Procedures Following Observed Damage (Structural and Non-Structural)

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The Contractor must submit all monitoring data, the results of any post-alarm survey, and the pre and post-construction surveys to the RCE in the form of a well documented report.

**Vibration monitors are to remain fully deployed and functioning for the duration of the construction project.*

10.83 DAMAGES TO HISTORIC STRUCTURES

The Contractor is to exercise all reasonable care to protect historic structures from vibration damages. The Contractor is required per the SP to conduct daily inspections of the specified historic structures to determine if any changes to cracks/other damages have occurred. The Contractor is also required to conduct a survey of damages following an alarm event. In the event that an alarm exceedence results in damage to a historic structure, the Contractor must:

1) Notify the RCE immediately of the observed damages.
2) Cease work until the RCE has approved continuation of the work.
3) Verify that the monitoring system that has been deployed is appropriate.

The RCE will then,

1) Notify OLE who will in turn coordinate with SHPO.
2) Notify the Contractor of any mitigation actions required by regulatory agencies.
3) Approve or disapprove of the Contractor's lower impact method to continue construction activities.

It is the Contractor's responsibility to follow instructions from OLE to repair damage to historic structures due to exceedance of vibration thresholds.

Procedures Following Observed Damage

1. Clarify contractor responsibility for damage
2. Contractor should change methods to lower energy methods!
3. Inspection by experienced structural engineer
4. Confirm and categorize the damage
   - *Threshold damage*
   - *Minor damage*
   - *Major damage*
5. For non-structural damage (threshold, some minor), contractor required to repair to pre-event condition
6. For structural damage (some minor, major), structural engineer to develop repair procedures and repair specifications/drawings

Categorizing Damage*

- Threshold Damage:

  Opening of old cracks and formation of new plaster cracks, dislodging of loose objects (e.g., loose bricks in chimneys)

- Minor Damage:

  Superficial, not affecting the strength of the structures (e.g., broken windows, loosened or fallen plaster), hairline cracks in masonry

- Major Damage:

  Resulting in serious weakening of the structure (e.g., large cracks or shifting of foundations or bearing walls, major settlement resulting in distortion or weakening of the superstructure – walls out of plumb)

* Dowding, Charles, *Construction Vibrations,* 2000, p. 110-111.

If Structural Damage

Structural Engineering Tasks:

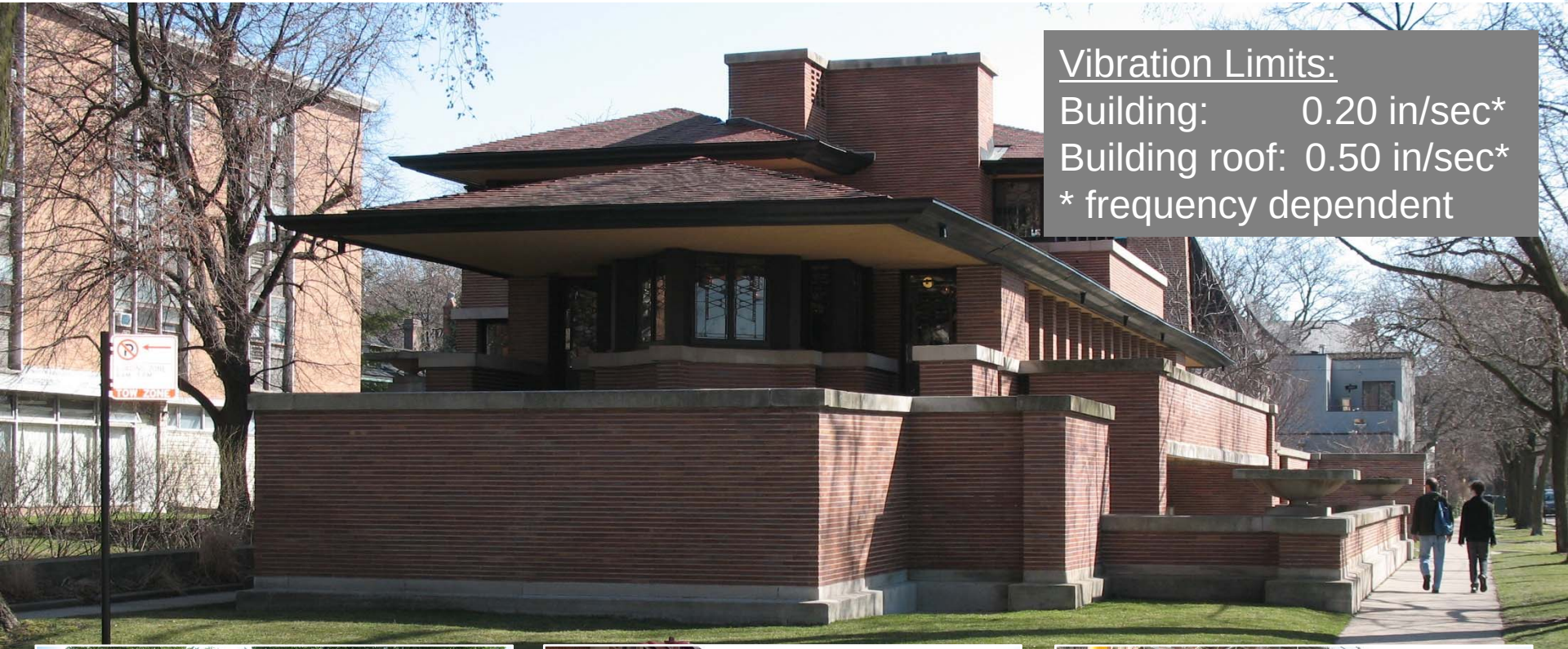
- Determine if temporary shoring or stabilization measures are needed for public safety or to prevent additional damage
- Investigate extent and structural significance of damage
- Is damage “direct” only, or might damage manifest in future?
- Develop permanent repair – typically drawings and specs:
  - Effective (to restore structure to pre-event condition)
  - Practical, constructable
  - Impact on construction schedule
  - Contractor submittals and approvals in advance of work
  - Coordinate with property owner (their agreement)

Examples – The Pierre, Chicago, IL

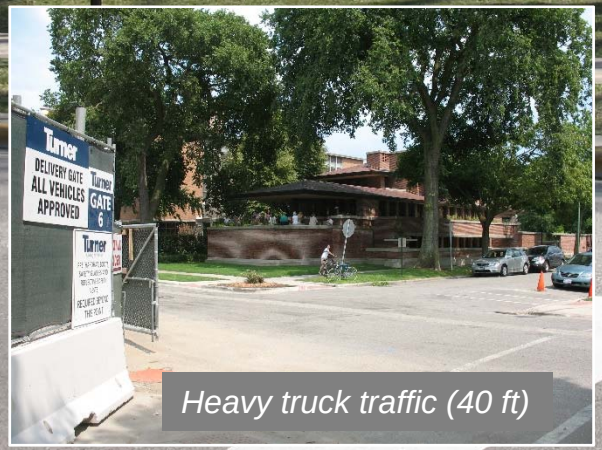
Examples - Iowa

The Robie House (Frank Lloyd Wright)

