Manual Rigging
Installation Manual

003-1034 Rev 0: April 2010

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IMPORTANT SAFETY INFORMATION

- **The procedures in this manual are for use by qualified personnel only. See Operations and Maintenance Manuals for user serviceable parts and procedures.**
- **Read this manual carefully before installing or using this product. Failure to do so can result in injury or death.**
- **User must be warned of these hazards. Deliver a copy of this manual to the user along with all other product documentation for future reference.**

WARNING! Improper installation or maintenance can cause the load to fall.

- **Rigging equipment impose significant loads on the structure to which they are attached. The installer is responsible for verifying that an engineer or other qualified person has determined that this structure can withstand the loads.**
- **Equipment must be installed and adjusted by qualified personnel.**
- **Do not substitute or modify components provided with this equipment.**
- **Do not exceed the total capacity of the system. Do not exceed the total capacity of any individual lineset. To do so may cause the equipment to fail and cause serious bodily injury or harm.**
- **Do not exceed the load limit on any one wire rope. See installation drawings for load specific information.**
- **Do not lift or support people or animals with this equipment.**
- **Improper operation or use of rigging equipment can result in serious injury or death. Do not operate without proper training and authorization.**

WARNING! Moving parts can cut or crush

- **Keep body parts away from machinery in motion.**

GENERAL

Inspect all components for shipping damage before acceptance of the shipment. Damaged arbors, guides and battens can be dangerous, as they may not work properly. Any damage should be reported to the freight company when the equipment is received and noted on the freight bill.

Read and understand all instructions before starting installation. If you have questions, contact J.R. Clancy.

Equipment sizes and capacities vary according to individual projects. Refer to the installation drawings for project specific information. Pay particular attention to installation notes and design loading information.

Re-check the interferences noted during the field check process. Take note of any interference not in the field check information and immediately analyze the impact on the installation. Contact J.R. Clancy with any changes that may result from alterations in design.

The installation manager must record any necessary changes to the design on the system drawings. These changes should be recorded on an AS-INSTALLED set of drawings and given to the owner at the close of the project.

If there are any questions, contact J.R. Clancy, at **1-800-836-1885** before proceeding with the installation.

GUIDE WALL SYSTEMS – J-GUIDE AND T-BAR

a. GENERAL DESCRIPTION

The arbor guide system consists of vertical, extruded aluminum J's (J-guide) or steel "T's" (T-bar) placed so that the guide shoes on counterweight arbors and tension floor blocks ride in the space formed between two adjacent members. Guides are usually spaced on 6" (152 mm) or 8" (203 mm) centers. Other centers are possible based on specifications.

Top and bottom "Stop" battens are installed on the face of the guides to limit the travel of the counterweight arbor and floor block. An angle with punched holes or eye bolts may be provided to tie off the ends of double purchased hand lines.

b. INSTALLATION

Installation of aluminum J-guide and steel T-Bar are similar. See ***FIGURE 1*** for J-guide system details and ***FIGURE 2*** for T-bar system details.

i. Locate guides so that the centerlines of head blocks fall at the midpoints between adjacent J's or T's. Note that the centerline of the head block will be offset from the centerline of the row of loft blocks. This is called "fair leading". It is sometimes desirable to increase the offset somewhat so that the cable to the second loft block does not scrape the first loft block side plate, etc.

ii. It is critical to make the first guide straight and plumb. Wall battens are fabricated with round holes because aluminum guides have close tolerances. This means that if the first guide is installed correctly, all of the rest will be correct without the need of adjustment between guides. T-guides must be plumb, parallel, and equally spaced. If the space between adjacent T's is not maintained, the arbor could bind in its travel or be released so it could hit adjacent arbors or other obstructions.

iii. The face of the guide should be 7-7/8" (195 mm) from the centerline of lift cables dropping down from the head blocks in single purchase sets. For double purchase sets, consult the system drawings.

iv. Check the system drawings for the exact locations of wall battens, but typically, the lowest should be located at 4'-5" (1346 mm) off the floor with additional battens spaced 4'-11" (1500 mm) apart vertically. Wall knees are typically mounted 5 feet (1525 mm) apart horizontally.

v. The tops of the guides should not contact the bottom of head block beams or other steel over head. Deflection in the head beams under load would cause the guides to buckle.

vi. Use 3/8" anchors and bolts which are suited to the wall material to install wall knees. Adjustable wall knees permit you to compensate for irregularities in the wall. See project drawings for wall knee details and range of adjustment.

vii. If the wall material lacks sufficient strength to hold anchors, it must be braced, or replaced with suitable materials. Contact the building architect or engineer for direction.

viii. Wall battens, splice bars, wall batten splice angles, guides, stop battens, floor batten, and wall knees are all assembled with Grade 5, 5/16" diameter bolts, flat washers, and serrated flange lock nuts that are supplied with the system. On T-bar systems flat washers should be used at each slotted hole and where only one U-clip contacts a T-guide.

ix. J-guide splices are made with a splice bar assembly attached to the foot of the J-guide. Tighten the bolts until the splice bar is pulled firmly against the channel. This wedges the clip against the foot, forming a strong connection. T-bar splices are a pair of punched plates that install on either side of the Tee leg and bolt through matching holes on the ends of the T-bar.

x. Splices between stacked sections of guide members must be carefully installed and adjusted to eliminate any burrs or corners that would catch on arbor guide shoes or make noise when joints

are passed. No adjustment should be required unless the guides are bent.

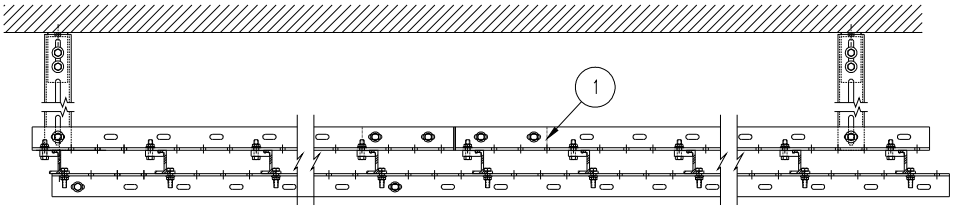
xi. (J-guide) The attachment of stop battens is made by clamping the battens into place and field drilling holes in the face of each J-guide. Skipping guides will reduce the system effectiveness. Holes in the battens act as guides and drilling the aluminum is very quick. This system permits the arbor travel distances to be easily established in the field for maximum travel. T-guides have punched holes for the wall batten bolts.

xii. Install optional 2" by 2" hardwood bumpers on the stop battens, using carriage bolts.

