TITLE: Lifting Operations (Mobile & Tower Cranes)		**STANDARD:**	222
ISSUE DATE:	31 October 2015	**ISSUE No:**	001

Definitions (in relation to this Standard)

Competent	Trained, experienced and qualified
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 221 – Lifting Operations (Personnel & Planning)

Standard

General Lifting Operations

Cranes

1. All cranes shall be inspected by a 3rd party on an annual basis.
2. All cranes shall display a sticker corresponding to the 3rd party inspection certificate, or a copy of the 3rd party inspection certificate shall be available in the cab.
3. Cranes having their configuration changed, dismantled or re-erected shall be 3rd party tested before lifting will commence.
4. Every crane shall be fitted with an appropriate load radius indicator.
5. Automatic safe load indicators must be tested and thoroughly examined after erection and/or installation of the crane before use.
6. All cranes shall be fitted with hazard flashing beacons.
7. All cranes (including boom trucks & HIABS) shall be fitted with Anti-two block device.
8. Crane shall cease operation when the wind speed exceeds the safe operating level recommended in the manufacturer's specification (operator's manual). Effect of Wind Speeds on Crane Operations:
   - When wind velocities are above 32 km/h (20 mph), the rated load and boom lengths shall be reduced according to manufactures specifications.
   - Wind forces are greater at height by as much as 35% or more. All lifts above ground level must account for wind forces (e.g., side loads, down drafts, etc.), as applied to the load and the boom.

- If there is no wind speed restriction information available at site from the crane manufacturer all lifting operations for that crane must cease when wind speeds are at, or above, 32 km/h (20 mph) (Wind chart given in Appendix 5 for reference).
- All contractors must have equipment (anemometer) on site at all times when cranes are on site to monitor wind speeds.

9. Crane operators shall conduct daily pre-use inspections of their equipment; records shall be kept and made available to Royal Commission.

10. Crane manufacturer's manual will be kept onboard the crane and adhered to for ongoing maintenance requirements. Manual must be in English and the language of the operator.

11. Ground conditions will be tested and verified, to comply with crane manufacturers safe working specifications, to ensure safe operation. This applies to all wheeled and tracked cranes.

12. All cranes / lifting equipment shall be checked at the start of the project or before using first time on the project by a competent mechanic along with ES&H staff using the form given in Appendix 6. These checks shall be repeated on a quarterly basis and contractor shall keep records of the same and produced to Royal Commission upon request.

Ground conditions

13. When planning a lift, consideration must be given to ground conditions:
    - Outrigger and track loading should be established before positioning of the crane: the competent person shall also take in to account the added weight when lifting operations take place.
    - When positioning a crane in live operational areas and on concrete ground the safe load limit shall be identified against the specification of the concrete, foundations etc. of the area involved. For other areas the density and compaction qualities shall be assessed.
    - Outrigger pad sizes shall be applied as per the crane manufacturers recommendations given against specific ground conditions and intended loads.

Lifting Operation Equipment

14. All lifting operation equipment shall be 3rd party inspected on an annual basis, and copies of certificates held at site.

15. All lifting operation equipment shall be inspected on a minimum 3-monthly basis by a competent rigger / slinger and a register of all equipments shall be maintained, identifying serial number, date of last inspection and name of inspector.

16. All lifting operation equipment shall be fitted with tags containing identifying serial number, and color coded by either tape or paint, which shall be clearly visible and durable.

17. Lifting operation equipment will conform to the following color coding following satisfactory completion of inspection:

    - red January – March inclusive
    - blue April – June inclusive

- yellow July – September inclusive
- green October – December inclusive

18. All lifting operation equipment shall be inspected by a competent rigger / slinger before each use.

19. Only a qualified rigger / slinger are to rig the load to be lifted.

20. All lifting operation equipment when not in use shall be stored off the ground.

21. Defective lifting operation equipment shall be made unusable immediately and clearly marked "defective" in all applicable languages to the workforce. Defective equipments shall be removed from site immediately for disposal.

