TITLE: Concreting Operations	**STANDARD:** 224
ISSUE DATE: 31 October 2015	**ISSUE No:** 001

Definitions (in relation to this Standard)

Competent	Trained, experienced and qualified
Formwork	Is the term given to either temporary or permanent moulds into which concrete or similar materials are poured.
False-work	Consists of temporary structures used in construction to support spanning or arched structures in order to hold the component in place until its construction is sufficiently advanced to support itself. False-work also includes temporary support structures for formwork used to mold concrete to form a desired shape.
Lifting Operation Equipment	Cranes and all other associated lifting tackle equipment such as spreader bars, lifting frames, spacers, slings, strops, chains and shackles

Cross-References

- Standard 204 – Planning & Preparedness
- Standard 208 – Construction Plant & Vehicle Management
- Standard 209 – Small Tools
- Standard 216 – Working Platforms
- Standard 222 – Lifting Operations (Mobile & Tower Cranes)
- Standard 225 – Stability of Structures
- Standard 303 - Control of Substances Hazardous to Health (CoSHH)

Standard

Planning

1. Royal Commission Construction Department already require a Method Statement for all concrete placement, with specific criteria to be included, including the following safety requirements:

    - Logical sequence of operations and emergency response plan
    - Details of Formwork
    - Details of Reinforcing steel and Rebar
    - Tying details for rebar structures to include, but not limited to: gauge of wire, tie method (figure 8, use of coted/uncoated wire etc.)
    - Access & egress to the placement site
    - segregated pedestrian walkways, vehicle routes and vehicle/equipment set-up locations (for example concrete trucks and concrete pumps)

- Resources required including construction plant, vehicles and manpower
- Training of the workforce
- Fall protection required, including working platform requirements
- Night work and Lighting (for placement of concrete - 50 lux minimum)
- Use of Concrete, sealants, form release agents
- Securing access to the concrete placement site
- Safety Induction of concrete equipment operators and equipment inspection prior to commence work
- Traffic management plan (storage area, assembly area, pedestrian walkways, crossing points, etc.)
- Conducting pre pour meeting which should include the quantity of pour, no of mixers, pumps, no of workers, tools required, sequence of pouring etc.

2. Contractor shall conduct a Risk Assessment and Safe Sequence of Works for all concreting operations, to be included in the Construction Phase ES&H Plan in accordance with Standard 204 – Planning & Preparedness. Additional topics to be addressed by these documents (that are not required by the Method Statement) are:

    - Personal protective equipment to be worn
    - Control of noise
    - Control of vibration from concreting vibratory equipment
    - Weather conditions

Unloading of Vehicles

3. On delivery to site, bundles of rebar must not be unloaded by hand (rolling off). Reinforcing mesh is not to be dragged off (i.e. by a static machine whilst the vehicle moves forward). All reinforcing materials are to be off-loaded by either a crane, vehicle with hiab, or forklift truck (or lightweight tractor (JCB/backhoe) with forks attachment).

4. All lifting operations are to be in accordance with Standard 222 – Lifting Operations (Mobile & Tower Crane).

Formwork / False-work

5. All Formwork and False-work shall be designed and built in accordance with Standard 225 – Stability of Structures.

6. Embedded items and anchor bolt shall be correctly supported; they shall not be supported by forms or reinforcing steel that may be subjected to movement during concrete placement. These items shall be monitored for movement during the concrete placement.

7. All ends of reinforcing bars must be protected to prevent impalement; plastic caps are not sufficient. International best practices can be found at Figures 1& 2 (see also *Figure 3* is also acceptable.

