

# CONSIDERATIONS FOR LARGE CRANES

Arun Bhimani, SE, President  
Liftech Consultants Inc.

AAPA Facilities Engineering  
Committee Seminar  
February 3-5, 1999

# What is a Large Crane?

	<b>Long Beach, California</b>	<b>Oakland, California</b>
<b>Vessel Size</b>	<b>16 wide</b>	<b>22 wide</b>
<b>Rail Span</b>	<b>100'</b>	<b>100'</b>
<b>Outreach</b>	<b>165'</b>	<b>213'</b>
<b>Backreach</b>	<b>50'</b>	<b>60'</b>
<b>Trolley Travel</b>	<b>315'</b>	<b>373'</b>
<b>Lift Height</b>	<b>110'</b>	<b>115'</b>

# Capacities and Speeds of Large Cranes

	Long Beach, California	Oakland, California
Vessel Size	16 wide	22 wide
Rated Load	50 LT	65 LT
Trolley Speed	800 fpm	800 fpm
Main Hoist Speed	200 fpm	230 fpm

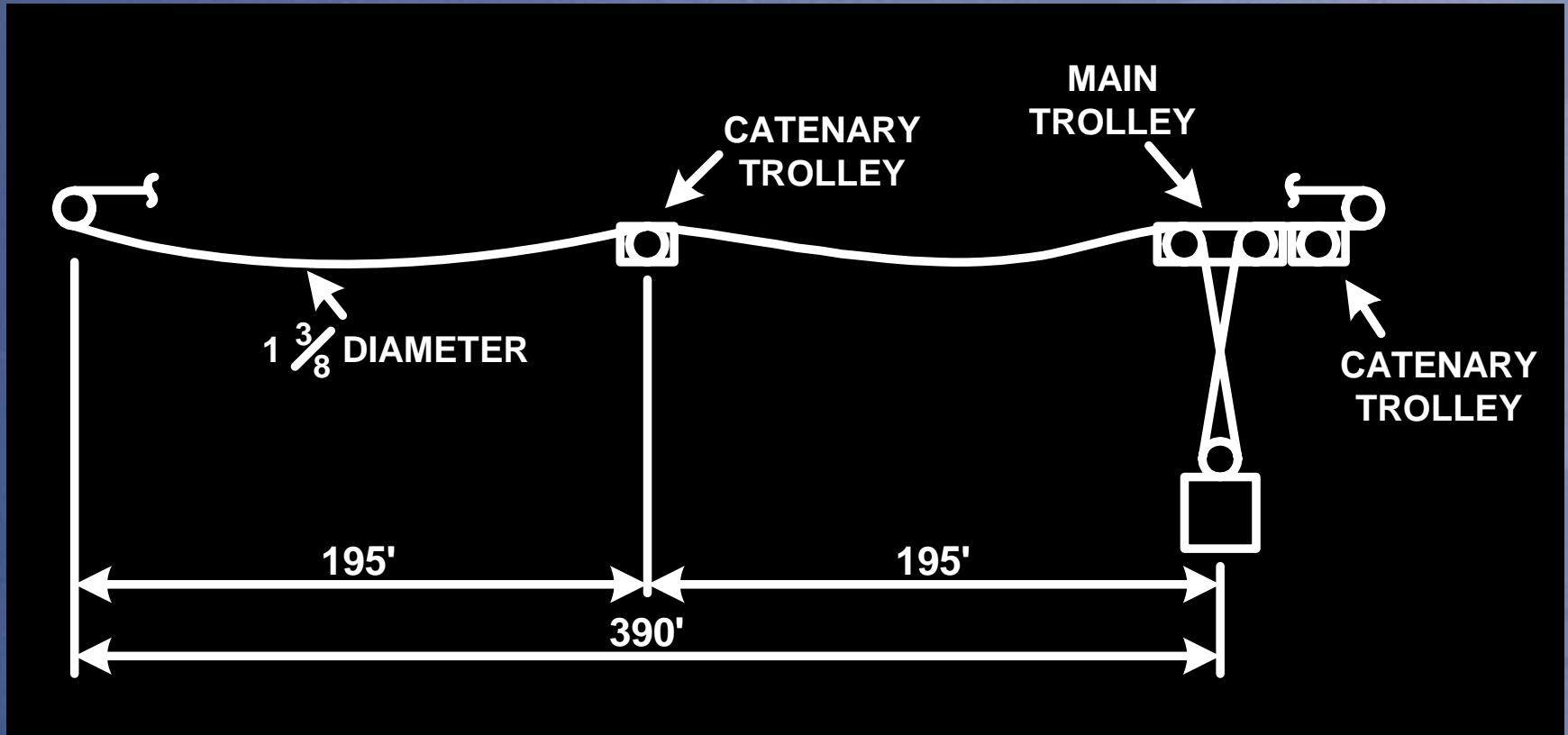
# Special Considerations

- ◆ Rope Sag
- ◆ Cost
- ◆ Weight and Wheel Loads
- ◆ Rope Trolley versus Machinery Trolley
- ◆ Excessive Gantry Frame Sway - Operator Comfort and Fatigue

# Rope Sag

- ◆ Rope wear due to slapping
