

# Increasing Crane Productivity



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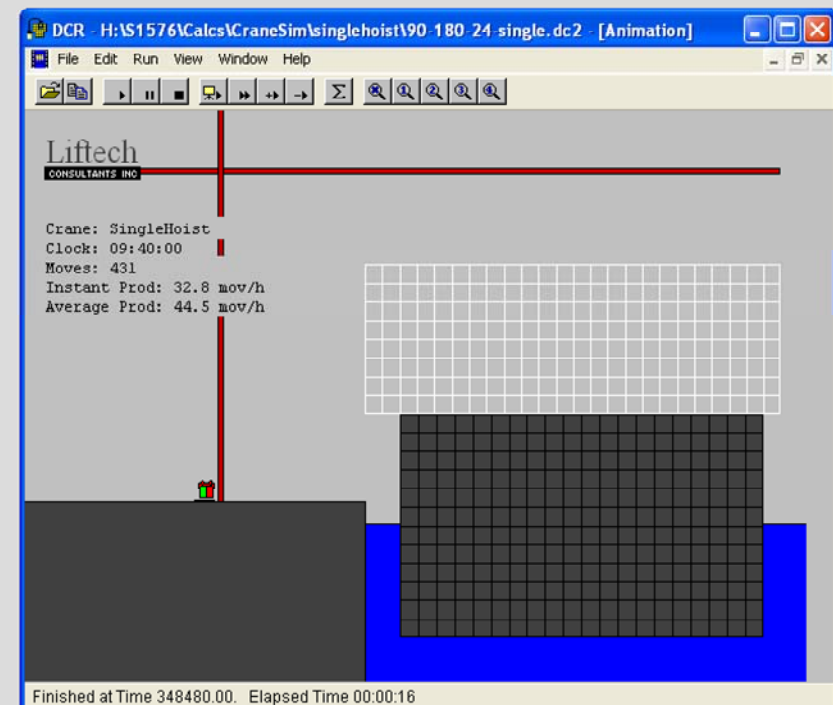
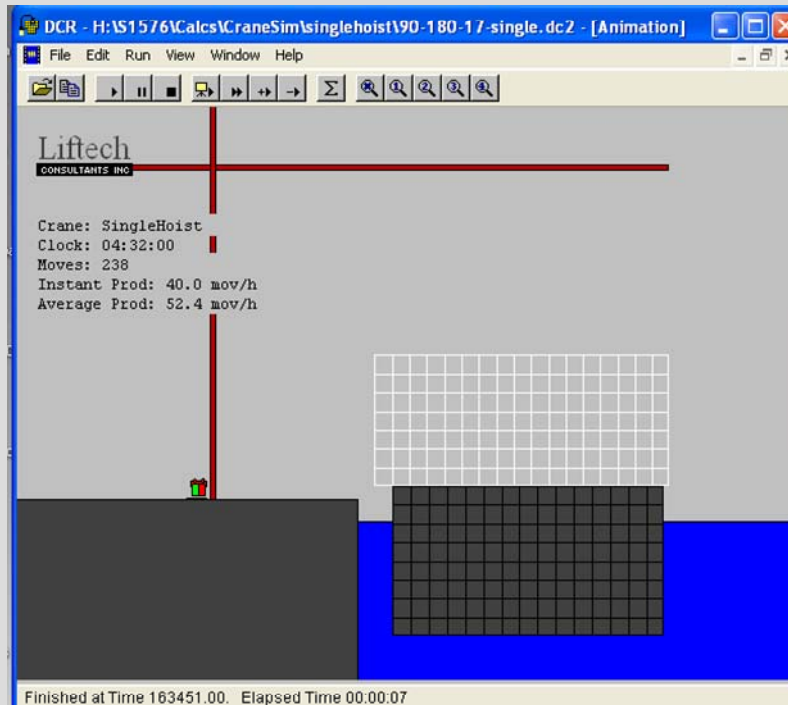
**Michael Jordan, S.E.**  
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# Embryo to Jumbo





# Productivity vs. Ship Size



With identical machinery, productivity 24 wide / 17 wide = 85%  
Speeds and accelerations must increase 45% to maintain productivity.

Other methods of improving productivity will be more practical.