Figure 1 – steel reinforced impalement caps

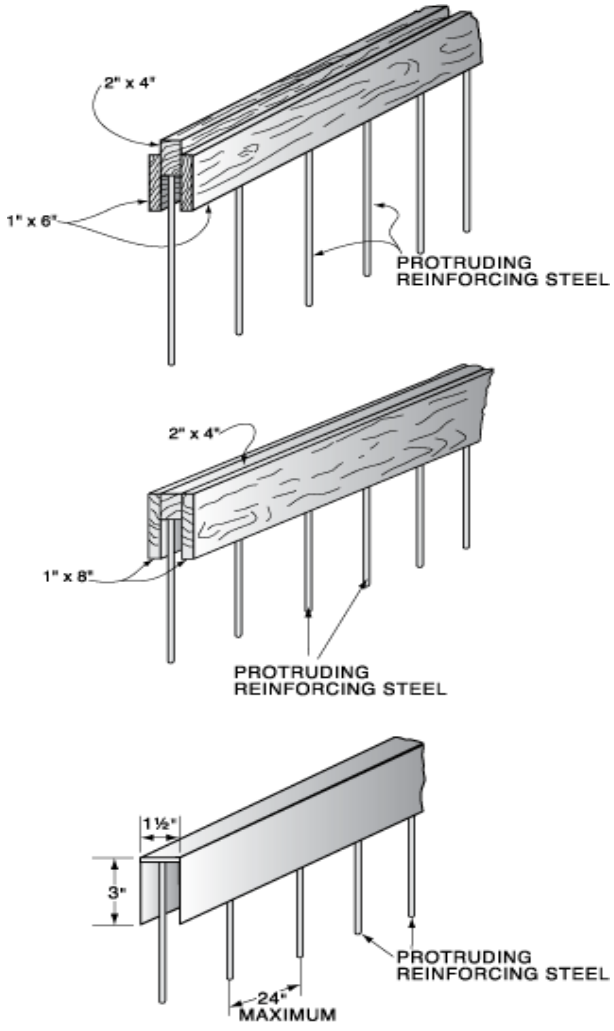

Figure 2 – Protection of rebar using timber

Figure 3 – bending of rebar

Access & Working Platform

8. Usually where formwork is constructed, there is a requirement for a working platform (See Figure 3). Working platforms may only be incorporated as a part of the formwork / false-work if it has been included in the design and calculations; otherwise it must be a separate entity.

9. Working Platform requirements and access are to be in accordance with Standard 216 – Working Platforms.

Figure 4– A working platform shall be provided when casting and tie-in of rebars, placement of the concrete and curing

Construction Plant and Equipment

10. All Construction Plant shall be fit for purpose, operated and maintained in a safe manner by a competent person as per manufacturer's recommendations.

11. Concrete pumps with placing booms shall be sited correctly, a minimum of 2m away from excavation edges, and outriggers fully extended. All concrete pump operators are to hold a valid 3rd party training certificate in addition to a Saudi Arabian Government license.

12. Ground bearing pressure calculations shall included as part of the Method Statement, with expected dynamic loading stresses taken into consideration (See Figure 4). Outrigger pads must be used on concrete pumps.

Figure 4 – Accident due to ground bearing pressure not having been calculated

13. All moving parts of concrete pumps, concrete mixers and other associated concreting equipments shall be guarded, specifically rotating parts (i.e. the driving gear chain - See Figure 5).

14. Plastic sheeting must be place underneath concrete pump/concrete truck to avoid possible ground contamination due to oil/diesel and concrete spills.