The Robie House (Frank Lloyd Wright)



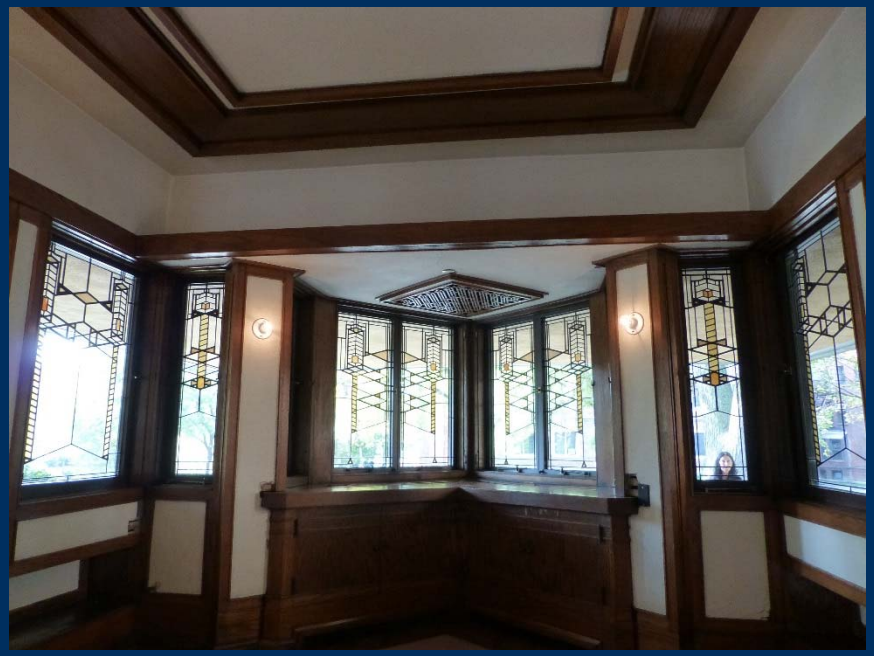
Vibration Limits:
Building: 0.20 in/sec*
Building roof: 0.50 in/sec*
* frequency dependent



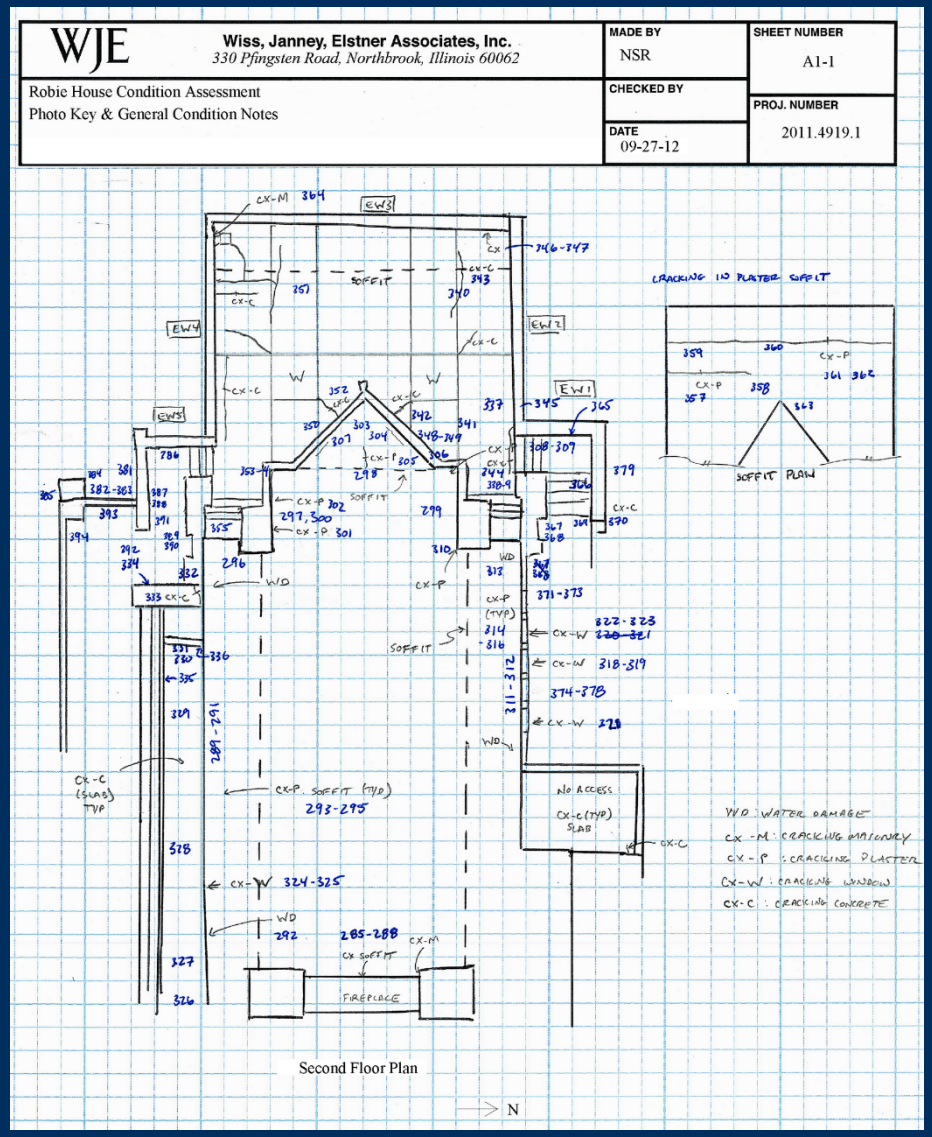
Heavy truck traffic (40 ft)

