



SAFE WORK PROCEDURES

SWING STAGE RIGGING

(FOR OPERATION AND INSPECTION)

The information contained herein is intended as a practical summary of generally recognized best industry practices. It is superceded by all manufacturer instructions and Provincial and Federal regulatory requirements. It is the user's responsibility to obtain suitable training and to consult with the appropriate regulating authorities and/or a professional engineer as required.

SAFE WORK PROCEDURES - SWING STAGE RIGGING

Written by	Date last revised
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Hazards Present	PPE Required	Additional Training Requirements
<ul style="list-style-type: none"> ● electric shock ● falling objects from overhead ● platform fall ● stranded workers ● cuts to hands 	<ul style="list-style-type: none"> ● 5/8" polypropylene/polyethelene lifeline (CSA) ● full body harness with front & back D-ring (CSA) ● 3' lanyard with shock absorber (CSA) ● ropegrab (CSA) ● hardhat (CSA) ● safety footwear (CSA) ● leather gloves ● cel phone 	<ul style="list-style-type: none"> ● swing stage rigging training ● fall protection training

*This task may only be performed by trained personnel.
It must always performed with at least two workers on site.
Workers will independantly verify all aspects of each other's rigging.*

Rooftop Rigging

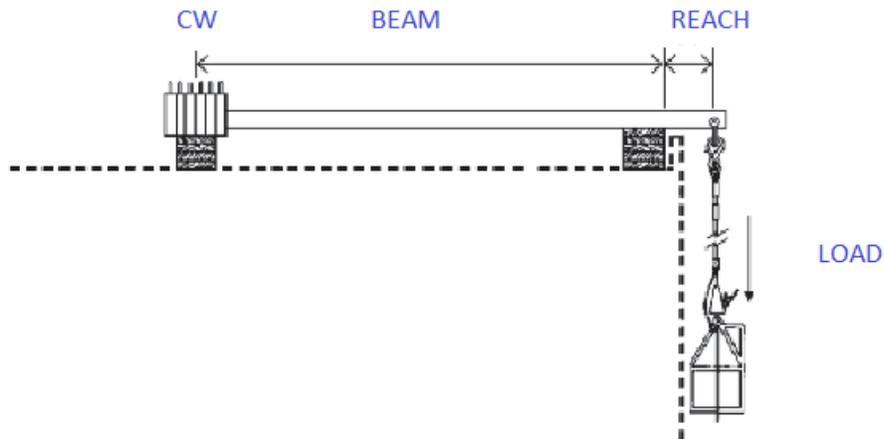
1. Assemble outrigger beams and confirm they are correctly spliced and fastened
2. Always wear fall arrest equipment when approaching a parapet less than 4' high (see attached fall protection summary)
3. Place the outriggers on the parapet, as close to perpendicular as possible to the lead wall. Outboard thrust (distance from wall to suspension point) should be approximately 19" with end stirrups or 24" with walk-through stirrups.
4. Measure distance between suspension points to correspond with stirrup spacing
5. Where unsure of the load capacity of the parapet, disperse the load with dimension lumber or use shoring to support the outriggers
6. Clamp outrigger beams to the shoring at front and back
7. Place 3/4" plywood on roof to disperse counterweight load
8. Ensure suspension rope reaches lowest possible landing

9. Fasten sufficient counterweight to the outriggers using the following formula:

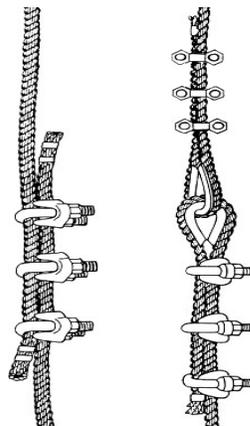
$$\text{Counterweight} = \text{Reach} \times \text{Load} \times \text{Safety Factor (4)} / \text{Beam}$$

where:

- “reach” is the distance from the fulcrum point to suspension point (usually 19 – 24”)
- “load” is the rated capacity of the platform or hoists, whichever is less (usually 1000#)
- “safety factor” is 4
- “beam” is the distance from the fulcrum point to the *center* of the counterweights



If the outriggers rest on shoring and are fastened to the longhorn (counterweights) with wire rope, the terminations should be as in the second diagram below, *never* the first.



