**Contractor Incompetence and Negligence**
**(The Problem with) Dan Hildebrand**
rev. 09/15/18, bsc

Dan was contracted to shotcrete our house structure. The house structure was a rebar and mesh entity, based on thin-shell, ferrocement practices, on a concrete slab. Specific issues of concern discussed in the interview included structural integrity (concrete specifications and order of application) as well as diligent attention to details. Dan reassured us that this was the kind of work he did and had the experience to see the job through to completion and to the standards we desired. He assembled his team and a date was finalized to start the project.

The team arrived, consisting of 3 people, along with a (monolithic) pump and mixer. Over the first 3 days, their pump broke multiple times, with the work typically getting underway between 2 and 3pm. In those 3 days, a total of about 3 yards were applied to the structure (versus a contractor-estimated rate of 9 cubic yards a day). The team could not get their equipment (pump specifically) to work consistently, and every time it broke, they went into panic mode. Shotcrete applied during this period was uneven and inconsistent, and there was extraordinary waste. The team seemed to have no focus, and the shotcreted areas tended to be random rather than the focus on critical structural elements (columns, beams, arch roots) as originally planned.

On the third day, after the pump and mixer had both broken once again, I ran into town to get replacement bolts. Upon return I found Dan and Lupe on the roof of the atrium potion of the house dumping buckets of concrete. They stated that the pump had once again broken and in a panic to remove the concrete from the pump, had decided to not waste it. Unfortunately they had not shot (filled) the columns and beams for that region, had not repositioned the supports, and were placing the concrete in the middle of the roof, with no effort to connect to or encase main structural members. I stopped the job and pointed out the issues and concerns. Thankfully, the structure supported the loads without collapse, albeit with sags, thereby impacting roof pitch and integrity (both structural and weather).

We regrouped over the next 3 days as they sought out a replacement pump and reassured me that they would follow the previously-agreed (structural) order of application, and that they would correct the structural compromise created at the atrium roof. Dan and his team also agreed to pay more attention to site and work preparation at start up, as well as site and structural issues at shut down, including equipment maintenance, cleanout of joint debris and preparing concrete bond areas before shooting, and the protection and curing of areas shot.

Another pump (and operator) was brought in and work was restarted. Work ramped up quickly, with peak application rates nearing 20 yards applied at the peak (overrunning the ability of the laborers to keep up, not to mention myself and the detail work needed to be addressed. Apparently the new pump they had brought in was 4 times as expensive as

the previous (which they did not initially disclose) and they were rushing to get more and more shot per day. On the third day they started talking about bringing in concrete trucks (staggered) to expedite the work, potentially increasing the application rate by 7 times, not to mention the use of retarders and similar untested admixtures. In addition, I was seeing more and more areas where they were not cleaning out prior to shooting (leaving a sand layer at the base), and they were continuing to ignore the critical structural elements (columns, beams, etc.). I was shocked when they got up on the roof, ostensibly to shoot the arch roots, and started shooting the unbalanced and unsupported main roof (they had knocked out the supports and, disregarding my instructions, had not replaced them). Each of these were pointed out to them over-and-over, with reassurance coming back that they would take care of it.

On the 4th day, mid-day, we exhausted the stock of Portland cement on hand (materials management, another issue). They decided that they wanted to shut down for 10 days while they went home to take care of personal business, assigning me to find another pump and coordinate materials and personnel for a re-start date. After they left, I walked through and found so many structural compromises (columns unfilled or partially filled at top or bottom, beams the same, sand lenses at the bases of walls and columns, unsupported roofs loaded, etc.), that I realized they were not addressing the basic instructions and concerns. I reached out to them that evening and asked them to pick up their equipment as I could no longer move forward with them and risk potentially fatal defects.

In summary, the primary oversights include:

- Disregard of structural elements and sequence of buildup (columns, beams first before walls or roof elements).
- Disregard of basic shotcrete practices, including cleaning out joints/work areas before shooting them (sand buildup/lenses and thereby non-contiguous structural elements), wetting bonding surfaces before shooting (dry/absorbtion of water from new concrete creating poor joints)
- Disregard of concrete curing needs (covering, moistening).
- Poor site, equipment and job management.

These, in sum, show a basic lack of understanding of concrete as well in structural elements (the interaction of concrete and reinforcing steel especially).

In retrospective, I feel that Dan's experience is related to one type of construction – building air-formed domes. In such domes, there are no distinct structural elements to focus on, only wide expanses of concrete fill. In addition, shotcrete rebound tends to fall out of the dome's wall as they build upwards due to the geometry.

I would strongly recommend that if you were looking to employ Dan and his team, that it be confined to dome type constructs. Regardless, I would caution you to monitor the job closely and not be afraid to shut it down as necessary. Unfortunately, when a mistake is made, reinforced concrete is very difficult (and expensive) to undo.

Initial Contact: March 21st, 2018, via phone, then email
Initial walk-through and in-person discussions: August 2nd, 2018-09-15

First Work Period: August 30th through September 1st, 2018 (3 days)
Second Work Period: September 5th through September 8th, 2018 (3-1/2 days)

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