

# DINCEL'S KNOWLEDGE

## NO: 2 CASE STUDY

- **Excavation / Trench Safety**
- **Ductility**

### **Preface**

Basement excavation and trenches for tanks/pits may collapse under heavy rain conditions unless they are stabilised. The earth stabilisation or shoring represents (costly exercise!) significant delay in the overall construction time, safety liability, as well as huge costs to rectify the problem.

The Dincel panels resist against such conditions to support the collapsing earth because of its patented panel joints. This feature ensures that the entire wall works monolithically, displaying ductility behavior normally not available to other forms of wall systems.

### **Case Study:** Dincel Water Tank

The water tank is an in-ground water tank that has two chambers. It is 4.0m deep and both chambers are 3.0m wide. The smaller chamber is approximately 6.0m long and the larger chamber is 6.6m long.

The base of the tank is a reinforced concrete raft slab while the walls are 200mm Dincel wall panels reinforced vertically only, i.e. no horizontal reinforcement used. The only horizontal reinforcements are those at the corners comprised of N12-600 centers, 600 long hooked bars. Refer to **Figures 1 and 2** below.

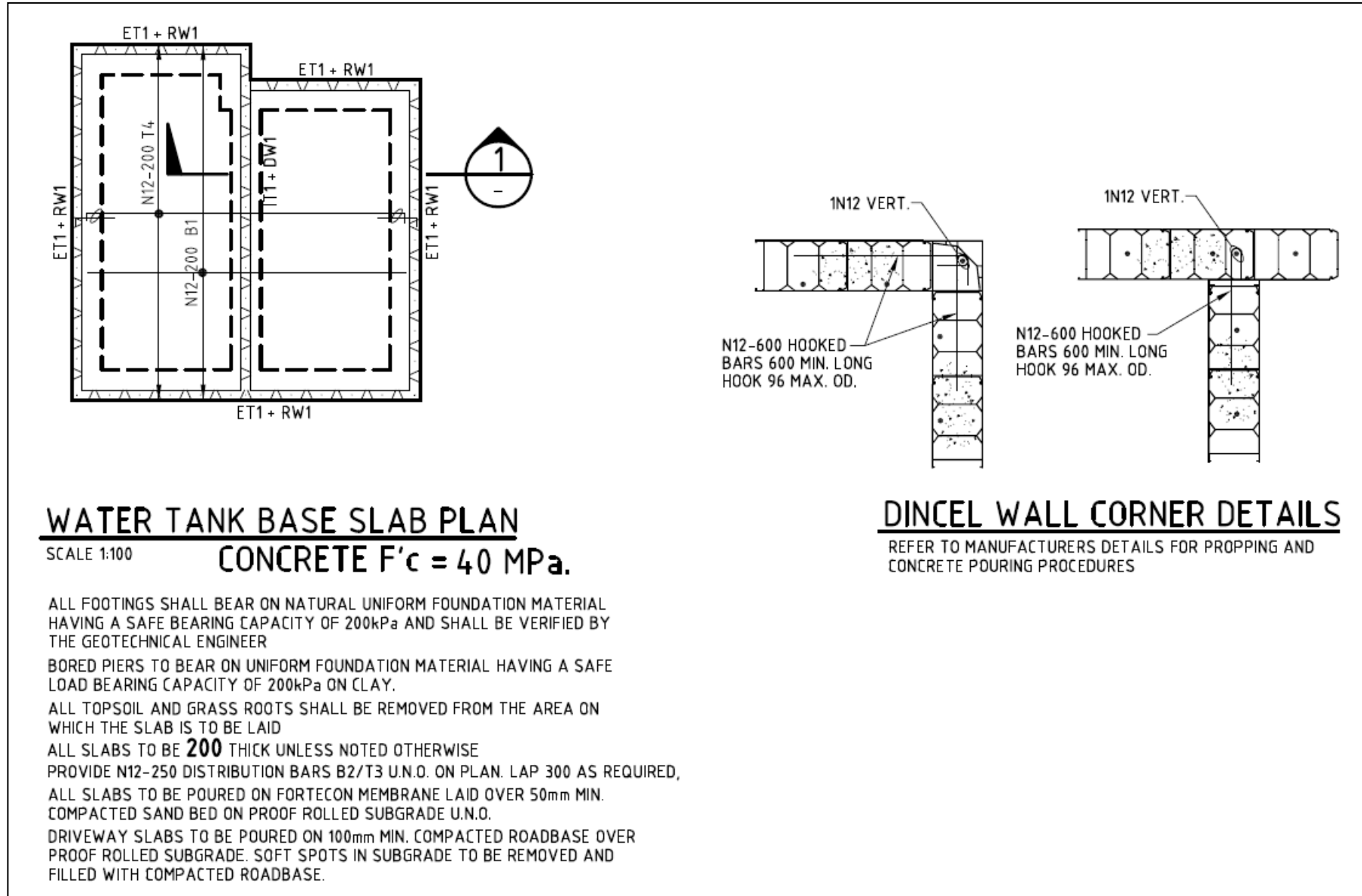


Figure 1

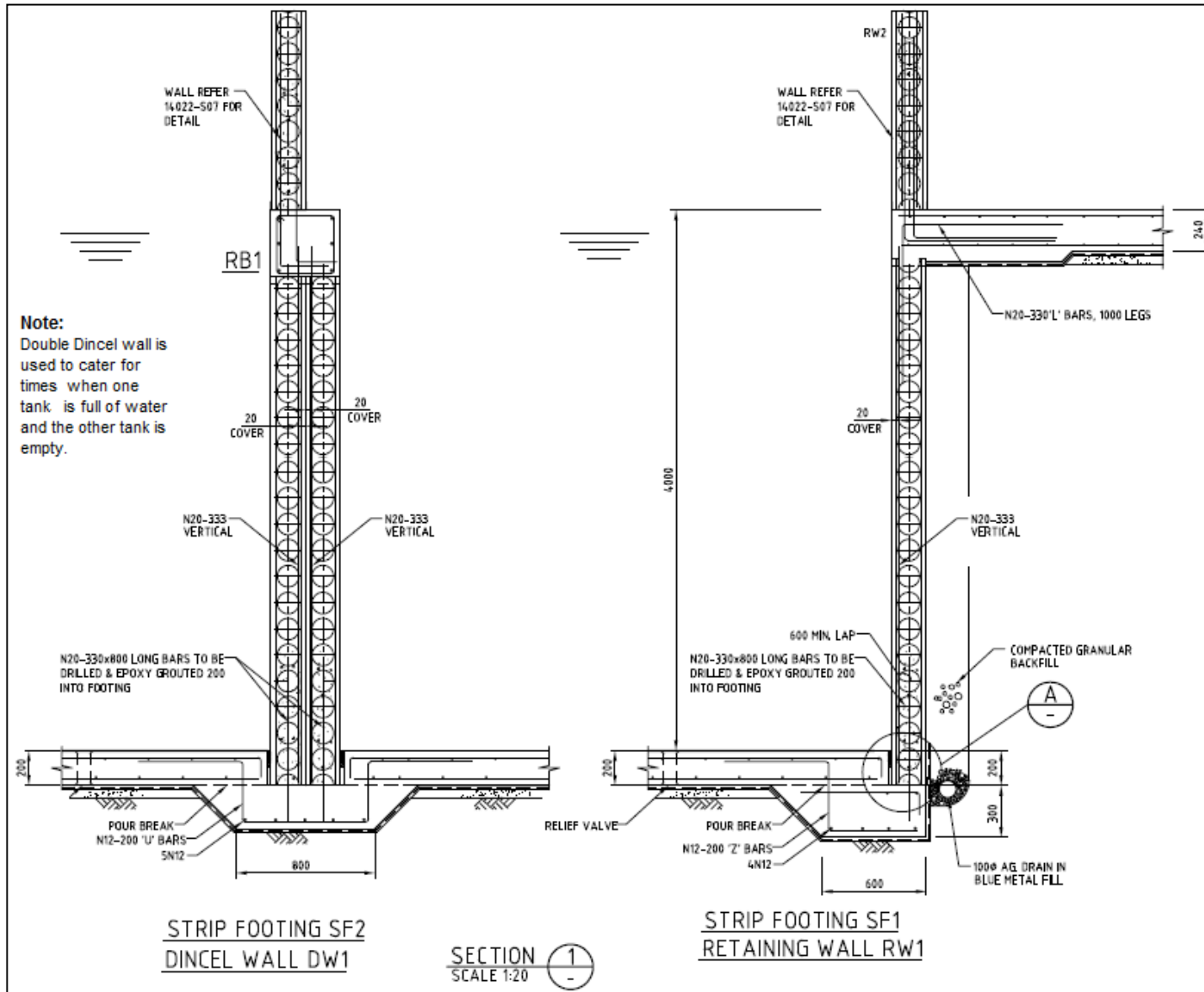


Figure 2

The tank walls are designed as a one way wall spanning vertically between the tank base slab and the slab on ground at the top of the wall.

The base of the tank was poured first and the walls were installed and poured later. Due to the construction constraints, construction of the top slab (or beam) of Section 1 that will act as the support for the top of the walls was not in position when the earth collapse occurred.

Days after the walls were poured the site suffered continuous torrential rain for approximately five (5) days. The water and soil were deposited behind the tank walls without top restraints causing the wall to shift approximately 100mm (span/66) from plumb position. Refer to **Photo No: 1**.



**Photo No: 1 – Shows Displaced Wall**



**Photo No: 2 – Shows Rectified Wall**

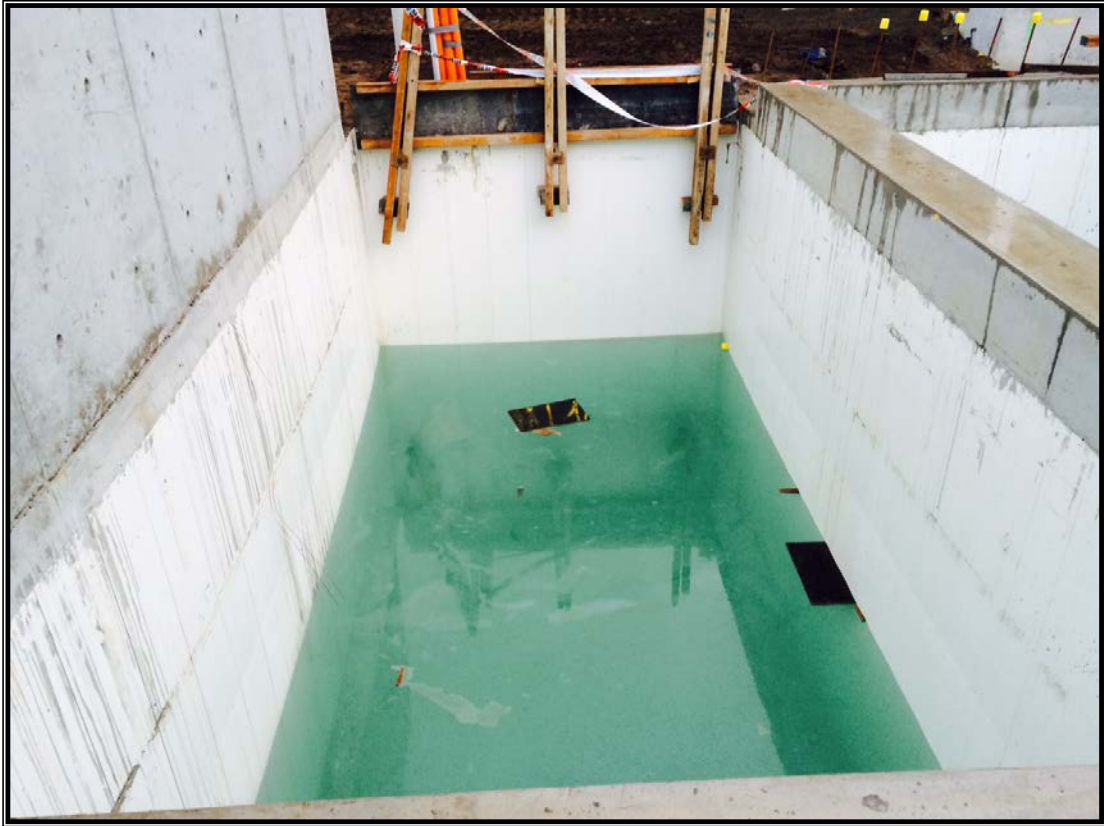
After the rain, the backfill behind the wall was removed and horizontal props were installed at the top of the wall. The props were also used to push the wall back into position as shown in **Photo 2**. There were no visible defects noted to the wall when inspected.

