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Dirty Jobs: A Hands-on Approach to Concrete Construction Defects

I. Purpose and Introduction to Concrete Defects

Why a Hands-On Defect Class?

Seeing, feeling, and touching something at the point of failure is different than reading about it. As humans, we process information differently when we are immersed in learning. Getting our hands dirty – with concrete – that's how this course begins. As an **interactive** course, with a **scripted approach** to attendees making their own beam, watching it cure, and then breaking the beam, provides a different view of concrete construction defects. The live demonstrative includes discussion and accompanies the course while providing a visual representation of construction/design defects – including concrete failures – as well as the interplay of concrete defects in insurance claims and litigated matters. The attendees see, feel, and participate in the failure mechanics of a concrete structure which are generally only reported by their expert; however, in this scenario, the sense of seeing and touching are added for educational purposes. In participating in the course, the attendees can then use their firsthand knowledge of concrete failures and develop their own non-technical descriptors to verbally convey similar failures in a mediation, arbitration, or to a jury during trial.

Concrete construction defects have been the center of many high profile and newsworthy claims, and provide underlying influence within this course:

- FIU Bridge collapse, 2018 – Florida (Magnum Construction Management, LLC v. WSP USA Solutions, Inc., et al., Case No. 20-24684-CIV ALTONAGA).
- Hard Rock Hotel collapse, 2019 – Louisiana (Suncoast Projects, LLC v. 1031 Canal Development, LLC et al 2:2020cv02791).
- Champlain Towers collapse, 2021 – Florida (Champlain Towers South Condo Assn Inc, Case No.: 01-26634 CA 22)

Throughout the course, the technical focus of this presentation relates to allegations of construction defects from pre-litigation matters to those that are in all stages of litigation. Best practices provide claims professionals and attorneys in attendance with knowledge of knowing when to retain an attorney, when to retain an expert, what expectations there should be from their expert, how experts develop their opinions, presenting their opinions in writing, among others.

Insurance and Concrete

Insurance carriers that underwrite concrete contractors must take notice of the risks associated with concrete construction. For starters, concrete contractors generally hold a large portion (and often the majority) of the responsibility with big ticket items on a construction project; consider their involvement with pouring a deep foundation system, foundation walls, superstructure walls, floor systems, flatwork, and more. Additionally, concrete contractors often perform their work with a wide scale of laborer's experience given the inherently small profit margins. The risk/reward scale is elevated given the exposure that is often created through the size and importance of concrete elements. Beyond the material costs alone, a critical foundation element that is defectively poured can create a domino effect if/when damage is found or a defect is alleged. Concrete contractors are typically named within the notice of claim process given their inherent inclusion in the project, and their work being a critical component of the construction. Such claims can then continue into litigation (as discussed herein)

Concrete contractors purchase insurance to protect the business entity, workers, and the property to which they are constructing. Insurance for such contractors is used to ensure said contractor can perform any type of concrete work, including pouring foundations, slabs, flatworks, finishes, amongst other concrete elements. Coverages that exist include general liability, commercial property, worker's compensation, and commercial auto. **Exclusions** do exist and can become relevant at latter stages of a project; with a singular first question, "was the insured covered to perform concrete work?" Additional exclusions can exist with asbestos, professional liability, and foundation work. The latter exclusion noted can be problematic if/when claims are asserted on "foundation" elements. Consider a slab with thickened edges/footings can be excluded.

Concrete: Did you know?

Many elements of concrete construction are too often misunderstood; technical knowledge from this course, including terminology and cause of damage, for insurance professionals **is** required to evaluate a concrete claim from notice of claim process and onward.

- It's "concrete," not "cement" – terminology matters in insurance policies and in engineering. Concrete is the same to cement, the same way flour is the same thing to bread. The majority (~60-65%) of concrete is comprised of aggregate (i.e., sand, rocks, pebbles, etc.) with water making up approximately 15-20%. Cement is the balance of concrete, only 10-15% of concrete wholly.
- Concrete cracks. The cause of such cracks can be attributable to the placement, mix of concrete, loading, underlying conditions or other. Cracks can be alarming and result in claims of damage or defect; however, cracks in concrete are often misunderstood as to the extent of damage, distress, and/or defect.
- Concrete is the most-used material in the world, with approximately 30 billion tons of concrete added to the built environment each year, per a 2021 report. The reason? The aggregates and water used to make concrete are for the most part available everywhere.
- Concrete reaches its design strength at 28 days but can continue to cure for decades. Additional strength is due to the conversion of calcium hydroxide into calcium carbonate, due to its absorption of carbon dioxide over time.

- Alternative construction methods are being used to replace concrete in some applications; the rise of mass timber exemplifies this including insurance carriers creating higher capacity for underwriting mass timber projects.