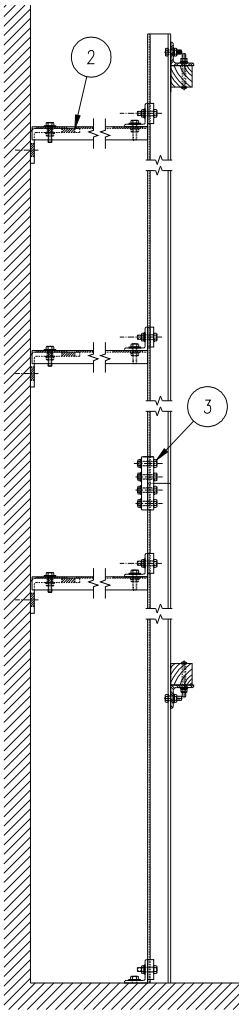
xiii. An additional batten may be supplied with the system for tying off the ends of double purchased hand lines. This angle has punched holes or forged eyebolts. Additional battens may also be provided to restrict the travel of floor blocks, or to limit the travel of selected sets.

xiv. The guide system is designed to allow the maximum safe travel distance for the arbors and battens. Travel is the distance between the upper and lower stop battens, minus the length of the arbor. If there are battens with restricted travel, it may be necessary to bolt an auxiliary stop batten between two guides. These are field located and it will be necessary to drill holes in the guides at the correct locations.

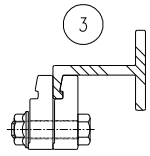
NOTICE: J.R. Clancy DOES NOT recommend the lubrication of guides or arbor shoes. Lubricants tend to collect dirt and will hasten wear and increase rather than reduce friction.



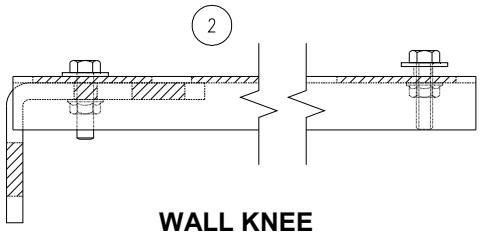
TYPICAL PLAN



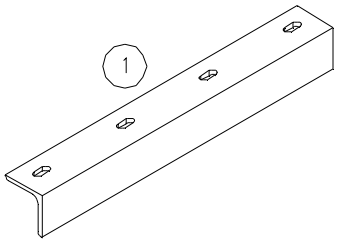
TYPICAL ELEVATION



J-GUIDE SPLICE

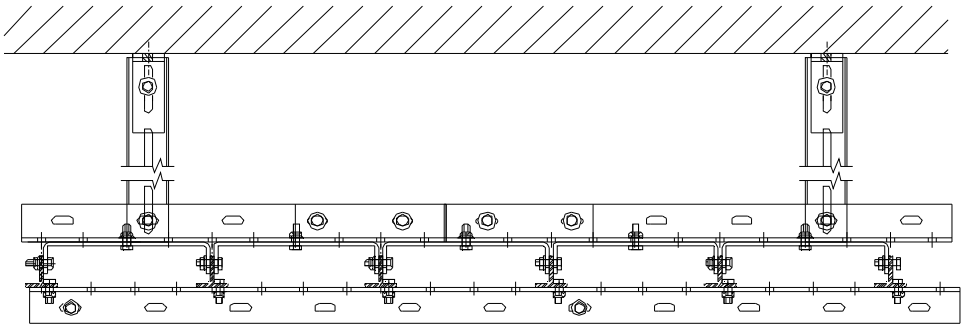


WALL KNEE



WALL BATTEN SPLICE

FIGURE 1 - J-GUIDE TYPICAL INSTALLATION



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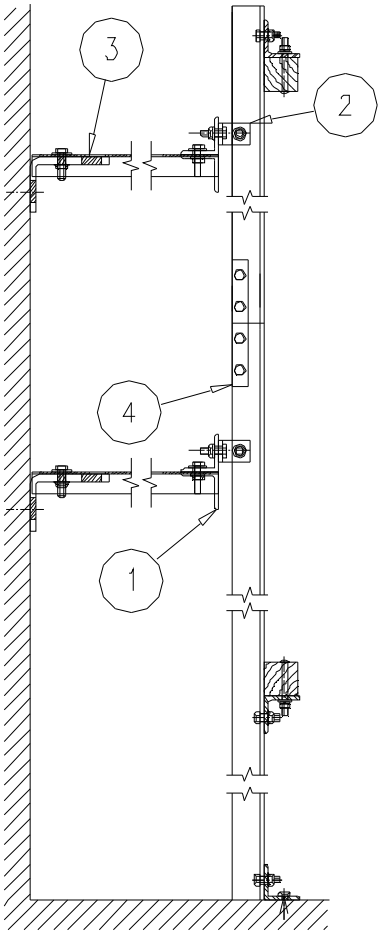
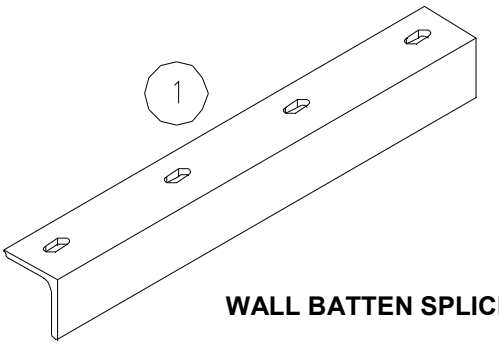
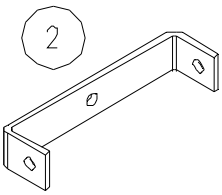


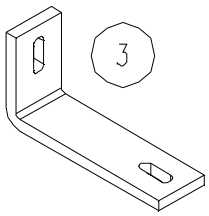
TYPICAL
ELEVATION



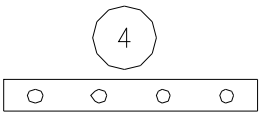
WALL BATTEN SPLICE



U-CLIP



WALL KNEE



T-BAR SPLICE

FIGURE 2 – T-GUIDE TYPICAL ASSEMBLY

LATTICE TRACK

a. GENERAL DESCRIPTION

A lattice track guide system consists of vertical steel angles placed so that the slotted guide shoes on counterweight arbors will ride in the space formed by the two opposed lattice guide rails. Guides are usually spaced to allow 14-3/8" (365 mm) clear between centers. They are located, supported, and protected by formed brackets bolted to the guides on 2 foot (610 mm) centers.