- ◆ Trolley position and bouncing load
- ◆ Catenary trolleys
- ◆ Anti-sway control

# Rope Sag



# Crane Cost

<b>13 wide</b>	<b>\$ 5.0 m</b>
<b>16 wide</b>	<b>\$ 5.5 m</b>
<b>22 wide</b>	<b>\$ 6.0 m</b>
<b>10% increase with each generation</b>	



# **Weights and Wheel Loads Rope Trolley Cranes**

<b>Vessel Size</b>	<b>16 wide</b>	<b>22 wide</b>
<b>Total Crane Weight</b>	<b>2,300 kips</b>	<b>2,500 kips</b>
<b>Factored Operating Wheel Load at Waterside 8 Wheels / Corner</b>	<b>200 kips / wheel</b>	<b>250 kips / wheel</b>



# Rope Trolley vs Machinery Trolley

	Rope Trolley	Machinery Trolley
<b>Trolley Weight</b>	<b>45 kips</b>	<b>180 kips</b>
<b>Lift System</b>	<b>37 kips</b>	<b>37 kips</b>
<b>Lifted Load; 65 LT</b>	<b>145 kips</b>	<b>145 kips</b>
<b>Total Moving Load</b>	<b>227 kips</b>	<b>362 kips</b>
<b>Moving Load for Fatigue Damage</b>	<b>150 kips</b>	<b>285 kips</b>
<b>Fatigue Damage</b>	<b>1.0</b>	<b>6.9</b>

