Site Reception of Concrete: What Not to Do!

From the moment the concrete arrives on site, the possibility of errors in reception, sampling, storing, testing and recording results is open-ended and successful supply dependent on the adequate training, competence and preparedness of concrete testing technicians. There is a lot riding on the correct acceptance of concrete; get it wrong and the cost in time and cash could be huge. But mistakes do happen – if the consequences weren't so expensive, they'd be hilarious!

We asked some of our longer-serving members (who shall remain anonymous here) for examples of dodgy site practice drawn from their own experience, and some of the following anecdotes – including some told against the narrator – are really quite revealing. Indeed, you couldn't make some of them up. If you wonder whether training is necessary, think no further.

Delivery procedure and recording

The driver being instructed to added water on arrival, before testing, is a commonplace, but sometimes poor practice in initial acceptance moves to another level. Here's an example. Two separate pours with concrete of different mix specification were scheduled to take place on the same site, all concrete supplied by the same firm. The banksman controlling the truck-mixer movements, and signing the delivery tickets, was seen directing loads to the pour area based simply on which pump was free, ending up with the two grades of concrete intermixed in each pour.

A member of site staff receiving concrete was found to be taking delivery tickets from the driver, signing them and putting them on the clipboard with no details recorded on the pour sheet. Consequently samples were taken and cubes made without link to any particular load. On another occasion, after failing to make some cubes for the client's records, a contractor turned up at the ICT member's laboratory with a 150mm 'cube' to test. He'd cut a chunk of concrete out of the corner of his slab with a circular saw!

Choice of non-compliant test equipment

There are numerous reports of slump testing and cubes made with irregular equipment: rebar for tamping rods, plywood sheets for baseboards or boxes. In one instance, when the first load of structural concrete arrived, the contractor's site technician directed the lorry to the pump, checked the delivery ticket, and took a sample for slump testing. His test equipment? … an old deformed cone, plywood base plate and a cut 16mm rebar! In another instance, on a bridge deck pour: "a plastic road cone used to slump concrete."

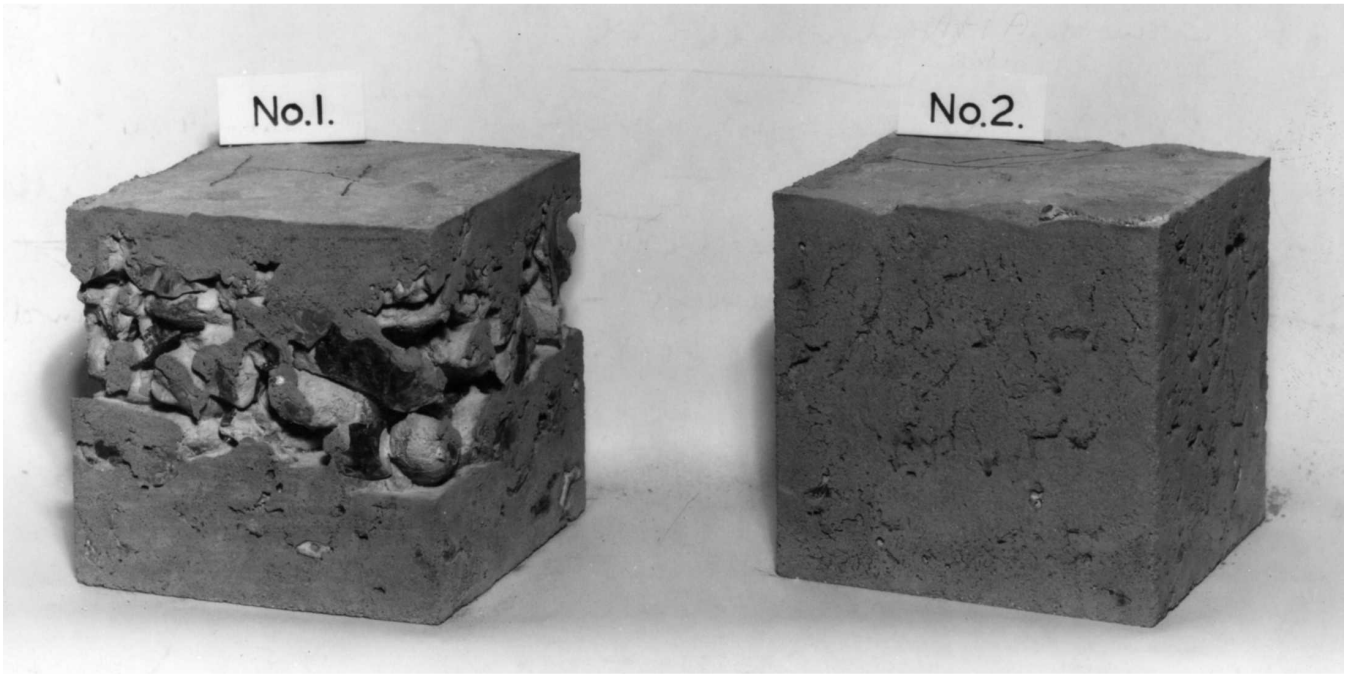
More than one contributor has seen wooden cube moulds made on site, but some of the more bizarre instances include the following: "We once received three cubes for testing from a site, they had been cast in drawers from an old chemists shop. The drawers still had a polished front, glass knobs and labels on them detailing what the drawers had once contained. At another site there had been some cube failures. On investigation it was found that the joiner had made some 150 mm cube moulds from 20 mm plywood. The workmanship was very good, the cubes were the correct size and square but when we put a straight edge on the faces of the cubes they were convex, meaning the load wasn't applied over the full face. Subsequent core testing proved the concrete was satisfactory, but the contractor's desire to save money by making his own moulds led to increased costs, as he had to pay for the core testing."