A bottom bracket is typically installed to help support the weight of the guides. A separate bracket equipped with springs to help stop a moving arbor is available as an option.

b. INSTALLATION

i. Locate the lattice track so the centerline of the head block falls at the mid point between the guides. If the lattice track is a double unit, the head blocks must be spaced the same distance apart as the arbors in the lattice track.

ii. Guides must be plumb, parallel, and equally spaced. The brackets should assure this within each section but track sections should be carefully checked for dislocation during shipment. Sections of track must be hung and shimmed out from the wall to maintain these conditions.

NOTICE: Install lattice guide angles with the angle toe toward the wall.

iii. Check the system drawings for the exact mounting location. Carefully check the distance of the guides from the wall so the lattice track is not installed backward in error.

iv. The top of the lattice track should not contact the bottom of head block beams or any other steel over head. Deflection in these members while under load would cause the guides to buckle.

v. Use 3/8" anchors and bolts which are suited to the wall material. See ***FIGURE 4***. If the wall material lacks sufficient strength to support the anchors and guide system, it must be braced or replaced with suitable materials. Contact the building architect or engineer for direction. The standard formed brackets have mounting holes 12" (300 mm) apart and the wall brackets are located 4 feet (1.2 meters) apart vertically. See ***FIGURE 3***. Special requirements will be indicated on shop drawings

vi. Track sections are assembled with splice bars, using Grade 5, 5/16" diameter bolts, flat washers, and serrated flange lock nuts that are supplied with the system.

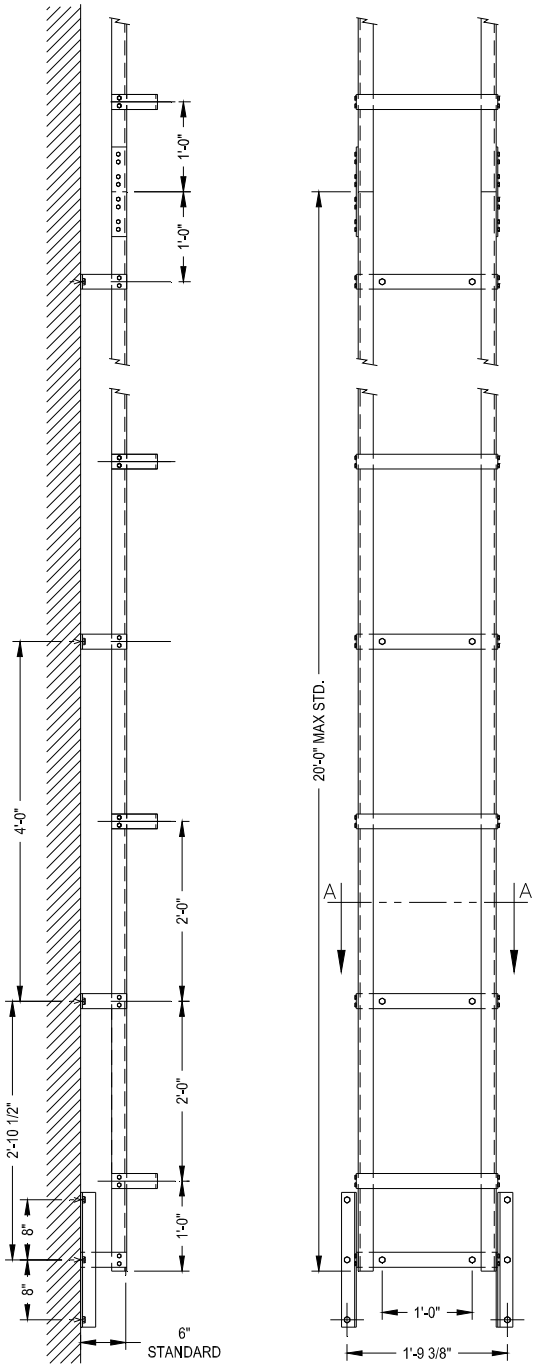


FIGURE 3 – LATTICE ELEVATION

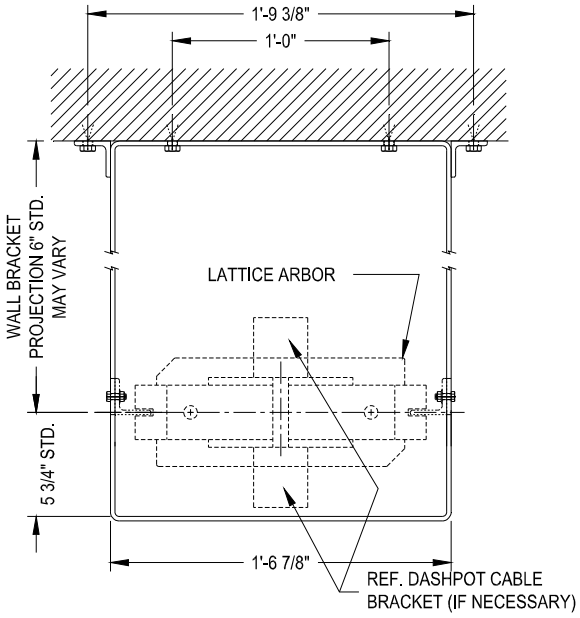


FIGURE 4 – SECTION A-A

RIGGING BLOCKS - GENERAL

NOTICE: Blocks and mounting hardware should be checked for quantity, size, and their suitability for the intended use. Mounting bolts supplied by J.R. Clancy are Grade 5 or better.

INSTALLATION AND ALIGNMENT:

Head blocks should be installed so that the lift line from the closest loft block is almost centered with an outer groove in the head block. The lift line in the next groove should go to the second loft block and so on.

In order to accomplish the above, the centerline of the head block will be offset from the centerline of the row of loft blocks. This is called "fair leading". It is sometimes desirable to increase the offset somewhat so that the cable to the second loft block does not scrape the first loft block side plate, etc.

Multigroove blocks and idlers should be centered on the head block.

Do not exceed a 1.5 degree fleet angle between any blocks (head block and mule or loft blocks). Consult a Clancy "Rigging Data" slide chart or “iRigging” application for a listing of fleet angles.

Never allow cables to become crossed so that they rub against each other. Never allow cables to rub against the building structure, other equipment, or electrical wiring.

