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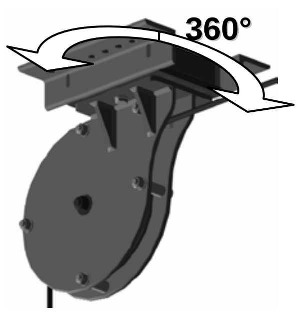
Installation, Operation & Maintenance Manual v1.1

SVLB series, Swiveling Loft block.

	***Swiveling Loft Block* (SVLB)** Sizes: 0800 Series – 8in [203mm] sheave, up to 1/4in [6mm] cable/rope rated for 875 lbs [397 kg] per line with a 10:1 Safety Factor 1000 Series – 10in [254mm] sheave, up to 3/8in [10.0mm] cable/rope rated for 2200 lbs [998 kg] per line with a 10:1 Safety Factor 1200 Series – 12in [305mm] sheave, up to 1/2in [14.0mm] cable/rope rated for 4000 lbs [1814 kg] per line with a 10:1 Safety Factor Multi-line sheaves available

Overview of AMC SVLB

The **SVLB** series of blocks consist of single or multi-line sheaves mounted between steel side cheeks then fastened through and welded to the swiveling hub. This hub is captured within the base angle frame and allows the sheave to rotate through 360°. The sheave can then be locked into the desired angle of rotation via four grub screws (optional).
The Side Cheeks and Base Angles are fabricated from A36 HRS, then powder coated matte black.
All fastenings are minimum Grade 8 or Class 10.9 and are correctly torqued at the factory.
Sheaves can be supplied in 6061-T6 Aluminum, Heat Treated Steel, Mild Steel and Nylatron®. Coatings and Plating's available as required per application.
Timken® Tapered Roller Bearings are fitted as standard to all AMC Blocks.
AMC products are engineered to meet current performer flying specifications and standard theatrical specifications.

Warnings:
The products contained within must be installed by qualified rigging personnel in accordance with all relevant Local & National Standards and Guidance.
Incorrect use may cause hazardous conditions and possible injury/death.
A qualified engineer must approve all applications and installation methods.
Full inspection is required after any occurrence of shock loading.

Installation Procedures:

- First check the condition of the block for any damage due to shipping accidents.

- Check the sheave groove for correct radius and contact with the Steel Wire Rope to be used. See Notes on Oversize Tolerance & Groove Diameter.

- Check for unobstructed free rotation of the sheave on the shaft bolt, small resistance is usual in a pre-loaded tapered bearing. Listen, the sheave should spin silently.

- Check the overall suitability of the surrounding support structure to which the block is to be fixed, take into account both the vertical and horizontal loads the block will impose on the structure when loaded. Note the resultant horizontal load the block will place on the supporting steel when swiveled off axis.

- Check the condition of the steelwork the block is to fastened to, the base angle must sit flush against the beam when correctly installed.

The block can either be directly bolted, clipped or welded to the structural steelwork of the building.

Bolts:
Whichever method (other than welding) is applied, AMC requires a minimum of 4 or 8 Grade 8 or Class 10.9 bolts together with Grade 8 or Class 10.9 nylon-insert locknuts be used, depending on model number. Bolt sizes and mounting configurations need to be as per AMC specifications as cited in the General Assembly Drawings and Engineering Reports with no substitutions.

Clips:
When specifying AMC mounting clips measure the flange width of the mounting beam. The clip plate heel should be equal to the flange width for full contact. When using the clips select the appropriate holes in the block base angle to bolt through so that the vertical load is applied directly under the web of the mounting beam; take into account the horizontal load that will be imposed on the block and push the appropriate pair of bolts against the beam to prevent any possible movement.

Welds:
Both the surface of the beam and the sheave base angle must be correctly prepared for welding.

All welds must conform to Local & National codes and be approved by a structural engineer.
The Block should be clearly marked with a unique identifier to associate with the Inspection and Maintenance Logbook.
All mounting hardware should be tightened to the correct torque and marked for future inspections.
The final location of the base angle and any clips should be marked against the mounting beam for future inspections.

Weld configurations need to be as per AMC specifications as cited in the Engineering Reports with no substitutions.

A full load test should be performed before the sheave and supporting structure is placed into regular service.

Inspection Procedures:

Static Inspection:
Load applied / Sheave static

- Inspect all attachment hardware for loosening, wear, bending and any signs of movement against the supporting structure.
- Inspect the clips for deformation, fatigue and any signs of movement against the supporting structure.
- Inspect all assembly hardware for loosening, wear, bending and any signs of movement.
- Inspect for any signs of deformation or fatigue in the base angles and side cheeks. Check the integrity of the assembly welds.
- Inspect for any signs of wear of the rope against the rope keeps/spacers.
- Inspect the sheave groove(s); look for wear patterns in the bottom. Wear on the bottom of the groove could be a sign of excessive tread pressure. (
- Inspect the sheave groove(s); look for wear patterns in the sides. Wear on the sides of the groove could be a sign of excessive fleet angle.
- Inspect that the sheave is properly aligned on the shaft bolt; look for an equal gap between the two side cheeks and the sheave. Look for any scoring, paint chips on the inside of the side cheeks.