Concrete Design Basics

Concrete is strong in compression. So, what does that really mean? Constructionknowldge.net provides a great analogy:

> "*To understand compressive strength, think about several packs of crackers sitting on the floor. If you carefully stand on those packs of crackers, your weight will probably be supported, but you are putting those crackers in compression. Your weight tends towards crushing those crackers. If you jump up and land on those packs of crackers, you will increase the force applied and probably crush the crackers. You will have made the crackers fail in compression.*
>
> *Now try to jump on a concrete sidewalk. You'd have to jump high to make that sidewalk crush under your weight. In fact, you probably couldn't make that sidewalk fail in compression. That's why concrete gets used so much in construction. But the story doesn't end with compression.*
>
> *Grab a piece of string and pull in either direction. You've just put the string into tension. If you can pull hard enough, the string will fail in tension by snapping. Concrete, while quite strong in compression, fails quickly in tension by cracking*."

Doubling down on the difference between compression and tension, concrete is designed with a "compressive" strength – consider a typical design of 4,000 pounds per square inch (psi) in compression. The tensile strength of concrete is a fraction of this value, only approximately 10% of the compressive strength, or 400 psi.

II. Defects, the Law, and the Interplay with Concrete Construction

Legal Definitions

Legal definitions with concrete construction defects are critical to the understanding of the subject matter. In general, "patent" defects are those that are visible and/or obvious, while "latent" defects are those that are hidden and/or concealed. Individual states provide definitions for both patent and latent.

The California Code of Civil Procedure, § 337.1(e) defines a patent defect as "*a deficiency which is apparent by reasonable inspection*." There is an interplay of "negligence" with insurance policies that may impact coverages and/or exclusions. The different between patent and latent is summarized well by a Cornell Law School brief with references to cases included: "*In further analyzing whether a defect is patent, courts may consider whether an objective person would discover the defect. For example, in Delon Hampton & Associates, Chartered, v. Superior Court, a California court described the California test for whether construction defects are patent as "whether the average consumer, during a reasonable inspection, would discover the defect. There, the court found that a stairwell that was too narrow with a banister which was too low was a patent defect. California case law has also included the following examples as patent defects: the absence of a fence around a swimming pool (Mattingly v. Anthony Industries, Inc.); raised paving stones on a patio (Tomko Woll Group Architects Inc. v. Superior Court); and defective construction of a landing that allows water to pool on the landing and to drain into an office (Sanchez v. Swinerton & Walberg Co.). By contrast, California case law found that the follow defects were not patent, and therefore latent: an improperly designed heating and air conditioning system, that causes uncontrollable temperature fluctuations (Baker v. Walker & Walker Inc.); and the absence of a vapor barrier, which caused the siding on a building to buckle (Mills v. Forestex Co.)*."

In the Florida Statute § 95.11(3)(c), latent defects "*…are generally considered to be hidden or concealed defects which are not discoverable by reasonable and customary inspection, and of which the owner has no knowledge*." Moreover, within this statute, the state bars an action "*founded on the design, planning, or construction of an improvement to real property*" if an action/lawsuit is not filed within four years of the date the latent defect "*is discovered or should have been discovered with the exercise of due diligence*." Refer to Case: The Cottages at Stoney Creek Condominium Association, Inc. et al v. JDR Construction, LLC et al, No. 1D20-956, 2021 WL 2209851 (June 1, 2021) aff'd per curiam.

This interactive course depicts both patent and latent defects with the intent of showing the "gray" in whether a defect is one or the other – as well as the subjectiveness of such assertion. Casetext.com summarizes this well: "*More often, the dispute centers on whether the manifestation is "obvious" or could be due to causes other than an actionable defect, in which case a factual issue remains*."

III. Concrete Claims in the Built Environment

Concrete in use

As discussed herein, concrete is one of the most frequently used building materials worldwide and by volume, holds the title of most-used. Given concrete's strength, durability, low-maintenance, energy-efficiency, and sustainability, concrete remains widely used. Vertical construction utilizes concrete for foundation systems, walls, floors, and more. Concrete is additionally utilized for civil engineering components including flatwork. Although far beyond typical life expectancy of a material, consider the Ancient Romans constructed the Pantheon in Rome around 120 ADS; the unsupported concrete structure remains standing.