All cables and ropes must be installed so they are fully in the sheave grooves and under the spacers. Check to be sure that cables do not hit the spacers, side plates, or sides of the grooves. If they do, the block must be adjusted, or mule blocks installed, to correct the entry direction of the lines.

Underhung blocks may need to be welded in place – see the project drawings. Mule blocks will need to be welded in place.

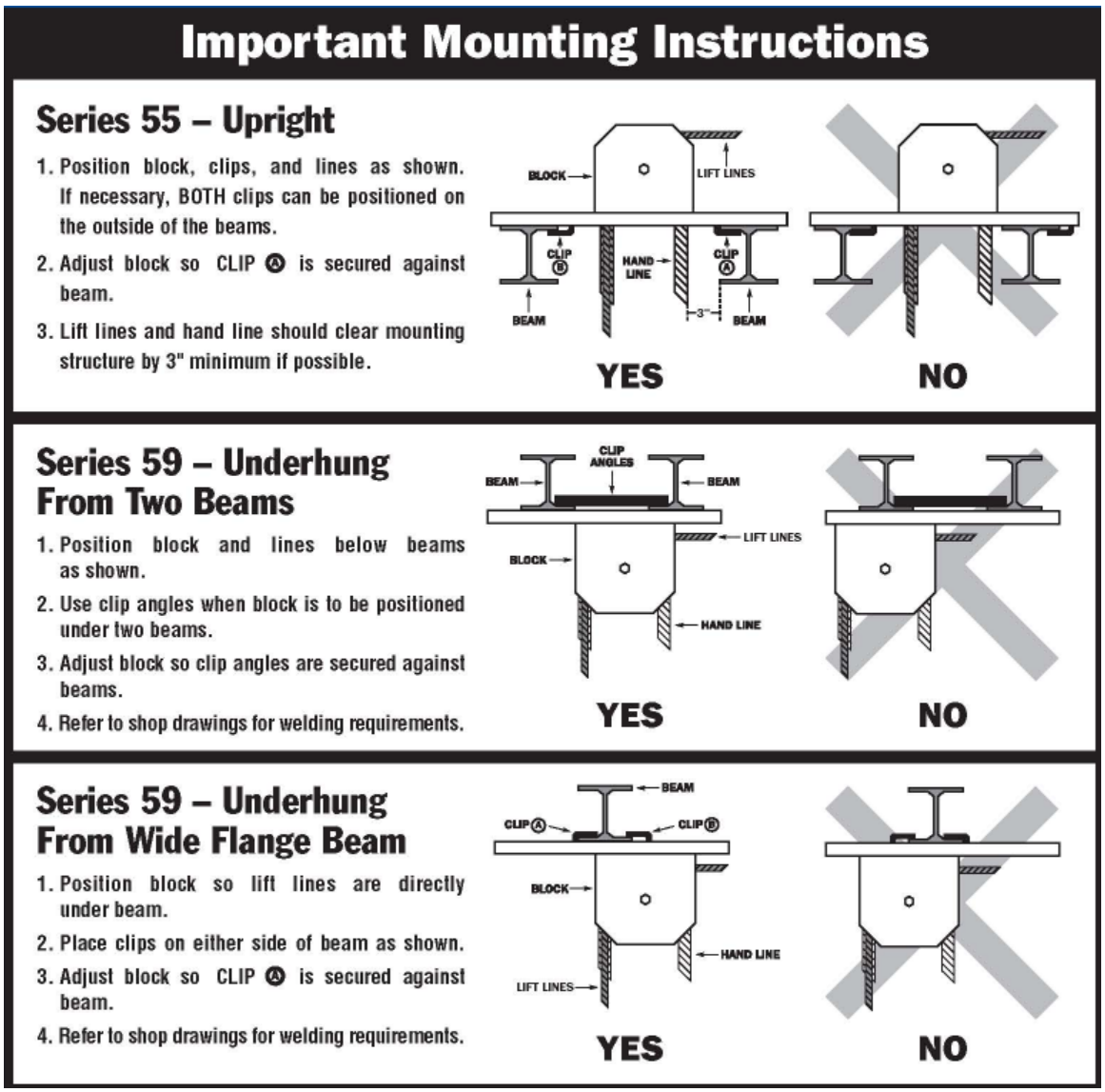
HEADBLOCKS

a. GENERAL DESCRIPTION

Blocks consist of a single or multigroove sheave mounted in a housing and installed on the stage gridiron or other support structure. Blocks support, and change the direction, of one or more lift lines and/or operating lines. They are located between the arbor or other lifting mechanism and other blocks such as loft blocks or mule blocks.

Head blocks are only one part of a mechanical system of rigging. Consult an operations manual for a full description of the system operation.

There are two major types of J.R. Clancy head blocks, with different mounting conditions and instructions. There are also variations within these types, many of which are discussed later in these instructions.



CAUTION ! Failure of the support structure to adequately support loads may result in death or serious injury. The horizontal loads imposed by single purchase head blocks upon the mounting steel are equal to the vertical loads. It may be necessary to brace the structure in order to carry the horizontal loading. Consult with the building architect or structural engineer for advice and approval.
Note: The vertical loading component is doubled when using double purchase arbors.

b. 55 SERIES - UPRIGHT

These blocks are designed to mount to an open floor (gridiron), or to a pair of properly spaced structural members. Mounting clips are securely bolted between beam flanges and each end of the base angles. Alternatively, the block may be bolted, anchored, or welded to the structure depending upon the conditions and materials used in the structure. Consult the system installation drawings for detailed information.

When head blocks are installed with mounting clips, the mounting clip bolts should be braced or pushed against the structure in the direction of loading prior to tightening. This will prevent the blocks from moving due to the horizontal loads imposed on them.

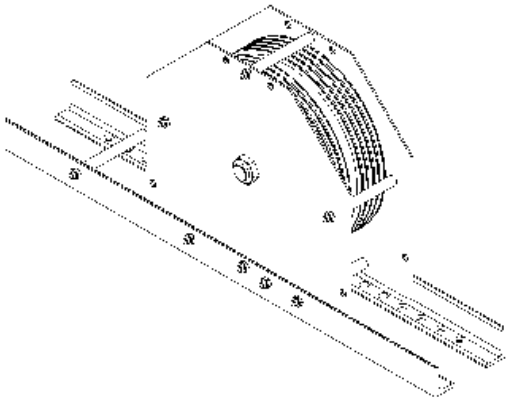


FIGURE 5

c. 59 SERIES – UNDERHUNG

These blocks are designed to mount to the underside of a structure or to the bottom of a pair of properly spaced beams. Clips or auxiliary base angles are securely bolted between the beam flanges and each end of the base angles. Alternatively, the block may be bolted anchored or welded to the structure depending upon the conditions and materials used in the structure. Consult the system installation drawings for detailed information.