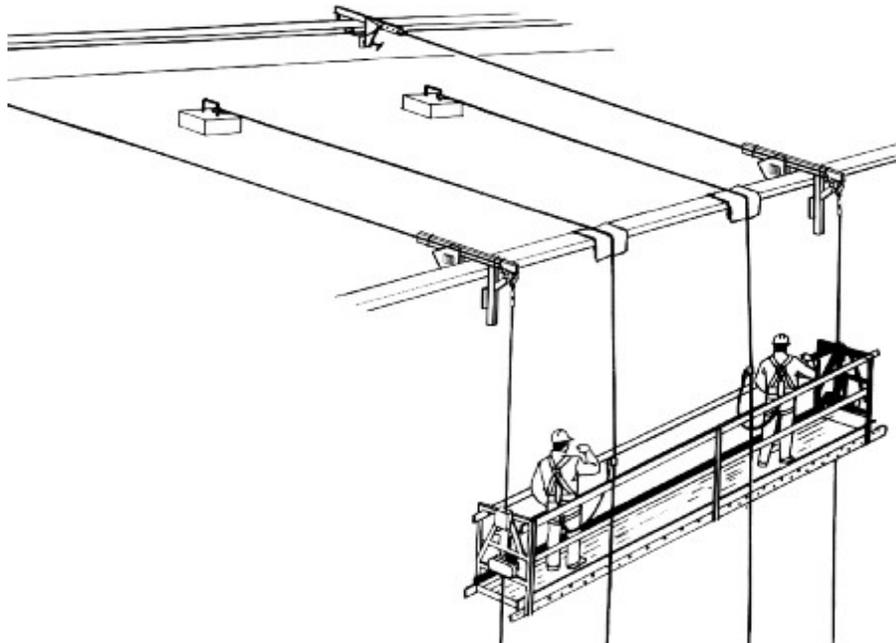
Wrong

Right

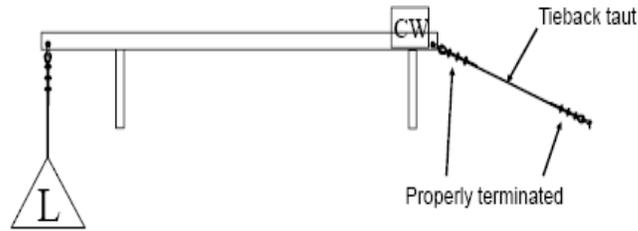
9. Tie back the outriggers, ensuring the tie-back wire rope has/is:

- a minimum rated working load of the hoist cable (usually 5/16")
- taut (with turnbuckle if possible)
- properly terminated at either end with thimble and 3 properly spaced and torqued clips (preferably fist grips)
- anchored to a substantial structure (4:1 safety factor)
- flagged with caution tape where it may pose a tripping hazard

A parapet clamp on the opposing wall may be used as a tie-back anchor as illustrated in the following diagram. It must be confirmed that the parapet can support the appropriate load.

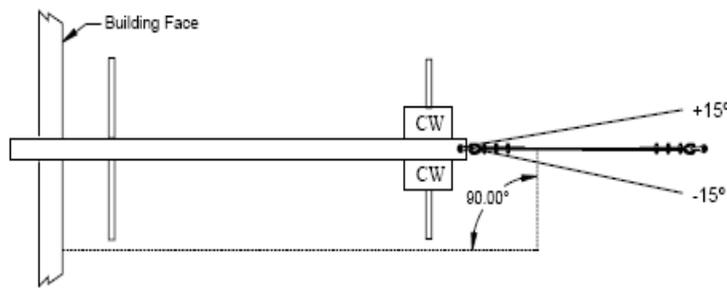


Where counterweights are properly fastened, Sky Climber maintains that the tie-back should be fastened to the *back* of the beam, *not* to the suspension point and wrapped around the beam as was the case with old “suitcase” style counterweights that could come loose from vibration, etc. This minimizes chaffing points and ensures a taut cable.