Dynamic Inspection:
Load applied / Sheave running

- Visually inspect the attachment hardware, clips, base angles and side cheeks for any signs of movement against the supporting structure.
  Pay particular attention when the sheave/load direction is reversed.
- Visually inspect the sheave rotation on the axle bolt when moving for any radial run out.

- Observe any unusual vibrations, movement and sounds.

The Dynamic Inspection requires two people; one qualified inspector observing the sheave and supporting structure while a second qualified person controls the movement of the rope through the sheave. Both persons should be in constant communication at all times during this inspection.

Maintenance Procedures:

The **AMC SVLB** are designed and engineered for a fully maintenance free lifespan.
All bearing lubricants are specified for an operating temperature range of 32°F (0°C) to 104°F (40°C) for the service lifetime of the bearing.
The bearings should not require further lubrication unless they become contaminated.
Do not attempt to re-lubricate the bearings in-place, any time the block is dismantled the cups must be thoroughly cleaned and inspected and the cones replaced and lubricated in a clean environment.
A synthetic Lithium based grease should be used to repack inspected/replaced bearings – as a rule of thumb bearings should be filled 30 – 40% of their space.
The Tapered Roller Bearings have the correct pre-load applied at the factory; the correct torque on the axle nut and on the rope keeps/spacers maintain this setting. See the table for correct torque values for all assembly fastenings.

Every **2000** running hours or **60** months perform a full refurbishment of the block.

This refurbishment is to include:

- Replacement of all mounting and assembly hardware.
  Torque fastenings to correct value.
- Replacement of the tapered roller bearing cup and cones. Repack with Lithium base grease per NLGI #2. Caution never use Teflon or Silicone base lubricants. Never use penetrates to clean bearings; this will lead to rapid failure of bearings.
  Both races must be replaced to guarantee accuracy.
- Detailed inspection of the roller bearing cups.
  Replace if there is any sign of wear, scoring or pitting.
  This requires a .0015 / .002 Interference Press fit. (See Timken for specific specifications.
- Detailed inspection of the sheave groove.
  If a wire rope check gauge check will not bottom out in the groove the sheave should be replaced or re-grooved.
- Certified weld inspection.
- Detailed inspections of the assembly – both surfaces are maintained parallel and perpendicular.

After refurbishment and placement of the sheave back into service a full load test must be performed.

Notes:

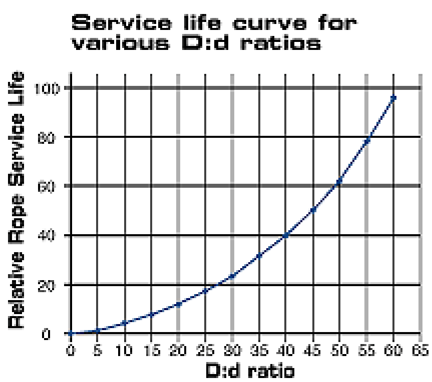
Radial & Bending Pressures.
In addition to bending stresses experienced by wire ropes operating over sheaves or pulleys, ropes are also subjected to radial pressure as they make contact with the sheave. This pressure sets up shearing stresses in the wires, distorts the rope's structure and affects the rate of wear on the sheave grooves. To great a radial pressure between the sheave and the rope will cause excess wear of the sheave groove(s) and could result in reduced rope life.
Excessive and/or Reverse bending will affect a ropes service life.
Recommended Maximum Tread Pressures and relative rope flexibility are available from your SWR supplier for most rope constructions.

The radial pressure may be determined from:

$$P = \frac{T_1 + T_2}{Dd}$$

P = The Tread Pressure lbsf/in^2 (kgf/cm^2)
T = Tension on each side of the Sheave lbsf (kgf)
D = Diameter of the Sheave in (cm)
d = Diameter of the Rope in (cm)

As with bending stresses, stresses due to radial pressure increase as the diameter of the sheave decreases.
Minimum D/d ratios must be observed, refer to your rope manufacturers recommendations. As a rule of thumb a minimum of 18:1 must be observed on most common SWR constructions and a minimum of 8:1 for fibre/synthetic ropes.



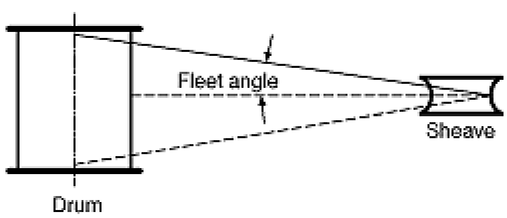
Load on bearing:
When a rope passes over a sheave, the load on the sheave bearing results from the tension in the rope and the angle of rope contact. It is independent of the diameter of the sheave.

