Preventing Struck-by Injuries Below the Hook

Moderator – Douglas Trout, MD – NIOSH Office of Construction S&H

Tom Gordon – International Union of Operating Engineers Local 14-14B
Jim Wiethorn, Ph.D., PE – Intl. Crane & Construction Safety Solutions, LLC
Mike Parnell - Industrial Training International

CPWR Informational Webinar Series

Thomas Gordon
Training Director
I.U.O.E. Local 14-14B N.Y.C.

- Tom is a 32 year member of the I.U.O.E. and has been a Training Director for I.U.O.E. Local 14-14B for 7 years. Tom is currently on multiple committees, both local and national involving safety standards, testing and best practice protocols in the construction industry. Specializing in crane & rigging safety.

CREATE A SPHERE OF SAFETY
PREVENT STRUCK-BY INJURIES

Jim D. Wiethorn, Ph.D., P.E.

Engineering Specialist
International Crane & Construction
Safety Solutions, LLC
Sugar Land, Texas

Dr. Wiethorn is a third-generation general contractor in the family business who has been involved in crane use and operations during his entire career. Dr. Wiethorn has analyzed over 1,200 crane accidents during his forensic career and published ***Crane Accidents: A Study of Causes & Trends to Create a Safer Work Environment-1983-2013*** in 2014. Dr. Wiethorn's dissertation, ***An Analysis of Critical Factors of Lift Planning to Improve Crane Safety Based on Forensic Causation of Crane Accidents***-2018, is based on his 35-year crane study data base on over 700 crane accidents. Dr. Wiethorn is a main committee member of the American Society of Mechanical Engineers (ASME B30), as well as sub-committee member of ASME B30.3-Tower Cranes and ASME B30.29-Self Erect Tower Cranes. Dr. Wiethorn also serves the National Commission for the Certification of Crane Operator (NCCCO) Tower Crane committee and Rigging Task Force committee.

CREATE A SPHERE OF SAFETY
PREVENT STRUCK-BY INCIDENTS

Preventing Struck-By Incidents

Mike Parnell

Senior Consultant, ITI – Field Services

ASME B30 Past Vice Chair (Cranes & Rigging)

ASME P30 Past Chair (Lift Planning)

CREATE A SPHERE OF SAFETY
PREVENT STRUCK-BY INCIDENTS

Objectives

- Discuss Key Roles and Responsibilities
- Identify the risks that need to be reviewed
- Discuss risk factors that lead to struck by incidents in the lift zone
- Discuss best practices

Personnel Roles and Responsibilities

- General Contractor
- Lift Director
- LHE Operator
- Rigger
- Signalperson

THE LIFT DIRECTOR'S JOB

STOP CRANE OPERATIONS IF ALERTED OF AN UNSAFE CONDITION

ENSURE PREPERATION OF THE AREA (GROUND CONDITIONS ECT.)IS COMPLETE TO SUPPORT CRANE

BARRICADING OF SWING RADIUS AND WORK ZONE

ENSURE THE NECESSARY TRAFFIC CONTROLS ARE IN PLACE FOR WORKERS AND THE GENERAL PUBLIC

ADDRESS ANY SAFETY CONCERNS OF THE OPERATOR OR OTHER PERSONNEL INVOLVED IN THE OPERATION

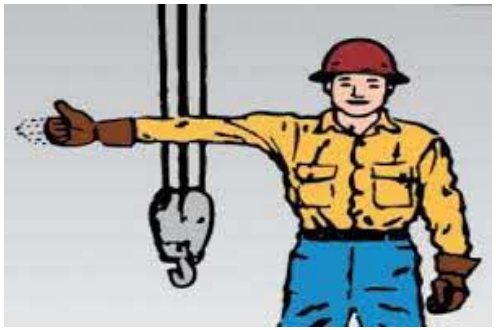
THE LIFT DIRECTOR'S JOB

FOLLOW OSHA GUIDELINES IN 1926.1400 WHEN ASSEMBLING/ DISASSEMBLING TRAVELING OR OPERATING CRANES AROUND POWER LINES

CREATE A SPHERE OF SAFETY PREVENT STRUCK-BY INCIDENTS

APPOINT SIGNALPERSON AND MAKE SURE THEY MEET REQUIREMENTS IN OSHA 1926.1400

ENSURE PRECAUTIONS ARE TAKEN DURING OUT OF THE ORDINARY LIFTS (CRITICAL PICKS)



