



Lesson to learn from crane lorry incidents and Application of De-rated Load Chart

Presented by Jeffrey LEE,
Sr. Project Manager

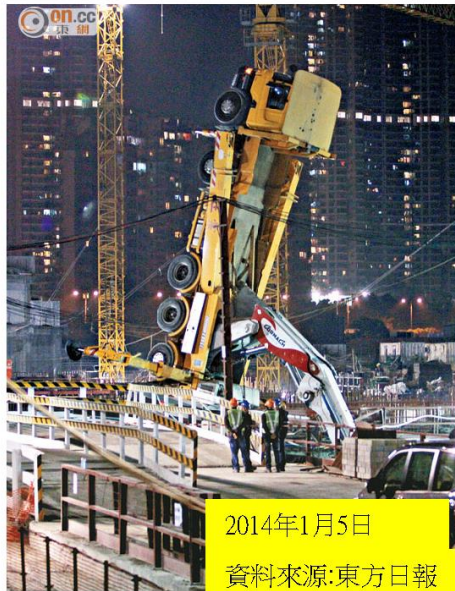
CONTENT

1. Crane related accident news
2. Safety Control Measures
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 - Critical Part inspection
 - Lifting Plan
3. De-rating chart
4. Summary



Total 15 mins

Crane related accident news



Date :

July 2014

Plant: 40T Crane Lorry

Material Description:

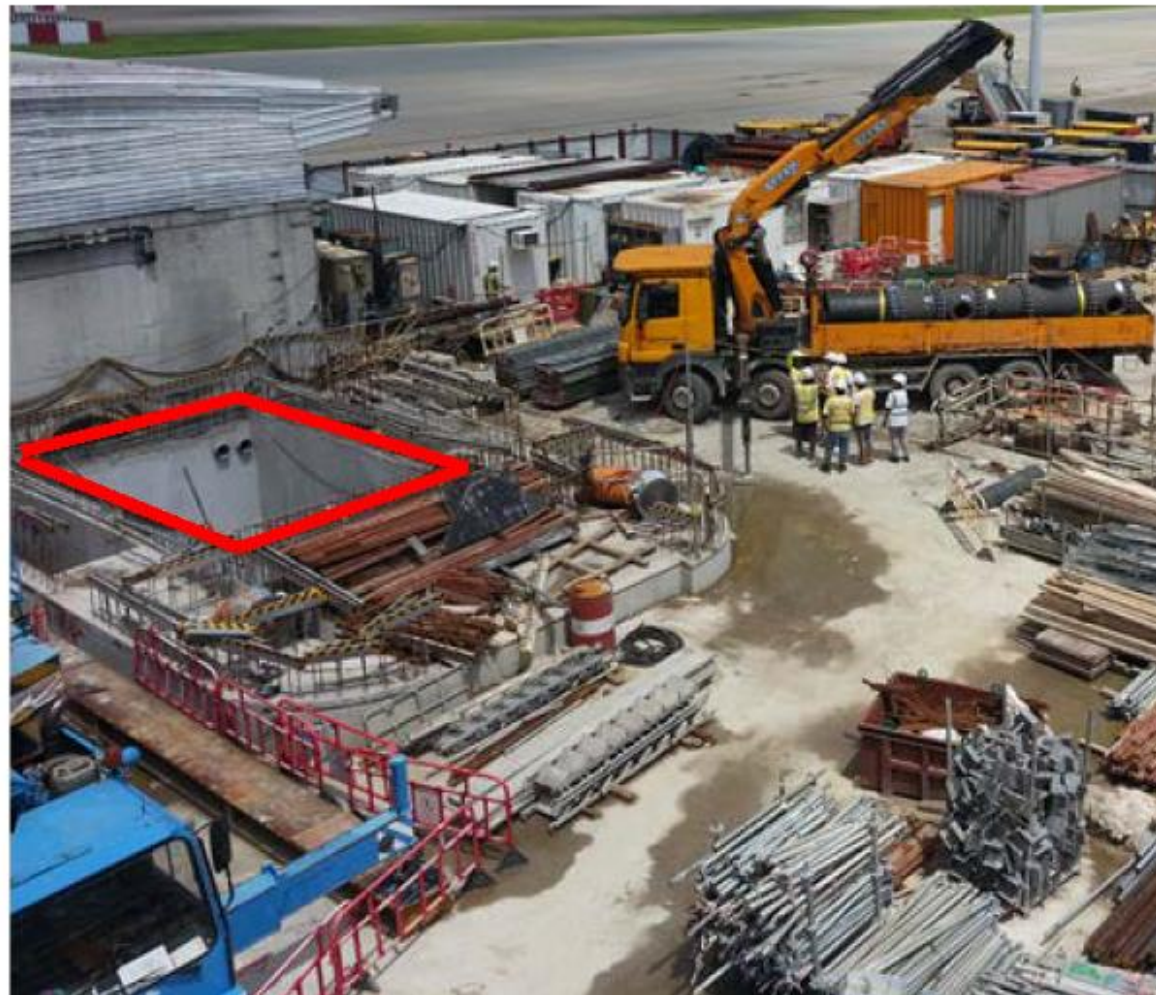
6 meter length 800mm

Ductile Iron assembled
pipe (Weight: 3.3 tonnes)

Destination:

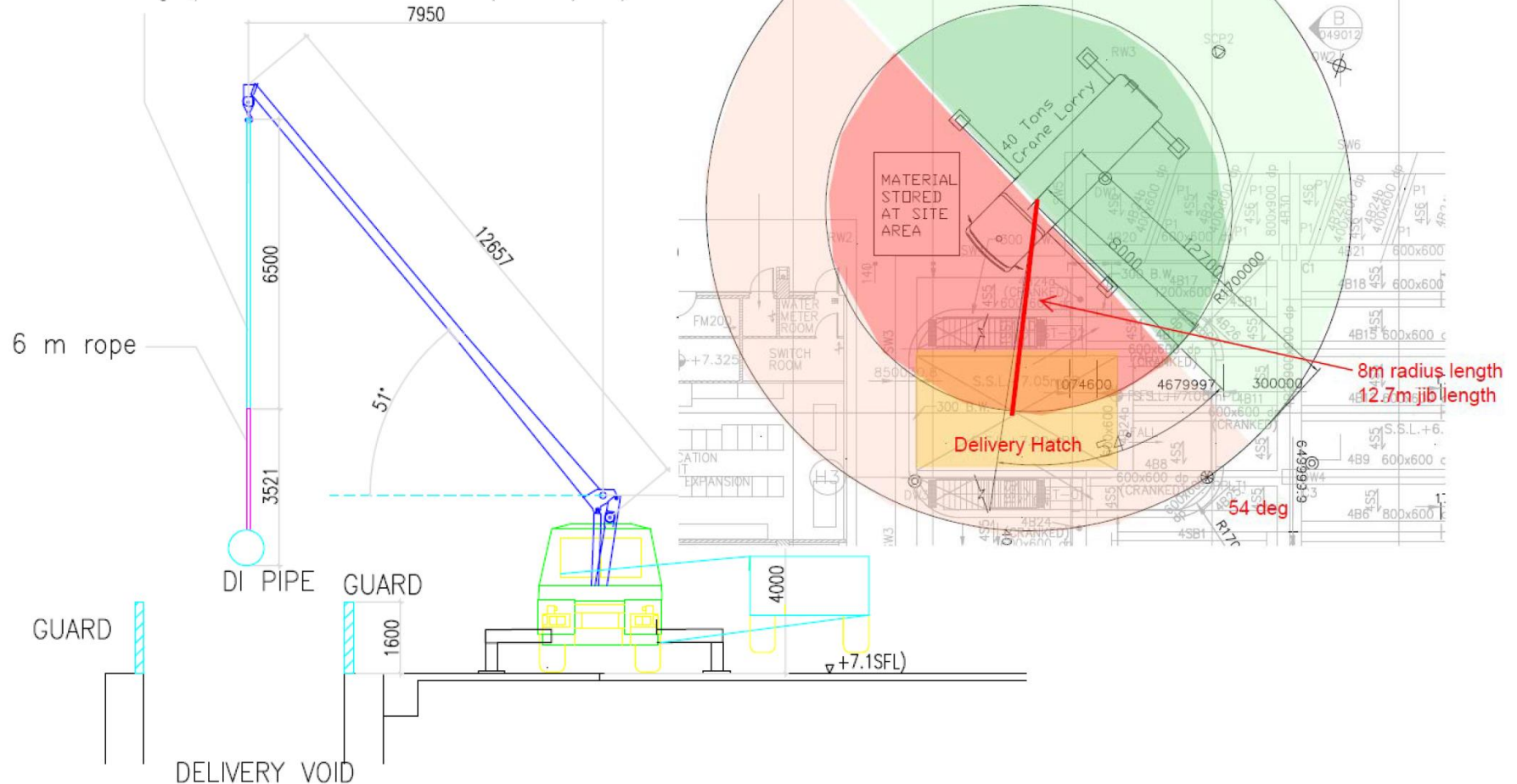
From Ground to
Basement

No one was injured and
no damage was caused.



Incident layout & description

6.5m chain sling (ref:form 7 cert no: CT/5103/14)



When lifting the pipe from the lorry to the opening, the jib was extended to around 8m radius length/12.7m jib length at a boom angle of 51deg and swing angle of 54deg (as shown in the drawing), at that moment the 2 back wheels of crane lorry rose up 500mm off the ground.

Safety Control Measures



Access control

- Gate permit
- Form 1,3,5
- LG certificates
- Provision of out-rigger pad



CPI inspection

- Inspected by Plant Dept
- Valid for 4 months
- Regularly checked by Site Plant Mechanic



Lifting Plan

- Load
- Ground condition
- Rigging method
- De-rating chart



Crane Lorry Access Control



Security Guard



Walkie Talkie to
Block Foreman



Borrow bearing pad if
they don't have

吊籠車進入工前檢查程序(驗訂)

1. 由「專門知識」在吊籠車檢驗員簽名證明，才可進入現場；
2. 檢查「吊籠車檢驗員證書」及「吊籠車」的有效期間；



2. 檢查「吊籠車檢驗員證書」顯示，是否止效



吊籠車作證號碼

吊籠車檢驗員證書		吊籠車檢驗員證書
吊籠車檢驗員證書 CRANE LORRY OPERATOR'S CERTIFICATE 此證書是根據《建築物條例》及《建築物(安全)規例》發出的。 This certificate is issued under the Building Ordinance and the Building (Safety) Regulations.		吊籠車檢驗員證書 CRANE LORRY OPERATOR'S CERTIFICATE 此證書是根據《建築物條例》及《建築物(安全)規例》發出的。 This certificate is issued under the Building Ordinance and the Building (Safety) Regulations.
姓名 (Name): 吊籠車檢驗員 (Crane Lorry Operator) 姓名 (Name): 吊籠車檢驗員 (Crane Lorry Operator)	吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number) 吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number)	吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number) 吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number)
簽名 (Signature): 簽名 (Signature)	簽名 (Signature): 簽名 (Signature)	簽名 (Signature): 簽名 (Signature)
日期 (Date): 日期 (Date)	日期 (Date): 日期 (Date)	日期 (Date): 日期 (Date)
有效期間 (Valid Period): 有效期間 (Valid Period)	有效期間 (Valid Period): 有效期間 (Valid Period)	有效期間 (Valid Period): 有效期間 (Valid Period)
吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number) 吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number)	吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number) 吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number)	吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number) 吊籠車檢驗員證書號碼 (Crane Lorry Operator's Certificate Number)
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Check certificate

