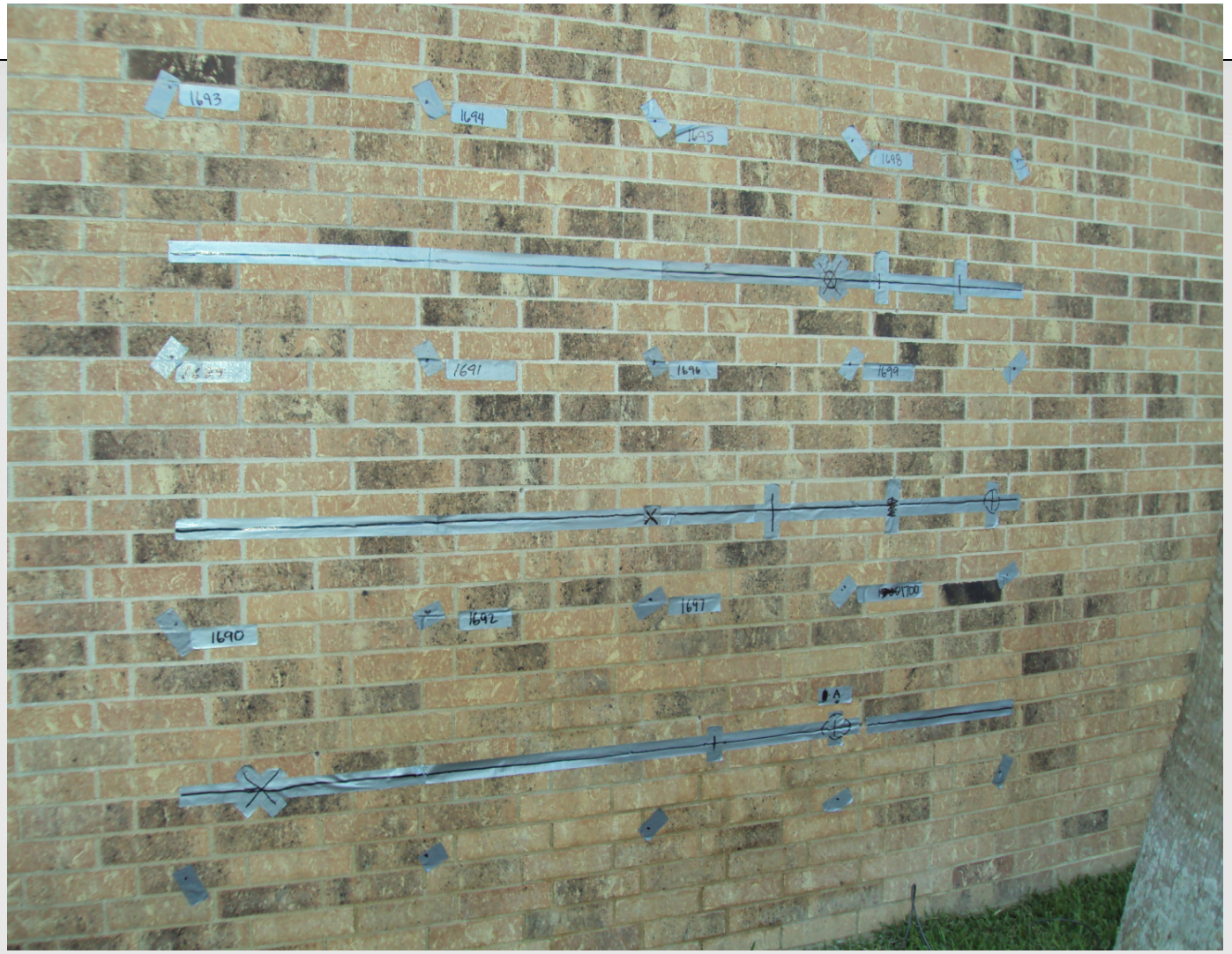
CMU Reinforcement/Grout Verification

- Bond beam horizontal bar was present with little or no grout.
- Column had no grout and no rebar except for the slab dowel

What can be detected?