Lifting Operations

22. All requirements of Standard 221 are to be met for Lifting Operations.

23. Contractor is to ensure all relevant Encroachment Permits have been approved and are available for inspection on site before lifting commences.

24. During all lifting operations, the use of mobile cell phones and pagers by anyone considered essential to the operation (crane operator, banks-man, slingers, and rigger) shall not be permitted.

25. All lifts must take into account wind conditions and rated load and boom lengths must be reduced according to manufacturer's specifications.

26. Prior to every lift, a test lift shall be conducted, raising the load to approx. 0.5m height and holding it for 2 minutes before proceeding.

27. Tag lines are to be used on all lifts.

28. Crane operator must have clear line of site with the banks-man at all times.

29. All windows are to be free from curtains or other obstructions to ensure that the operator has clear vision at all times.

30. No person is permitted to be under any load that is suspended.

31. No person is permitted to be on or touching any load that is suspended.

Specific to Mobile Cranes

32. Outriggers must be used as specified by crane manufacturer and fully extended on all sides when performing static lifting operations.

33. Sound timber packing or metal plates shall be positioned under each outrigger pad to distribute the load.

34. The outer edge of crane outrigger pads must be a minimum of 2m from edges of excavations or any other bearing surfaces.

35. A safety clear zone consisting of the full length of jib + 10m should be identified 360 degrees around all cranes, (or where impracticable around the working arc of the lift zone), and exclusion barriers erected. No persons apart from banks-man and rigger are allowed in the safety clear zone during a lifting operation.

36. Fly jibs on telescopic cranes shall only be erected or dismantled by a competent crane operator.

37. Anti-two block to be fitted and functioning.

38. Unless in an emergency situation, no lifting operations may take place on roads and highways unless coordinated and approved through Royal Commission Roads Department, and the correct signage and barricades are in use.

39. It is strictly forbidden to move any crane boom or load line within the following distances of overhead power lines, unless the line has been de-energized:

    - up to 25000 volts 35 feet (10m)
    - over 25000 volts 60 feet (20m)

40. Any lifting operations that are within the above distances of any other electrical power lines require an Encroachment permit issued and approved by SECO.

41. Once voltages have been identified height restrictors (goal posts) must be erected at both sides of overhead lines to indicate the safe working distance.

42. Crane Operator is to ensure that counterweight and housing swing radius of all mobile cranes are barricaded to prevent accidental direct contact by the crane or load.

43. Any lifting operations that are within 15m of any water lines require an Encroachment permit issued and approved by Marafiq.

Excavators

44. Excavators will only be approved for lifting operations when:

    - supplied with manufacturer's lifting point attachment and check valves (no site fabricated lifting points/devices permitted. Manufactures operation manual is in the vehicle cab, and the manual shows the machine can be used for lifting and only when the manual requirements are fully complied with.
    - supplied with a safe load indicator
    - has the safe working load (SWL) clearly displayed
    - has a 3rd party inspection certificate [for lifting]
    - a task specific risk assessment has been completed

Loader Cranes (Hiab)

45. Loader cranes may only be used for loading and unloading of materials and/or equipment to and from their own payload area, unless prior approval has been sought from Royal Commission ES&H Department.

46. In these exceptional circumstances, approval will only be given when:

    - The driver / operator holds a valid and in-date Saudi Government driving license, and is trained to operate the specific Hiab by examination, holding a current approved certificate / license from an approved and internationally recognized source
    - The safe working load (SWL) of the Hiab is clearly displayed
    - The Hiab has a 3rd party inspection certificate
    - Anti-two block is fitted and functional
    - All other requirements for lifting operation equipment and mobile cranes are met.

47. Hiabs used on public roads for lifting operations shall comply with Saudi Arabian Ministry of Communications Standards for Road Safety Features & Royal Commission guideline details for temporary traffic control (01570-1).