Crane lorry check at site

Site:- _____ Serial No. _____

吊運車輛之起重裝置檢查表

到料日期: _____ 車牌號碼: _____

檢查項目:	檢查後請加上V	備註
操作人員證書:	☐ 合要求 ☐ 不合要求	
起重機操作員每週檢查表:	表格 1 ☐ 合要求 ☐ 不合要求	
起重機證書: (有效期為一年)	表格 3 ☐ 合要求 ☐ 不合要求	
	表格 5 ☐ 合要求 ☐ 不合要求	
使用之吊具(包括索、吊帶、鋼絲及塞古等): (有效期為6個月)	表格 6 ☐ 合要求 ☐ 不合要求	
	表格 7 ☐ 合要求 ☐ 不合要求	
安全操作負荷表(顯示在操作桿附近):	☐ 合要求 ☐ 不合要求	
伸縮桿之擺放: (1) 平穩及完全伸展 (2) 擺放在枕木或實土上	☐ 合要求 ☐ 不合要求	
塞古使用情況: (1) 吊帶及鋼絲沒有破損 (2) 吊帶及鋼絲適當使用於不同的物料	☐ 合要求 ☐ 不合要求	
沒有明顯修補, 例如焊接附加鐵板以穩固吊臂等(如有明顯修補, 須出示有關測試合格記錄)	☐ 合要求 ☐ 不合要求	
油壓喉管沒有漏油跡象	☐ 合要求 ☐ 不合要求	

承辦商代理人姓名及簽名確認: 姓名: _____ 簽署: _____

建築公司人員姓名及簽名確認: 姓名: _____ 簽署: _____

吊車司機聲明: 本人明白使用吊運車輛運吊的安全要求。並承諾會依據運吊第一碼的程序

及方式進行運吊, 確保一切符合法例要求。

姓名: _____ 簽署: _____

(完成吊運後, 須將此表格交予地盤行政部存檔)

Document check at site

- LALG RPE cert
- ASLI (Loading indicator) check
- Safety Certificate of operator

Fail

Not allow to enter to site

Pass

Allow to enter to site

Remark:

All lifting operations (deliveries or general lifts) must be accompanied by at least 1 rigger and be supervised by a lifting supervisor and a general supervisor (foreman, engineer or equivalent)

Crane lorry check at site

吊車進入工地前檢查程序(驗證)

- 由「金門防架」在車間檢驗吊車有關證書，才可進入地盤：

a. 檢查「操作貨車吊機證明書」及「平安咭」的有效期限。

操作貨車吊機證明書
Certificate of Operation of Truck-mounted Crane
工廠及工業經營(起重機械及起重裝置)規例(第59章)第15A(1)(b)
Reg. 15A(1)(b) of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations

持證人姓名 Holder's Name:
(中文/Chinese): [Redacted]
(英文/English): [Redacted]
編號 Reference No.: B075309
發證日期 Date of Issue: 04/05/2009
有效期限 Validity: 由 04/05/2009 至 03/05/2014

本證明書由 Issued by:
建造業議會發給 Construction Industry Council (CIC)
Mr. Keith Koo, J.P., Chairman of CIC

檢查證書有效限期

相片 Photo

- 檢查「負載操作訊號燈」指示，是否正常。



OK

FORM 5
Particulars and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations
LIFTING APPLIANCES
CERTIFICATE OF RESULTS OF THOROUGH EXAMINATIONS IN THE PRECEDING TWELVE MONTHS
Form approved by the Commissioner for Labour for the purposes of regulation 15(1) of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations

Name of owner: [Redacted]
Address of installation: [Redacted]
Description of appliance: [Redacted]
Date of examination: [Redacted]
Result of examination: [Redacted]

Vehicle: [Redacted]
Model: [Redacted]
Serial No.: [Redacted]
Year: [Redacted]

Max. S.W.L.: [Redacted]
Load on length of 36: 3M

Signature of Registered Professional Engineer: [Redacted]
Date of certificate: [Redacted]

Permit No. 01

入閘証編號

J3559 TM54

駕駛者守則

1. 車窗 在地盤內
2. 檢查 CCTV 鏡頭 後車
3. 溝通 後車
4. CCTV 鏡頭 後車
5. 8 車速

Permit No. 01

入閘証編號

Temporary Permit valid for 1 day only

Critical Part Inspection

01) Mobile crane – Kobelco RK250-III (S/N: EZ05353) – Hold point failure.

Special Plant Inspection (SPI) for Mobile Cranes (移動式吊機)

Date Of Inspection: 12-9-2008 Person Conducting: 李俊傑 簽名: 李俊傑
 Equipment ID No: EZ 05353 Description: KOBELCO RK250-III Company 所屬公司: [Blank]
 檢驗編號: 12-1003

Report Log No. 1

Inspection Item 檢查項目:	Checked: 檢查		Condition: 狀態					Conformity: 合規			Hazard Potential: 潛在危險			Remarks 備註/ Remedial Action Required 須改善:
	Yes	No	A	B	C	D	E	AA	BB	CC	1	2	3	
Boom Assembly 主臂組合	✓													
Upper Carriage Structure 上座	✓													註: 查閱 CHYN-DPOFF-01 日期: Sep 25, 2008 X W W R 0221 P61
Chassis 底盤	✓													
Ballast and Ballasting System 平衡及穩定系統	✓													
Slewing Bearing 轉向系統	✓													
Tyres 輪胎	✓													
Outriggers and Supports 外支撐腳	✓													
Block Brakes/ Safety catch 主制動及安全鎖止裝置	✓								✓					註: 回車後, 需小心 主制動, 安全鎖止裝置, 需小心 主制動, 安全鎖止裝置, 需小心
Pulleys 滑輪組	✓								✓					
Wire Ropes 鋼索	✓								✓					註: 鋼索已檢查, 安全鎖止裝置, 需小心
Winches 捲揚機	✓								✓					
Brakes 制動	✓													
Engine 引擎	✓								✓					車主大型
Aggregate 變速	✓													
Cylinders 汽缸	✓													
Attachments 附件	✓													
Hydraulics 油壓	✓													
Hoses 喉管	✓													
Slewing gears 轉向齒輪	✓													
Secondary steel structures 二座	✓													
Limit Switches 限位開關	✓													
Controls/Indicators 控制及顯示	✓													
Electrics / Switchbox 電器 / 電箱	✓													
ASLI 安全吊車系統	✓													
Safety Cut-Offs 安全鎖止	✓													
Flood light 工作燈	✓													
Warning flash light 閃燈	✓													
Cabins / Controls 座仔 / 控制	✓													
Access 上落通道	✓													
Horn & side mirror 喇叭及側鏡	✓													
Guards and Protections 安全及保護裝置	✓													
Fire Extinguisher 滅火筒	✓													
Emergency Stops 急停	✓													
Warning notice 機器移動告示	✓													
SWL notice 安全吊量告示	✓													