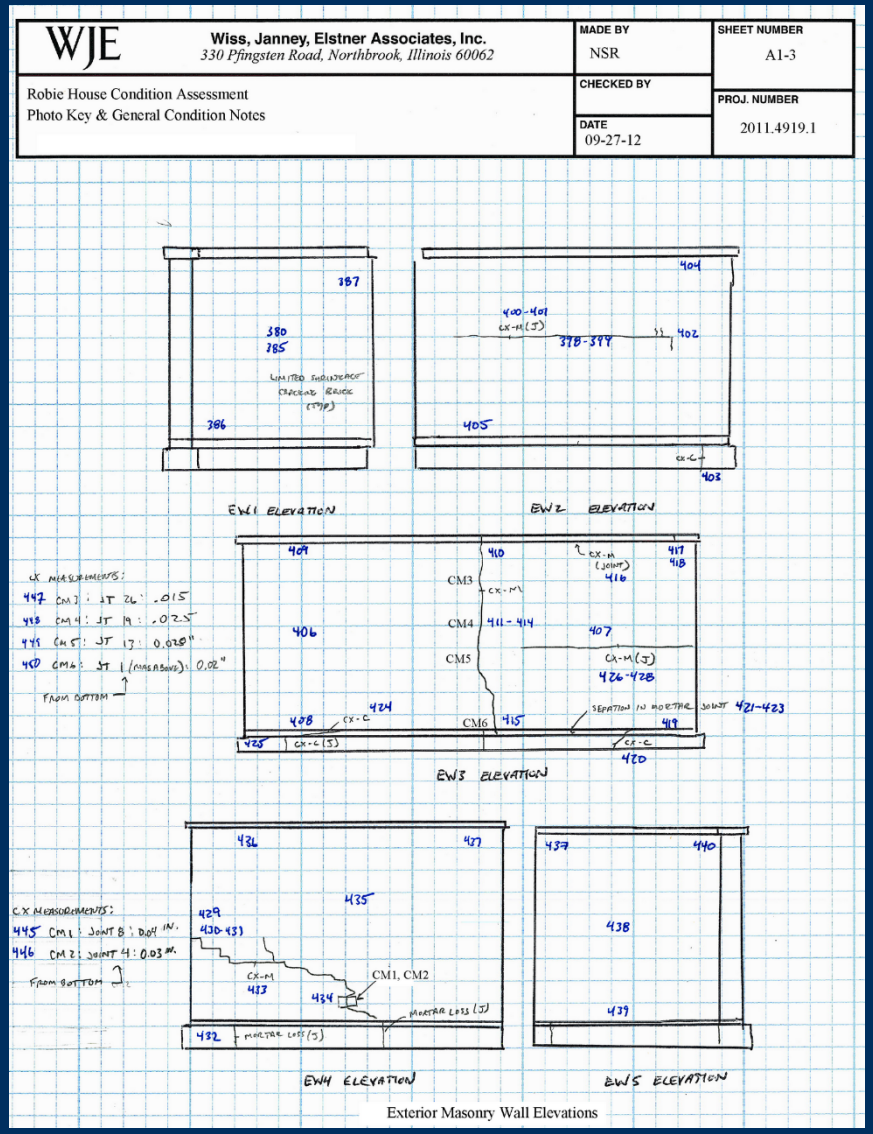
Excavation and sheeting (70 ft)

Demolition on building wall (110 ft)