Similarly: "A customer arrived at our testing laboratory with a 'cube' for testing. When he opened the back of his van there was a block of concrete that had been carefully made in a hand-made mould that was approximately 500 x 500 x 500 mm. The customer was puzzled when we told him we couldn't test it. We had to explain that a) we couldn't lift it and b) it wouldn't fit in the testing machine. He was adamant that he had to have a test result for the concrete or the Site Engineer would insist he removed the lintel that had been cast with it. We had no other option than to take a core out of the concrete block and test that, at great expense to the customer.

Poor sampling and testing technique

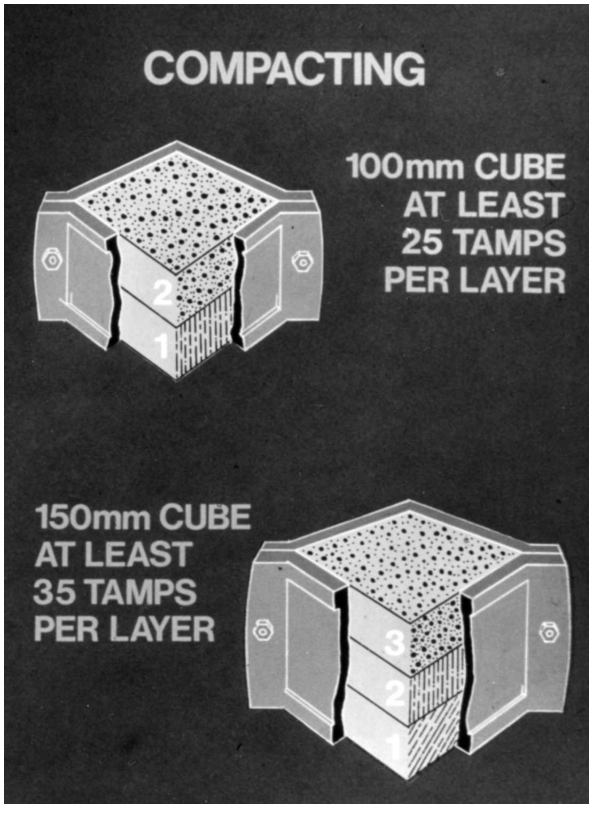
Inadequate training

Training is essential to instilling proper practice, though it is no guarantee. After completing his training, one technician decided it would be better to leave the cubes to vibrate themselves in the back of his van as opposed to actually tamping them. The result was "some lovely looking cubes" the consistency of an Aero Bar.