LIFT DIRECTOR'S JOB

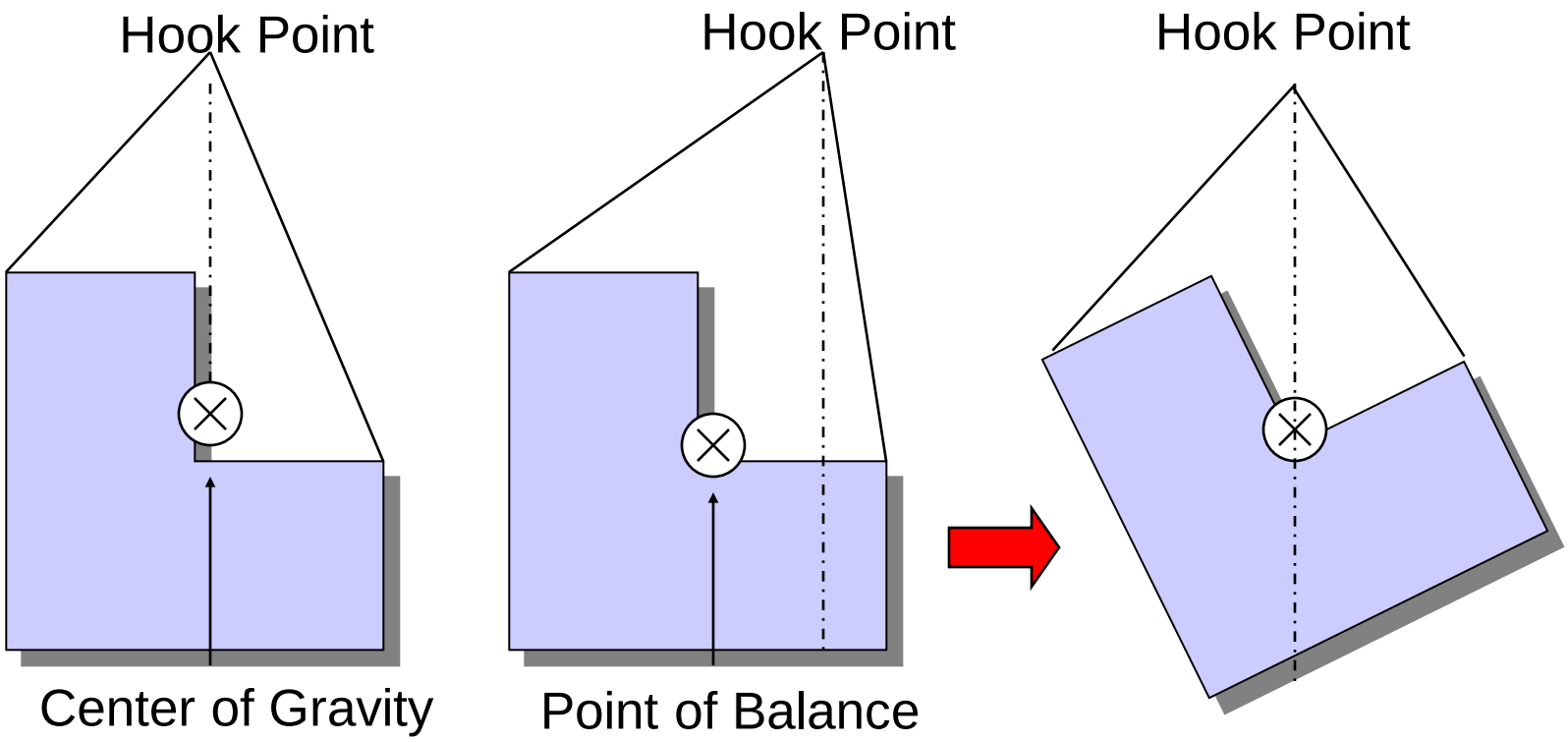
BE ONSITE DURING ALL LIFTING OPERATIONS

CREATE A SPHERE OF SAFETY PREVENT STRUCK-BY INCIDENTS

ENSURE THE LOAD IS PROPERLY RIGGED AND BALANCED BY QUALIFIED PERSONAL AS PER OSHA 1926.1400

INFORM THE OPERATOR OF THE WEIGHTS OF THE LOADS AND WHAT THE PLAN IS FOR MOVING AND PLACING THEM

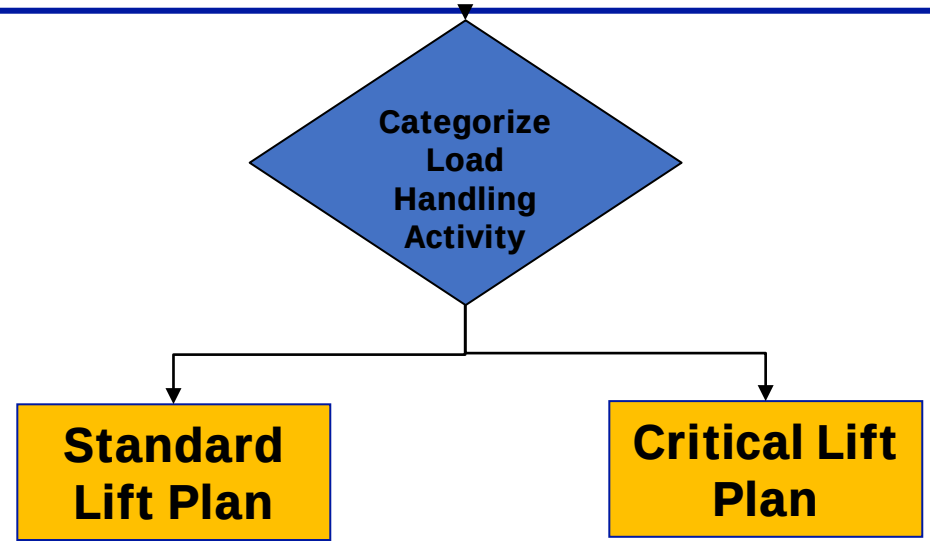
Center of Gravity



The Load will find the point of balance

Load Handling Considerations

a. Potential Hazards to Persons
b. Hazards in Proximity to the Work Area
c. Complexity of the Load Handling Activity
d. Adverse Impact from Environmental Conditions
e. LHE Capacity and/or Performance
f. Rigging Capacity and/or Performance
g. Adverse Commercial Impact
h. Site Requirements Unique to Load Handling Activity
i. Repetitive Lifts



Lift Plan Categories

Standard Lift Plan

- The load handling activity can be accomplished through standard procedures, and that the load handling activity personnel can execute using common methods, materials and equipment.
- Does not require written plan.

