

# DEFECTIVE CONCRETE FOUNDATIONS

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WHERE ARE WE AND WHERE  
ARE WE GOING?

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# Background – what I am

- Licensed Professional Engineer
- Licensed Home Inspector
- Certified for Disaster Building Damage Assessment – American Red Cross
- In business 25 years
- Over 14,000 inspections, engineering design, and construction supervision jobs



# Let's start with disclaimers – what I am not

- Not a concrete expert
- Not my intention to offer advice or opinions outside my expertise
- It is my intention to relate our experiences with this problem and share what we have learned

# Concrete in affected foundations has a material defect

- May be due to ASR (Alkali-Silica-Reaction)
- May be due to iron pyrotite
- May be Alkali-Aggregate-Reaction
- Many other possibilities



# The material defect is not immediately obvious or visible

- Typically is visible after 15 to 30 years (plus or minus)
- It cannot be repaired
- Foundation must be replaced
  - \$150,000 to \$250,000 is typical cost
- Found in
  - Houses
  - Commercial buildings
  - Additions
  - Garages
  - Condos
  - Septic tanks

# Conditions required

- A sufficiently high alkali content of the cement
- A reactive aggregate
- Water (damp or wet concrete) apparently drives the reaction
  - We typically find the worst damage in damper parts of the foundation



# Problem discovery is time related

- Earliest problem we have found - built in 1983
- Latest problem we have found – built in 2003?
- We typically inspect 15 to 30 years after construction
- Occupants noticed the problem 1 to 15 years ago

# What do we know?

- Known defective foundations are found in Northeast Connecticut on the east side of the river within 30 miles of Stafford
- When the supplier is known, defective concrete has been supplied by J. J. Mottes Concrete, located in Stafford (Name soon to be changed?)
- We do not know of any defective foundation where concrete has been supplied by others
- J. J. Mottes, as stated by their spokesman, has supplied the same concrete mix from 1983 to the present



# What don't we know?

- What is the cause of the defect?
  - ASR? - yes
  - Iron pyrotite? - yes
  - Something else? – to be determined
- More than one problem?
- Is defective concrete still being supplied?
- Are others supplying defective concrete?
- Is all J. J. Mottes concrete defective?
- How fast a given foundation will continue to deteriorate

# More than one problem?



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# Where have we found ASR?

- Andover
- Ashford
- Bolton
- Coventry
- East Hartford
- East Windsor
- Ellington
- Enfield
- Glastonbury
- Manchester
- Mansfield
- Somers
- South Windsor
- Stafford
- Tolland
- Union
- Vernon
- Willington

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# Beware of offers to “test”

- Is the person qualified?
- What are they testing for?
- Do they know what the problem is that they should be testing for?
- Is it ASR? Iron pyrotite? What??
- Strength testing doesn't tell us anything
- Testing does NOT provide any useful information

# Why not test? Let's Look at a typical ranch

- 1500 sq. ft. - foundation is 24' x 60', 7' high, 10" thick
- 37 cu yd = 1003 cu ft = 1, 750,000 cu in
- Typical test core is 3" diameter and 5" long =12 cu in
- Test core is only 0.0007 % of the foundation
- Average cement truck delivers 8 cu yd
  - about 5 different loads
- How can one sample possible tell us what is going on in the rest of the foundation?



# Other test considerations

- The test most commonly used only tests for ASR
  - Does not look for other causes
- Test only identified the products (silica and calcium based gels) produced by active ASR
- Does not and cannot predict whether the problem is dormant or developing



# Structural distress/failure is possible



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# Claims that repair is possible have not been substantiated

- Build new block or concrete foundation inside existing – doesn't work
- Repair cracks with epoxy – doesn't work
- Structural steel buttresses – doesn't work
- Defective foundation will continue to expand and move until “repair” fails

# How a new “inside” foundation “works”



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# Steel buttresses aren't any better



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# Typical photos

- This is what we see in advanced deterioration























