- Brick Masonry Wall Ties:
  - Location of Ties (important during failure or deterioration analysis)
    - Also benefits using endoscopic techniques for corrosion examination
  - Missing Ties
  - Improperly installed ties (certain cases)
  - Quality of fill for brick masonry columns

Brick Walls – Masonry Tie Location



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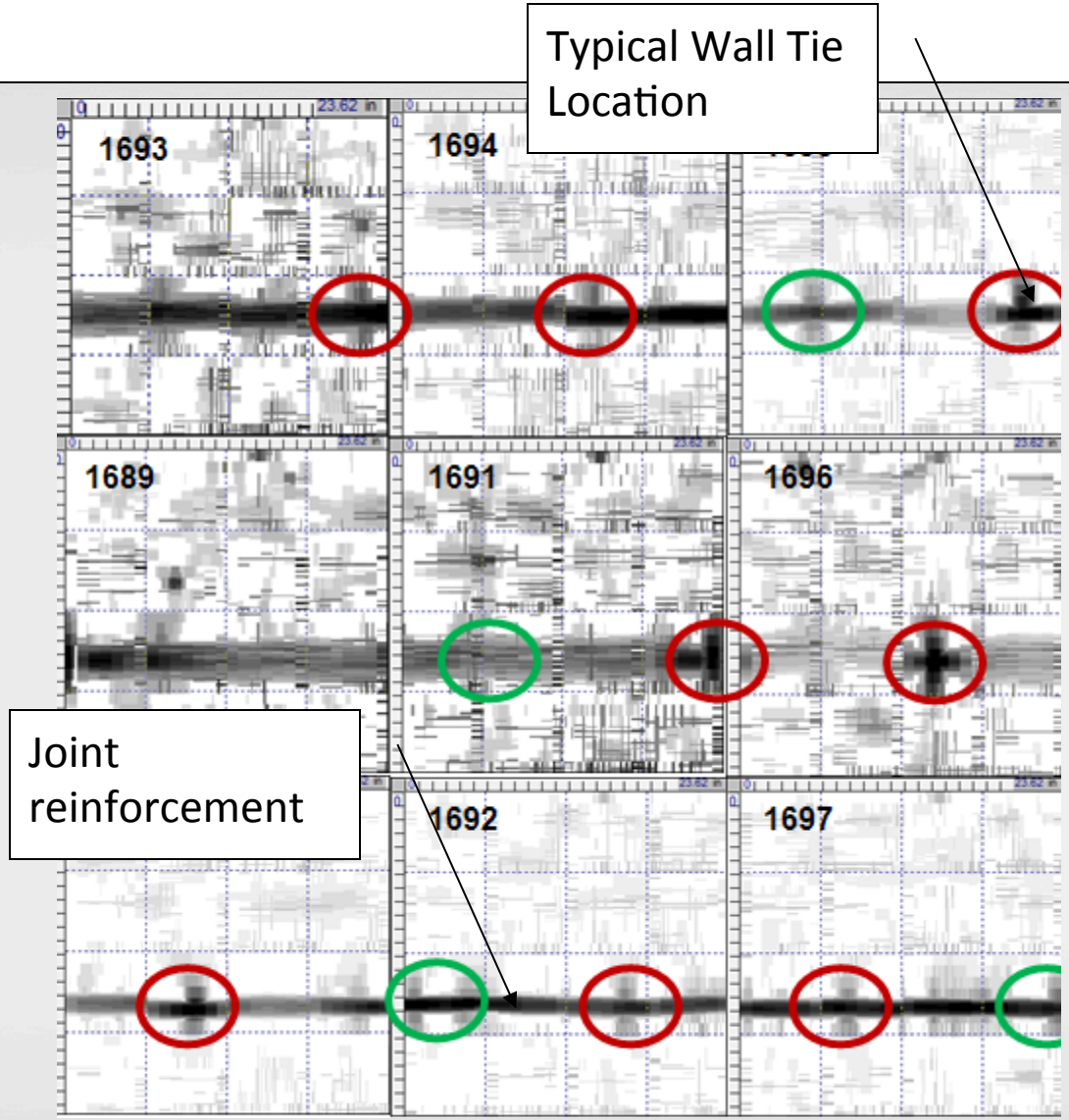
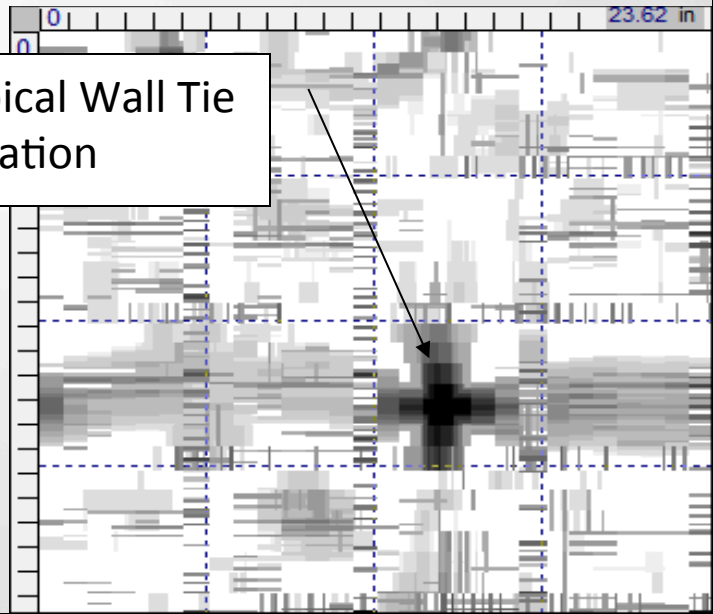
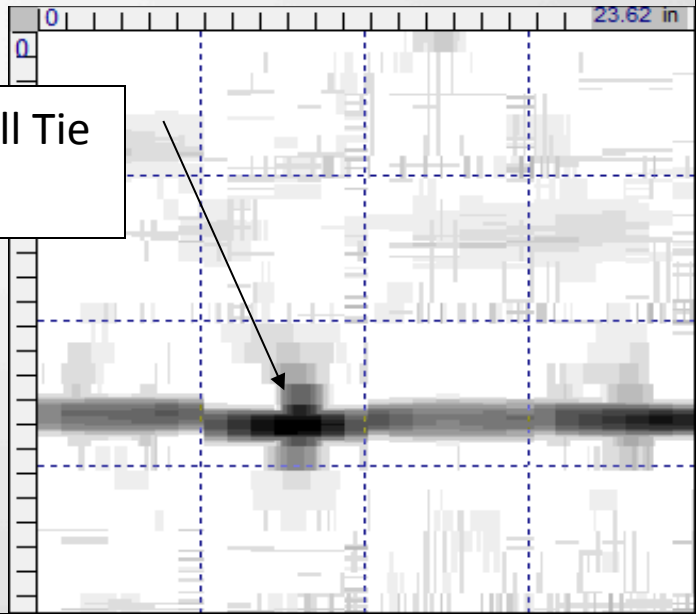