Poor preparedness

One member recalls that as a young technician he was ill-equipped to act with authority: "I once went to a site in Whitwood, the concrete was specified as 50 mm slump. As it came down the truckmixer chute the site agent said that it was not the correct slump, it was too dry. I said it was in specification but I didn't have a slump cone with me (a cardinal sin as I was a concrete technician). I took the sample back to the plant and carried out a slump test; it was 55 mm and the concrete would have been over an hour old. I returned to site with the next load and told the agent what the slump had been. As the second load was being discharged the agent said 'that's more like it, that's 50 mm slump'. I disagreed and told him it was too wet. The Clerk of Works (a rare breed nowadays) asked if I had my slump cone with me. I told him I did and he asked me to slump the concrete; it was 85 mm, out of specification this time, the limits at that time being ± 25 mm. By the time I had returned to the plant the agent had been on the phone and said, 'tell that f***ing technician never to come on this site again'. I didn't, though I did meet him again some years later when he was a Contracts Manager and I was Assistant Technical Manager, but he didn't remember me."



Failure of understanding

Sometimes the training sticks, though not always quite as intended. "On a road contract in Bolton we were carrying out plant trials and I was berated by the Clerk of Works for using more than 35 tamps per layer on some 150 mm cubes. He would not accept that BS 1881 said a minimum 35 tamps per layer; to his mind it was exactly 35, no more, no less!"

As for slump testing, "I have seen various methods of twisting the slump cone, whilst being removed vertically from the specimen during a slump test – the operative no doubt believing that if you twist the cone as you remove it will retain or increase the concrete's vertical stability."

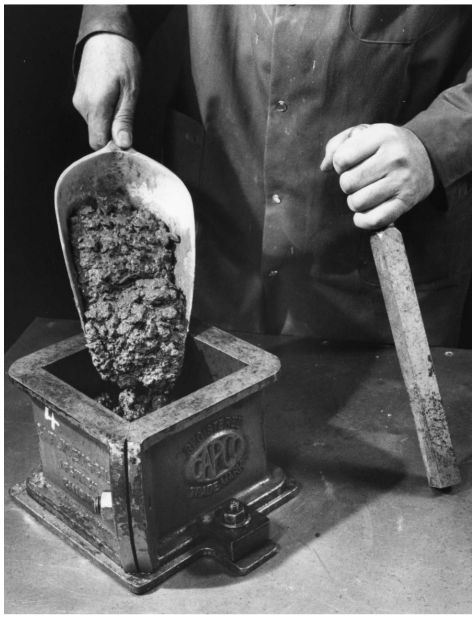
Lack of care

But more often than not, consciously or otherwise, poor site practice is down to a lack of care. Maybe it is a case of cutting corners under pressure of time, simple inattention, or individual indolence. One member notes a time when the same sample of concrete was used for slump testing and then remixed to make cubes. Here are some other examples of slack technique:

"When I first started as a technician I went to a site where the contractor had placed 3 x 150 mm cube moulds, without base plates, on a scaffold board. He threw a shovelful of concrete in each, hit it with the back of the shovel and then asked if we could test them.

"I was called out on site one evening to a complaint of wet concrete. The contractor got a sample of concrete to carry out a slump test. It was a sloping site and the contractor got a plank of wood, placed it on the ground (not level), poured concrete into the slump cone (in one layer), compacted it with a piece of rebar, then whipped the cone off and said, 'see, the concrete is too wet'. I acknowledged the concrete was wetter than specified but told him that in my time in the concrete industry that was the worst example of a slump test I had ever seen.