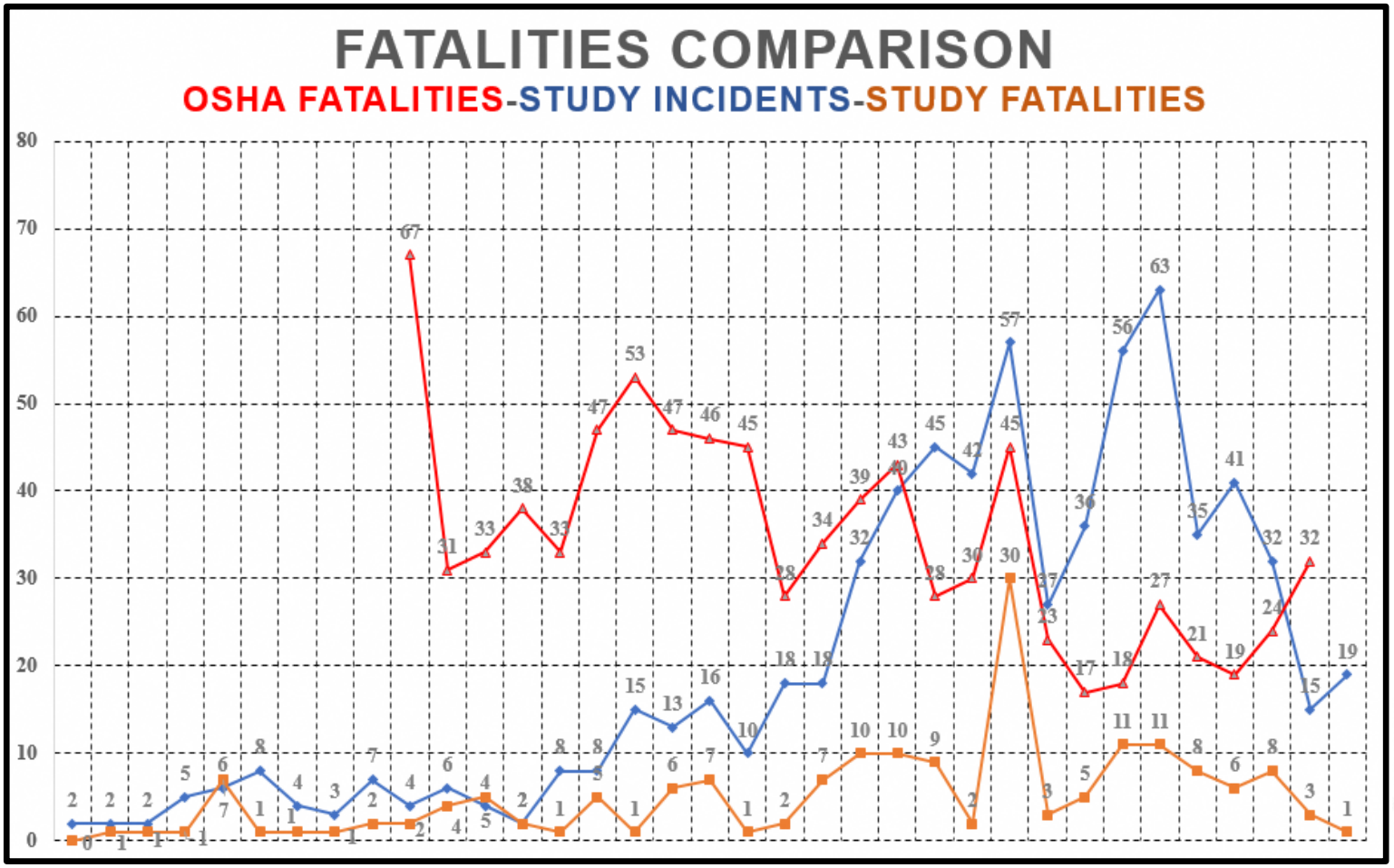
Critical Lift Plan

- The load handling activity exceeds standard lift plan criteria and requires additional planning, procedures or methods to mitigate the greater risk.
- Requires a written plan.

Pre-Lift Meeting

- Review activity
- Handling sequence
- Personnel assignments
- Questions/solutions
- Review

Estimated Crane Accident Population



Estimated Crane Accident Population

YEAR	YEARS	STUDY FATALITIES	OSHA* FATALITIES
1992	1	2	67
1993	2	4	31
1994	3	5	33
1995	4	2	38
1996	5	1	33
1997	6	5	47
1998	7	1	53
1999	8	6	47
2000	9	7	46
2001	10	1	45
2002	11	2	28
2003	12	7	34
2004	13	10	39
2005	14	10	43
2006	15	9	28
2007	16	2	30
2008	17	30	45
2009	18	3	23
2010	19	5	17
2011	20	11	18
2012	21	11	27
2013	22	8	21
2014	23	6	19
2015	24	8	24
2016	25	3	32
TOTAL		**159**	**868**

* Data obtained from OSHA Directorate of Construction

Estimated Total Crane Accidents

868	Total OSHA Fatalities - 1992-2016	
25	Number of years of data	
34.72	OSHA Fatality Per Year	
4.8	Study number of Non-Fatal to Fatal	**(701/144)**
166.656	Total Estimated Accidents per year	**(34.72x4.8)**
5832.96	Total number of crane accidents 35 years	**(167x35)**

Estimated Confidence Level

5833	TOTAL ESTIMATED ACCIDENT POPULATION
701	TOTAL STUDY ACCIDENTS
99%	Confidence Level
4.55%	Margin of Error
7000	20% INCREASE FOR UNREPORTED ACCIDENTS
701	TOTAL STUDY ACCIDENTS
99%	Confidence Level
4.60%	Margin of Error

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Accident Types – Personnel Descriptions