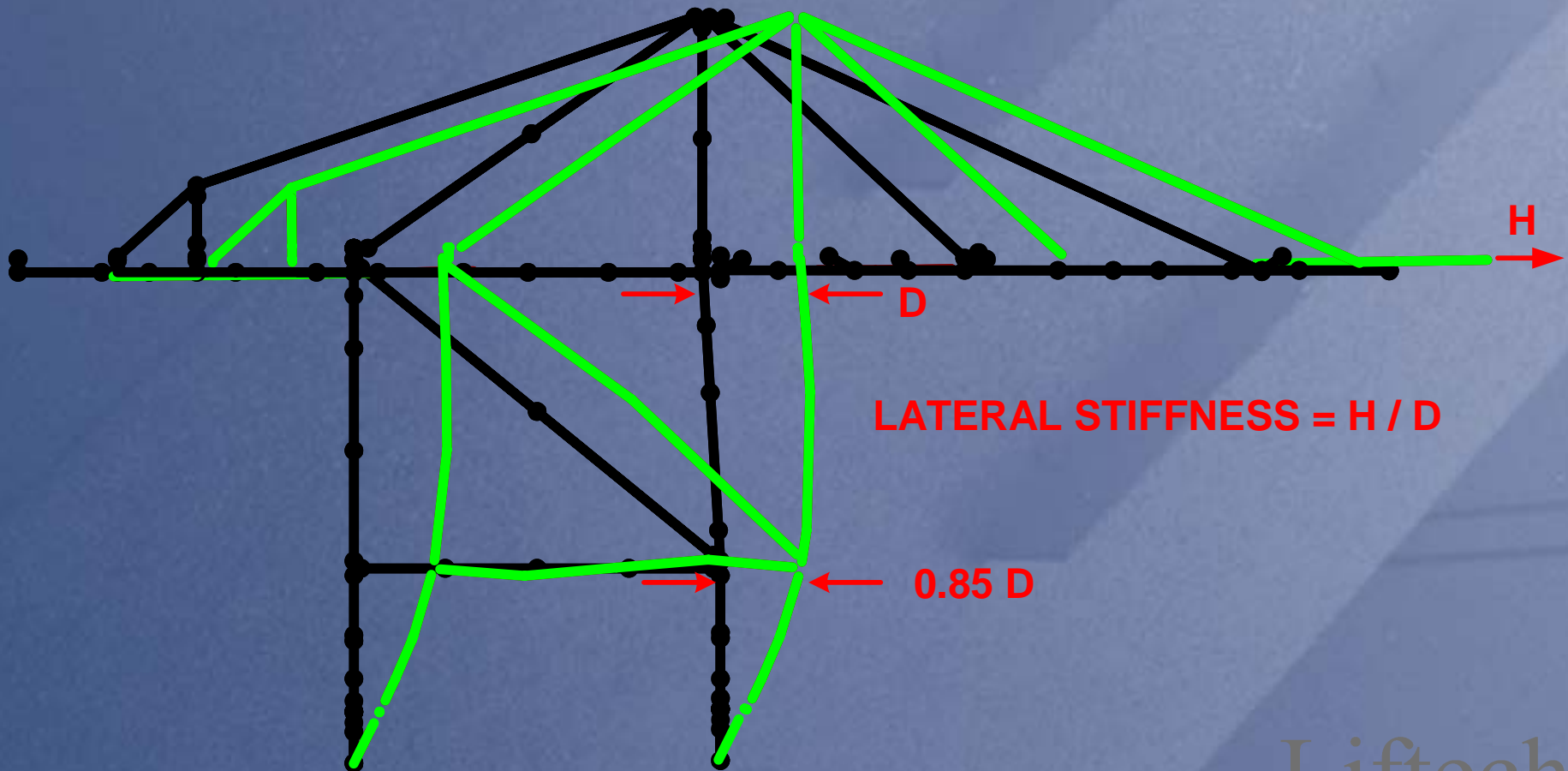
# RT vs MT

	<b>Rope Trolley</b>	<b>Machinery Trolley</b>
<b>Vessel Size</b>	<b>22 wide</b>	<b>22 wide</b>
<b>Total Crane Weight</b>	<b>2,500 kips</b>	<b>2,700 kips</b>
<b>Factored Operating Wheel Load at Waterside 8 Wheels / Corner</b>	<b>250 kips / wheel</b>	<b>290 kips / wheel</b>