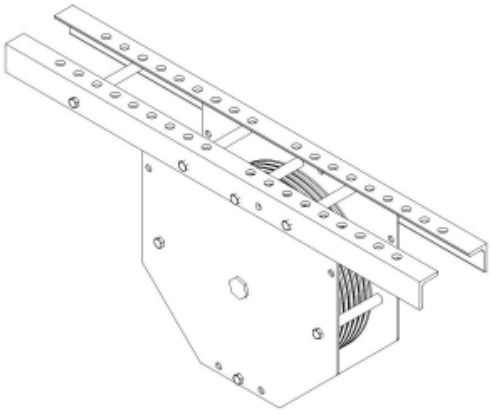


FIGURE 6

- **NOTICE: J.R. Clancy recommends that 59 Series blocks be welded in place after final alignment to prevent slippage or failure caused by bolts improperly tightened or loosened by vibration.**

d. DOUBLE PURCHASE HEAD BLOCK

Double purchase head blocks are equipped with a bracket to tie off the dead ends of the lift lines. Cables should be attached to the bracket using thimbles and cable clips or Nicopress sleeves. Shackles or turnbuckles can be used to facilitate installation and adjustment.

e. WIRE GUIDE HEAD BLOCK

These head blocks are equipped with brackets for attaching the upper ends of guide wires for wire guided counterweight arbors. **DO NOT OVER TIGHTEN GUIDE WIRES. The maximum recommended tension in guide wires is 100 lbs. (45 kg).** Too much tension in the guide wires can damage the head block and even the supporting structure.

LOFT BLOCKS

a. GENERAL DESCRIPTION

Blocks consist of a single or multigroove sheave mounted in a housing and installed on the loft block beams, stage gridiron or other support structure. Blocks support, and change the direction of, one or more lift lines. They are located between the head block or lifting mechanism and the pipe batten or other load.

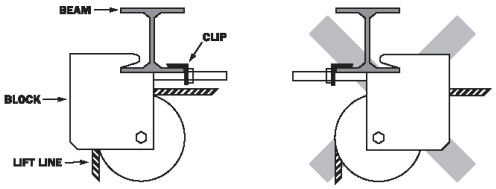
Loft blocks are only one part of a mechanical system of rigging. Consult an operations manual for a full description of the system operation.

There are two types of J.R. Clancy loft blocks, each with different mounting conditions and instructions. There are also variations within these types, some of which are discussed later in these instructions. Standard blocks are available with Nylatron GS or cast iron sheaves depending upon cable and groove size.

Important Mounting Instructions

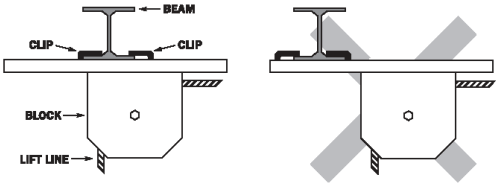
Series 19 – Underhung

1. Install block, clip, and lift line as shown.
2. Do not overtighten clip. (150 in-lbs MAX)



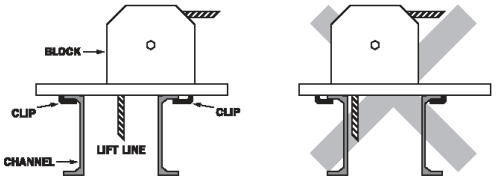
Series 55 – Underhung on Wide Flange Beam

1. Lift line must be perpendicular to base angle.
2. Lift line must be between the clip bolts.
3. Clip bolt farthest from the headblock or hoist must bear against the beam.
4. Clips must face opposite each other.
5. Distance between bolts must be 5" to 14" for single beam mount.



Series 55 – Upright on Channels

1. Lift line must be perpendicular to base angle.
2. Lift line must be between the clip bolts.
3. Clip bolt farthest from the headblock or hoist must bear against the beam.
4. Clips must face opposite each other.
5. Distance between channels must be 6" to 12".



CAUTION ! The horizontal loads imposed by loft blocks upon the mounting steel are equal to the vertical loads. Resultant loads vary with the degree of cable wrap around the sheave. It may be necessary to brace the structure in order to carry the horizontal loading. Consult with the building architect or structural engineer for advice and approval.

b. 55/56 SERIES – UPRIGHT & UNDERHUNG

Universal loft blocks may be mounted upright or underhung. When used upright they are generally mounted to the gridiron, to the loft wells, or other properly sized structural members. Mounting clips are securely bolted between beam flanges and each end of the base angles. Alternatively, the block may be bolted, anchored, or welded to the structure depending upon the conditions and materials used in the structure.

Standard clip packs are available with a selection of mounting clips, j-bolts, and fasteners. These allow mounting to a great variety of gridiron types, etc.

Blocks should be braced or pushed against the mounting bolts that are on the side away from the head block when they are installed to prevent the blocks from moving due to the horizontal loads imposed on them.

Universal loft blocks may also be mounted to the underside of a structure or to the bottom of a beam or beams. Clips or clip angles are securely bolted between the beam flanges and each end of the base angles. Alternatively, the block may be bolted, anchored or welded to the structure depending upon the conditions and materials used in the structure.

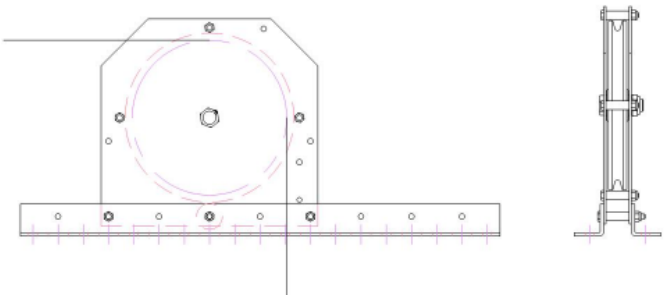


FIGURE 7A – 55/56 SERIES UPRIGHT

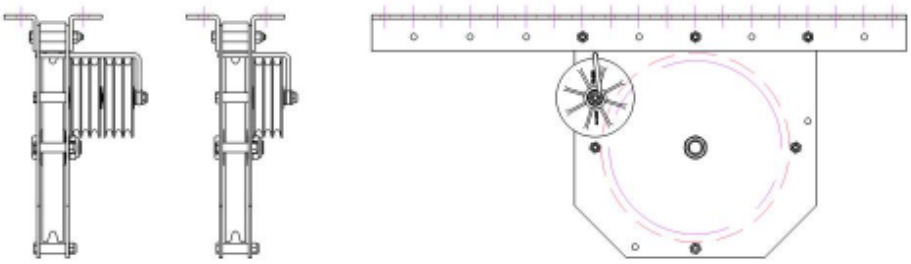


FIGURE 7B – 55/56 SERIES UNDERHUNG

- **NOTICE: J.R. Clancy recommends that underhung loftblocks be welded in place after final alignment to prevent slippage or failure caused by bolts improperly tightened or loosened by vibration.**