# Tandem 40 dual hoist



## Crane – Yard Interface



# Tandem 40 Container Cranes

## Issues

Single Hoist

Dual Hoist

Spreaders

Machinery House

Hoist Machinery

Trolley

Production

Weight and wheel loads



# Tandem 40 Hoist Systems

Single hoist systems

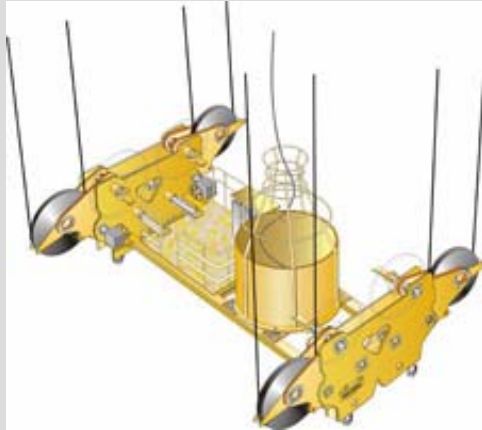


Dual hoist systems

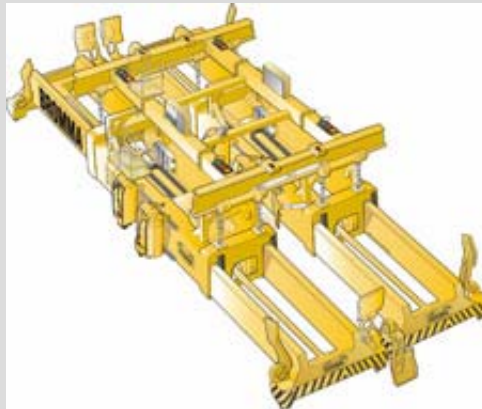




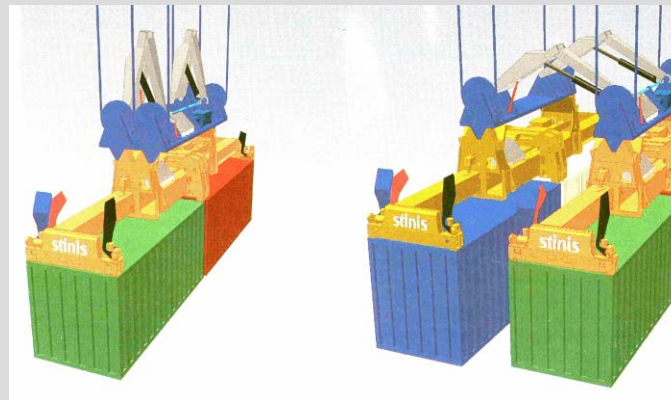
# Tandem 40 Single Hoist Equipment



RAM Headblock and Spreader  
Source: World Cargo News, October 2005



Bromma Headblock and Spreader  
Source: Bromma Conquip AB



Stinis Headblock and Spreader  