Brick Walls – Masonry Tie Visual Corrosion Survey



Brick Walls – Masonry Tie Visual Corrosion Survey

Typical Wall Tie Location



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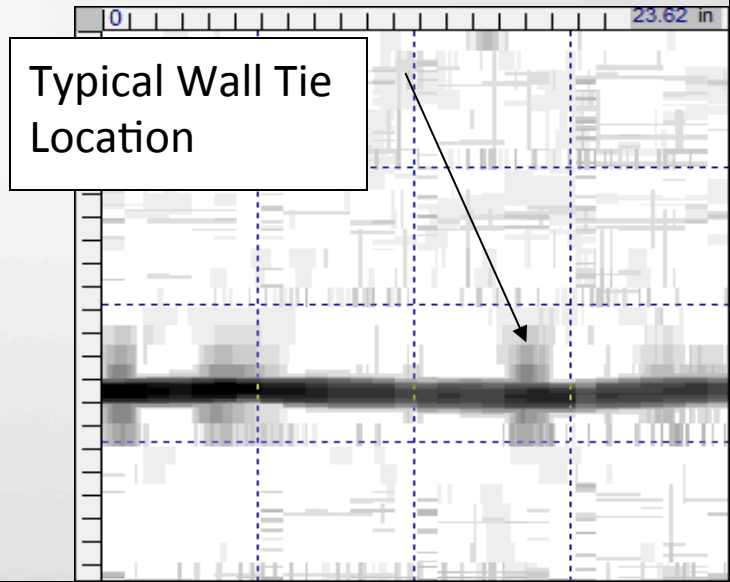
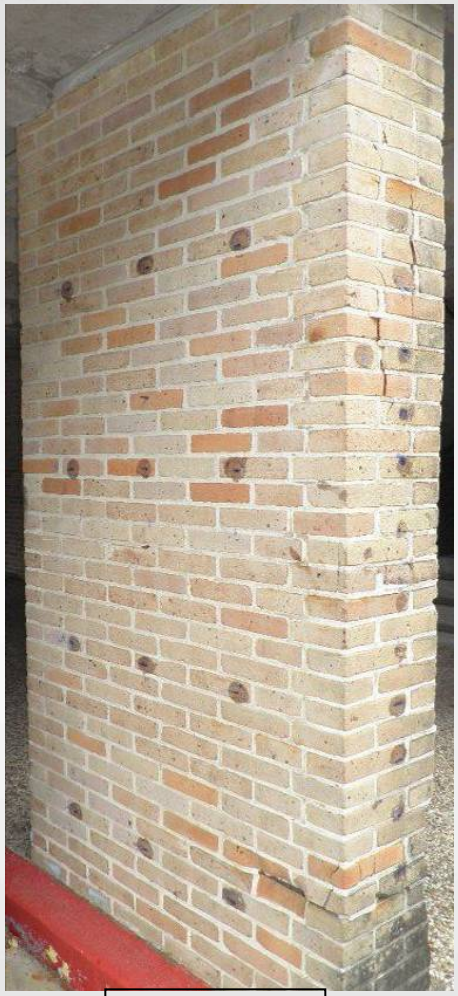


