

CHECKLIST FOR FIXED MOUNT TOWER CRANE USERS

This checklist provides an overview of the basic requirements which would help to ensure that a tower crane is safe for use. Tower crane users should work with suppliers / owners to meet these minimum requirements and address any concerns before the use of these lifting equipment.

The items in this checklist are non-exhaustive and users are encouraged to make modification and customization to suit to your work processes and conditions at the workplace.

A. EQUIPMENT APPROVED FOR USE		SUGGESTED EVIDENCE	Yes	No
1	Tower crane is of type-approved by MOM. (registered with effect from 1 April 2004)	<ul style="list-style-type: none"> Type-approval document 	<input type="checkbox"/>	<input type="checkbox"/>
2	Tower crane is registered with MOM.	<ul style="list-style-type: none"> LM Certificate or equivalent 	<input type="checkbox"/>	<input type="checkbox"/>
B. RISK ASSESSMENT		SUGGESTED EVIDENCE	Yes	No
3	Risk assessment conducted for the various work processes (e.g. installation, alteration, use, maintenance and dismantling)	<ul style="list-style-type: none"> Completed risk assessment form for the various work processes 	<input type="checkbox"/>	<input type="checkbox"/>
4	Risk assessment team comprised of representatives from the occupier, equipment supplier, equipment operator etc.	<ul style="list-style-type: none"> Risk assessment form indicating the composition of risk assessment team 	<input type="checkbox"/>	<input type="checkbox"/>
5	Safe work procedures are developed and implemented before work is being carried out.	<ul style="list-style-type: none"> Safe work procedures implementation plan Inspection to verify implementation of safe work procedures 	<input type="checkbox"/>	<input type="checkbox"/>
6	Safe work procedures are effectively communicated to all relevant parties (e.g. approved crane contractor, crane operator, lifting supervisor, signalman, rigger etc.)	<ul style="list-style-type: none"> Records of briefing / training to relevant parties 	<input type="checkbox"/>	<input type="checkbox"/>
C. LAYOUT PLAN		SUGGESTED EVIDENCE	Yes	No
7	Layout plan is updated and clearly indicates the zones of influence of the tower crane.	<ul style="list-style-type: none"> Layout plan complied with requirements outlined in appendix 1 	<input type="checkbox"/>	<input type="checkbox"/>

8	Layout plan is checked and endorsed by an Authorised Examiner (AE) for full compliance	<ul style="list-style-type: none"> Authorised Examiner's stamp and signature to endorse the layout plan 	<input type="checkbox"/>	<input type="checkbox"/>
9	Operators, lifting supervisors , riggers and signalmen have seen and understood the zone of operation	<ul style="list-style-type: none"> Layout plan with acknowledgement signature from various relevant persons (Operators, lifting supervisors, riggers and signalmen) 	<input type="checkbox"/>	<input type="checkbox"/>
10	Approval by other relevant authorities for the usage of tower crane	<ul style="list-style-type: none"> Approval documents from CAAS, LTA, Mindef and SLA 	<input type="checkbox"/>	<input type="checkbox"/>
D. DESIGN AND CONSTRUCTION OF FOUNDATION / WALL TIE		SUGGESTED EVIDENCE	Yes	No
11	Tower crane's foundation and wall tie are designed and endorsed by a Professional Engineer (PE)	<ul style="list-style-type: none"> Document of design drawing and calculations of foundation and wall tie with Professional Engineer's stamp and signature 	<input type="checkbox"/>	<input type="checkbox"/>
12	Construction of the tower crane's foundation and wall tie are supervised by a Professional Engineer	<ul style="list-style-type: none"> Load data sheet and letter of undertaking from the PE that he would supervise the construction of the foundation / wall tie Letter of undertaking from the PE that he had supervised the construction of the foundation / wall tie and that they are constructed in accordance to his design 	<input type="checkbox"/>	<input type="checkbox"/>
13	Tower crane's foundation is sufficiently barricaded to prevent against being knocked by moving objects	<ul style="list-style-type: none"> Document of design drawing to include plan for barricade Inspection to verify barricades are installed 	<input type="checkbox"/>	<input type="checkbox"/>
14	Tower crane's foundation is not submerged under water and is cleared of debris / rubbish	<ul style="list-style-type: none"> Inspection to verify requirements are met 	<input type="checkbox"/>	<input type="checkbox"/>
E. PRE-INSTALLATION		SUGGESTED EVIDENCE	Yes	No
15	All load bearing parts and safety devices are checked by an Authorised Examiner before installation to ensure that they are of good construction, sound material, free from patent defects and of adequate design	<ul style="list-style-type: none"> Inspection Checklist completed and signed by Authorised Examiner (Appendix 2) Non destructive tests (NDT) report (if applicable) 	<input type="checkbox"/>	<input type="checkbox"/>