c. 19 SERIES - UNDERHUNG

19 Series Blocks are designed to be mounted to the bottom flange of a single, wide flange beam or structural tee. The loft block must be installed, and cables run, so the resultant load pulls the block securely into the hooks (throat) cut into the side plates.

The clip and nuts on the center bolts should be securely snugged but not over tightened (maximum value 150 in-lbs). The clip is designed to keep the block from moving, NOT to carry the load imposed by the cables.

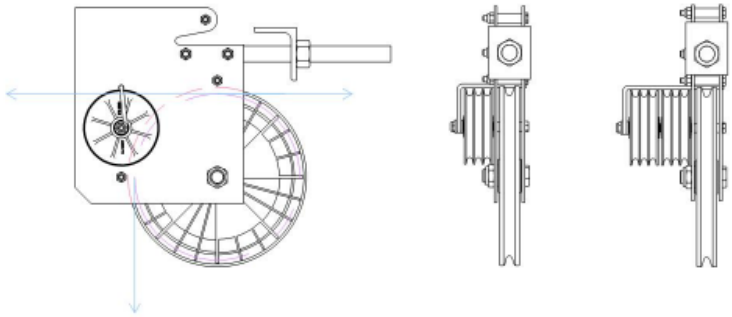
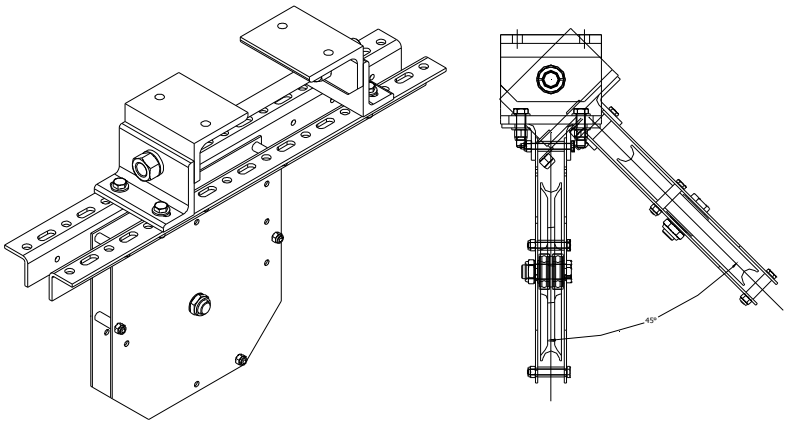


FIGURE 8

d. 19 and 55/56 series loft blocks are available with optional idlers. Blocks can be equipped with 3, 6, or 9 idlers factory mounted to either side plate, although they can be switched to the other side in the field. Idlers prevent passing lift lines from rubbing against the side plates or from drooping because of their own weight when lightly loaded. **They are NOT intended for use as mule or deflector blocks.**

e. The 55/56 series loft blocks are available with optional pivot brackets (070-PIVOT) to allow the loft blocks to be mounted below sloped rigging steel and allow the cable to hang plum. The max angle achieved by these pivot brackets is ±45º. They are attached to the rigging steel with clips & bolts. **The pivot brackets <u>MUST</u> be welded in place to prevent them from sliding along the beam as a load is applied to the system**



<u>FIGURE 9 – PIVOT BRACKET</u>

MULE BLOCKS

a. 12 SERIES MULE BLOCKS

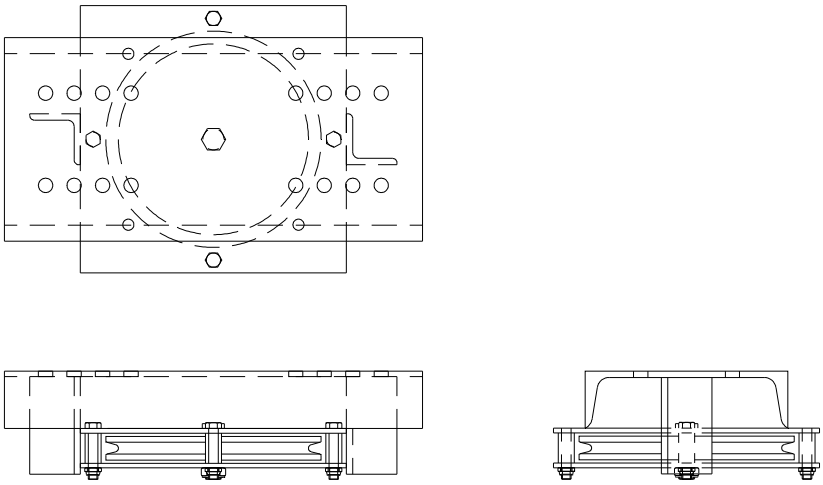


FIGURE 10

Mule Blocks are designed to be mounted to the bottom flange of a single, wide flange beam or structural tee. The mule block must be installed, and cables run, so the angles of entry and exit from the block and into adjacent blocks are kept to a fleet angle of 1 1/2º or less.

Additional steel may be required to provide a suitable mounting point for the block at the required elevation and angle.

Mounting clips are securely bolted around beam flanges. Alternately, the block may be bolted, anchored or welded to the structure depending upon the conditions and materials used in the structure. Depending on the angle of loading, special provisions may be needed to keep the block from sliding along a beam to which it has been clipped.

After the angles of cable entry are established and the block is installed, but before the cables are installed, weld any required bracing plates or angles between the side plates of the block to brace the plate away from the mounting surface. See system installation drawings for further details.

CAUTION ! Loads imposed by mule blocks on the mounting steel vary with the degree of cable wrap around the sheave. Loads also increase with the distance the cables are away from the mounting structure surface. It may be necessary to brace the structure in order to carry the resultant loading. Consult with the building architect or structural engineer for advice and approval.

