

Builder: Perkins Builders

Date: 28th November 2009

REPORT

By

CFMEUWA

Principal Contractor – Perkins Builders

Project – Christ Church Grammar School
North-west corner development,
Stirling Hwy, Claremont.

Background

Perkins Builders are the principal contractor of the new North West corner development for Christ Church Grammar school on the Stirling Hwy, Claremont. Construction commenced about 10 weeks ago.

On Saturday morning the CFMEU were informed of a suspended deck had collapsed during the placement of concrete. Fortunately no one was injured from the collapse. The deck area was approximately 1200 square meters in area and was around 95% complete. CFMEU arrived on site to see that concrete pour had ceased. Worksafe were notified of the incident and the investigation continues.

Observations

Inspection of the incident site with Perkins representative and Worksafe has identified many contributing factors.

The formwork being used was Star Sure System supplied by Hire Access; the formwork contractor was Formstruct; the reinforcing was post tension cables supplied and installed by DGS; concrete placement by Trimac and pumping by Rowlands Pumping.

It is the opinion of the author that the star sure formwork system failed because of insufficient bracing and missing ledgers and transoms on each bay, some bays had gaps of no less than 1500mm from top of screw jack U head and the bottom of first ledger *Ref photos*.

Many of the bays across the formwork area have evidence of stress from overloading. *Ref photos*

There were no formwork design erection drawings on site. It appears that there was no engineer "sign off" prior starting concrete pour commencing, only a generic Job Safety Analysis "JSA" was on site but didn't seem to be reviewed by principle contractor and failed to identify many job specific hazards. *Such as only one access to work deck* I was informed that it's not a requirement for the principle contractor to request a "pre pour checklist for concrete placement" or engineer sign off.

Investigation continuing.

Photos
Photo 1.



Collapsed formwork leaves large hole. Notice where concreter's screed is located.

Photo 2.



Notice the concreter's screed in the centre of the collapse



Twisted formwork scaffolding standards

Photo 3.



Scaffold standards buckling under the pressure from concrete above. Notice the distance between jacks and bottom ledgers.

Photo 4.



Scaffold standards buckling under the pressure from concrete above. Notice the distance between jacks and bottom ledgers.

Photo 5.



No bracing throughout *star-sure* formwork system

Photo 6.



Collapsed bond-deck and post tension cables

Photo 7.



Twisted star sure scaffold components

Conclusion interim recommendations

It is alarming that the concrete pour got to the stage it did 95% complete given the visible signs of fatigue on the formwork scaffold components. The question must be asked why the concrete wasn't stopped in the early stages when visible signs of potential failure were obvious.

Although investigation is continuing it is advisable that the principle contractor develop a safety system of formwork and concrete placement in accordance with AS 3610 formwork for structures. Including pre concrete placement checklists and engineers sign off. *See attached example*

Independent engineer is engaged to make recommendations on the recovery dismantle process prior to any works continuing.

Before dismantling formwork scaffold all star sure scaffold components should be clearly marked with paint once dismantled quarantined, inspected and tested before any components are put back into service or destroyed.

OCCUPATIONAL HEALTH AND SAFE PRE-POUR CHECKLIST FOR CONCRETE PLACEMENT

No.	WORK DESCRIPTION	RESPONSIBILITY	TICK
1.	Workers to be inducted into JSA/SWMS for placement of any concrete. Eg Ground or suspend slab, columns, stairs, and walls.	Concrete Foreman	
2.	Engineers "signoff" prior to concrete placement to suspended deck. E.g. Formwork, bondeck, condeck.	Principle Builder	
3.	Access and Egress points to be appropriately placed and accordance with the Standard.	Principle Builder	
4.	Appropriate number of workers for the size of concrete pour (i.e. one worker to 100m ² and two extra workers to allow for rotation.	Concrete Foreman	
5.	Fully locked in body stretcher to be available for injured person evacuation off suspended decks or equivalent site emergency first aid plan.	Principle Builder	
6.	Block off all access under suspended slabs with appropriate webbing and signage.	Formwork Forman & Principle Builder	
7.	All handrails and other fall protection to be checked and made secure, including penetrations and blockouts.	Formwork Forman	
8.	Beams 350mm deep and over from finished floor level to bottom of beam to be meshed out for fall protection and prevent concrete burns.	Steel fixer Forman	
9.	Formwork to be de-nailed and removed from inner and outer area of pour.	Formwork Forman	
10.	Perimeter access around concrete pour of 1.5 meters minimum to be clear of any obstacles.	Principle Builder	
11.	All post tensioned cables to be capped/tapped and all starter bars to be capped.	Steel fixer Forman	
12.	Ticketed workers for traffic management and for spotting trucks backing up to the concrete pump.	Principle Builder & Concrete Forman	
13.	Ensure adequate lighting to perform all associated tasks safely, including set-up of pumps and placement and finishing of concrete.	Principle Builder	
14.	The concrete pump shall be suitably maintained with maintance records, thickness test results and MPI/Ultrasonic inspection reports available for boom pumps.	Pump Operator	
15.	Concrete pump to be set up in a clear area on stable, level ground and barricade webbing applied if and where necessary.	Pump Operator	
16.	Concrete pump can only be operated by ticketed person and with visual and or radio contact to be maintained.	Pump Operator	
17.	Concrete pump to be washed out in appropriate area.	Pump Operator	
18.	Concreters to wear appropriate PPE	Concrete Forman	