Source: Cargo Systems, December 2005

# Tandem 40 Single Hoist Systems

## Advantages

Can use with existing single hoist systems

## Disadvantages

Cannot separate to fit into some ship holds

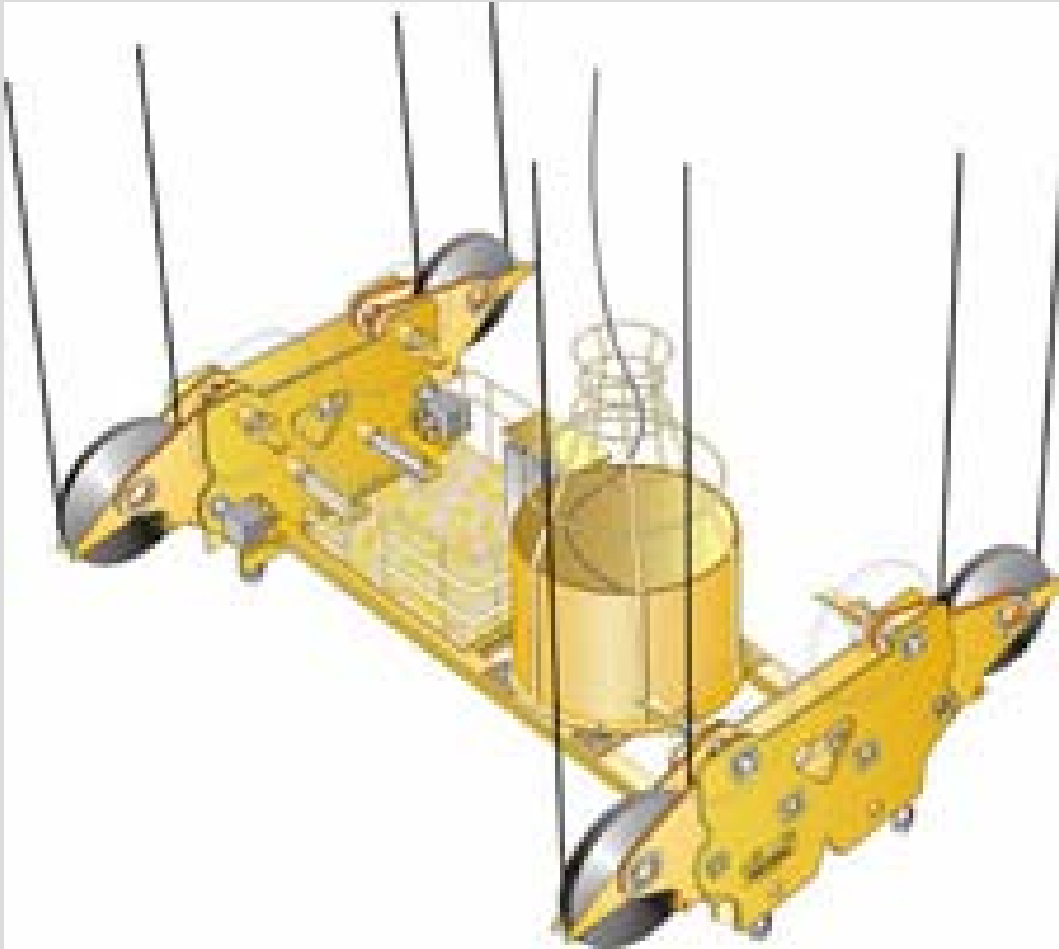
Balancing



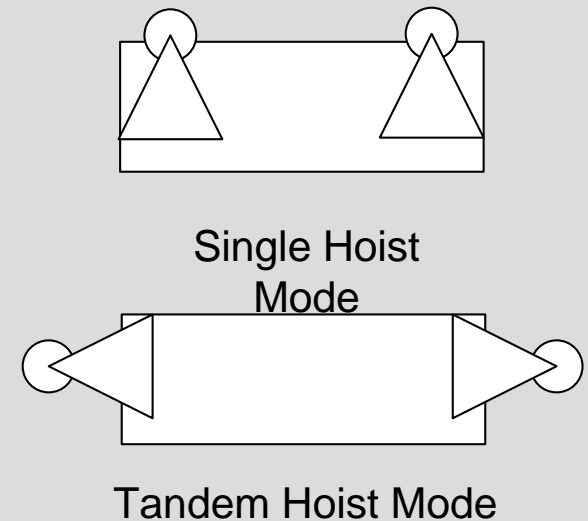
Source: Bromma Conquip AB



# Tandem 40 Single Hoist Headblock



Source: Bromma Conquip AB



# Tandem 40 Dual Hoist System



# Dubai Tandem 40





# Two 40s, Four 20s 80 long tons



# Shanghai Tandem 40s





# Twin Tandem 20s





# Lowering to Chassis



# Lowering to Chassis

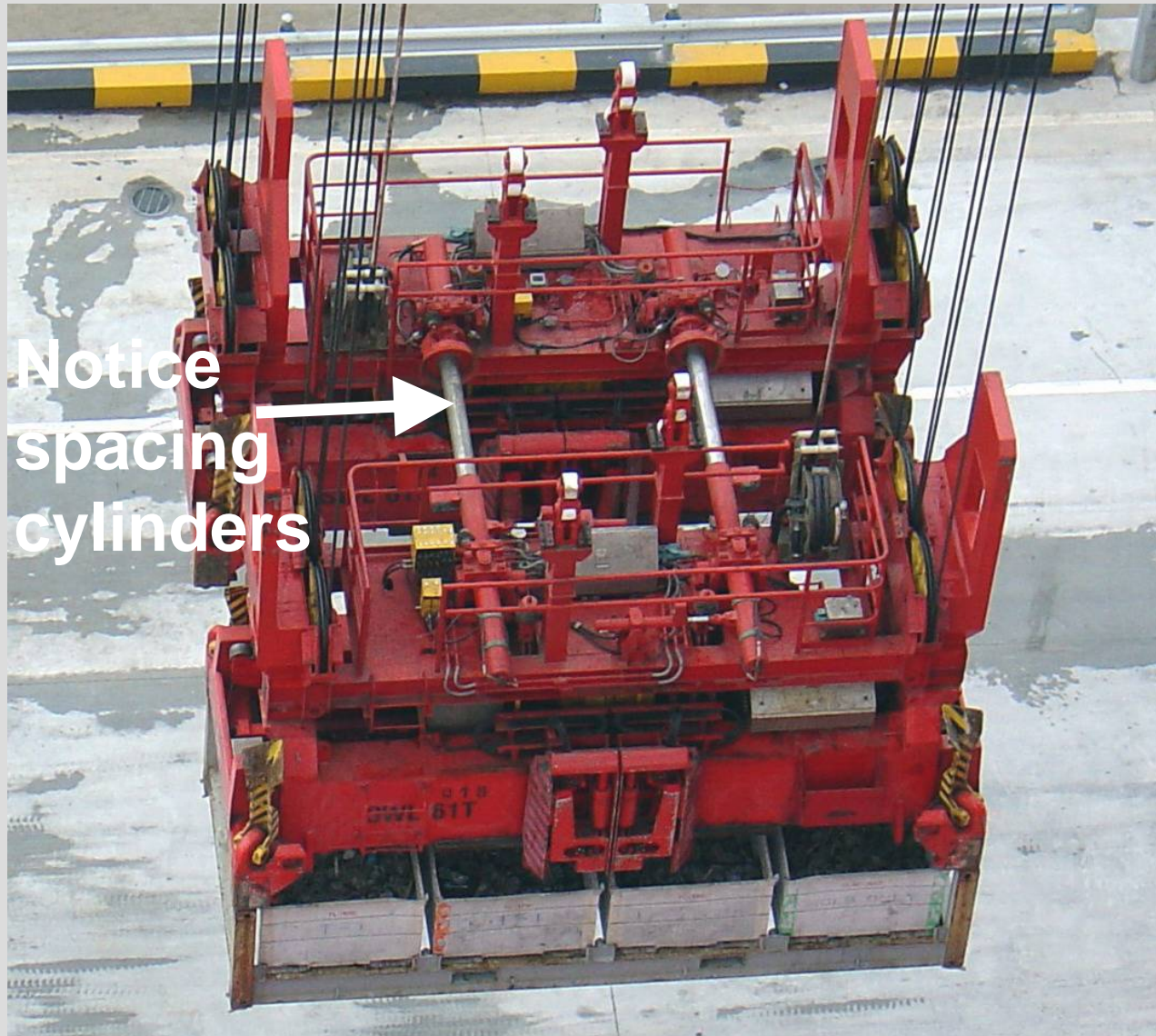