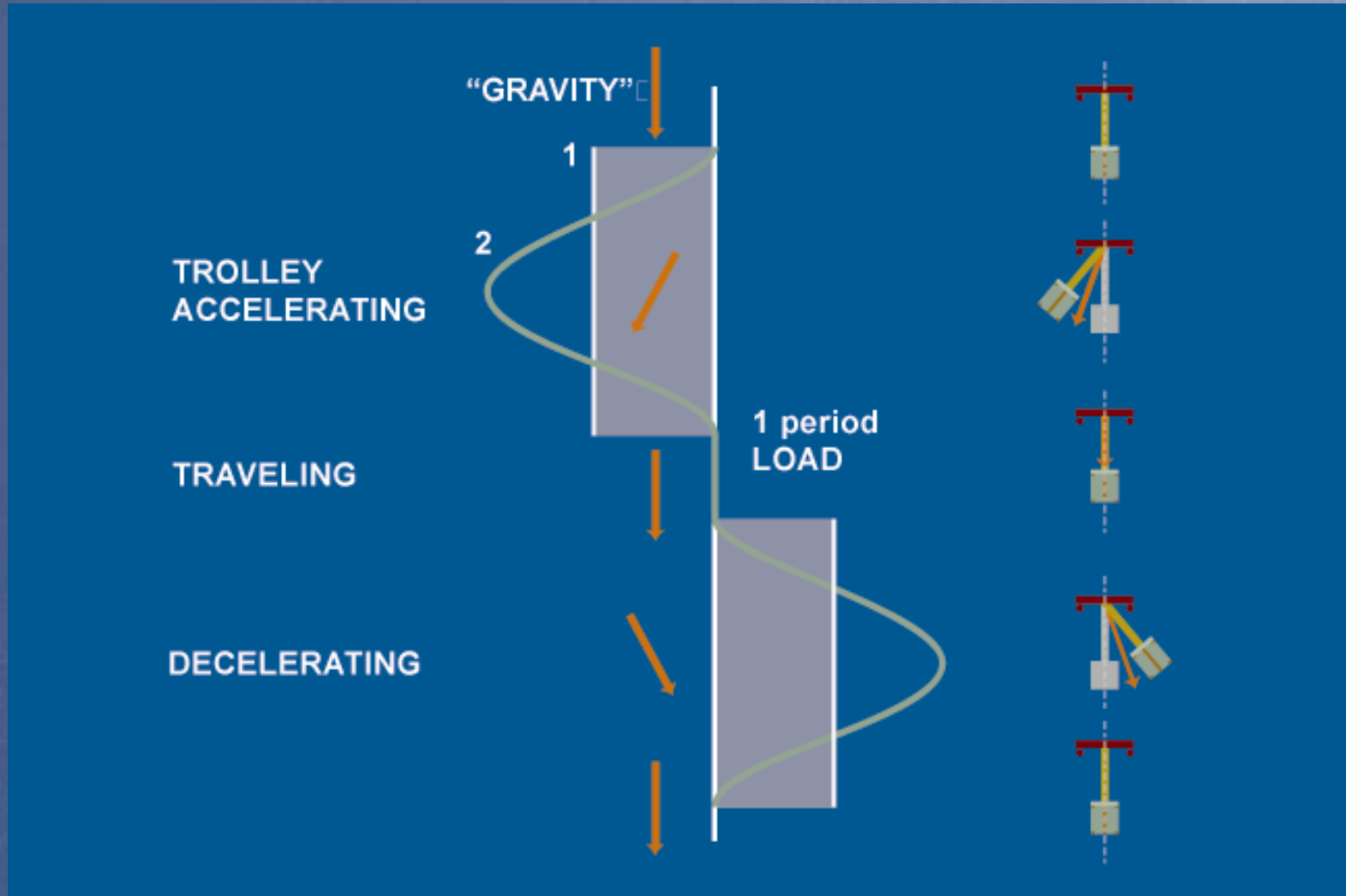
# Excessive Gantry Frame Sway



# Frame Deflection and Stiffness

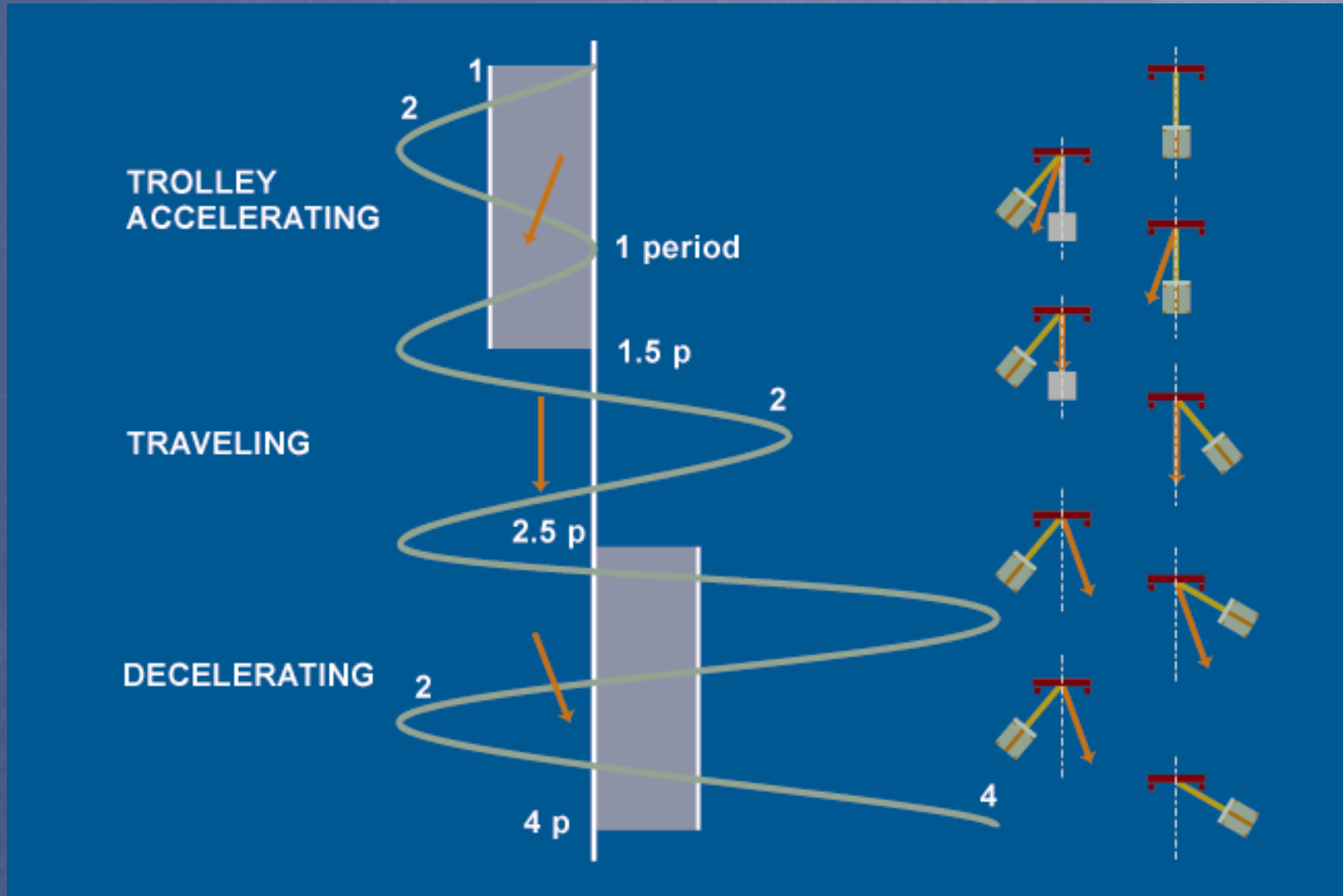


# Load Control - Best Case





# Load Control - Worst Case



## Best Load Control at Worst Hanging Load Period





# **Liftech Crane Specification Requires:**

**The first period of the frame in  
the trolley travel direction shall  
be 1.5 seconds or less.**