Preconstruction Survey, 9/27/2012





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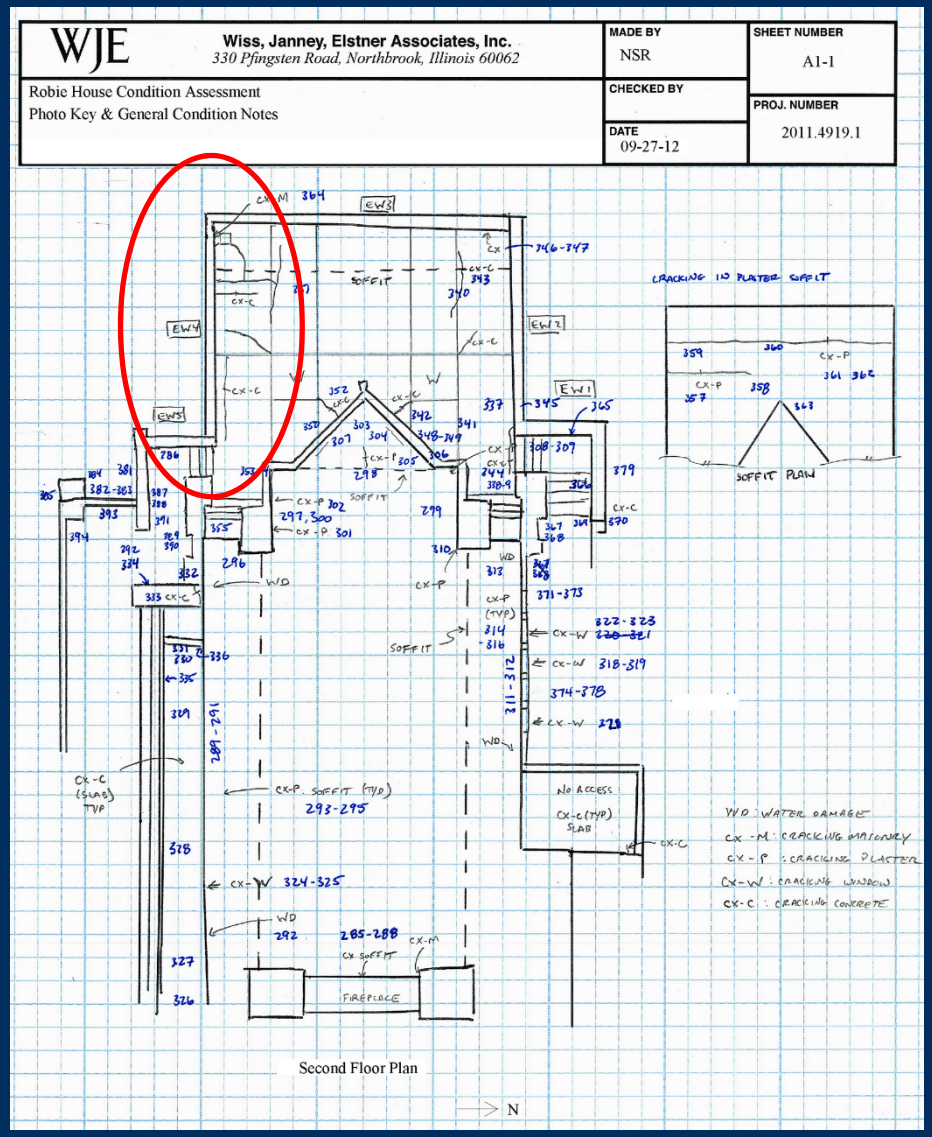