Basic Formwork & Concreting Checklist

1. Has the formwork system been properly designed?

A competent formwork designer and/or formwork manufacturer/supplier should design the site formwork system. The formwork contractor should have erection design drawings and specifications for the particular formwork system to be constructed. Ensure a copy of the design drawings and loading calculations are available on site. Make sure the building's design engineer specifies when the formwork can be dismantled (concrete cure requirement).

2. Has the formwork been properly constructed?

All modular or framed formwork components, support timbers and structural ply, need to be in a serviceable condition. Check that the constructed formwork is on firm foundations (suitable soleplates, hardness of ground or adequacy of support structure). Make sure the formwork system is the same type and capacity as specified in the design drawing and is erected in accordance with the design. Ensure any adjustable building props are tied to each other or to the shoring frames so they cannot collapse when released.

3. Is the formwork deck being laid safely?

The work method used to lay out and secure form ply must protect the workers from falling. When required to work from the formwork itself, make sure they have a full deck of scaffold planks and safe access. When laying additional sheets from the formwork deck, workers should stay clear of the leading edge, pushing out the sheets as they go. Perimeter edge protection (temporary guardrails or scaffolding) needs to be provided. Ensure workers have safe and secure access and egress to and from all the formwork areas, including deck

4. Is steel fixing being done safely?

Make sure plastic protective caps are always placed on the ends of starter bars to safeguard workers. When fixing steel for concrete walls and columns, steel fixers will need properly constructed scaffolds. Steel fixers need protective glasses when using bolt cutters to stop steel fragments from wounding their eyes.

5. Is the formwork structurally adequate?

Before pouring concrete, use an experienced structural engineer to inspect the erected formwork system. This inspection should also include any supporting structure the formwork is constructed upon; for adequacy and the ability to take the loads of the new suspended concrete floor or beam. The engineer should supply an inspection certificate to verify the structural integrity of the support structure and formwork system

6. Are wall and column shutters safely lifted and properly secured?

Formwork shutters need to be securely slung and controlled with a tagline when they are being crane-lifted. Do not allow large shutters to be lifted in strong winds. Where possible, push-pull angled props should be fixed to cast-in anchors. Workers installing she-bolts need to work from properly constructed scaffolds or other safe temporary work platforms

7. Are workers prevented from accessing the area underneath the concrete pour?

Ensure that no worker is allowed to access the immediate area beneath the section of formwork where the concrete is being poured. If an observer is to be positioned at a lower level during the pouring operation, they must be located in a position that will safe guard them from injury if the formwork fails during concrete placement. Generally, neither the observer nor any other worker should be permitted to access the area below the pour once concrete placement has commenced, even to rectify problems.

Basic Formwork & Concreting Checklist cont;

8. Are concrete pumps being used safely?

Concrete pumps must be well maintained, fully serviceable and should comply with the requirements of the Industry Standard for Concrete Pumping. The operator of a truck mounted concrete placing boom must hold a WorkSafe certificate of competency (Class PB). Ensure mobile boom-type units are set up correctly and fully comply with the NO-GO-ZONE rules for overhead power lines. Concrete pumping lines need cleaning out after each use.

9. Are kibbles being used safely?

Crane-lifted concrete kibbles normally require a person with a WorkSafe dogging or rigging certificate to operate them and direct their movement. Make sure the dogman understands the need to release the concrete gradually from the kibble so as not to overload the formwork and risk structural failure. The sudden release of concrete from the kibble can also make the crane boom whip upwards, causing the kibble to bounce dangerously. Never allow workers to "ride the load" by standing on a kibble while it is being lifted.

10. Are concrete vibrators being used safely?

Check that vibrators are well maintained and fully serviceable. Residual Current Devices (RCDs) must be fitted for the protection of all electrical power leads and electric vibrators. Do not use petrol-driven vibrators in cellars or other poorly ventilated areas

11. Are the concreters working safely?

Make sure there are no open sides or penetrations where a worker could fall. Where required, provide temporary guardrails or a heavy duty perimeter scaffold

12. Is formwork being dismantled safely?

Do not allow formwork to be removed prior to the concrete reaching its required strength. When stripping the underside of a suspended floor slab, barricade the area off from other workers. Make sure people dismantling the formwork are working from properly constructed scaffolds or properly planked shoring frames. Never allow "drop stripping" of form ply and falsework.