# IBC Removal







# Tandem Head Blocks, Spreaders



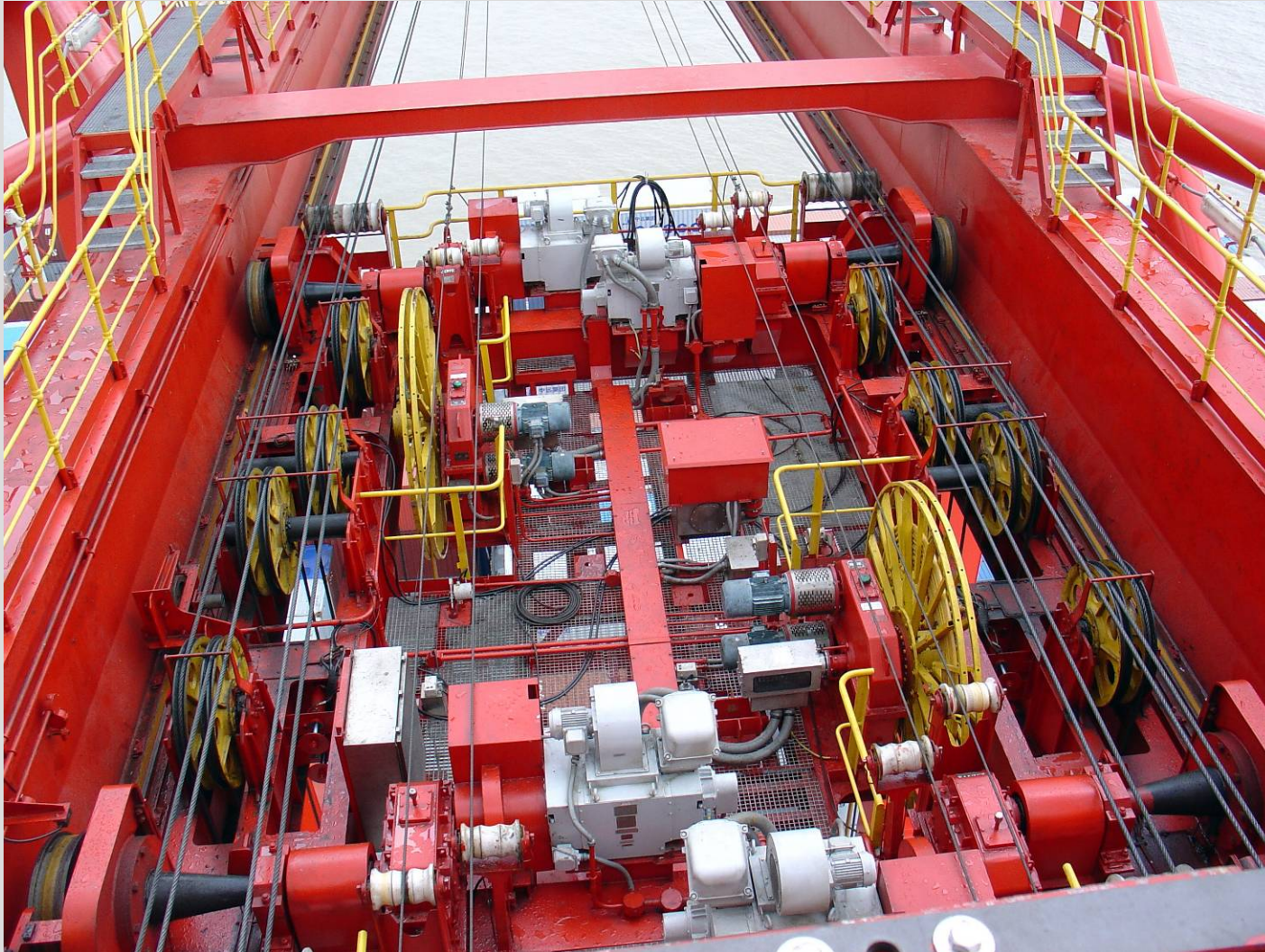


# Headblock Spacing Cylinders

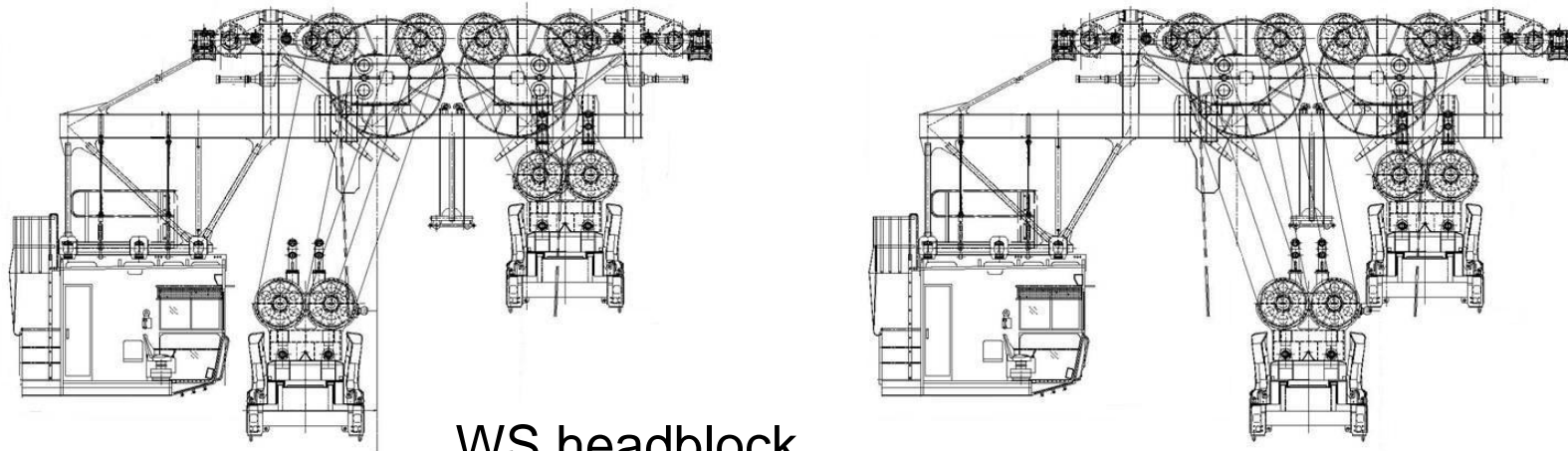




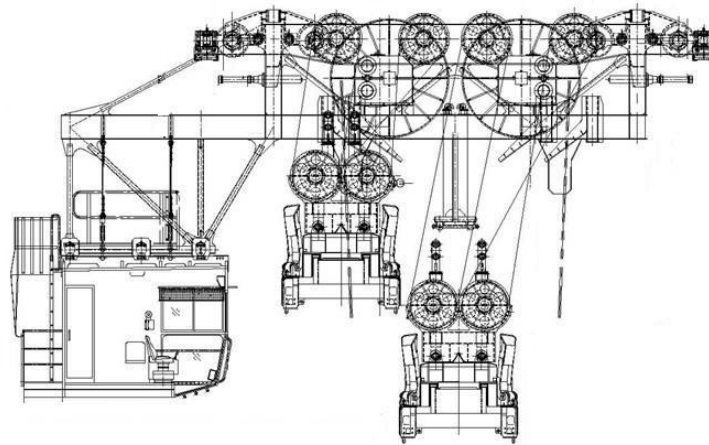
# Trolley



# Trolley Arrangement



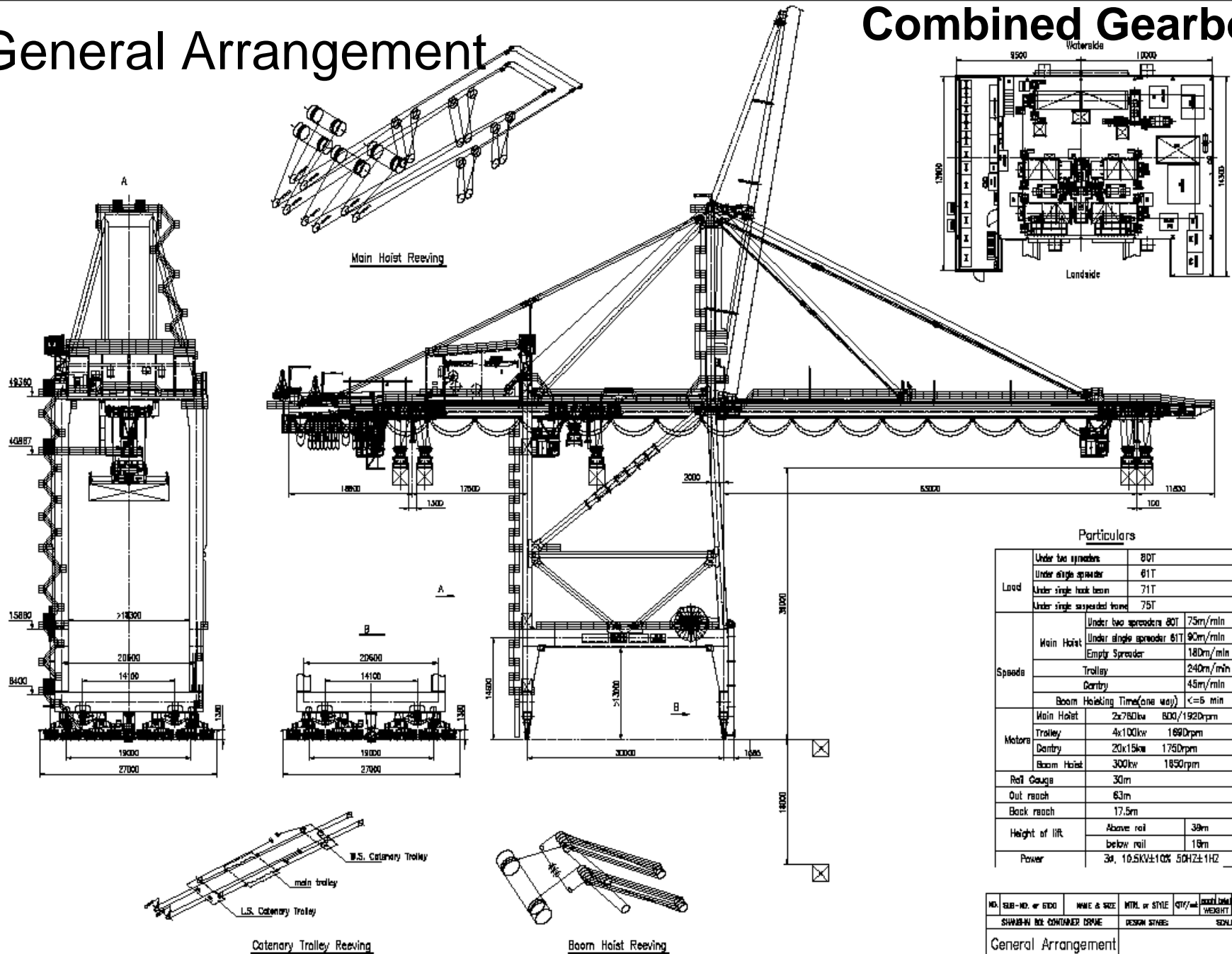
WS headblock  
stowed





# General Arrangement

## Combined Gearbox

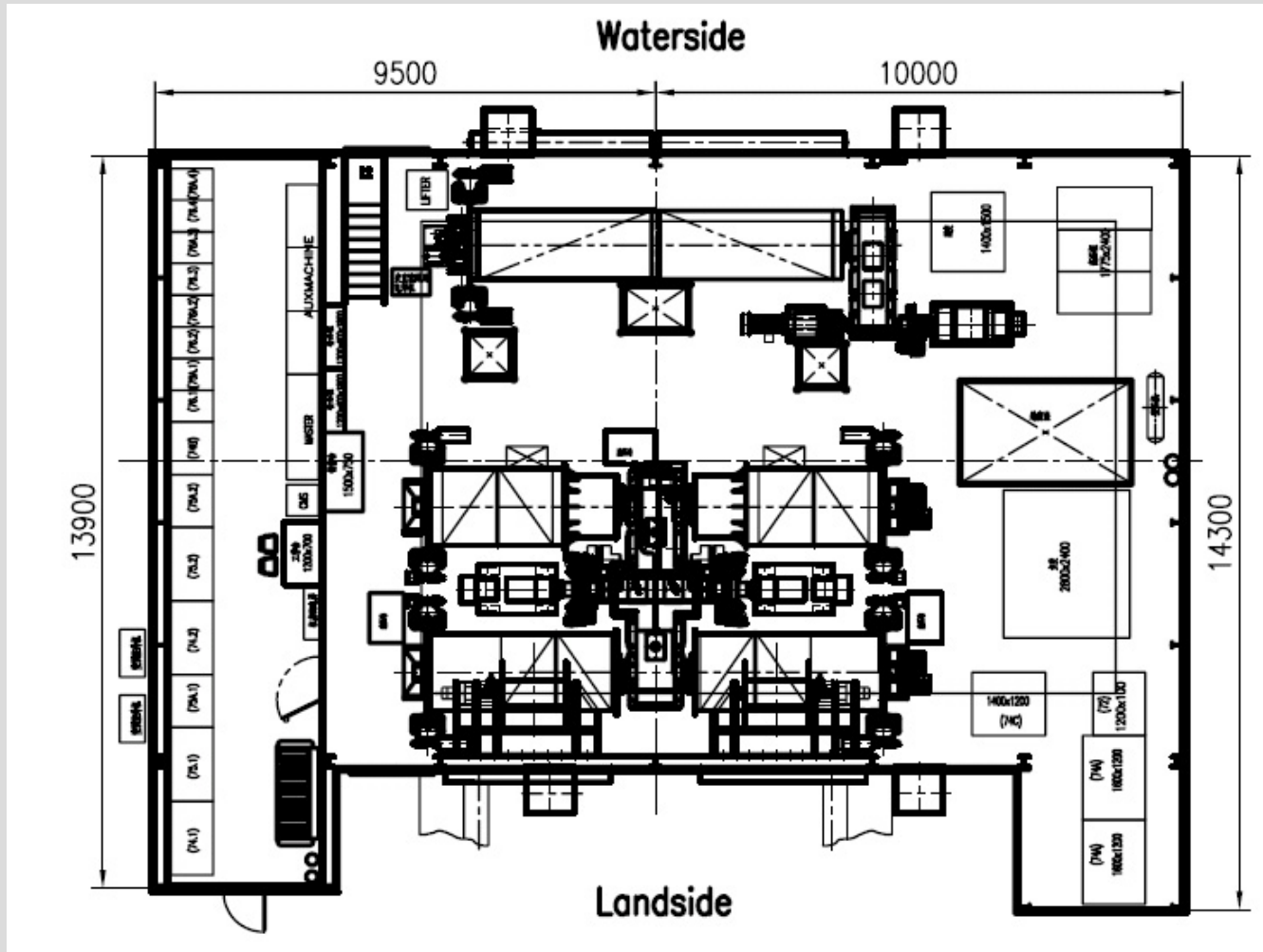


### Particulars

Load	Under two symeters	80T
	Under single spreader	61T
	Under single hook beam	71T
	Under single suspended frame	75T
Speeds	Under two spreaders 80T	75m/min
	Under single spreader 61T	90m/min
	Empty Spreader	180m/min
	Trolley	240m/min
	Cantry	45m/min
Motors	Boom Hoisting Time(One way) <= 5 min	
	Main Hoist	2x780kw 800/1920rpm
	Trolley	4x100kw 1690rpm
	Cantry	20x15kw 1750rpm
	Boom Hoist	300kw 1850rpm
Rail Gauge		30m
Out reach		63m
Back reach		17.5m
Height of lift	Above rail	39m
	below rail	18m
Power		3x 10.5KV±10% 50HZ±1HZ

NO.	SUB-NO. or EUDO	NAME & SIZE	MTL. or STYLE	QTY/mtl.	WEIGHT	NOTE
SHOWER-H. BIL. CONTAINER CRANE			DESIGN STAGES		SCALE: 1:250	
General Arrangement						
ZPMC	NO.		THICK			APP.
	BRG		CHCK			ST/NAME
	CHCK		VER			DATE