16	Only original load bearing members from the manufacturer are to be used for the installation	<ul style="list-style-type: none"> Letter of undertaking from supplier / owner stating that original load bearing members are used 	<input type="checkbox"/>	<input type="checkbox"/>
F. INSTALLATION		SUGGESTED EVIDENCE	Yes	No
17	Notify MOM at least three days before the date of installation	<ul style="list-style-type: none"> Notification form to MOM for use of tower crane in workplace 	<input type="checkbox"/>	<input type="checkbox"/>
18	Only Approved Crane Contractors (ACC) are to install, alter, dismantle and repair tower crane.	<ul style="list-style-type: none"> Approval document as Approved Crane Contractor (ACC) 	<input type="checkbox"/>	<input type="checkbox"/>
19	Post installation inspection carried out by Authorised Examiner which include load tests, inspection of safety devices and limit switches	<ul style="list-style-type: none"> Inspection checklist completed and signed by Authorised Examiner (<u>Appendix 2</u>) 	<input type="checkbox"/>	<input type="checkbox"/>
G. OPERATION OF CRANE		SUGGESTED EVIDENCE	Yes	No
20	Only trained and competent persons are to be involved in the lifting operation (i.e. crane operator, lifting supervisor, signaller and rigger)	<ul style="list-style-type: none"> Crane operator registration card, training records and certificate Lifting supervisor, signaller and rigger's training records and certificates 	<input type="checkbox"/>	<input type="checkbox"/>
21	Lifting plan is developed and made available to all persons involved in the lifting	<ul style="list-style-type: none"> Written lifting plan and acknowledgement from persons involved in the lifting 	<input type="checkbox"/>	<input type="checkbox"/>
22	Manufacturer's operating manual and operation log book are made available to the crane operator	<ul style="list-style-type: none"> Manufacturer's operating manual Crane operator log book 	<input type="checkbox"/>	<input type="checkbox"/>
23	<p>Crane operator to conduct pre-operational checks at the start of the work shift. The checks should include but not limiting to the following areas:</p> <ul style="list-style-type: none"> Observing the verticality of the crane Check all limit switches Check all brakes Check all warning devices Ensure that the electrical cables in the mast are free from twisting (if the crane is without corrective rings) Observe any other visual or audio abnormalities <p><i>Source: CP62: Code of practice for Safe Use of tower Cranes</i></p>	<ul style="list-style-type: none"> Pre-operation inspection checklist based on manufacturer's instruction Record of completed checklist by operators 	<input type="checkbox"/>	<input type="checkbox"/>

H. MAINTENANCE		SUGGESTED EVIDENCE	Yes	No
24	Tower crane has a regular maintenance programme that is based on manufacturer's instructions	<ul style="list-style-type: none"> Written maintenance programme by supplier / maintenance service provider Maintenance record and service report 	<input type="checkbox"/>	<input type="checkbox"/>
25	Maintenance is carried out by competent person	<ul style="list-style-type: none"> Training record or relevant document of competency 	<input type="checkbox"/>	<input type="checkbox"/>
26	Tower crane is inspected by an Authorised Examiner at least once every 12 months	<ul style="list-style-type: none"> Inspection report signed by authorized Examiner 	<input type="checkbox"/>	<input type="checkbox"/>

Comments:

Note:

- Professional Engineer (PE) refers to a person who has a valid registration with the Professional Engineers' Board, Singapore
- Authorised Examiner (AE) refers to a person who is approved from the Commissioner for Workplace Safety and Health to carry out examination or test as stipulated by the conditions of his approval.

Useful References

Legislations:

- Workplace Safety and Health Act
- Workplace Safety and Health (General Provisions) Regulations
- Workplace Safety and Health (Construction) Regulations
- Workplace Safety and Health (Risk Management) Regulations
- Factories (Operation of Cranes) Regulations

Code of Practices & Singapore Standards:

- CP62: 1995 Code of Practice for Safe Use of Tower Cranes
- SS343 – 1: 2001 Lifting gear – wire rope slings
- SS343 – 2: 1989 Lifting gear – hooks
- SS343 – 3: 1990 Lifting gear – Shackles

Guidelines:

- Technical Advisory on Safe Operation of Lifting Equipment
- Guidelines for the Notification for Use of Tower Crane in Workplace
- Risk assessment Guidelines

Where to find:

- Workplace Safety and Health Act and subsidiary legislations are available for download at:

<http://www.mom.gov.sg>

- In addition, guidelines and technical advisories are also available for download at:

<http://www.wsh.sg>

- Code of Practices & Singapore Standards can be obtained from:

SNP Corporation (Legal) Ltd
Legal Publication Retail Outlet
1 Kim Seng Promenade #18-01/06
Great World City East Tower S(237994)

Tel : (65) 6826 9691

Website : <http://www.snpcorp.cpm/webshop>

APPENDIX 1: ACCEPTANCE CRITERIA FOR THE LAYOUT OF TOWER CRANES

Source: Guidelines for the Notification for Use of Tower Crane in Workplace

The table below shows the acceptance criteria for tower cranes to be used:

Issues	Criteria
Zone of Influence (includes both jib and counterjib)	<p><u>For Saddle Jib (Hammer-head) Tower Crane</u></p> <p>The Zone of Operation is within the factory boundary.</p> <p>unless:</p> <ul style="list-style-type: none"> Slewing limit switches are installed (and indicated on the plan) to prevent the jib from slewing beyond the factory boundary; i.e. the tower crane shall not slew 360 degrees.
	<p><u>For Luffing Jib Tower Crane</u></p> <ol style="list-style-type: none"> To conduct Risk Assessment with control measures on the proposed use of luffing jib tower crane. The control measures shall be reviewed and endorsed by an AE. To implement and maintain records for the safe use of luffing jib tower crane. The Zone of Collapse is within the factory boundary. <p>unless:</p> <ul style="list-style-type: none"> The collapsed zone lies within uninhabited areas or non-public access areas; The tower crane is sited such that it is within or surrounded by the building/s under construction; i.e. the zone of collapse is mitigated by the building structure. <p>Written acknowledgement and agreement from the owner of the adjacent properties that their property lies within the zone of collapsed shall be obtained.</p> <ol style="list-style-type: none"> The luffing jib tower crane when not in operation shall be so parked within the zone of collapsed as proposed in the layout plan.
Crane to crane interference	<p>For factory with more than one tower crane, crane-to-crane interference must be prevented by suitable devices, such as slew or trolley limit switches or anticollision device. The zone of influence of the counter-weight jib must not interfere with the zone of influence of another tower crane. The minimum horizontal buffer distance between the jibs / counter-jibs of both tower cranes shall not be less than 3 metres.</p>
Height Separation	<p>Where the zone of influence of two or more tower cranes interferes with one another within a site, there must be a height separation of at least 3 metres vertically between the jib of a tower crane to the highest point of the other tower crane or structure within the zone of influence.</p>

Note : The zone of collapse refers to the affected area in a worst case scenario should a tower crane collapse completely, i.e. both mast and jib.

1. The occupier and AE shall ensure that:
 - a) The jib, counterjib and counterweights of the tower crane shall not over-sail or interfere with **any buildings, structures, bridges, public roads or areas within the railway protection zone (ie 40m from the outermost edge of the rapid transit system structure)**, unless the owner/occupier of the tower crane has obtained the consent from the occupant of the building or relevant authorities (eg LTA), etc allowing the jib of the tower crane to over-sail the building or public roads.
 - b) The written consent shall be accompanied by a proposal by the occupier stating down preventive measures to be taken if the jib is over-sailing the building or road (e.g. special hoarding or periodic road closure).
 - c) The jib or counterjib of the tower crane shall not over-sail any **school, petrol station, community clubs, places of worship or any other public buildings** beyond the factory boundary. This is regardless whether permission had been obtained by the owner of the establishment.
2. Written approvals shall also be obtained from the Civil Aviation Authority of Singapore and Ministry of Defence for the Installation of the tower crane. This is to ensure that the tower crane, among other things, will not interfere with their activities.
3. The addresses of the relevant authorities are as follows:
 - (a) Director-General of Civil Aviation
Civil Aviation Authority of Singapore
Singapore Changi Airport
P.O. Box 1
Singapore 918141
 - (b) Manager
Development & Building Control
Land Transport Authority
PSA Building
460 Alexandra Road #19-00
Singapore 119963
 - (c) Head, Air Plans
Air Plans Dept, HQ RSAF
Mindef Building
Gombak Drive
Singapore 669638