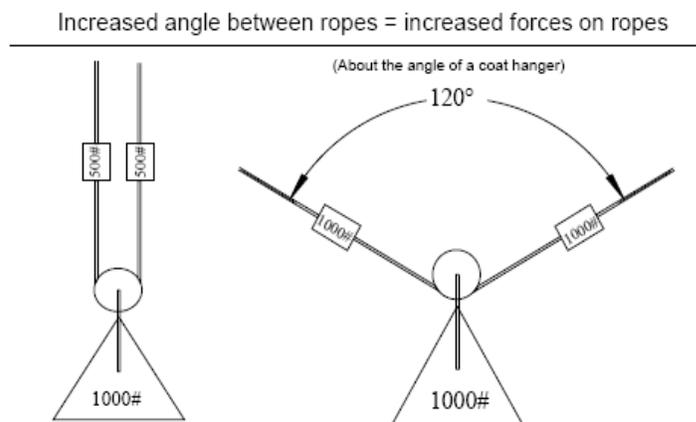


The above diagram shows the beam perpendicular to the lead wall. Where that is not possible, the tieback should fasten to the *front* of the beam so as to reach *straight* back to the anchor point.

Where a single tieback is used, it must be at a right angle to the lead wall (+/- 15 degrees)

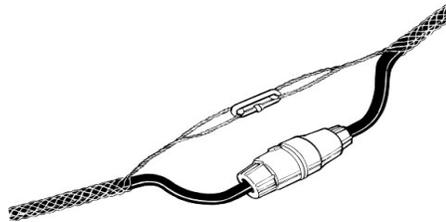


If no tieback anchor is available at a right angle, two independent tiebacks may be used. They should form equal opposing angles. Keep the angle as little as possible as in the first figure below.



Power

1. Inspect power cord to ensure it is not worn
2. Connect to a dedicated 220V 20amp circuit
3. If installing a “pigtail” in the panel, replace panel cover. If not possible, mark clearly with caution tape.
4. Anchor power cord to a substantial structure on the roof
5. Elevate power cord connections to remove risk of resting in a puddle after a rain
6. Install a “sock” supporting device (see picture below) to relieve strain on connections in a vertical run.



7. Place a carpet, hose, or other method of protecting the power cord at all possible points of chaffing
8. Where there is power drop due to length of cord, install booster as close to power source as possible
9. Run power cord *behind* platform rather than against wall
10. Maintain clearance below by placing barriers, caution signage, and/or overhead protection as required
11. *Slowly* lower power cord

Hoist Cables

IMPORTANT: OUTRIGGERS MUST BE WEIGHTED AND TIED BACK BEFORE PROCEEDING

1. Inspect the hoist cables for birdcaging, kinks, broken strands, or adhesive substances (tar) that may affect their integrity or ability to pass through the hoist
2. Connect swaged end of wire rope to rigging collar with shackle and move rigging collar to appropriate outboard distance (approximately 19” for end stirrups, 23” for walk-throughs)
3. Ensure all shackle pins are secure so they cannot loosen (moused if they are not threaded)
4. Put on leather gloves and *slowly* lower wire ropes to ground

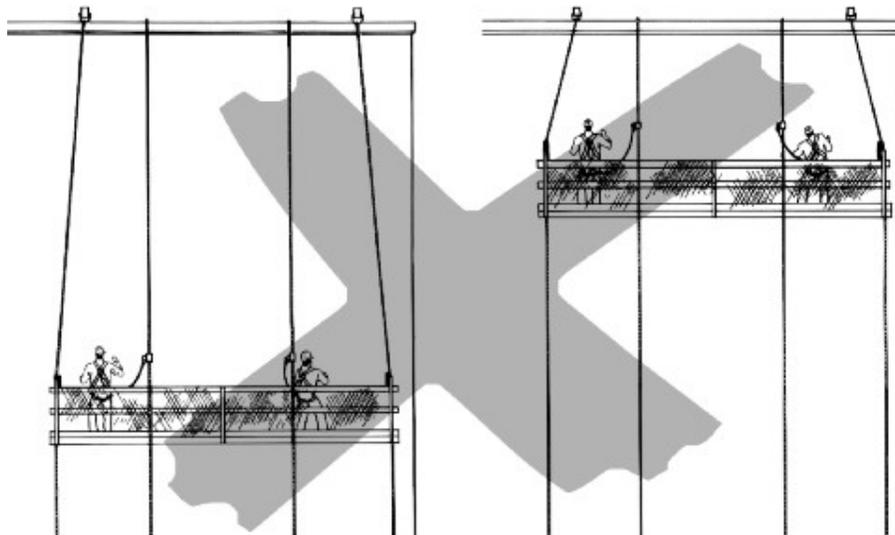
Platform Assembly

1. Always wear a hardhat when working on ground level
2. Assemble the platform modules according to the following diagram