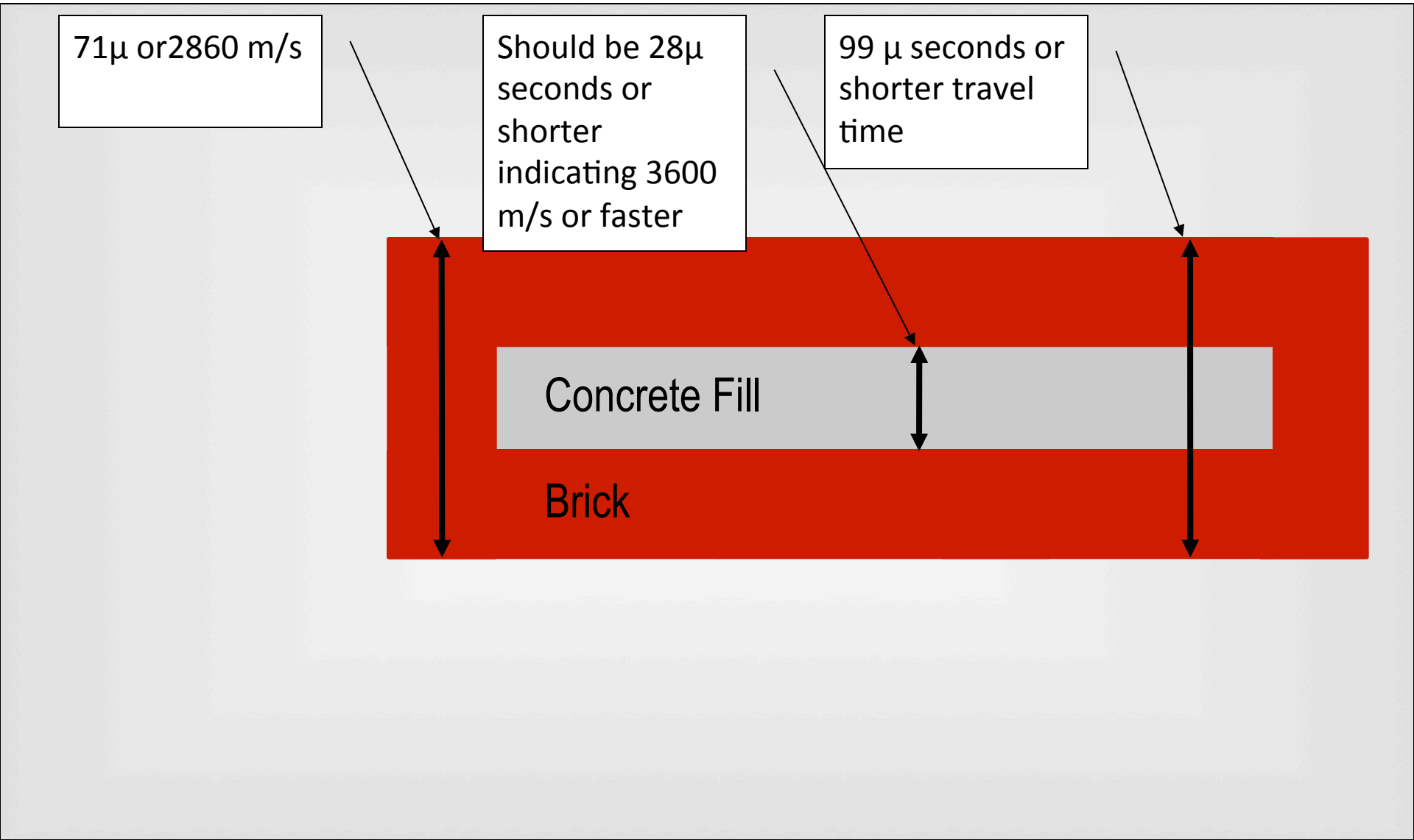
Quality of fill for brick masonry columns