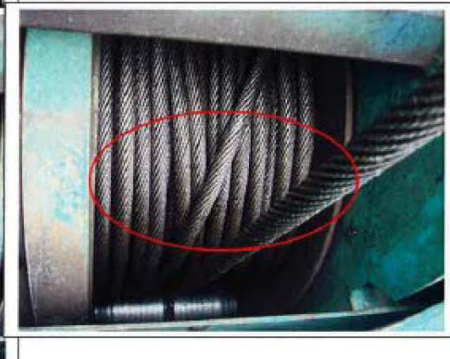
General Upkeep: Excellent 非常良好 ☐ Good 滿意 ☐ Fair 一般 ☐ Poor 劣 ☒

Remedial Action Required 必須改善:	Yes	No	Person Responsible for Taking Remedial Action 負責人姓名:	Department: 部門:
Completed 改善完畢:	Yes	No	Signature of Person Responsible for Taking Remedial Action 負責人簽名:	Date: 日期:
Remedial Action Completed 改善完畢:	Yes	No	Signature of PM / Plant Manager to acknowledge completion of remedial action 項目經理 / 機廠經理簽名:	Date: 日期:

Notes:

A In good order 狀況良好	E Unserviceable condition and not usable 不可使用及不適用	CC Fair practice but does not meet any law or site rules 做法良好, 但未符合任何法例或公司規定
B Condition acceptable/maintenance or repair action required 狀況可接受, 需維修或修理	AA Sub standard & breaks the law, 違例	1 Unserviceable condition, with potential to cause injury / major property damage 狀況不可接受, 有造成人員受傷 / 重大財產損失之可能
C Condition not acceptable and maintenance or repair is required 狀況不可接受, 需維修或修理	BB Sub-standard & does not conform to site specific rules 違反公司規定	2 Hazardous with potential to cause serious injury / property damage 有造成嚴重人員受傷 / 財產損失之可能
D Poor condition and needs immediate improvement 狀況極差, 需立即改善	BB Sub-standard & does not conform to site specific rules 違反公司規定	3 Hazardous with potential to cause harm, minor injury / minor property damage 有造成人員受傷 / 財產損失之可能

Note: Input values in column A or B of "Conditions" will not require input values in both "Conformity" & "Hazard Potential", whereas inputs in column C, D and E will. Original completed reports signed by both the person conducting the inspection & the person responsible for remedial actions are to be submitted to the Safety Department.



Lifting plan sample

Crane Lorry Lifting Plan
貨車吊機吊運計劃

Gammon **ZEROHARM** MAKE SAFETY PERSONAL

This permit must be approved by the Area-in-charge (Supervisor/Foreman) of the work area before commencement of work.
此許可證必須由工作區域的當值料文/主管批核後方可工作。
Without signatures works cannot commence.
簽字核實，方可進行吊運工作。

Plate No. 車牌號碼: AA XXXX
Company 公司: 建 X
Date 日期: 8-6-2015
Time 時間: 09:00 a.m.

Lifting Activity 吊運項目詳情: ELS Work (Sheet Pile Installation)
Location 工作位置: Basement Carpark

Weight and Nature of Load 吊載物種類及重量: P.S.P. (Sheet Pile)
Radius of Crane 吊臂作業半徑範圍: 8m Max.
Safe Working Load of Crane at Planned Radius 半徑內減重後安全重量: 7.26 Ton
Type of Slinging 吊鏈種類: Chain Sling

Operator Name & Card Number 操作機員姓名及卡號: 陳大文
Bankman Name & Card Number 合資格司機姓名及卡號: CWR09020547

Lifting equipment has correct colour code and certificates
吊運裝置已貼有顏色標識及相關證書 ☒ Yes 有 ☐ No 沒有

Good ground condition and inspected by Lifting Supervisor
良好的路面並已由吊運監工檢查 ☒ Yes 有 ☐ No 沒有

Correct selection of lifting gears for the lifting operation
正確地選擇起重裝置來進行吊運工作 ☒ Yes 有 ☐ No 沒有

All outriggers were fully extended and rested on outrigger pads
所有的支腳必須完全伸展並放在指定的腳墊上 ☒ Yes 有 ☐ No 沒有

Any overhead services
是否有高架設施 ☐ Yes 有 ☒ No 沒有

Ground checked for suitability (including underground services, culverts, nearby excavations etc.)
工作範圍內是否適宜施工 (包括地下喉管、管道、地洞等) ☒ Yes 是 ☐ No 否

Permit Prepared by: 申請人: [Signature]
Name and Signature of Bankman 司機姓名及簽署: [Signature]
Date 日期: [Blank]
Name and Signature of Area-in-charge 地盤管工姓名及簽署: [Signature]
Date 日期: [Blank]

Please turn over for the Diagram Showing Slinging Arrangements and Lifting Plan.
吊鏈位置分佈圖及吊運區平面圖在背面

Crane Lorry Lifting Plan
貨車吊機吊運計劃

Gammon **ZEROHARM** MAKE SAFETY PERSONAL

Diagram showing slinging arrangements
吊鏈位置分佈圖

Lifting Plan
吊運區平面圖

Diagram showing slinging arrangements for various loads and lifting methods, including single point, two point, and four point slinging, and lifting from the ground or a platform.