# Combined Gearbox





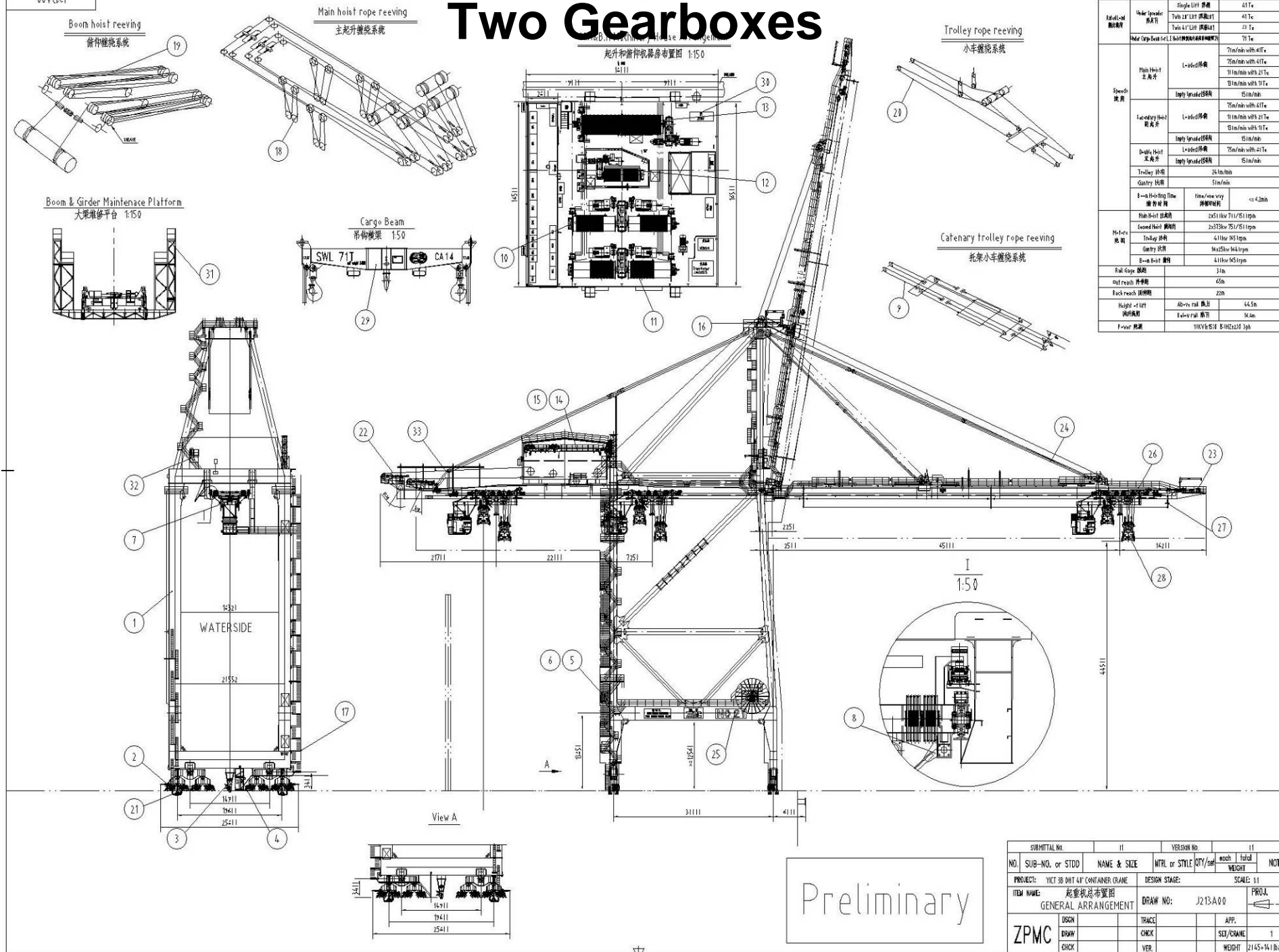
# Combined Gearbox



00VSLZ/

Main Parameters 主要参数

# Two Gearboxes



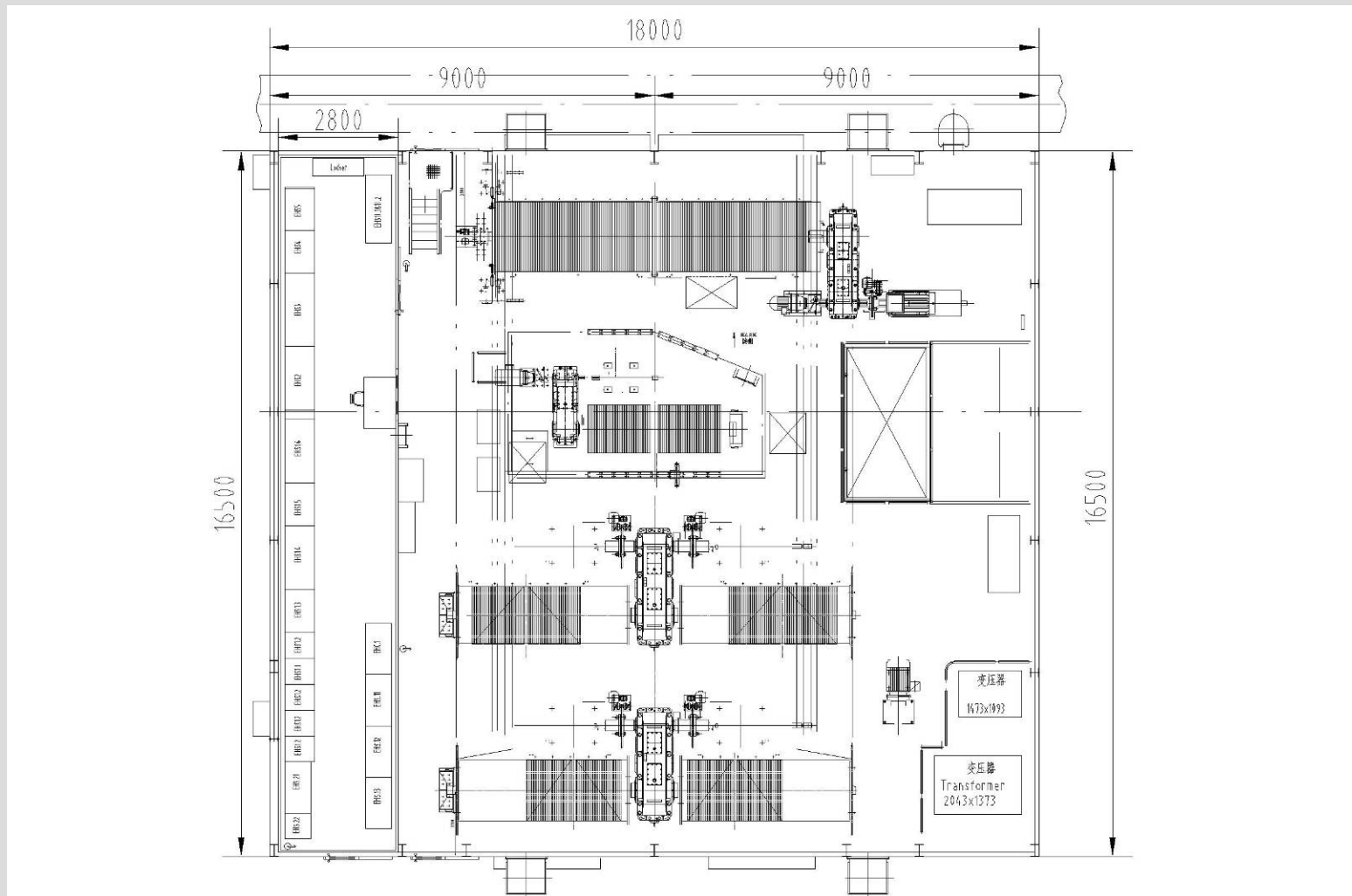
Rated Load 额定载荷	Under Spreader 吊钩下	Single Lift 单吊	41T
		Two Lift 双吊 乘数:1.4	41T
		Two Lift 双吊 乘数:1.4	41T
Main Hoist Gear Ratio 主起升传动比			
Speeds 速度	Main Hoist 主起升	L=2000 吊钩	71m/min with 41T 75m/min with 41T 71m/min with 21T 61m/min with 11T
		Empty Spreader 空吊钩	61m/min
	Secondary Hoist 副起升	L=2000 吊钩	75m/min with 41T 11m/min with 21T 61m/min with 11T
		Empty Spreader 空吊钩	61m/min
Double Hoist 双起升	L=2000 吊钩	75m/min with 41T Empty Spreader 空吊钩	61m/min
	Trolley Hoist 小车起升	61m/min	
	Gantry Hoist 大梁起升	61m/min	
8-10 Hopping Time 跳跃时间		51m/min	
Main Hoist 主起升	Time/one way 单程时间		cc 42min
	Main Hoist Gear Ratio 主起升传动比	2x511/71/511rpm	
	Second Hoist Gear Ratio 副起升传动比	2x273/51/511rpm	
	Trolley Hoist 小车起升	4111/151rpm	
	Gantry Hoist 大梁起升	16x51/151rpm	
	8-10 Hopping Time 跳跃时间	4111/151rpm	
	Full Crane 整机	31m	
	Out reach 外伸距	45m	
	Back reach 后伸距	22m	
	Height of Lift 起升高度	40m 吊钩 满载 40m 吊钩 空载	44.5m
P=over 功率		110KW 吊钩 空载 50KW 吊钩 满载	