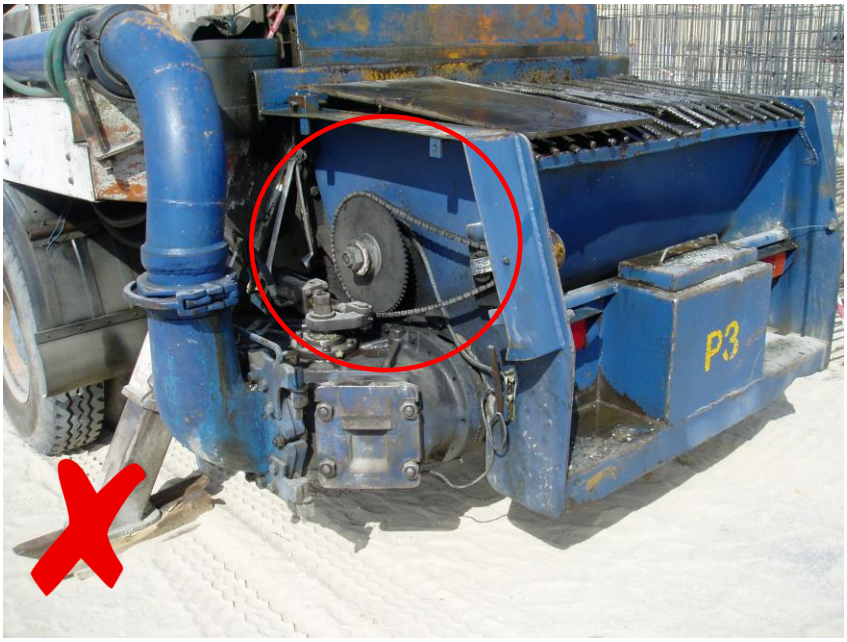

Figure 5 – Example of an unguarded driving gear chain

15. The discharging end of the placement boom must be under control during concrete placement (See Figure 6).

Figure 6 – Example of a placement boom not under control

16. Fixed concrete saws (as shown in Figure 7) shall only be operated by competent persons with proof of training. They must strictly be operated in accordance with manufacturer's instructions; this usually entails remote operation through control cables. There shall be no persons within 10m during operation and inspection records must be available on site for information.

Figure 7 – Example of a fixed concrete saw

17. Concrete skips / buckets shall have dedicated lifting equipment, 3rd party inspected on an annual basis, capable and tested to withstanding 3 times the maximum load of the skip / bucket with tag lines attached when lifting on going.

18. Suitable control measures shall be out in place when concrete cutting takes place to mitigate the risk posed by silica dust.

19. All lifting equipment shall conform to Standard 222 - Lifting Equipment (Mobile & Tower Cranes)

20. The manual lever to open concrete skips / buckets shall be opened by touch; a tagline tied onto the lever is strictly forbidden. Tag lines shall be only tied to the lifting eye of the skip / bucket when lifting.

21. Rider-operated concrete skips / buckets are for all intents and purposes to be treated the same as a man-basket, and tested in accordance with Standard 223 - Man-baskets.

22. During operation the rider shall wear a full body harness, with lifeline attached independently (using a sling as an extension if necessary) to the main crane hook, or headache ball (See Figure 8). On no account is the lifeline to be attached to the rider-operated concrete skip / bucket or its lifting equipment (See Figure 9) with valid third party inspection certificate.

Figure 8 – Good example of an independent lifeline

Figure 9 – Bad example of a lifeline attached to the concrete skip / bucket

Training

23. Contractor shall ensure that the workforce is trained on all equipments and tools used during the concrete operation, including internal vibrator pokers and external vibrator pokers (screed-boards), not only for safety reasons, but also as an aid to quality.

Personal Protective Equipment

24. Material Safety Data Sheets (MSDS) control measures for concrete, sealants, form release agents, curing compounds and all other chemicals involved during concrete operations that are to be used, shall be communicated by pre-task briefing to the workforce.

25. Contractor shall ensure that all MSDS Personal Protective Equipment (PPE) requirements are provided.

26. The minimum requirements for PPE for all concreting operations shall be:

    - Safety Helmet
    - Safety Glasses
    - Non-permeable (rubber) gloves
    - Safety Boots / Wellington Boots (if standing in the concrete during placement)
    - Rubber overalls for concrete placement boom operator
    - Hearing protection (where required)
    - Face-shield for persons holding concrete placement hose

v.	Date	Description	Prep.	Checked	Approved
000	May-2009	Original	MS	WG	HS
001	Oct - 2015	1st Revision	FH	FC	AK