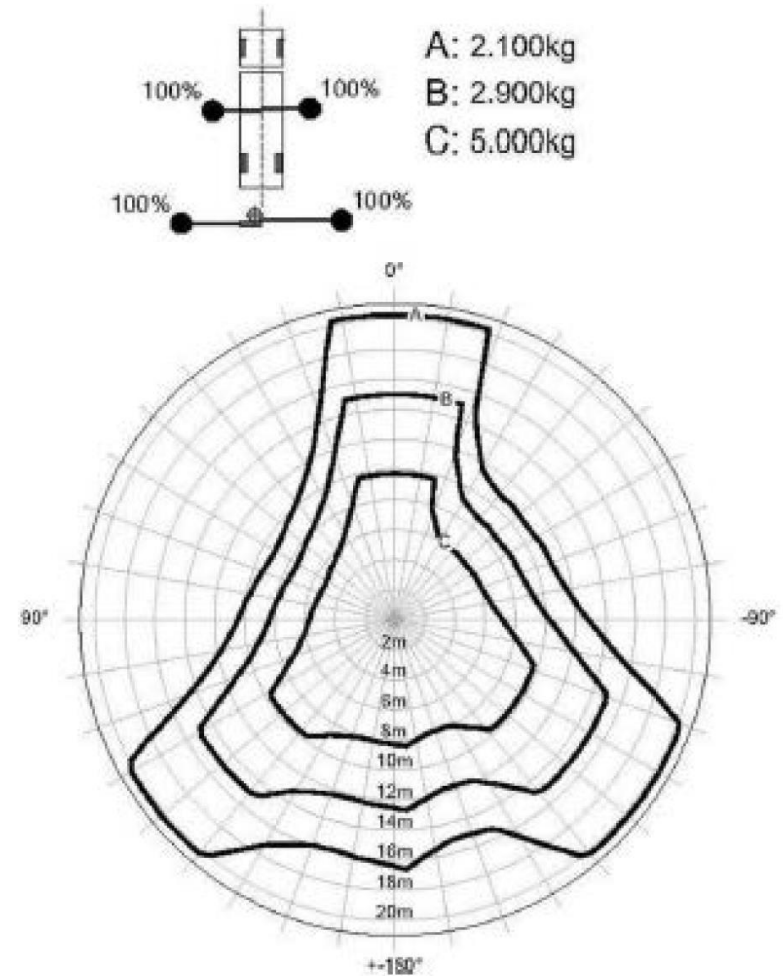
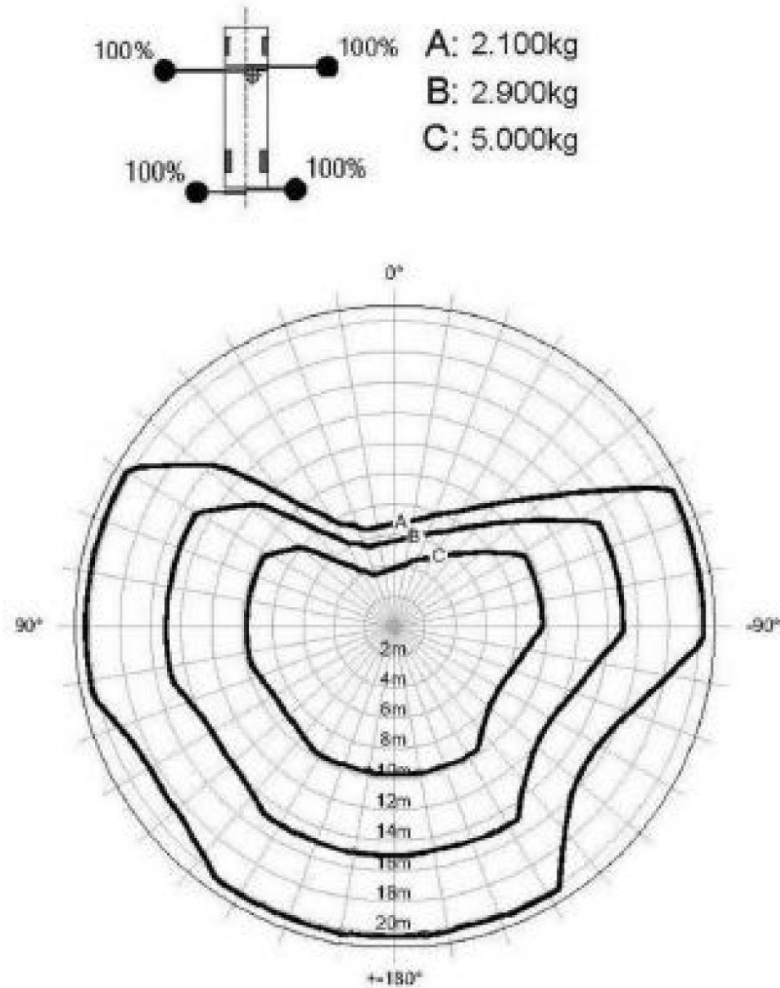
Diagram showing the lifting plan for the sheet pile installation, including the location of the crane, the sheet pile, and the lifting point.

Diagram showing the lifting plan for the sheet pile installation, including the location of the crane, the sheet pile, and the lifting point.