Preliminary

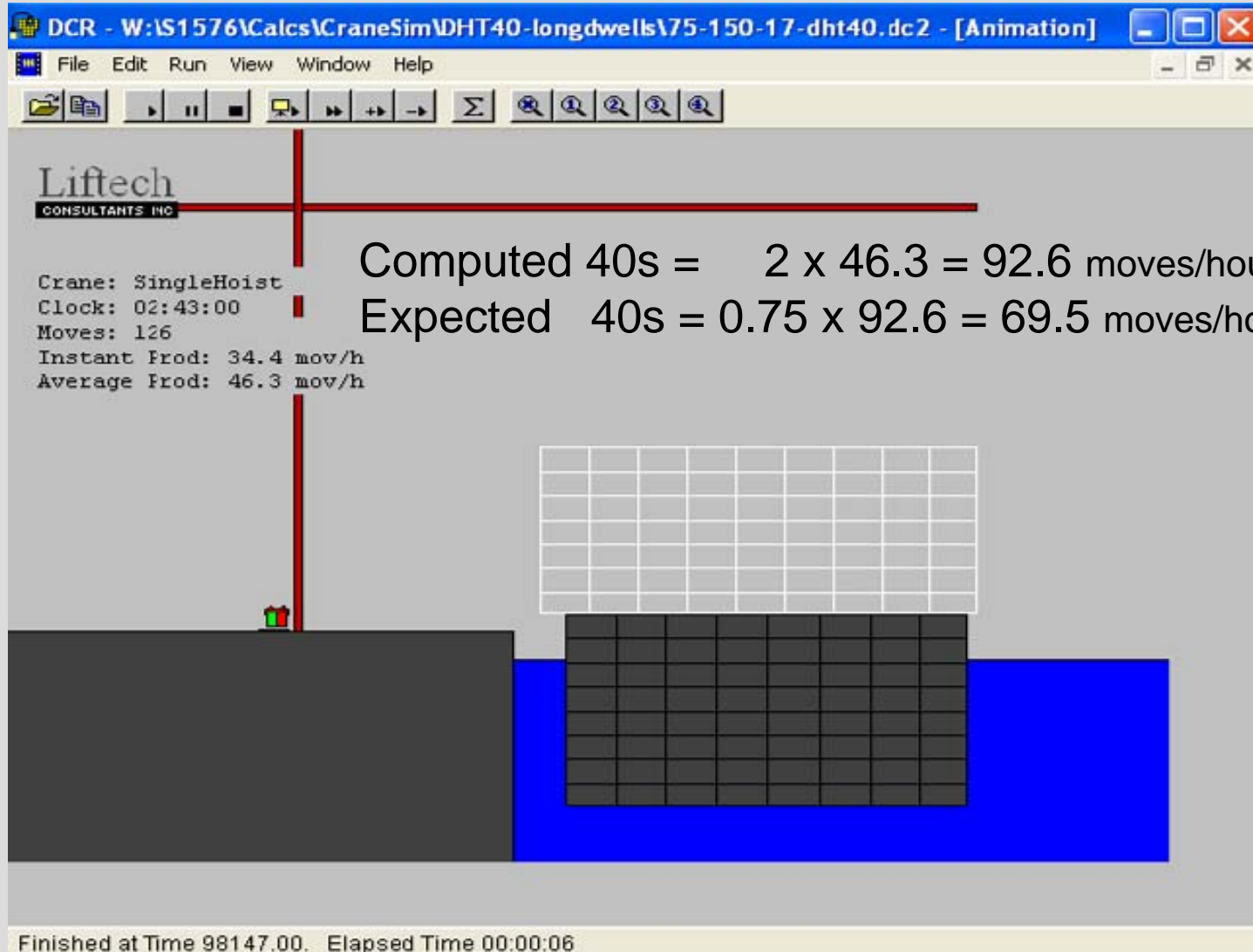
SUBMITTAL NO.		II		VERSION NO.		II		
NO.	SUB-NO. or STD	NAME & SIZE		MTL or STYLE	QTY/SET	each	total	NOTE
PROJECT: YICT 30 DHT 40' CONTAINER CRANE				DESIGN STAGE:		SCALE: 1:1		
ITEM NAME: 起重机械布置图		DRAW NO: J213-A00		PROJ. 1				
GENERAL ARRANGEMENT				TRACE NO:				
ZPMC	DRAWN	DRAW		APP.				
	CHECK	CHK		SII/CRANE		1		
	CHK	VER.		WEIGHT		2145x141 (Ballast)		



# Two Gearboxes



# CraneSim Tandem 40 Productivity



# A Few Statistics

Crane	Single Hoist 65 lt capacity Oakland B55	Tandem 40 Dual Hoist 80 lt capacity Yantian, China
Weight metric tons	1300	1800
LS / WS Factored Operating Rail loads	35 / 55	55 / 70
kips/ft 40s per hour	30 – 45	45 - 70



# Crane – Yard Interface

Lane Arrangement

Elevated Lanes

Overhead Protection

Considerations for Tandem 40  
Operations

# Landside Lanes



Source: ZPMC



# Lane Overhead Protection



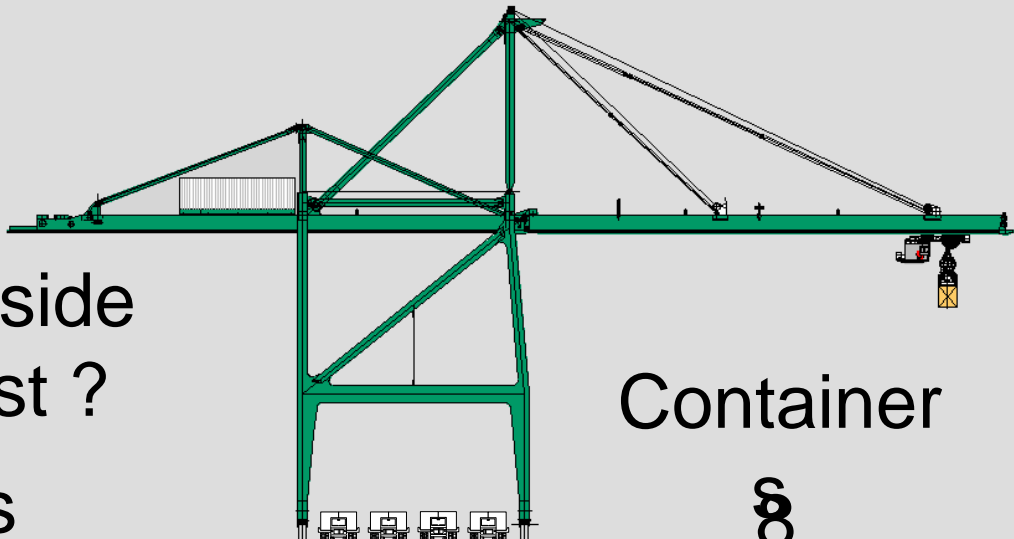
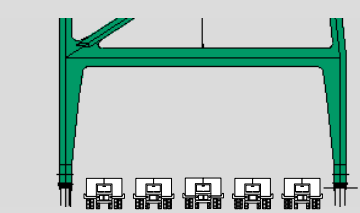
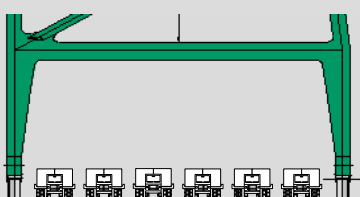
Source: ZPMC