The load on the bearing can be determined from:

Load on Bearing = 2T sin è/2 **T = rope tension (pounds)**
è = angle of rope contact

Fleet Angle:
Where a fleet angle exists as a rope enters a sheave, it initially makes contact with the sheave flange. As the rope continues to pass through the sheave it moves down the flange until it sits in the bottom of the groove. In doing so even under tension, the rope will roll as well as slide. As a result of the rolling action the rope is twisted, i.e. turn induced into or out of the rope, either shortening or lengthening the lay length of the outer layer of strands.
As the fleet angle increases so does the amount of twist, resulting in increased sheave wear and decreased rope life.
Excessive fleet angle can result in severe wear of the rope and sheave due to scrubbing against the groove flange.

Fleet angle is usually defined as the included angle between two lines, one which extends from a fixed sheave to the flange of the drum and the other which extends from the same fixed sheave to the drum in a line perpendicular to the axis of the drum.



If the drum incorporates helical grooving, the helix angle of the groove needs to be added or subtracted from the fleet angle as described above to determine the actual fleet angle experienced by the rope.

The maximum recommended fleet angle for a rope entering an AMC block is 1.5°

Oversize Tolerance & Groove Diameter for SWR use:

Oversize grooves offer insufficient support to the steel wire rope leading to increased localized pressure, flattening of the rope and premature wire fractures.
Grooves are deemed to be oversize when the groove diameter exceeds the nominal rope diameter by more than 15%.
Undersize grooves will crush and deform the swr, leading to two clear patterns of wear on the sheave and associated wire breaks.
Wire ropes are manufactured slightly larger than the nominal diameter.
The maximum allowable oversize tolerances provided by Wire Rope industry standards are shown below:

Nominal Rope Diameter	Tolerance %	
	under	over
Up to [•	-0	+8%
Over [• to 3/16•	-0	+7%
Over 3/16" to ¼"	-0	+6%
Over ¼"	-0	+5%

For general purposes, a recommended groove diameter is equal to the nominal SWR diameter +6%.
The profile at the bottom of the groove should be circular over an angle of approximately 120°, and the angle of flare between the sides of the sheave should be approximately 52°.

Groove Wear:

Nominal Rope Diameter	New Groove		Worn Groove	
	Inches	mm	Inches	mm
1/8	0.156	3.97	0.141	3.57
3/16	0.219	5.56	0.203	4.76
¼	0.281	7.14	0.266	6.75
5/16	0.344	10.3	0.328	8.33
3/8	0.438	11.1	0.406	10.3

Oversize Tolerance & Groove Diameter for fibre/synthetic rope use:

The profile at the bottom of the groove should be circular over an angle of approximately 180°, edges should be chamfered or radiused.
The Groove diameter should be nominally 20% larger than the nominal rope diameter

Torque Settings Tables

Metric Fasteners

Torque figures for bolts and screws with metric thread and head dimension, as in DIN 912, 931, 933, etc.

The Figures in this table include:

a) Coefficient of friction = 0.14
b) 90% of minimum elongation
c) Torque figures when assembling fasteners

The coefficient of friction = 0.14 applies for fasteners without coating (self-color) when slightly lubricated. Additional lubrication of the thread will substantially alter the coefficient of friction, leading to uncontrollable pre-load situations. Pre-load situations will also be influenced by the fastening methods and tools used. The following figures are guidelines only. Figures in Nm (Newton meters)

All hardware used in block construction must be Class 10.9 or Grade 8.

Thread Diameter (coarse)	Tightening Torque max (Nm)
M6	15
M8	38
M10	72
M12	125
M14	200
M16	310
M18	430
M20	610
M22	820
M24	1050
M27	1550
M30	2100

Imperial (Standard) Fasteners

The Figures in this table include:

a) Dry coefficient of friction = 0.20
b) Lubricated coefficient of friction = 0.15
c) Torque figures when assembling fasteners

The dry coefficient of friction of 0.20 applies for fasteners without coating when un-lubricated. Additional lubrication of the thread will substantially alter the coefficient of friction, leading to uncontrollable pre-load situations. Pre-load situations will also be influenced by the fastening methods and tools used. The following figures are guidelines only. Figures in ft lb (foot pounds)

All hardware used in block construction must be Class 10.9 or Grade 8.

Thread Diameter	Dry Tightening Torque max (ft lb)	Lub Tightening Torque max (ft lb)
1/4 – 20	12	9
5/16 – 18	25	18
3/8 – 16	45	35
1/2 – 13	110	80
5/8 – 11	220	170
3/4 – 10	380	280
7/8 – 9	600	460
1 – 8	900	680
1-1/8 – 7	1280	960
1-1/4 – 7	1820	1360
1-3/8 – 6	2380	1780
1-1/2 – 6	3160	2360