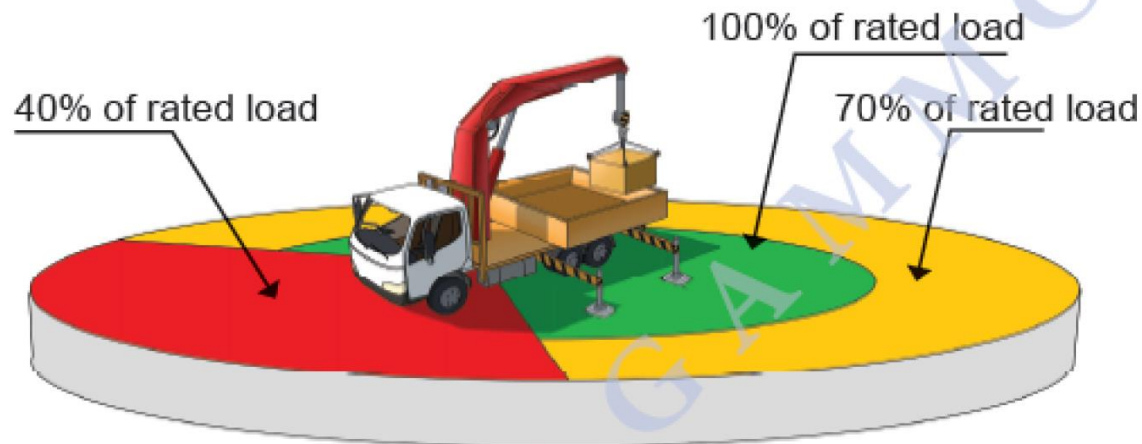
Simulation of crane failure



- Lifting capacity varies with different jib orientation & jib position on truck base

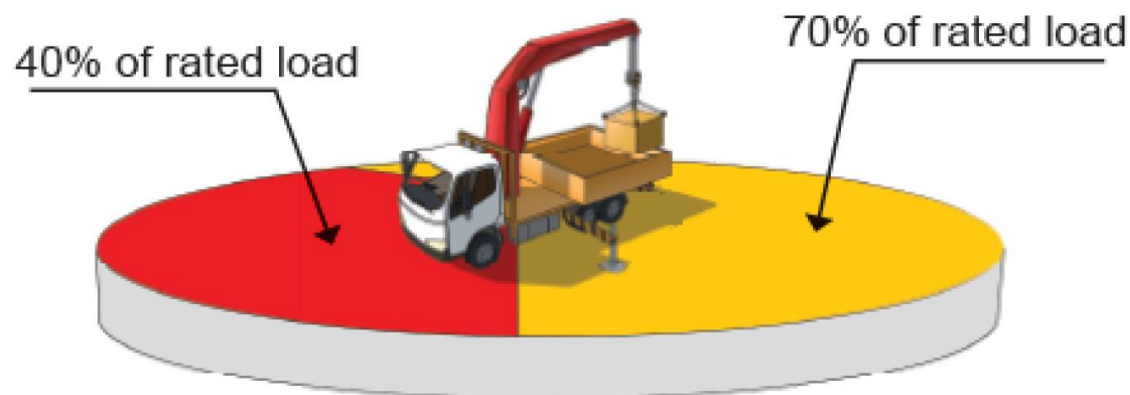


De-rating Chart – Front Mounted Lorry Cranes



Strongest at: Rear and both sides
Weakest at: Front side

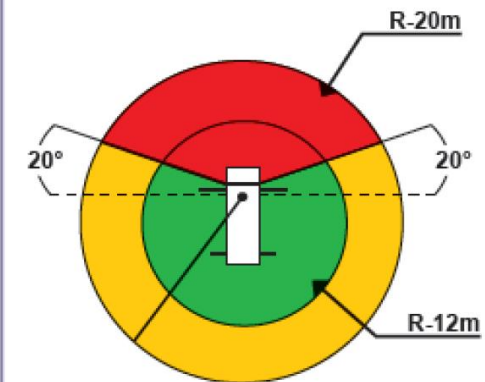
- 40% of rated load
- 70% of rated load
- 100% of rated load



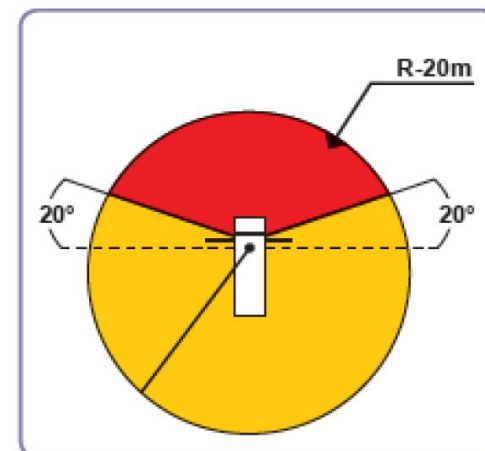
Strongest at: Rear and both sides
Weakest at: Front sides