Accident Types:		
Assembly/Disassembly	22	3.1%
Bomm/Jib Collapsed	1	0.1%
Boom/Jib Collapsed	104	14.8%
Boom/Jib Dropped	45	6.4%
Crane Overturn	129	18.4%
Crane Travel/De-Railed	12	1.7%
Landed Load-Stability Failure	44	6.3%
Other	12	1.7%
Personnel Basket Failure	6	0.9%
Power Line Contact	26	3.7%
Rigging Failure	33	4.7%
Signaling	17	2.4%
Slewing Assembly Failure	4	0.6%
Trip/Slip/Fall/Jump From Crane	10	1.4%
Two Block	11	1.6%
Unstable/Dropped/Lost Load	111	15.8%
Worker Contact by Crane-Accident	7	1.0%
Worker Contact By Crane-No Accident	32	4.6%
Worker Contact by Load-Accident	10	1.4%
Worker Contact By Load-No Accident	65	9.3%

Descriptions:	
Rigger	Connects the rigging to the load
Ironworker	Receives load-disconnects
Operator	Operates the crane
Signal Person	Signals the crane
Oiler	Supports Operator/Maintenance
Management	Supervisory-not physically involved in lift
Other Field Personnel	Other personnel on site
Pedestrian/Bystander	Individuals not authorized to work on the site

Fatalities by Trade/Category

FATALITIES BY TRADE	Arborist-Logging - Agriculture	Commercial Construction	Highwy-Road & Bridge	Industrial-Refining	Manufacturing	Marine	Mining	Oilfield-Land Base	Oilfield-Offshore	Residential Construction			
Ironworker		13	11	7				2			33	18.9%	3
Operator	1	16	6	11	6	5	1	1	1		48	27.4%	2
Rigger	2	4		6	1		2	3			18	10.3%	
Management		5		5			1				11	6.3%	
Other Field Personnel		16	11	9	6	7		5	1	1	56	32.0%	1
Signal Person		2								1	3	1.7%	
Oiler		2									2	1.1%	
Pedestrian/Bystander		3	1								4	2.3%	
	3	61	29	38	13	12	4	11	2	2	175		
	1.7%	34.9%	16.6%	21.7%	7.4%	6.9%	2.3%	6.3%	1.1%	1.1%			
		1	3	2									

Injuries by Trade/Category

INJURIES BY TRADE	Arborist-Logging - Agriculture	Commercial Construction	Highwy-Road & Bridge	Industrial-Refining	Manufacturing	Marine	Mining	Oilfield-Land Base	Oilfield-Offshore	Residential Construction			
Ironworker		33	11	15	2	1	2	2	5		71	17.4%	3
Operator	4	10	5	12	11	4		2		4	52	12.7%	
Rigger	3	58	6	35	6	9		5	9	6	137	33.6%	1
Management		3	1	1		1				1	7	1.7%	
Other Field Personnel		42	6	22	8	3	2	8	6	2	99	24.3%	2
Signal Person		5	1	5					1	1	13	3.2%	
Oiler				1							1	0.2%	
Pedestrian/Bystander		4	2	21						1	28	6.9%	
	7	155	32	112	27	18	4	17	21	15	408		1
	1.7%	38.0%	7.8%	27.5%	6.6%	4.4%	1.0%	4.2%	5.1%	3.7%			
		1	3	2									

Statistics

- 701 crane accidents were evaluated and analyzed:
  - 146 of the 701 crane accidents involved at least 1 fatality: 1 fatality for every 5 accidents – (20.8%)
    - 167 accidents per year equates to 33.4 fatalities/year
  - 408 of the 701 crane accidents involved at least 1 injury: 1 injury for every 2 accidents - (58.2%)
    - 167 accidents per year will equates to 83.5 injuries/year

- Accidents also occur when there is **No Load** on the hook:
  - 243 of the 701 crane accidents involved no load on the hook - (34.7%)
    - 167 of the 243 accidents involved an injury – 68.7%)
    - 83 of the 243 accidents involved a fatality – (34.2%)

Statistics

- New Employees are inherently more likely to be involved in an accident as compared to more experienced workers:
  - Special color for hard hats
  - Shadow more experienced workers

- Crew members that are unfamiliar with each other and their procedures are similarly inexperienced as a group: **operator-riggers-ironworkers-management**
- It is imperative to implement communication with a pre-lift meeting that discusses roles and responsibilities of all parties involved
  - Detail of crane movements

- Analysis indicated that crane lifts that did not have a pre-lift meeting have a **335 times higher risk** of having an accident than one that has a meeting.
- Understand your role and follow the plan

To Avoid Struck-By Incidents

Let’s Get Into The Weeds

Step 1

- Pre-lift meeting
  - Identify Load Handling Activity
  - Identify Roles / Responsibilities / Positions
  - Talk Through Lift & Move Sequence
    - Hoist, Boom Down, Swing Right…