### **Observation**

The displaced tank wall exhibits a ductile behavior horizontally when there was no horizontal reinforcement in the wall. The vertical steel reinforcement is dowelled to the base slab meaning that there are no possible cantilever action can be expected from this. The wall therefore theoretically has a limited stiffness and strength horizontally. The wall horizontal behaviour was not expected from a vertically designed wall.

It appears that the PVC skin of the Dincel panels provided the diaphragm action in the absence of horizontal steel in this case. The 100mm or span/66 displacement is considered excessive and traditionally reinforced concrete structures are not expected have this degree of displacement. **Photos No: 3 and No: 4** show the finished tank.





**Photo No: 3**

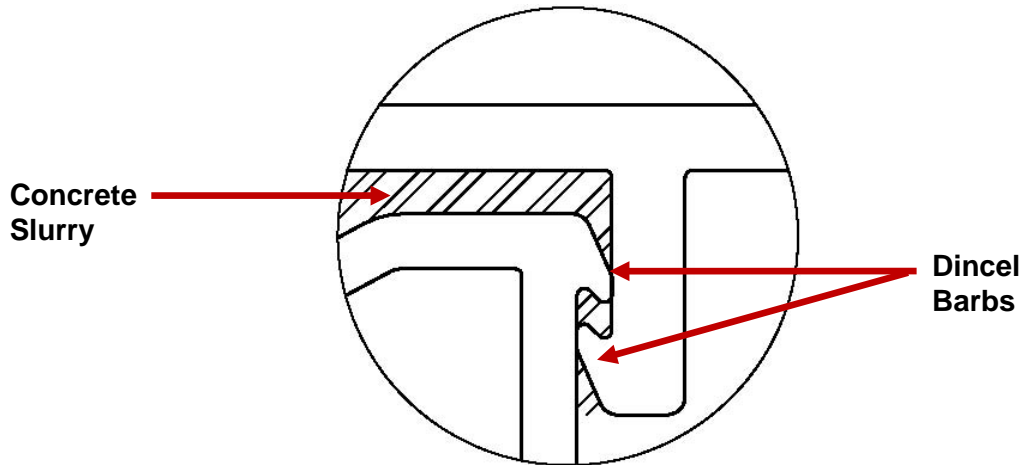


**Photo No: 4**

## Conclusion

The subject wall would have collapsed if Dincel Wall panels did not have the special barbs (similar to clutches of sheet piling) shown below.

**Barbs ensure that the panel connection does not slip under pressure thus ensuring the entire wall acts monolithically.**



Dincel Patented Panel Joint

This patented panel joint was originally developed to ensure that waterproofing without the use of membrane is achieved. For detailed information [\(download\) Dincel Wall Waterproofing, Page 9.](#)

Readers may refer to [\(download\) Dincel Earthquake Testing Video](#) for additional ductility display of Dincel Panels at an earthquake shake table.