- 40% of rated load
- 70% of rated load

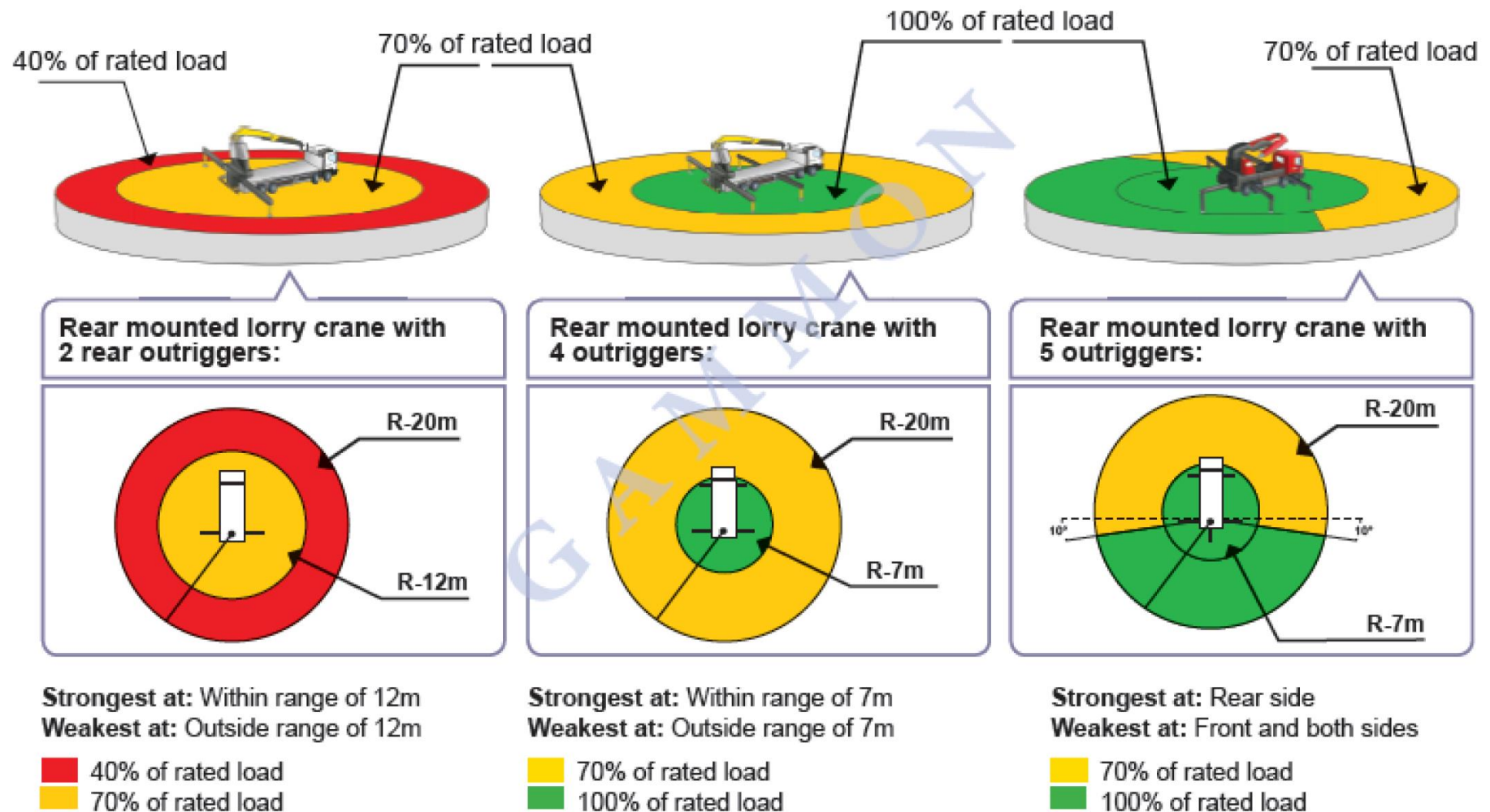
**Front mounted lorry crane
with 4 outriggers:**



With 2 front outriggers



De-rating Chart – Rear Mounted Lorry Cranes:

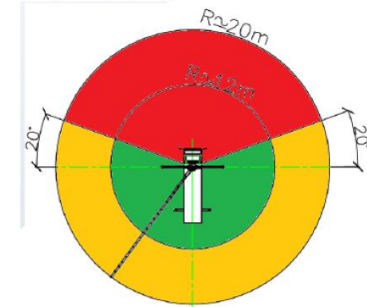


Near Miss Case Review

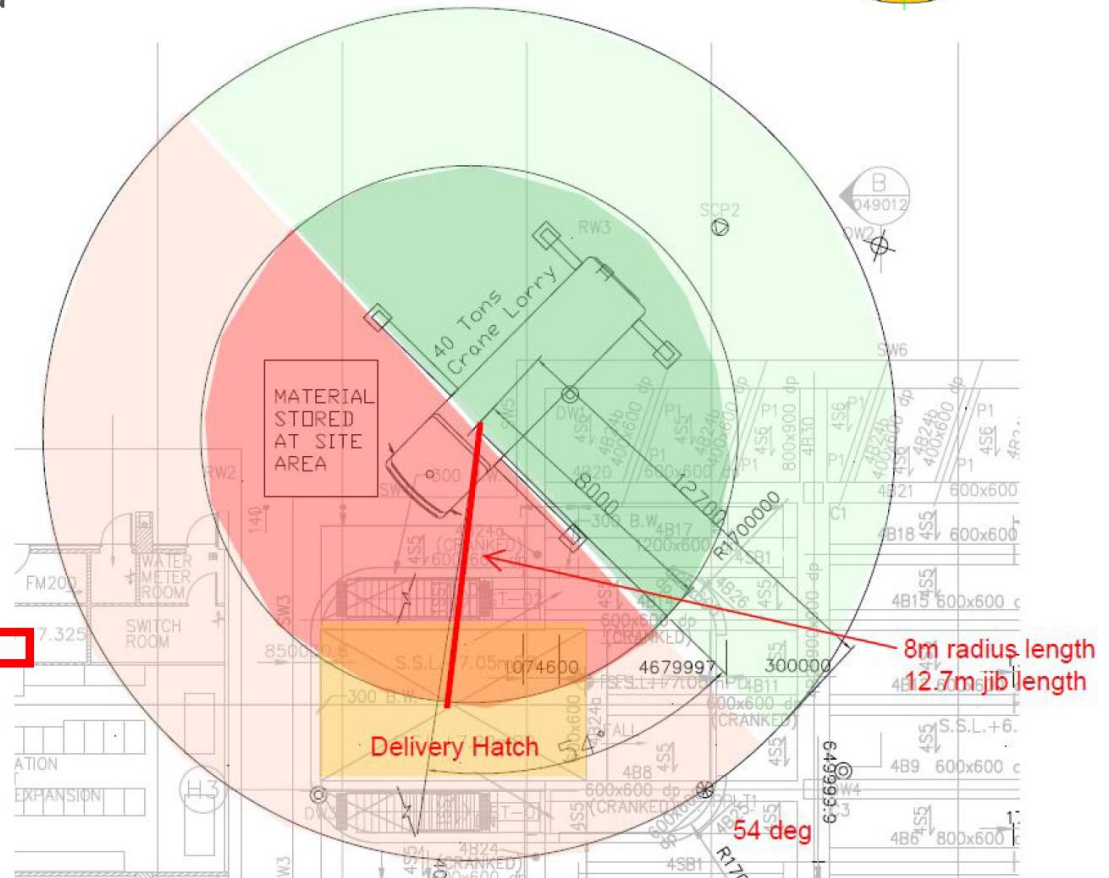
The investigation revealed:

- The jib angle inside the Red Zone
- The weight of pipe exceed the de-rated SWL
- At De-rating factor to 40%, SWL at 8m is $\sim 7.47 \times 40\% = \sim 2.99$ tonnes.
Overloaded by ~ 0.31 tonnes.