South Face



North Face

Quality of fill for brick masonry columns



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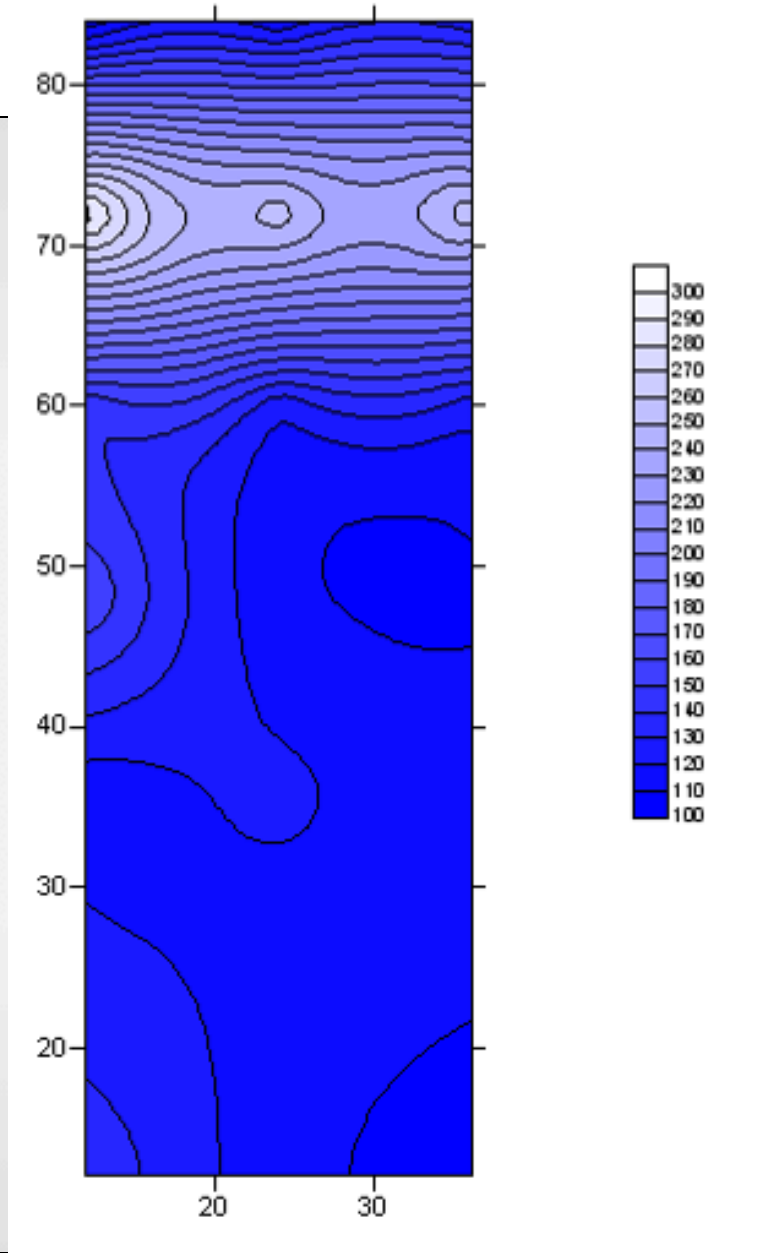

Thank you