SKY STAGE		SAFE WORKING LOAD ONLY FOR CONFIGURATIONS WITH END STIRRUPS						SKY STAGE	
Max. Safe Working Load (uniformly distributed)	Suspension Distance	Self-Weight	Instructions for actual safe working load Add working load limit of holsts. Compare working load limit of holst with max. safe working load of platform. The LOWEST rating is the ACTUAL SAFE WORKING LOAD. Read 'Installation Instructions' prior to assembling.				Self-Weight	Suspension Distance	Max. Safe Working Load (uniformly distributed)
2000 lbs (900 kg)	6' 9" (2m)	249lbs (113kg)	2	3	3	3	584lbs (265kg)	(9m) 29'3"	1000 lbs (450kg)
	9' 9" (3m)	285lbs (129kg)	5	2	3	3	662lbs (300kg)	(10m) 33'0"	
	13' 6" (4m)	363lbs (164kg)	7	2	3	3	698lbs (316kg)	(11m) 36'0"	
	16' 6" (5m)	399lbs (181kg)	7	3	3	3	734lbs (333kg)	(12m) 39'0"	750 lbs (340kg)
19' 6" (6m)	435lbs (197kg)	3	3	3	2	811lbs (368kg)	(13m) 42'9"		
23' 3" (7m)	512lbs (232kg)	2	3	2	3	847lbs (384kg)	(14m) 45'9"		
1500 lbs (680 kg)	26' 3" (8m)	548lbs (249kg)	3	2	3	3	883lbs (401kg)	(15m) 48'10"	

**** maximum safe working load on a cantilever is usually only 250lbs!**

3. Confirm that the guardrails are in place
4. Verify all of the pins are present and correctly fastened with the keepers in place
5. Ensure distance between suspension cables never greater than 48' (15m)
6. Ensure the distance between the stirrups/hoists matches the distance between suspension points above.



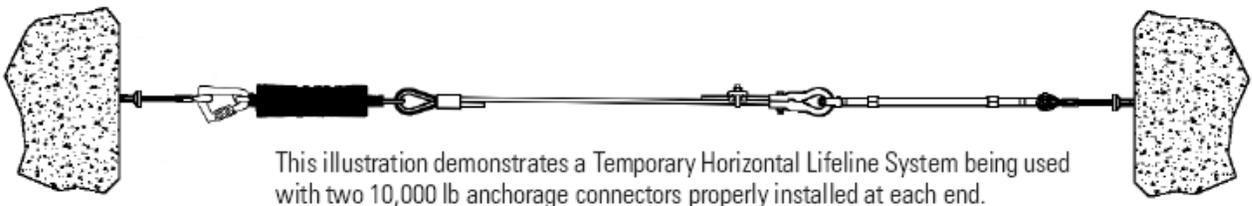
7. Ensure distance beyond hoists (cantilever) never greater than 10' (3m)
8. Ensure an operator's manual is stored on the platform
9. Connect power and wrap cord around stage truss so it does not shake loose and fall
10. Reeve hoists, being careful not to kink the wire rope
11. Test the hoists' emergency features (mechanical descent switch, red power "kill" switch, and Skylock)
12. Ensure the load does not exceed the rated capacity of the platform or hoists (usually 1,000#)
13. Roll the excess wire rope and tape it in a neat spool. Do likewise with the lifelines to avoid tripping hazards.
14. Connect rope grab to lifeline
15. Have one man on the roof maintain contact while watching for movement while the stage is lifted
16. Raise the stage to top of building to confirm correct spacing from wall. Make necessary adjustment by moving rigging collars. (Operator must maintain constant alertness as to obstructions, ledges, and other possible impediments to the stage.)
17. At end of shift, rest the stage on a firm surface such as on top of scaffolding to ensure it does not blow in a wind.
18. Disconnect the power on the roof to prevent vandalism.