# Original Frame, $T_s = 2.6$ seconds

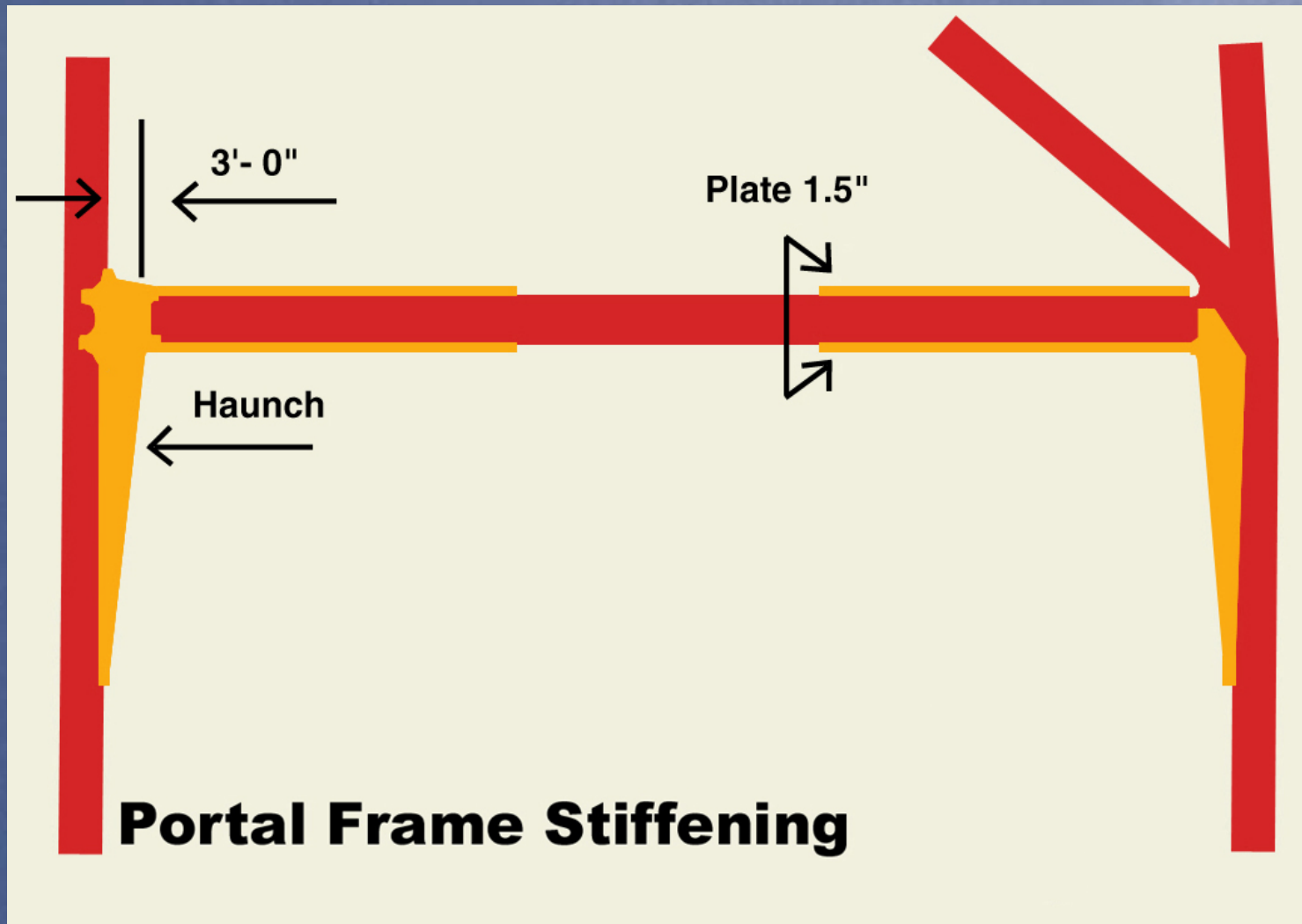




# Temporary Stiffening, $T_s = 1.6$ seconds



# Permanent Stiffening, $T_s = 1.75$ seconds



# Permanent Stiffening





# Summary of Special Considerations

- ◆ Rope Sag
- ◆ Cost
- ◆ Weight and Wheel Loads
- ◆ Rope Trolley versus Machinery Trolley
- ◆ Excessive Gantry Frame Sway - Operator Comfort and Fatigue

**Copyright 1999 by Liftech Consultants Inc. All rights reserved.**

This material may not be duplicated without the written consent of Liftech Consultants Inc., except in the form of excerpts or quotations for the purposes of review.

The information included in this presentation may not be altered, copied, or used for any other project without written authorization from Liftech Consultants Inc. Anyone making use of the information assumes all liability arising from such use.