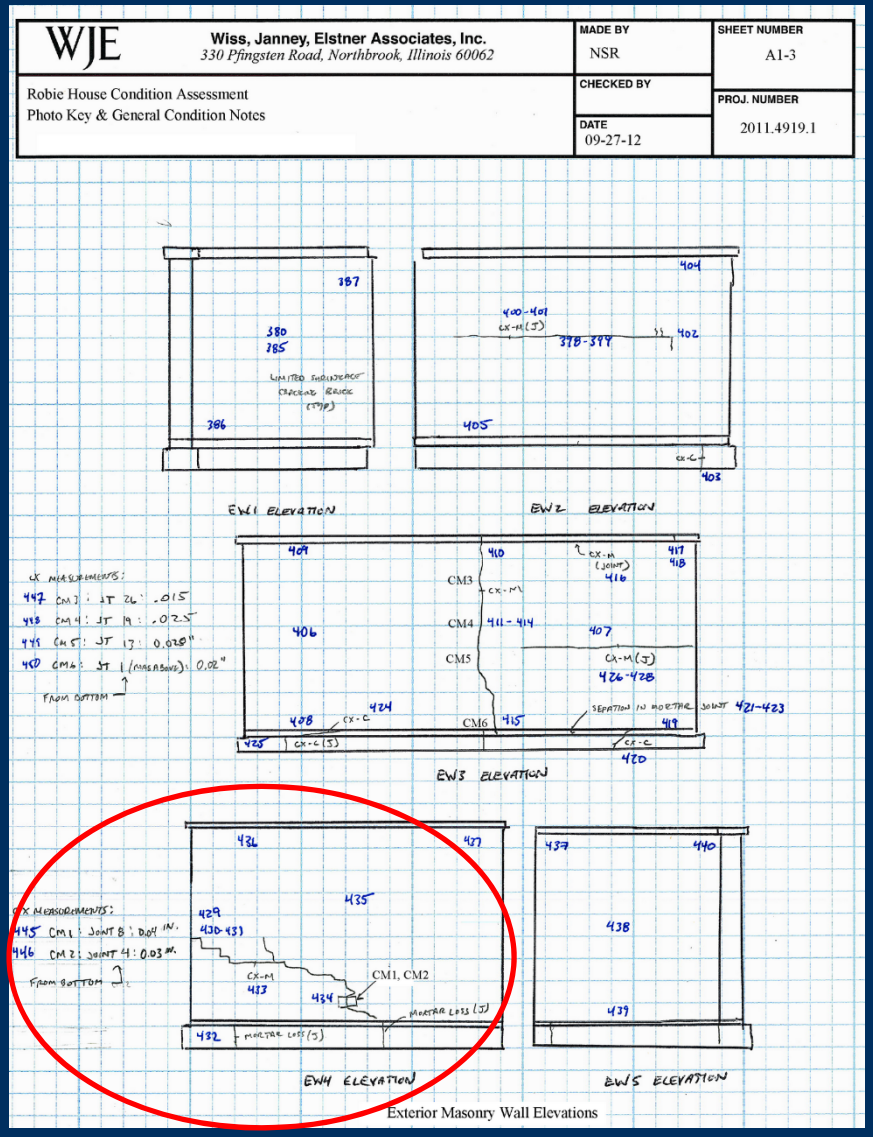
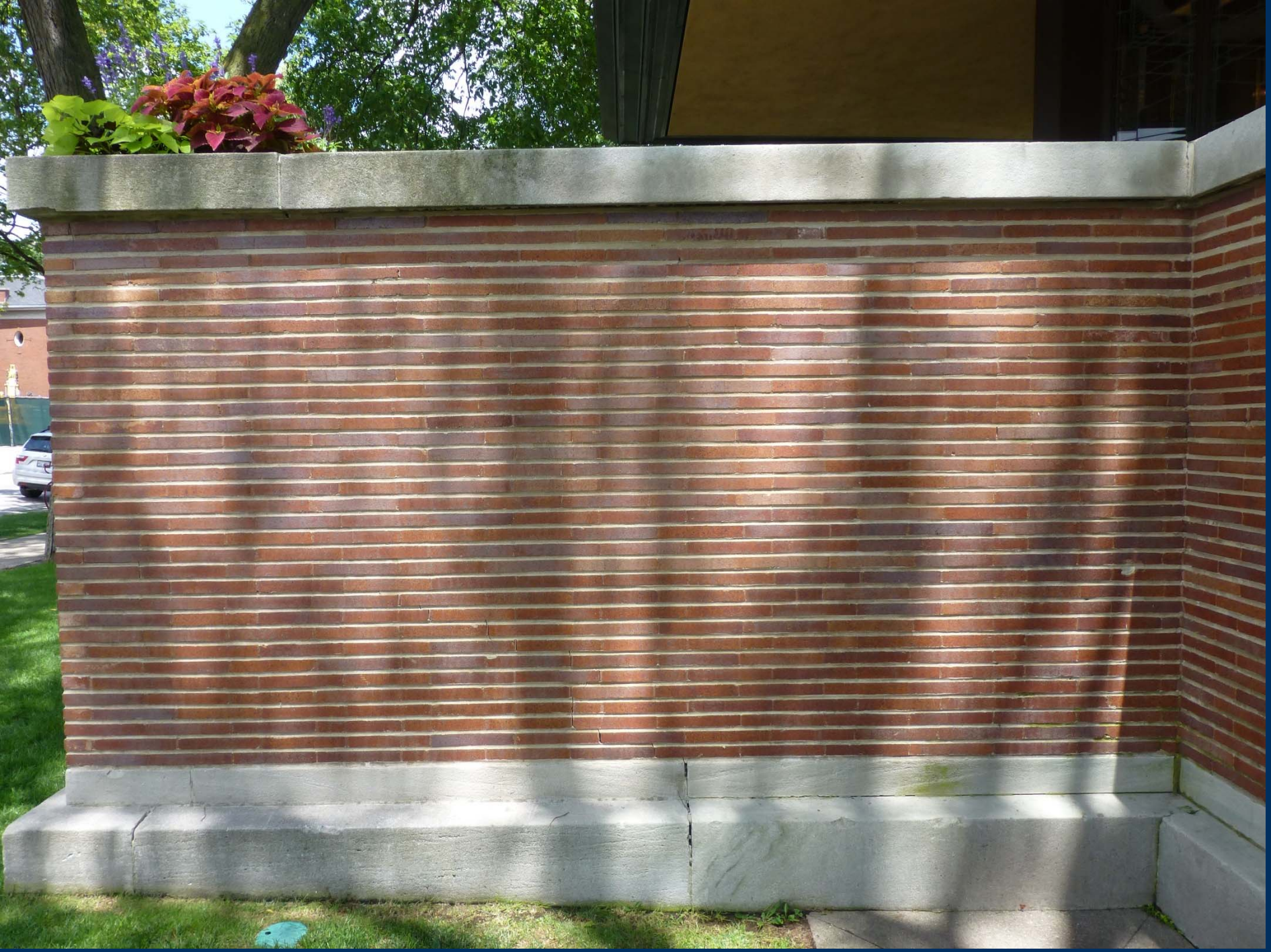
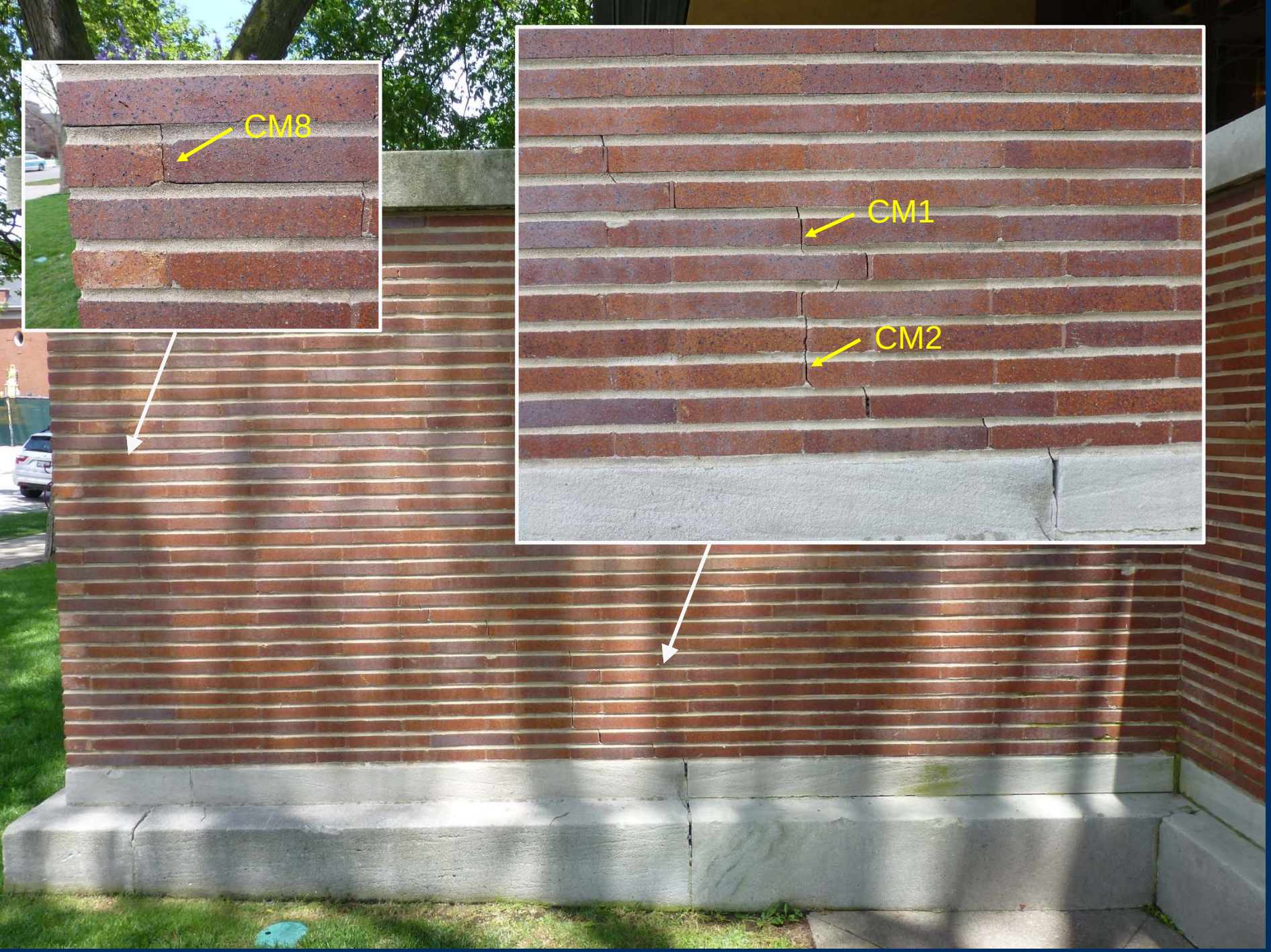
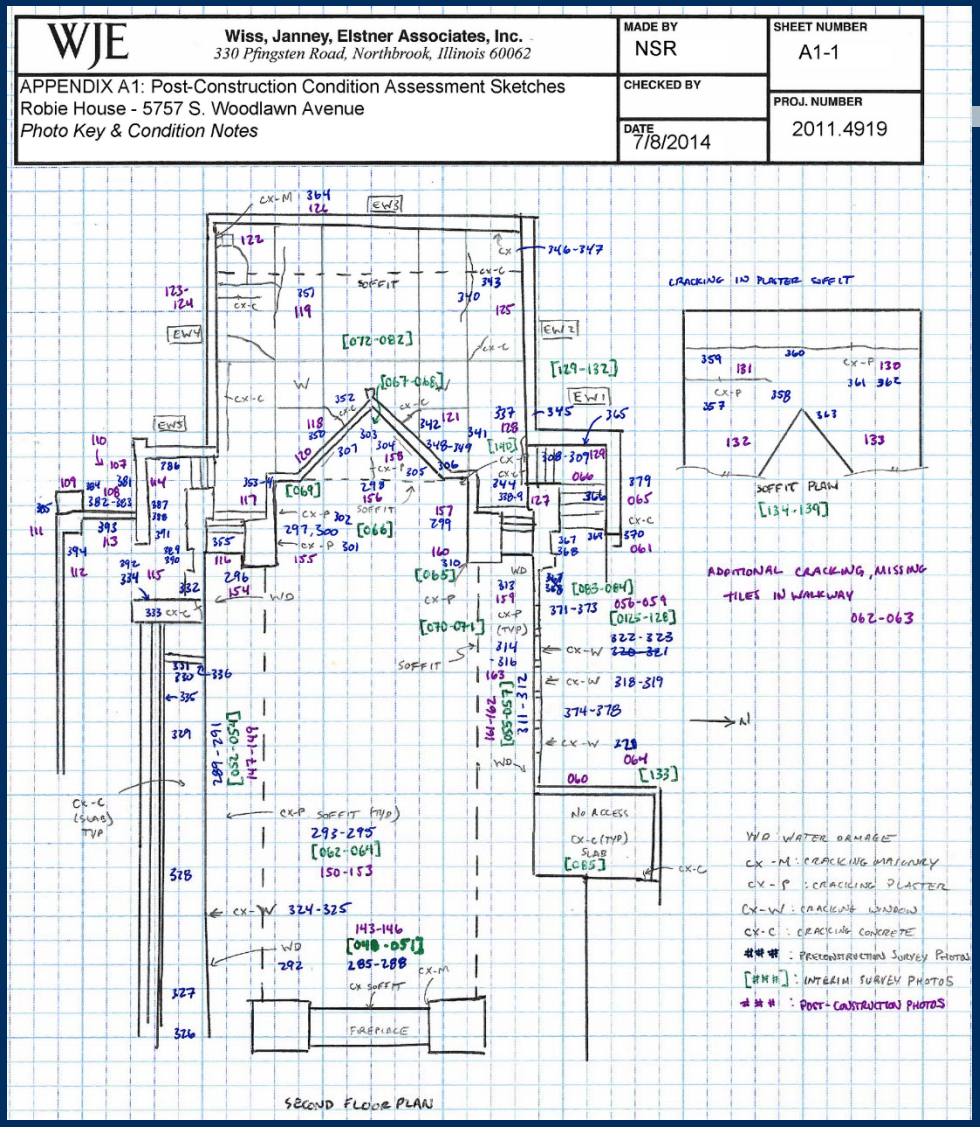