48. Hiabs shall at no time be used for lifting people, even in approved/certified man-baskets.

49. Anti-two block to be fitted and functioning.

Specific to Friction Cranes

50. A friction crane operator shall have been trained specific to that particular friction crane and shall be trained on the requirements of Friction crane which is stipulated in this standard and proof of training shall be retained by the contractor and produced to Royal Commission when this is being demanded.

51. A Friction Crane Pre Lift checklist (Appendix 7) shall be completed for every lift made with a friction crane.

52. The friction crane operator and ground support personnel shall ensure that all personnel are removed from the swing path and that no personnel walk or work under a suspended load.

53. The friction crane team shall maintain a 10 foot minimum distance from suspended loads and a greater distance if the load is suspended at heights above 15 feet. Tag lines of sufficient length shall be used to maintain the required 10 foot separation distance. The use of grab hooks will allow ground support personnel to grab tag lines and maintain a safe distance from suspended loads.

54. The friction team shall establish radio communications requiring the operator to announce via radio prior to releasing the break and once the break is set to alert the rigging crew of the status of the crane and potential risk of free fall. The hoist drum parking break shall be set whenever the crane is in idle and not directly engaged in lifting activities.

55. When not being used for a lift, the headache (overhaul) ball and main block, if not tied back, shall be lowered to within 8 feet from ground surface and a 10 foot exclusion zone established around the headache ball, and as applicable, main block. The requirement to lower the headache ball and main block is not applicable when walking a friction crane; however, the crane crew shall make sure that no personnel are allowed within the fall zone of the headache ball and main block during travel.

56. Friction cranes shall not be used to hoist suspended personnel platforms. Suspended personnel platform shall only be hoisted with power operated up and down boom and load lines.

57. Any hydraulic crane which have the option of using it in free fall mode shall have the system disabled and cannot be enabled by the operator from the cab.

58. Contractor shall make sure that any subcontractors who use friction cranes are complying with the requirements of Friction cranes set forth in this standard.

Specific to Tower Cranes

59. Contractor must seek prior approval from Royal Commission Construction Department to install, erect and use any tower crane for construction contracts. Proposed tower crane details are to be included in the initial application.

60. Once approval has been given in writing, Contractor must submit foundation design, including calculations to Royal Commission Construction Department for approval. Once approved, a Tower Crane Foundation Design Certificate (Appendix 1) will be issued by the Resident Engineer (Facility Contracts Supervisor (FCS)) of the Area Construction Team.

61. Prior to the concrete pour of the foundation for the tower crane, Contractor must contact the Resident Engineer (FCS) of the Area Construction Team who will issue, and sign, a Tower Crane Foundation Compliance Certificate (Appendix 2), confirming that the construction is in compliance to the approved design.

62. After curing of the foundation, the Contractor must contact the Resident Engineer (FCS) of the Area Construction Team who will issue, and sign, a Tower Crane pre-erection Inspection Certificate (Appendix 3), confirming the foundation meets quality control standards.

63. Once the tower crane has been constructed and inspected by a 3rd party, before any works may commence, Contractor must contact Resident Engineer (FCS) of the Area Construction Team who will issue a Tower Crane Certificate to Operate (Appendix 4).

64. All tower cranes are to have a Lift Plan containing separate lift calculations for average lift and worst case scenario lift.

65. All tower cranes are to have aviation warning lights fitted.

66. All tower crane Lift Plans are to contain an emergency procedure for extracting an injured tower crane operator. This procedure must be tested by emergency drill on a quarterly basis

during the life of the Contract and documented; documentation will be made available to Royal Commission on request.