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PREVENT STRUCK-BY INCIDENTS

Step 2

- Confirm Crane Capacity
- Confirm Rigging Capacity / Hitch Configuration
- Tagline or Push / Pull Stick …

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Step 3

- Rigging Collected Over the Center-of-Gravity
- Hoist Line / Boom Point Over the CG

Step 4

- No Gawkers or Non-Essential Personnel

- Assigned Personnel to Avoid Being Between the Load and an Obstruction

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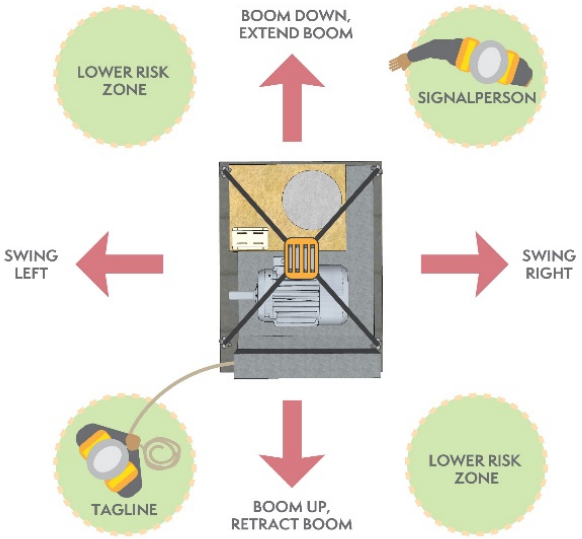
PREVENT STRUCK-BY INCIDENTS

Step 5

- Tagliner, Signaler, Rigger in Low-Risk Zones



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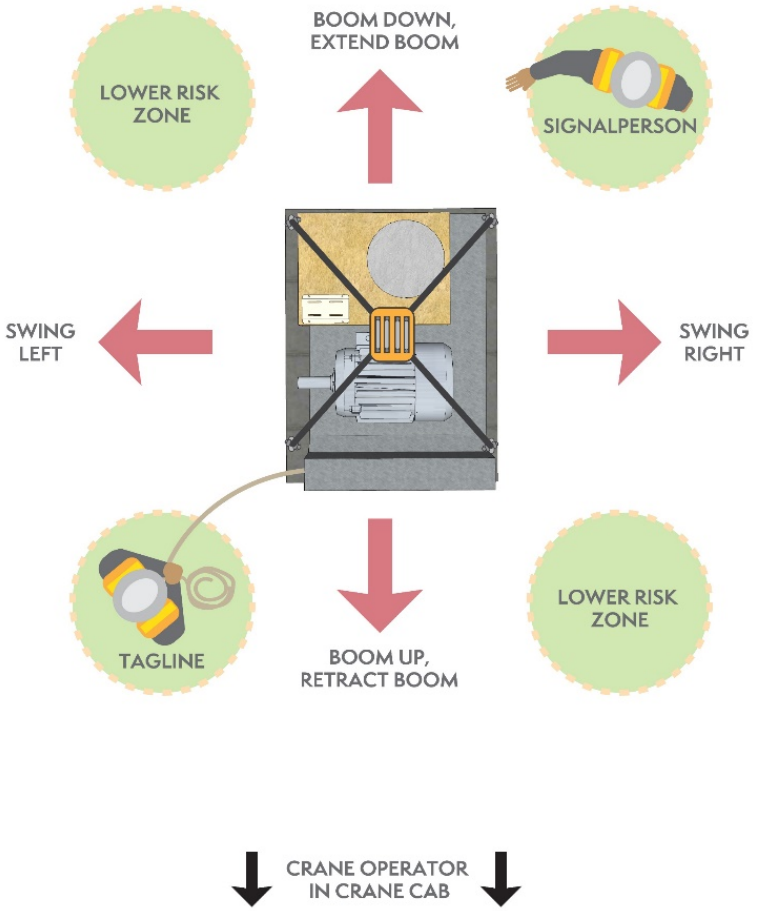
Review

- Planning and Pre-Lift Meeting
- Capacity and Configuration
- Center-of-Gravity
- Personnel in the Low-Risk Zones
- Execute the Lift

Thank You



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Questions and Comments

Thanks for Your Participation!