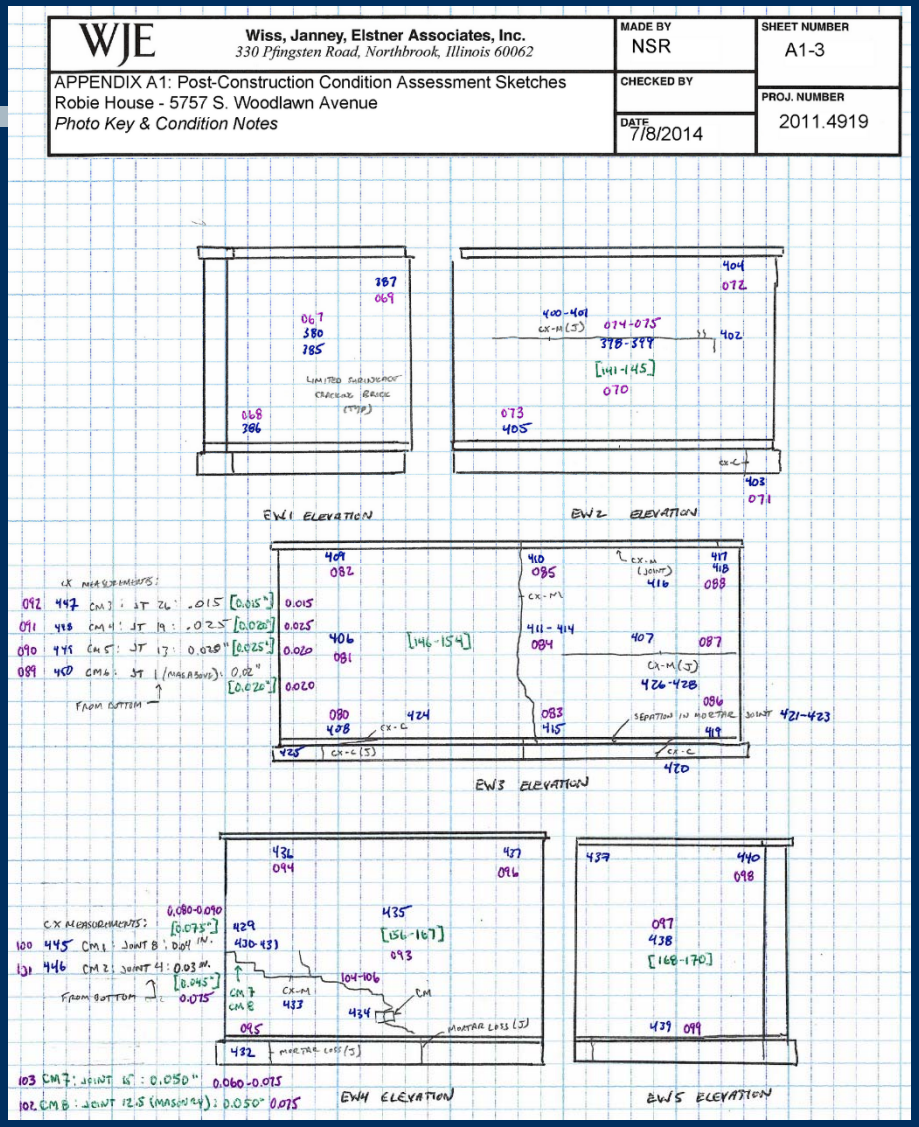





CM8
CM1
CM2

Interim Survey, 4/19/2013 / Post-construction Survey, 7/8/2014





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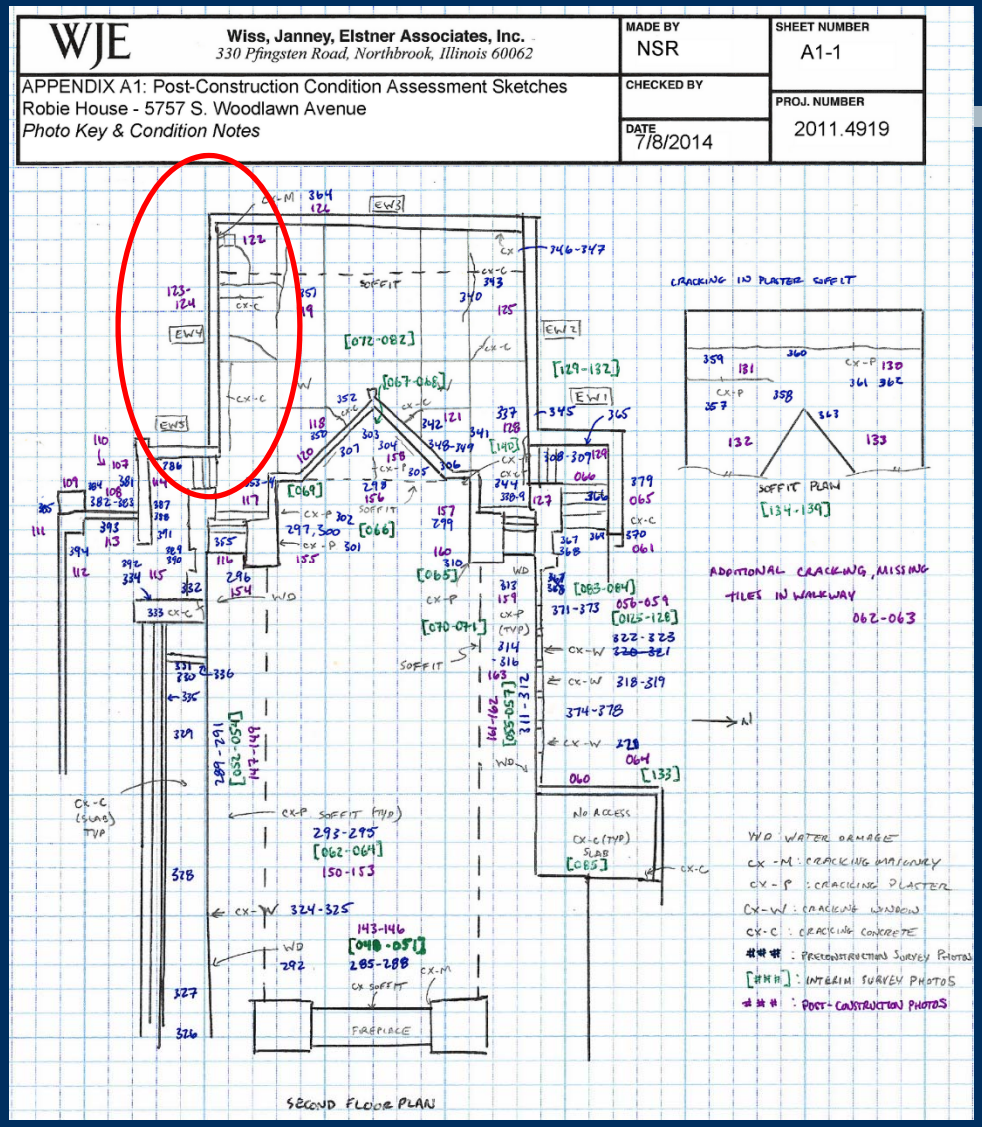
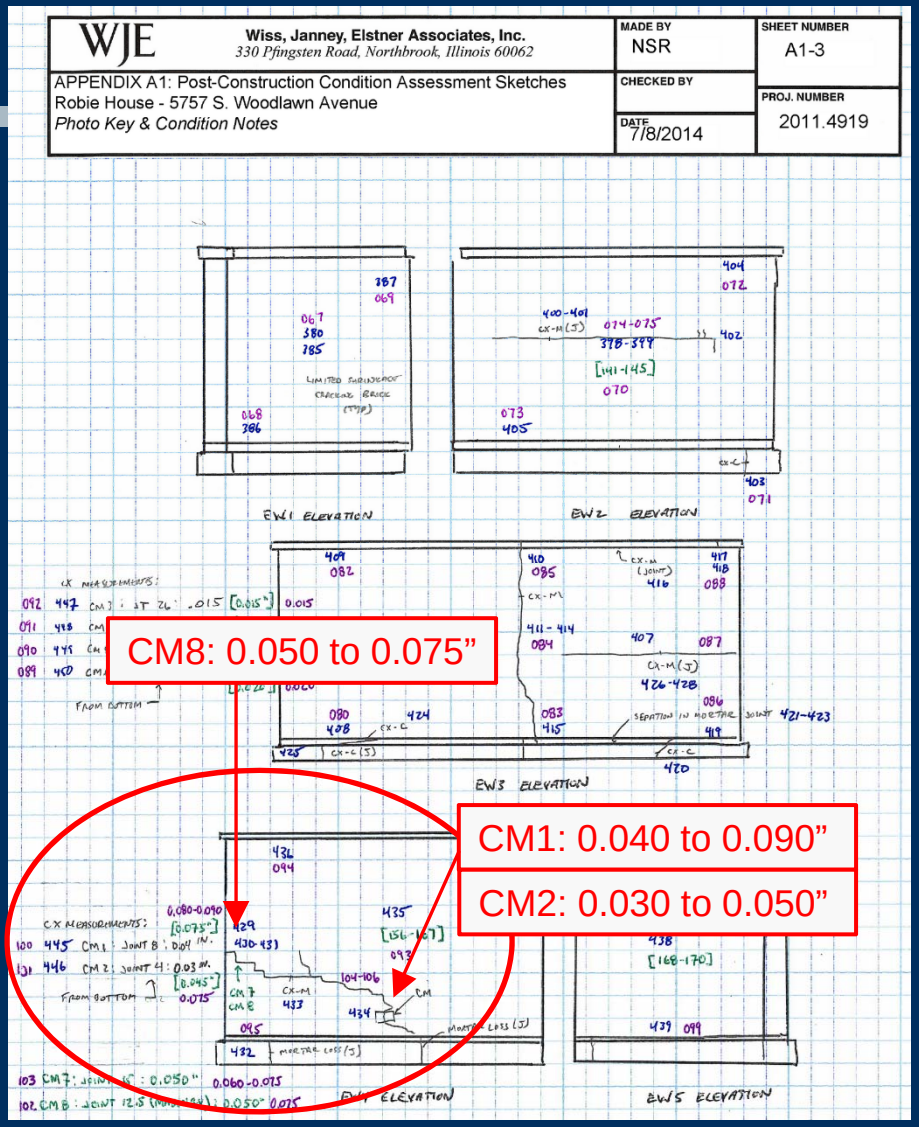
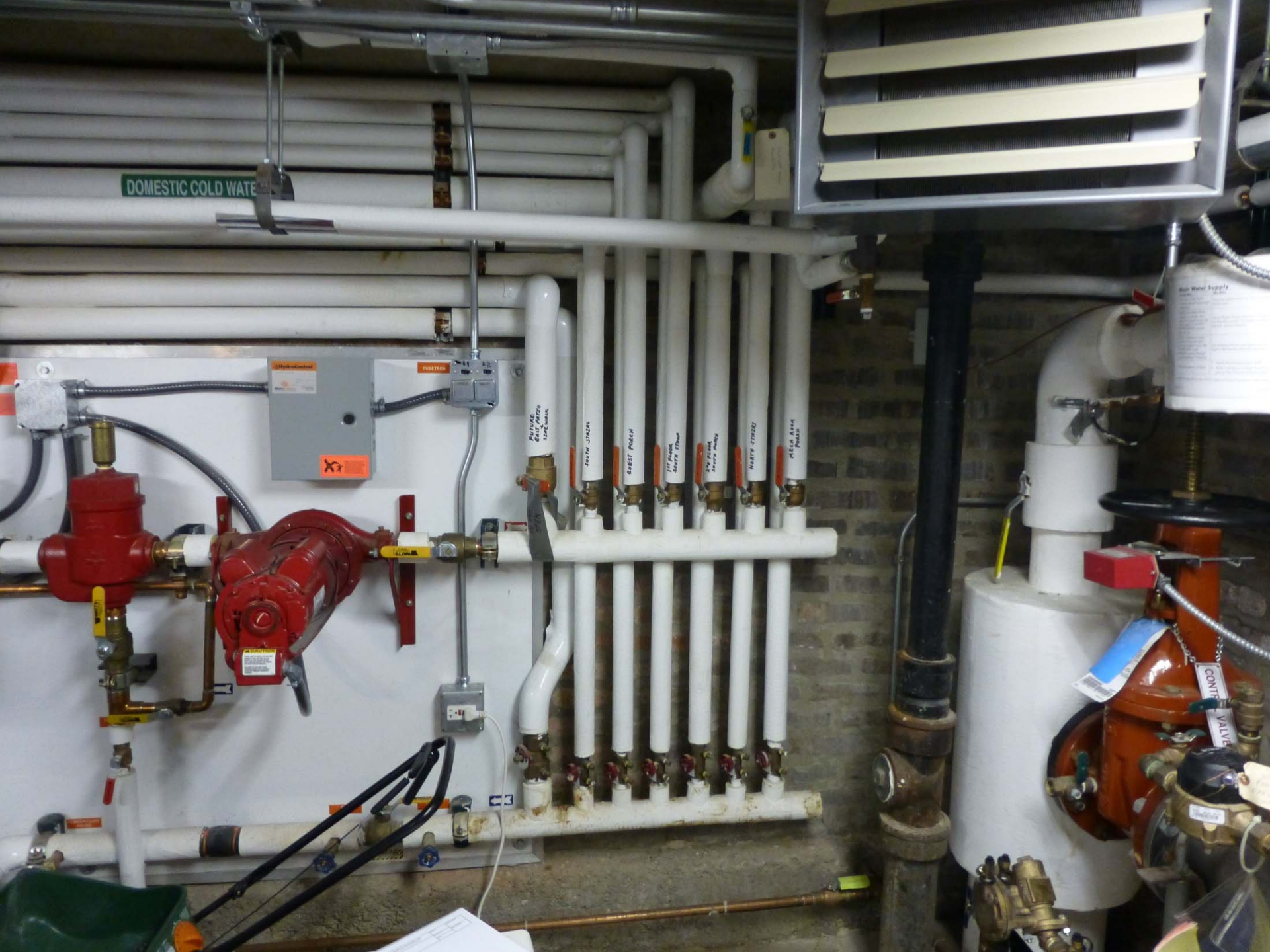