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

TOWER CRANE
FOUNDATION DESIGN CERTIFICATE

Certificate #:

Project:

Tower crane #/Location

Tower Crane Make & Model

Design criteria and references:

Drawings and Documents issued to site:

Limitations or Restrictions:

We certify that reasonable professional skill and care has been used in the preparation of this design, that the details have been checked for compliance with the relevant standards listed above and that the design has been accurately translated into the drawings and other documents issued to site:

Signed

Name:

Position:

Company:

Appendix 2

TOWER CRANE
FOUNDATION COMPLIANCE CERTIFICATE

Certificate N$^{O.}$:

Project:

Tower crane N°/Location

Tower Crane Make & Model

Information Checked:

Design Criteria:

Notes and observations:

We certify that reasonable professional skill and care has been used in checking the design of this tower crane foundation including the drawings and other documents listed above:

Signed **Date**

Name:

Position:

Company:

Appendix 3

TOWER CRANE
PRE -ERECTION INSPECTION CERTIFICATE

Certificate N$^{O.}$:

Project:

Tower crane N°/Location

Tower Crane Make & Model

Item (delete or complete where not applicable)	Checked by:	Date:
Compliance with design drawings/specification		
Level check		
Cast-in items within tolerance		
Concrete quality/strength		
Pile Tests (if applicable)		
Steel grade		
Weld Quality (if applicable)		
Bolt grade		
Torque tightness		
Electrical devices		

Documents against which foundation has been checked: (Drawings No's / Document Reference)

Foundation Design Cert No.

Design Check Cert No.

The above inspections having been carried out satisfactorily, erection of the tower crane superstructure may proceed:

Notes and observations

Signed **Date**

Name:

Position:

Company:

Appendix 4

TOWER CRANE
CERTIFICATE TO OPERATE

Certificate N$^{O.}$:

Project: **Tower crane N°/Location**

Tower Crane Make & Model

TOWER CRANE FOUNDATION DESIGN CERTIFICATE	
TOWER CRANE FOUNDATION DESIGN CHECK CERTIFICATE	
TOWER CRANE FOUNDATION PRE - ERECTION INSPECTION CERTIFICATE	
TOWER CRANE TEST INSPECTION CERTIFICATE	
LIMITATIONS OR RESTRICTIONS PLACED ON CRANE USE	

We certify that reasonable professional skill and care has been used in the preparation of this design, erection and independent testing for compliance with the relevant standards and maybe operated by competent and trained personnel only:

Signed **Date**

Name:

Position:

Company:

Appendix 5

WIND SPEED DEFINITION

The following table lists speed in the major units, relative to Beaufort Wind Scale Numbers, the internationally reference for wind force.

Cranes shall cease operation when the wind speed exceeds the safe operating level recommended in the manufacturer's specification.

Updated weather reports from the local weather office or equivalent must be obtained prior to each lift.

Beaufort Numbers	Description	Knots	M/Sec	KM/H	Miles/H
0	Calm	0-1	0 – 0.51	0 – 1.84	0 – 1.15
1	Light Air	1-3	0.51 – 1.53	1.84 – 5.52	1.15-3.45
2	Light Breeze	4-6	2.04 – 3.07	7.36 – 11.04	4.6 - 6.9
3	Gentle Breeze	7-10	3.58 – 5.11	12.88 – 18.4	8.15 – 11.5
4	Moderate Breeze	11-16	5.62 – 8.18	20.24 – 29.44	12.65 – 18.4
5	Fresh Breeze	17-21	8.69 – 10.73	31.38 – 38.64	19.55– 24.15
6	Strong Breeze	22 – 27	11.24 – 13.80	40.48 – 49.68	25.3 – 31.05
7	Near Gale	28 – 33	14.31 – 16.87	51.52 – 60.72	32.2 – 37.95
8	Gale	34 – 40	17.38 – 20.44	62.56 – 73.6	39.1 – 46
9	Strong Gale	41 – 47	20.96 – 24.02	75.44 – 86.48	47.15– 54.05
10	Storm	43 – 55	24.53 – 28.11	88.32 – 101.2	55.2 – 63.25
11	Violent Storm	56 – 63	28.62 – 32.20	103.04 – 115.92	64.4 – 72.46
12	Hurricane	64+	32.71+	117.76+	73.6