"I received a call from one concrete plant who said that that a customer, a piling contractor, was complaining that the concrete was too wet and then too dry. I went to site, the chap carrying out the slump test had an old gallon paint tin with some wire through it to form a handle as his bucket. He was getting a sample from a heap of concrete that had been discharged on to the ground, using his gloved hands to pick up the concrete, and as it was 175 mm slump, grout was running through his fingers. He then put what was left into the 'bucket' from his hands. I forget what slump he got but as he stood up he said it was out specification. I took a sample from the same heap of concrete using the correct equipment, carried out a slump test and showed him it was in specification – no further complaints.



Storage time and temperature

"I have seen cube curing tanks being reversed into by dumpers and other plant (as tanks are sometimes placed outside the curing facility) and have watched site operatives breaking the ice from the surface of the tank to retrieve cube specimens on more than one occasion." As an example, "collecting cubes in the depths of winter, I was directed to find the cube tank behind the site hut. The cubes were in a purpose made curing tank and the cubes were actually being cured in water. Unfortunately, I had to ask the site agent for a hammer to break the ice before I could get to the cubes"Storage conditions make a big difference.

"I went to a wind farm above Aberdeen to assist a contractor who had low 7 day cube results. They had provided a cabin and all new equipment for the technician, but unfortunately they hadn't trained him properly. He obtained a sample for a slump test and used the wrong number of tamps per layer. I pointed this out to the engineer, who asked if I was sure. The curing tanks in the cabin were 30 °C and when I asked him what he did with the cubes, he said he kept them in the warm cabin overnight and the he had put them in his van over the weekend. It was April North of Aberdeen and they wondered why they had low cubes."

It doesn't have to be in the north of Scotland to get cold. One member attending a complaint about low cube results from site-made samples was asked, 'can you test some of them for us?' When he turned up, he was directed to a pile of snow, under which the cubes had sat for five days awaiting collection. Elsewhere the cubes were made on site by a competent person in late January, demoulded the following day and taken to head office with details for test house to pick up. The cubes were kept outside the store for three weeks before collection by the test house, resulting in very low results.

The storage temperature, if not cold, might be intermittent: "We were supplying concrete containing 70% ggbs to a new gas compressor station and I received a call about low cube results. I visited site to see what was going on and the site agent said that they had made the cubes. They were stored in a container that contained a heater overnight and then demoulded and put in a heated curing tank to await collection for testing. All seemed OK – but the site was in a field, power being supplied by generators and at night the generators were turned off. Consequently the container was no longer heated overnight and the curing tank went cold, and as the concrete was being supplied in February this did have an effect on the results. Also whilst there, I watched them sample and make some cubes. The sample was left in a bucket outside in the winter sun for up to an hour whilst they demoulded the cubes from the previous day and cleaned the moulds. The bucket of concrete was then upended on the container floor, covered in sawdust and other debris, to remix and the whole procedure started again."

"Similarly I was invited to look around a site laboratory, after some low cube strengths were reported, to find the plug for the cube tank electrics on the floor and covered in sufficient spiders' web to necessitate a broom handle: 'I'm not sticking my hand in there'!" Little wonder the temperature was uncontrolled and the cubes low.

Temperature matched curing

Even in the factory-controlled conditions of a precast works, there is scope for error: "I remember visiting a precast site to discuss high performance concrete and being shown the slab units with the test cubes alongside. This was announced as temperature matched curing, even though there were no probes, no data logging and the cubes were certainly not in a temperature-maintained box. Indeed, not only were the cubes (steel moulds) simply left alongside the open cast slab, they were so precariously balanced on the edge of the forms that two were distinctly sloped (by a couple of cm) on the finished surface."

"The big message that contractors don't appear to understand", argues one contributor, "is the requirement to follow the methods in the standards. If one piece of equipment is incorrect, or one requirement of the standard is not followed correctly, the test is void and the specimens can be disregarded. Ultimately contractors are wasting resource, time and money if they do not follow the requirements of the standard."

For qualified site staff, approved training is available from QSRMC and The Concrete Society, while the Institute of Concrete Technology offers an introductory-level qualification entitled Concrete Practice and, in partnership with the American Concrete Institute, certification of concrete field testing technicians to EN Standards.

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