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CONCRETE:

FAILURE MODES

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3 ☐ **AGENDA**

4 ☐ **AGENDA**

5 ☐ **HISTORY OF CONCRETE**

6 ☐ **AGENDA**

7 ☐ **IS CEMENT**

THE SAME THING AS

CONCRETE ?

8 ☐ **WHAT IS CONCRETE?**

9 ☐ **CONCRETE**

10 ☐ **AGENDA**

11 ☐ **HEAT OF HYDRATION**

12 ☐ **SHRINKAGE**

13 ☐ **CREEP**

14 ☐ **WHY DESIGN WITH CONCRETE?**

15 ☐ **DISADVANTAGES OF CONCRETE?**

16 ☐ **UNREINFORCED MASONRY & CONCRETE MASONRY**

17 ☐ **REINFORCING STEEL**

18 ☐ **AGENDA**

19 ☐ **“THE CRACK”**

20 ☐ **SHRINKAGE**

21 ☐ **AGGREGATE SEPARATION**

22 ☐ **SURFACE DELAMINATION**

23 ☐ **CHALKING**

24 ☐ **EFFLORESCENCE**

25 ☐ **SURFACE DEGRADATION**

26 ☐ **RUST / CORROSION**

27 ☐ **RUST / CORROSION**

- 28 ☐ HONEYCOMBS
- 29 ☐ CONCRETE TESTING
- 30 ☐ COMPRESSION / SLUMP TESTS
- 31 ☐ COMPRESSION / SLUMP TESTS
- 32 ☐ AGENDA
- 33 ☐ CONTROLLED & CATASTROPHIC FAILURES
- 34 ☐ CONTROLLED & CATASTROPHIC FAILURES
- 35 ☐ COLUMN FAILURES
CONTROLLED & CATASTROPHIC
- 36 ☐ COLUMN FAILURES
CATASTROPHIC
- 37 ☐ COLUMN FAILURES
CATASTROPHIC
- 38 ☐ COLUMN FAILURES
CATASTROPHIC
- 39 ☐ COLUMN FAILURES
CATASTROPHIC
- 40 ☐ COLUMN FAILURES
CATASTROPHIC
- 41 ☐ COLUMN FAILURES
CATASTROPHIC
- 42 ☐ CONTROLLED & CATASTROPHIC FAILURES
- 43 ☐ BEAM FLEXURE
- 44 ☐ BEAM FLEXURE
CATASTROPHIC FAILURE
- 45 ☐ BEAM FLEXURE
CONTROLLED FAILURE
- 46 ☐ BEAM SHEAR
- 47 ☐ BEAM SHEAR
- 48 ☐ BEAM SHEAR FAILURE
CATASTROPHIC FAILURE
- 49 ☐ BEAM SHEAR FAILURE
CATASTROPHIC FAILURE
- 50 ☐ BEAM FLEXURE
CONTROLLED FAILURE
- 51 ☐ CONTROLLED & CATASTROPHIC FAILURES
- 52 ☐ DEEP BEAM DESIGN
- 53 ☐ DEEP BEAM DESIGN

- 54 ☐ **DEEP BEAM DESIGN**
- 55 ☐ **BEAM & COLUMN FAILURES**
- 56 ☐ **BEAM & COLUMN FAILURES**
- 57 ☐ **PRESTRESSED &
POST-TENSIONED BEAMS**
- 58 ☐ **POST-TENSIONING**
- 59 ☐ **POST-TENSIONING**
- 60 ☐ **POST-TENSIONING**
- 61 ☐ **POST-TENSIONING**
- 62 ☐ **POST-TENSIONING**
- 63 ☐ **CONTROLLED & CATASTROPHIC FAILURES**
- 64 ☐ **SLABS (SHALLOW BEAMS)**
- 65 ☐ **SLABS (SHALLOW BEAMS)**
- 66 ☐ **HOLLOW CORE SLABS**
- 67 ☐ **TENDON FAILURE**
- 68 ☐ **TENDON FAILURE**
- 69 ☐ **TENDON FAILURE**
- 70 ☐ **SLAB FAILURE**
- 71 ☐ **SELF-HEALING CONCRETE**
- 72 ☐ **CONTROLLED & CATASTROPHIC FAILURES**
- 73 ☐ **PUNCHING SHEAR FAILURE**
- 74 ☐ **PUNCHING SHEAR FAILURE**
- 75 ☐ **PUNCHING SHEAR REINFORCEMENT**
- 76 ☐ **CONTROLLED & CATASTROPHIC FAILURES**
- 77 ☐ **ATTACHMENT FAILURE**
- 78 ☐ **POTENTIAL STUCCO DELAMINATION**
- 79 ☐ **STUCCO DELAMINATION**
- 80 ☐ **PARTIAL STUCCO DELAMINATION**
- 81 ☐ **QUESTIONS?**