Fall Protection Summary

- When working on the roof, fall protection is required where the parapet is less than 4' high
- When working on roof, the fall protection system may consist of guardrails, a travel restraint system, or fall arrest
- When working on the swing stage, ensure that each worker has a vertical lifeline that is independently anchored to one of the following:
 - a substantial structure
 - a 5,000# permanent anchor point
 - a Temporary Fixed Support System capable of supporting a static force of 1,350# when using a shock absorber (see p.26 Manitoba Fall Protection Guide), such as Miller 496 anchor



- an engineered horizontal lifeline system installed according to manufacturer's directions



- Protect lifelines from chaffing with carpet, hose, or other suitable material. Fasten it to the lifeline to prevent it from coming loose and falling (figure 1)

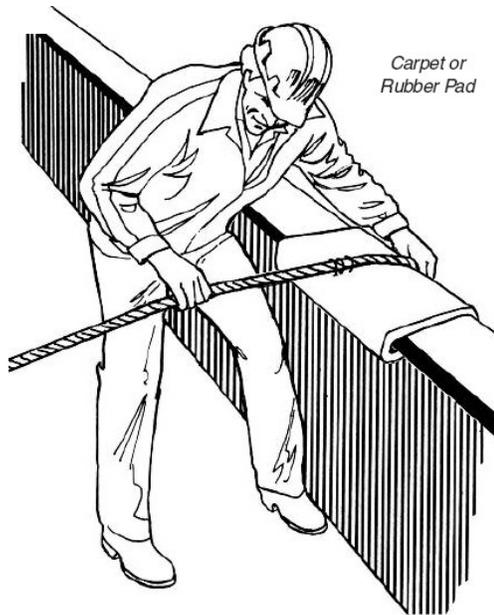


figure 1



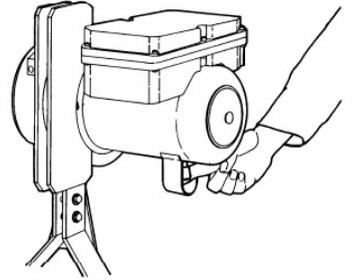
figure 2

- Ensure rope grab is never below waist height to minimize free fall (figure 2)
- confirm that:
 - lifeline reaches the ground
 - lifeline is not joined (ie- is one continuous rope)
 - each man has an independant lifeline
 - fall clearances are accounted for so as not to “bottom out”
 - harnesses are snug fitting and properly fastened
- All PPE, wire ropes, power cords, hoists, Skylocks, or any other equipment deemed to be defective will be immediately tagged and removed from service.

Emergency or Malfunction of Hoists

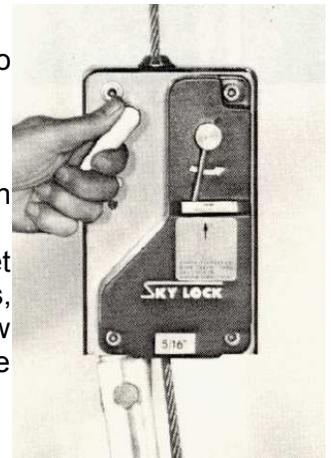
No Power

1. Check power cord connections
2. Have worker on roof check for tripped breaker
3. Lower using mechanical descent switch
4. Identify and solve problem or service hoist



Skylock Deployed

1. Ensure that the stage is not caught or obstructed and that there is no slippage of the wire rope through the hoist
2. Go up 6 inches to remove weight from Skylock
3. Pull the large lever as in the photo
4. While holding the large lever up, push the reset switch (smaller lever) in the direction of the arrow until you hear a clicking noise
5. If the operator has not carefully followed the above steps, the reset switch's pin will break. In that event, remove the two screws on the sides, and remove the U-shaped cover (to the top and sides). Push a flat screw driver into the opening above (where the wire rope enters) and reset the device in this manner.
6. Lower to the ground and service Skylock



Hoist will not stop running up or down

1. Hit the red "kill" power switch as soon as possible so the stage does not move into a vertical position
2. Lower stage to the ground using the mechanical descent switch
3. Service Hoist



Stranded worker (none of the above works)

Follow emergency preparedness/rescue plan

Documents, Standards, Applicable Legislation

- Manitoba Workplace Safety and Health Regulation 217/2006
 - Part 13 – fall protection
 - Part 28 – scaffolding
- Manitoba Fall Protection Guideline July 2008
- CSA Z271-98
- Ontario SAE
- Sky Climber LLC
 - Letter Oct. 2, 2009
 - Operator's Manuals
 - Classroom Training