# Tandem 40 trailer



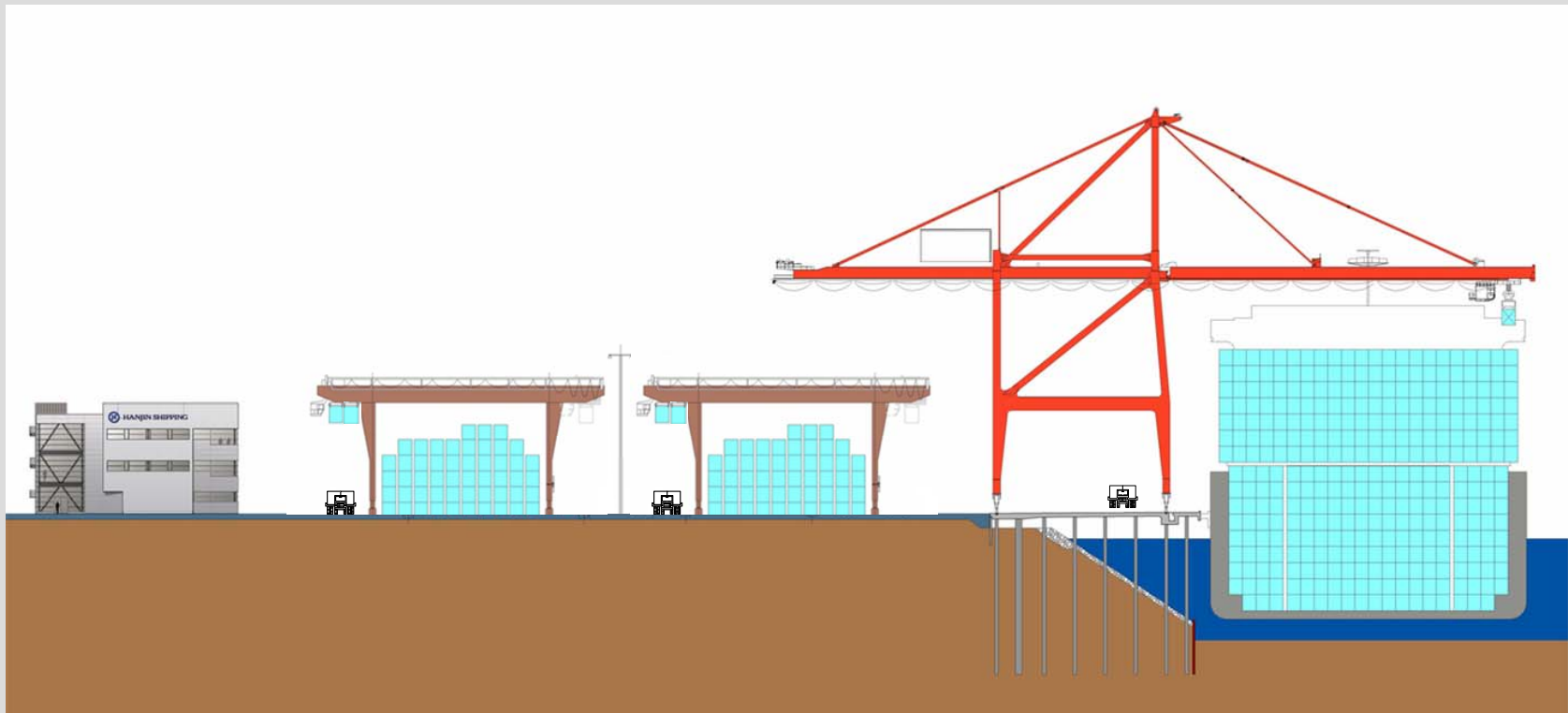


# Crane Gage – Tandem Operations

<p>Landside ballast ?</p> <p>Yes</p>		<p>Container</p> <p>8</p>	<p>Approximate gage required</p> <p>29.24 m</p>
<p>Maybe</p>		<p>10</p>	<p>35.88 m</p>
<p>Unlikely</p>		<p>12</p> <p>m</p>	<p>42.52</p>

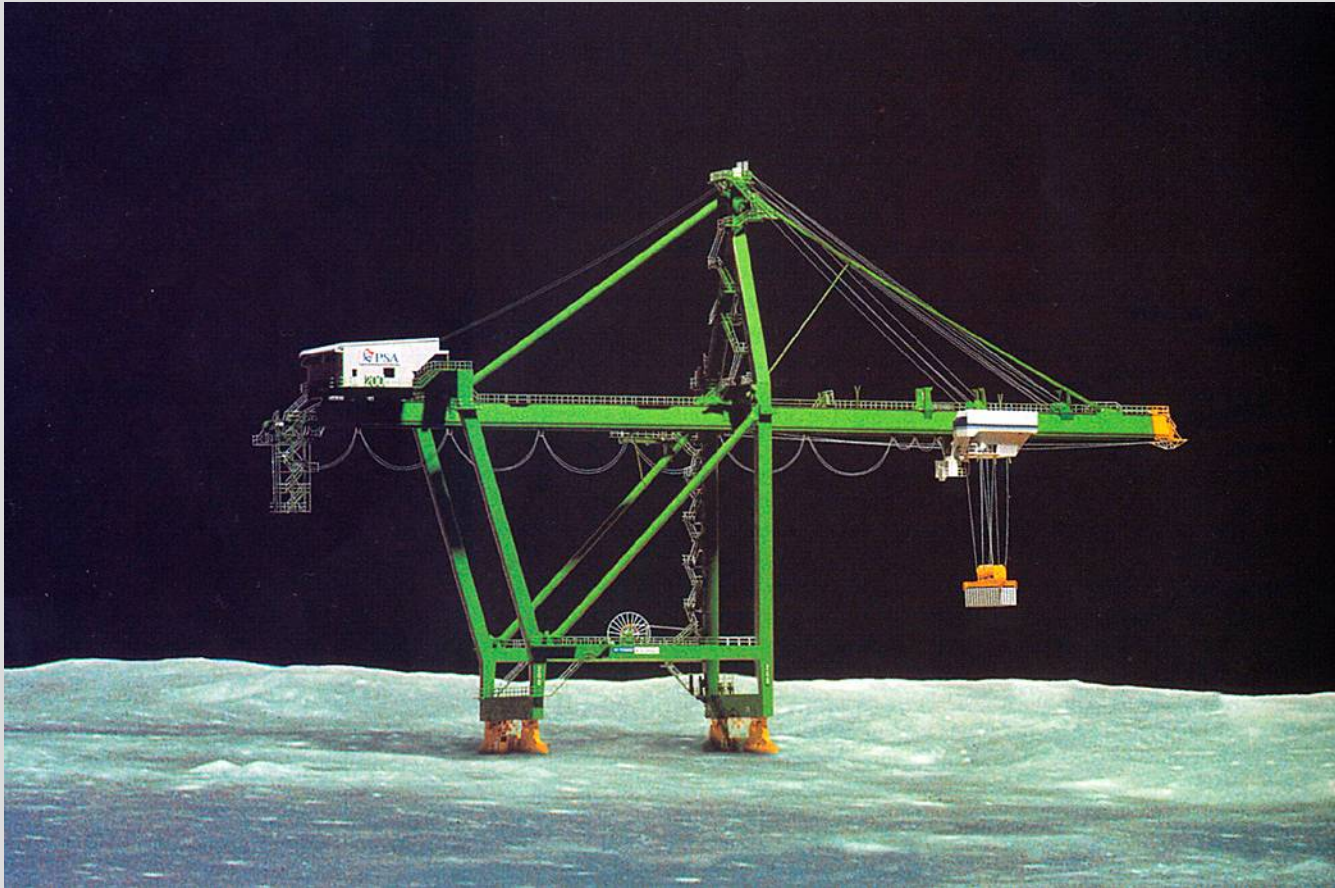
# Yard Layout - Equipment

Tandem yard cranes will be more viable





# Summary



# Increasing Crane Productivity

Liftech Consultants Inc.

January 10, 2006

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## Thank you

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**FYI - Much content originally came from the Zelus Port Congestion 2005 presentation.**