APPENDIX 2: CHECKLIST FOR INSPECTION & TESTING OF TOWER CRANE

Source: Guidelines for the Notification for Use of Tower Crane in Workplace

Factory No.	
Occupier	
Location	
Name of Approved Crane Contractor/Erector	

LM No.	Serial No.	Brand/Model	Year Manufactured

Pre-Installation Checks		Date / Time:															
S/No.	Item	Yes / No	Remarks														
1	The tower crane was of the type submitted to the Occupational Safety and Health Division. (OSHD).																
2	All bolts/pins or connecting fasteners used are in accordance to manufacturer's design and readily identifiable.																
3	All mast sections have identification markings.																
4	a) All mast sections are free from defects and corrosion that may affect their structural integrity. b) Non-destructive testing not required to establish this.																
5	Random samples of all bolts/pins or connecting fasteners used are non-destructively tested for any defects.*																
	<table border="1"> <thead> <tr> <th>Number of bolts/pins used (excluded those used at the bottom 3 mast sections)</th> <th>Sample size required</th> </tr> </thead> <tbody> <tr> <td>9 to 15</td> <td>5</td> </tr> <tr> <td>26 to 40</td> <td>10</td> </tr> <tr> <td>41 to 65</td> <td>15</td> </tr> <tr> <td>66 to 110</td> <td>20</td> </tr> <tr> <td>111 to 180</td> <td>25</td> </tr> <tr> <td>181 to 300</td> <td>30</td> </tr> </tbody> </table>			Number of bolts/pins used (excluded those used at the bottom 3 mast sections)	Sample size required	9 to 15	5	26 to 40	10	41 to 65	15	66 to 110	20	111 to 180	25	181 to 300	30
	Number of bolts/pins used (excluded those used at the bottom 3 mast sections)			Sample size required													
9 to 15	5																
26 to 40	10																
41 to 65	15																
66 to 110	20																
111 to 180	25																
181 to 300	30																
6	<p>a) Random samples of all slew ringbolts used are tested for any defects. These bolts should be taken from positions on the slew ring that are mutually 90 degrees apart and identified in some manner that is indicative of their original position.*</p> <p>b) Non-destructive test is conducted on the welding of the slew ring attachment to the slew ring mount.</p>																
7	The machine deck is free from any corrosion or defect that may affect its structural integrity.																
8	The operator's cabin is free from any defects that may affect its serviceable use.																

Pre-Installation Checks		Date / Time:	
S/No.	Item	Yes / No	Remarks
9	A safety bar is fitted across the operator's cabin window where there is likelihood of the operator falling through it.		
10	An approved fire extinguisher is provided in the operator cabin.		
11	An emergency stop button, which will terminate the operation of the crane engine, is installed in the operator cabin and correctly identified.		
12	All controls are checked for correct identification.		
13	The hydraulic system is free from any oil leaks.		
14	All the brake and clutch mechanisms have been stripped and serviced.		
15	An emergency load lowering device is fitted.		
16	All rope anchorages are serviced.		
17	All counter-weight attachments, trolley, trolley wheels etc., are serviced and free from defects.		
18	The cat-head including the tie-rods are free from any defects that may affect its serviceable use.		
19	All jib sections are free from defects and corrosion that may affect their structural integrity.		
20	All main cords on each jib section are thickness tested to detect internal corrosion. .		
21	All sheaves and bearings are free from any defects that may affect their serviceable use.		
22	The hook, hook block, overhauling weight and associated attachments are free from wear and damage.		
23	The climbing frame and equipment is free from any defects that may affect their serviceable use.		
24	The foundation has been designed; and certified by a Professional Engineer of the relevant discipline and constructed accordingly.		

Installation Checks		Date / Time:	
S/No.	Item	Yes / No	Remarks
25	The tower crane is sited as indicated in the layout plans endorsed by the Occupational Safety and Health Division.		
26	The installation is in accordance with the configuration and manufacturer's instructions.		
27	The bolts/pins or other connecting fasteners used for the bottom 3 mast sections are new ones.		
28	The tower crane is plumbed to check that it is vertical.		

29	All the pins/bolts or fasteners used for the assembly are fitted with safety pins or locking pins.		
30	Bolts are tightened to the correct torque.		
31	Tie rods to the boom and jibs are securely fastened.		
32	Tie-backs are fastened as per designed.		
33	Fixed access ladders are provided for access to all serviceable parts of the tower crane.		

Other Tests / Checks		Date / Time:	
S/No.	Item	Yes / No	Remarks
34	The tower crane is load tested at both its maximum and minimum working radii with sufficient load.		
35	Limit switches are tested : a) overhoist limit switch b) overload limit switch c) trolley limit switch d) slewing limit device		
36	A load-radius indicator with warning signal is installed and in good working condition.		
37	All safety devices and brakes are checked.		
38	Wind anemometer is installed and in good working condition.		
39	Anti-collision devices are tested to stop the tower crane's operation such that the crane-to-crane interference must be maintained at not less than 3 metres.		

Other Remarks:

Name & Signature of authorised examiner: _____

Date : _____