Top Concrete Claims

Concrete construction defects can be attributable to multiple causes from design to construction to material deficiencies. Testing can be used to determine more accurately which cause was primary and/or contributory. The following have been found to encompass most defect **insurance claims**:

- Construction defects (i.e., means and methods)
- Design defects (i.e., errors & omissions, under-designed)
- Preparation/mix
- Material defects
- Damage from catastrophe (i.e., fire, flood, storm)
- Damage due to chemical attack
- Freeze/thaw
- Differential movement

IV. Concrete in Litigation

In consideration of concrete defects in litigated matters, the overarching commonalities come to the science and facts, and whether a concrete defect exists. Moreover, whether the plaintiff can demonstrate said defect exists. Specifically, litigation often centers around the direct physical evidence, interpreting the evidence, and presenting the evidence. Direct physical evidence in an investigation, and at the core of litigation, can include visual investigation, petrographic examinations of concrete samples from the constructions involved, and other sources. Forensic professionals are utilized to evaluate the facts and present professional opinions. Through collaboration with attorneys and claims professionals, the claims team can work to determine if conclusions are biased (i.e., hired gun), or erroneous, either because the data is incomplete data or improper handling of such evidence.

Case Study 1 – FIU Bridge Collapse (2018)

Refer to Magnum Construction Management, LLC v. WSP USA Solutions, Inc., et al., Case No. 20-24684-CIV ALTONAGA. Case highlights:

- The bridge was designed as a cable-stayed structure with one central pylon. The cables were to support the post-tensioned, prestressed-concrete deck structure with the bottom flange to serve as the walkway and a top flange providing protection (roof) from the elements.

- At time of collapse, the deck structure had been installed over the main highway, but the back span, spanning over a river, the pylon, and the cables had yet to be installed.
- Investigators concluded that the trigger for the collapse was punching shear failure at the node where the end vertical and diagonal truss members met. Reportedly, "*the NTSB has been unequivocal in stating that Figg's load and capacity calculation errors at this key node probably led to the failure. Post-collapse calculations showed that the load demand on the node was twice that designed*."
- NTSB report noted: "*The collapse of the FIU pedestrian bridge traced back long before the afternoon of the collapse, to FIGG's bridge design errors […] In summary, because the design calculations were wrong, the bridge collapsed*." Additionally, "*Because nobody took action despite clear signs of structural distress, the collapse killed six people and injured ten*."

Hard Rock Hotel Collapse (2019)

Refer to Louisiana (Suncoast Projects, LLC v. 1031 Canal Development, LLC et al 2:2020cv02791. Case highlights:

- The collapse happened 8 days after the last batch of concrete was poured at the roof level. The concrete and steel "pancaked."
- The collapse killed three works, injured dozens, and disrupted an area of downtown New Orleans for over a year.
- WWL-TV reported that "a key supplier of materials for the Hard Rock Hotel construction project tried to warn the builders they needed more steel supports on the upper floors, but those supports were never added before the partially built 18-story high-rise collapsed, …"
- OSHA preliminarily concluded that "Heaslip Engineering, the firm that designed the hotel, committed serious violations related to the building's support structure of steel beams and columns on portions of its upper floors."
- Significant design and construction changes were made that may have caused/contributed to the collapse.

Champlain Towers Collapse (2021)

Refer to Champlain Towers South Condo on the building Assn Inc, Case No.: 01-26634 CA 22. Case highlights:

- The condo building underwent a significant "concrete structural repair" in 1996 after reportedly "500 feet of cracks" were discovered in the roof of its underground parking garage.
- The garage and the pool deck above it were primary areas of the investigation.
- A 2018 engineering report alleged "major structural damage," including "abundant" cracking. Roughly 8% of the concrete slabs used in the garage and the building's plaza showed signs of "concrete deterioration," according to the report.

V. Closing / Summary of Concrete & Defects?

As it relates to this interactive, yet technically heavy course, attendees can visualize defects/damage in a new way. With built-in, commonly found defects incorporated into the

premade beams, attendees can watch as beams are loaded at the center of the span, from the top. The weights on the beams slowly depict deflection, cracking, distress, and subsequent failure. In seeing this representation multiple times during the course, the attendee can then use their firsthand knowledge of concrete failures and develop their own non-technical descriptors to verbally convey similar failures in a mediation, arbitration, or to a jury during trial. The firsthand knowledge from the technical coursework and the live demonstration is used in discussing technical defects with their retained expert – and can be flipped and used in discussions and/or testimony with opposing experts. Throughout the course, the technical focus of this presentation relates to allegations of construction defects from pre-litigation matters to those that are in all stages of litigation. Best practices provide claims professionals and attorneys in attendance with knowledge of knowing when to retain an attorney, when to retain an expert, what expectations there should be from their expert, how experts develop their opinions, presenting their opinions in writing, among others. Additionally, with a diverse claims team co-presenting the course, legal perspective and best practices are also provided, specifically related to the tripartite relationship, attorney-client privilege, and expert witness interactions.