NOTICE: J.R. Clancy recommends that mule blocks be welded in place after final alignment.

b. SWIVEL MULE BLOCKS

Set the block on its post so that it is at the proper elevation and degree of rotation and snug the adjustment screws. Run the cable(s) through the block and lightly tension to establish the degree of pan and tilt. When all the angles are in proper alignment tighten all set screws and bolts. If the installation is permanent we require that the block be welded into place to prevent future movement.

Mounting clips for the post are securely bolted around beam flanges. Alternately, the block may be bolted, anchored or welded to the structure depending upon the conditions and materials used in the structure. Depending on the angle of loading, special provisions such as welding the block in place, may be needed to keep the block from sliding along a beam to which it has been clipped.

c. Pairs of angle brackets can be provided for mounting 55/56 series blocks when used as mule blocks. Securely mount the brackets to the gridiron or the floor so the vertical legs from a plane where the base angles of the block will be mounted. The block should be clamped to the vertical legs at the proper angle and elevation. Check the elevation and angles of both the cable entry and exit by running a string in the groove. Check each groove in the block. Adjust the block as necessary.

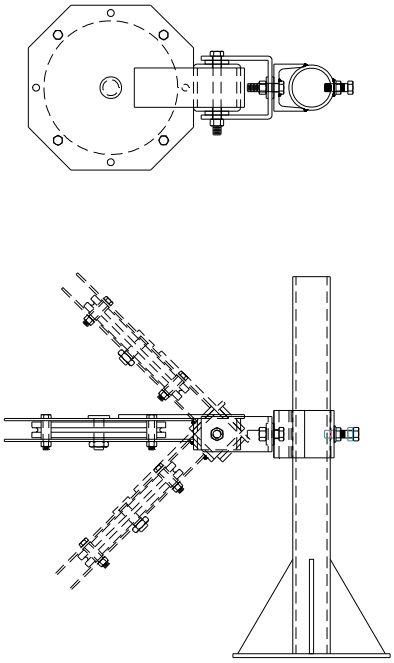


FIGURE 11

FLOOR BLOCKS - GENERAL

There are several types of J.R. Clancy floor blocks listed in these instructions, each with different mounting conditions and instructions.

Floor blocks should be installed so that the hand line is centered under, and parallel to, the counterweight arbor. Blocks with sliding sheaves should be set near the center of travel and adjusted again after the initial rope stretch. If the rope lock is separate, it should be located far enough in front of the arbor so the hand line clears the front of the arbor in its path up to the head block.

a. 006-118 FLOOR BLOCK AND ROPE LOCK

Blocks are designed to be used in locations where only a few wire guided counterweight sets are installed. There is no built in provision for adjusting the hand line, but a rope lock is mounted on the floor block frame. Spacers are provided in the housing for mounting the arbor guide wires.

Mount the floor block with 3/8" (10 mm) bolts and anchors which are suitable for the supporting structure.

See separate instructions for adjusting rope locks.

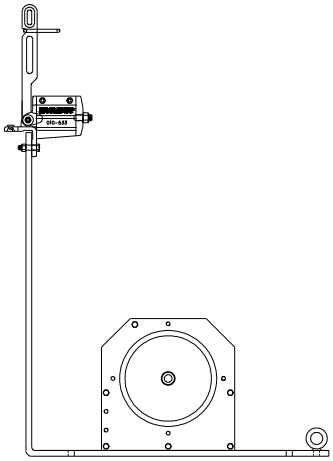


FIGURE 12 – 006-118

b. 006-218 AND 006-418 ADJUSTABLE FLOOR BLOCK AND ROPE LOCK

Blocks are designed to be used in locations where only a few wire guided counterweight sets are installed. There is built in provision for manually adjusting the hand line and a rope lock is integral to the unit. Spacers are provided in the housing for mounting the arbor guide wires. Mount the floor block with min. 3/8" (10 mm) dia. bolts and anchors which are suitable for the supporting structure or floor.

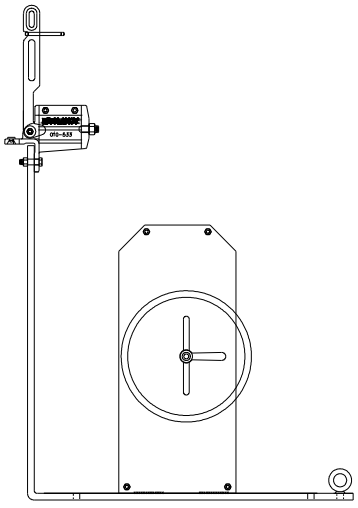


FIGURE 13 – 006-218

c. 6CR-855M AND 6NR-855R WIRE GUIDE FLOOR BLOCK

Blocks are designed to be mounted on a wire guide type locking rail using the furnished clips and bolts. U-clips go over the base angles and formed clips below to engage the attachment angles located in the locking rail. These blocks have no provision for adjustment of the hand line.

Locate the floor block so the hand line hangs plumb over the rear of the sheave and installs with no fleet angle. Spacers are provided in the housing for mounting the arbor guide wires.

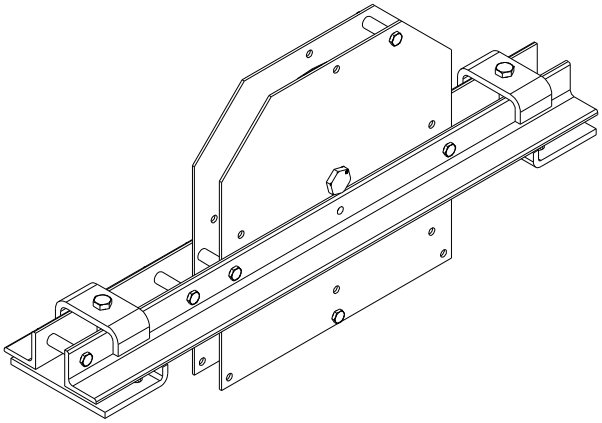


FIGURE 14 – 6CR-855M

d. 6CR-1015 AND 6CR-1215 TENSION FLOOR BLOCK

Blocks are designed to attach to pairs of tee guides with the attached guide shoes. Blocks may be put in place as the guides are being installed or the guide shoes can be disassembled and reattached on the T-guides.

When tension is put on the hand line either during operation, or due to shrinkage of the hand line, the block will lock up against the tee guides. This prevents it from moving while the set is in operation. Push down on the toe clip at the front of the block to adjust the tension in the hand line. This breaks the grip on the tees and permits the weight of the block to put the correct amount of tension in the hand line. The weight of the block will provide automatic adjustment if the hand line stretches.