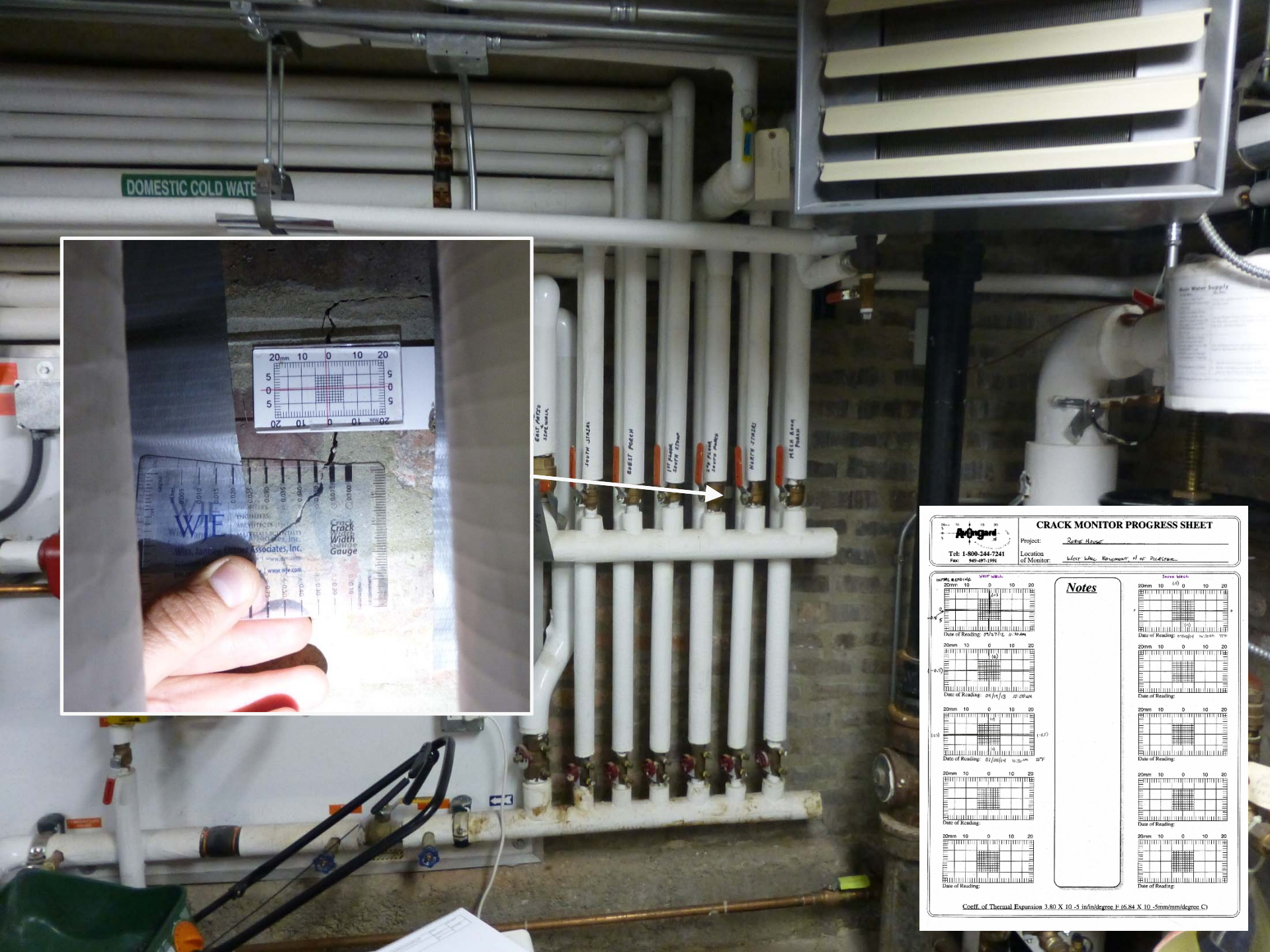





DOMESTIC COLD WATE
HydroControl
FUSETRON
FUTURE EAST PATIO & SIDEWALK
SOUTH STAIRS
GUEST PORCH
1ST FLOOR SOUTH STOOP
2ND FLOOR SOUTH PORCH
NORTH STAIRS
MECH ROOM PORCH
CONTR
VALVE


DOMESTIC COLD WATE
Crack Width Gauge
Wiss, Janney, Elstner Associates, Inc.
CRACK MONITOR PROGRESS SHEET
Avongard
Tel: 1-800-244-7241
Fax: 949-497-1991
Project:
Location of Monitor:
Notes
Coeff. of Thermal Expansion 3.80 X 10 -5 in/in/degree F (6.84 X 10 -5mm/mm/degree C)

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Questions / Discussion