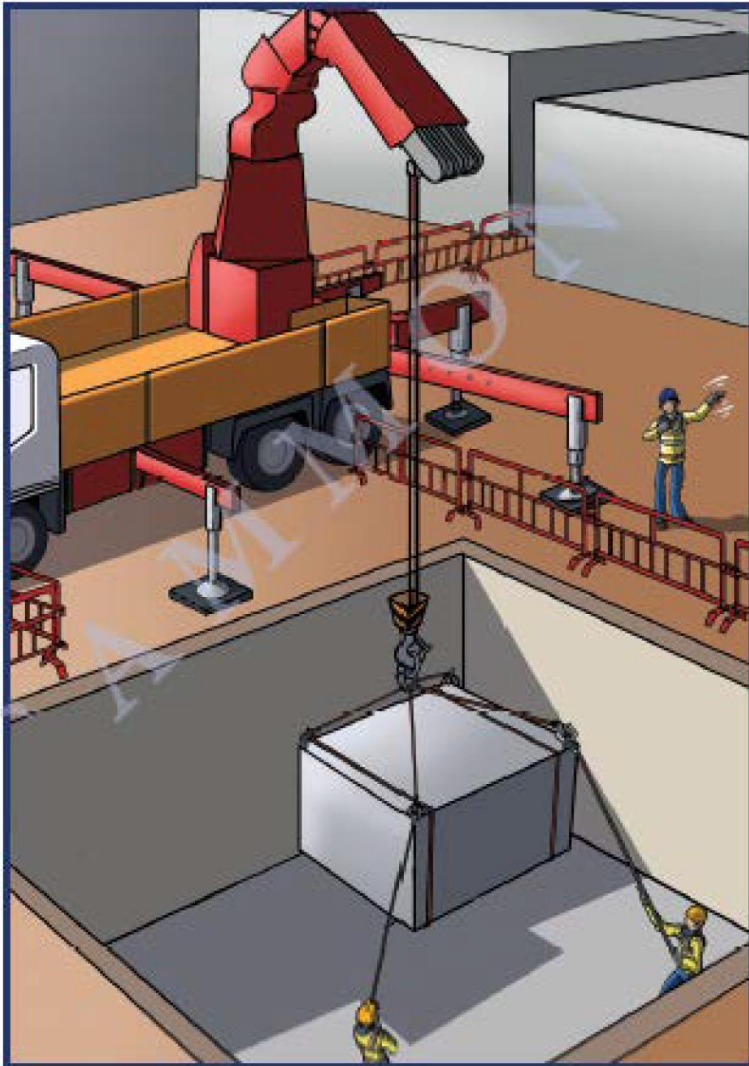
- 40% of Rated Load
- 70% of Rated Load
- 100% of Rated Load



(1) Length of jib (metres) 吊臂長度 (以米為單位)	(2) Radius (metres) 半徑 (以米為單位)	(3) Test load (tonnes) 測試時所用負荷 (以公噸為單位)	(4) Safe Working load (tonnes) 安全操作負荷 (以公噸為單位)
2.92	2.92	-	20.27 (Theoretical Load)
4.68	4.68	14.5	13.7
6.43	6.43	-	9.62
8.23	8.23	-	7.16
10.09	10.09	-	5.57
12.04	12.04	-	4.39
14.08	14.08	-	3.61
16.22	16.22	-	3.06
18.42	18.42	-	2.67
20.68	20.68	2.5	2.32



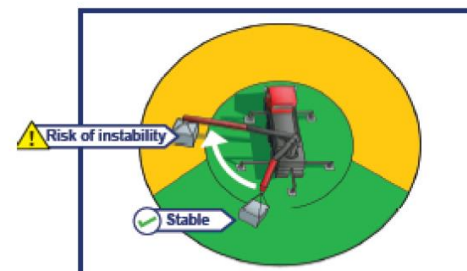
Lift Plan



What Could Fail?

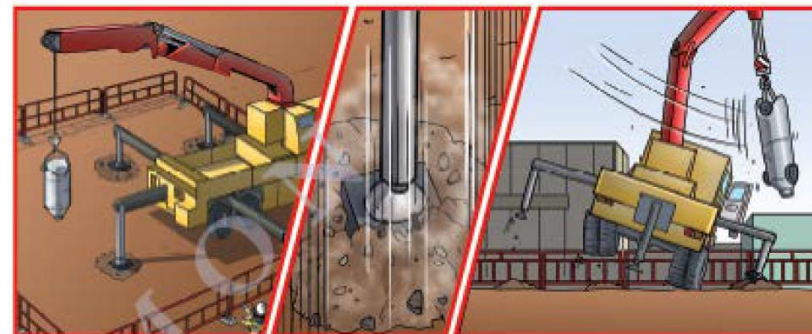
A Lift Plan Must Consider:

- The Foundation
- The Crane
- The Load
- The Rigging
- The De-rating Chart



Summary

- Note the importance of planning to safe use of crane
- Select correct type of crane for your lifting work
- Follow the safety procedure for lifting such as confirm the load, weight, size & shape, rigging method & correct lifting gear, lifting path, use the crane to confirm the weight of load, De-rating chart, etc.
- STOP the crane operation if you find them UNSAFE during site walk
- Use the crane safely



Questions & Answers