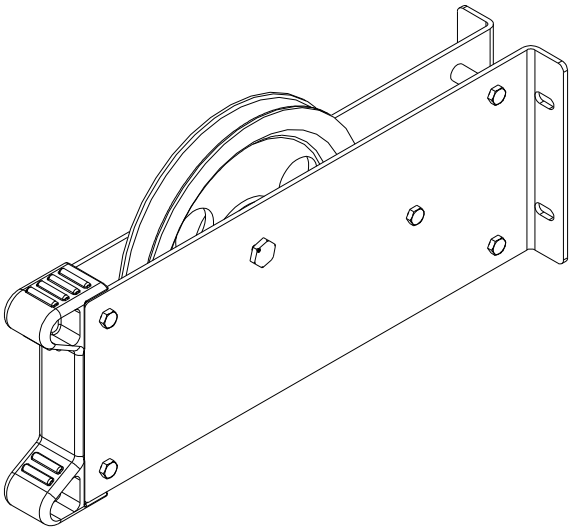


FIGURE 15 – 6CR-1015

e. 006-1218 AND 006-1618 SLIDING TENSION PULLEY

Free standing blocks designed primarily for use with fire curtains or other sets where a rope lock is not needed. The block adjusts automatically for both stretch and shrinkage in the hand line. A locking bolt is provided to lock the sheave in position, if desired, during manual operation.

Holes are provided in the base for four 3/8" (10 mm) diameter bolts and anchors. Select anchors which are suitable to the structure or floor material.

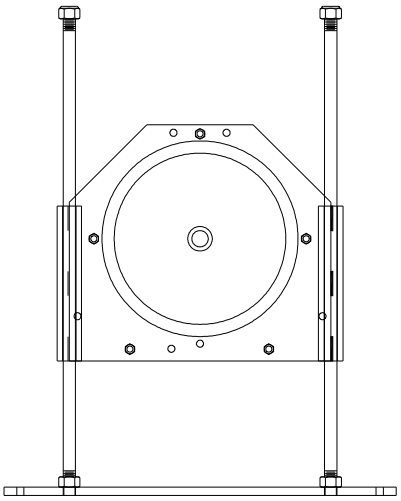


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FIGURE 16 - 006-1218

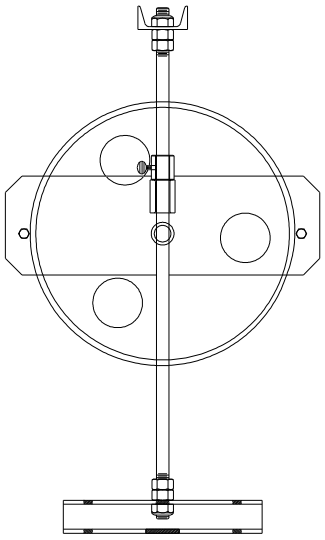

FIGURE 17 – 006-1618

f. 006-1618L SLIDING TENSION PULLEY WITH ROPE LOCK

Free standing blocks designed primarily for use with House Curtains that are installed independently of the rest of the rigging system. The block adjusts automatically for both stretch and shrinkage in the hand line. A locking bolt is provided to lock the sheave in position, if desired, during manual operation. A rope lock is mounted on the floor block frame to grasp the hand line and prevent unwanted movement in the system.

Mount the floor block with 3/8" (10 mm) bolts and anchors which are suitable for the supporting structure or floor. Bolts can be inserted through holes drilled in the base angles or through U-clips which are provided with the floor blocks.

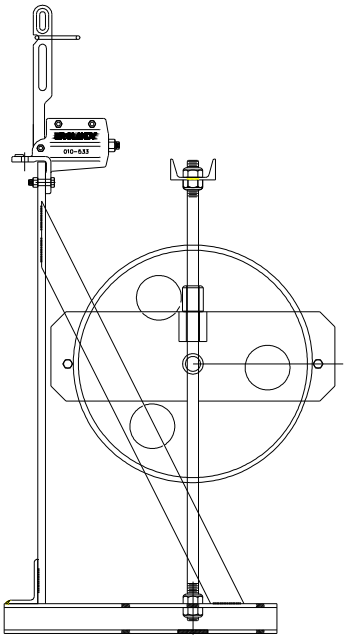

FIGURE 18 – 006-1618L

LOCKING RAILS

Locking rails function as mounting locations for rope locks, as safety railings to keep people out of the path of moving counterweight arbors, and as locations for counterweight set identification labels. Finally, the locking rail transmits loads caused by out of balance counterweight arbors into the building structure. J.R. Clancy produces three different locking rails in several variations.

INSTALLATION

i. The preferred material under a floor mounted locking rail is concrete. The slab under the locking rail should be installed so it is flush with the finished stage floor or the locking rail floor stanchions should be shimmed so that the installed rail is flush with the stage floor elevation.

ii. If the locking rail must be installed on a wood floor any voids under the floor at the stanchion locations must be filled or the floor must be sufficiently strong and stiff to withstand all imposed loads. Any spring in the floor under the rail may cause the bolts to loosen over time.

iii. Locate the locking rail so that the centerline of attached rope locks will be on the centerline of the counterweight arbors and floor blocks. The back of the rail should be far enough from the arbors so that rope locks clear the fronts of arbors. When used with T or J-guides, the back of the rail should be 23 inches (585 mm) from the face of the guide.

iv. Use 1/2" (12 mm) anchors and bolts in the holes provided in the locking rail base. Use bolts and anchors that have been selected for the materials to which the locking rail is installed. Rails with capstan reaction bars must be able to resist the added reaction at any point along the rail.

v. Install the index card clips with the provided pan head screws and nuts.

vi. Plastic Index cards are furnished with set numbers. Further descriptive data can be added with china marker or temporary felt tip marker. When in doubt use the back of a card for testing and removal of the marker before adding “temporary” data to cards.

WARNING ! The floor must be capable of supporting, without deformation, the self weight of any rigging equipment attached to it as well as and imposed rigging loads (i.e. uplift). If wood flooring is used, it should be solid or heavily blocked under the members to support the weight of the system without deflection.

a. 011-518R LOCKING RAIL

For wire guided counterweight arbors the locking rail has provisions for mounting floor blocks and rope locks, and stop angles Typically rails are supplied for counterweight sets on 6" (150 mm) or 8" (200 mm) centers. This rail is used with #855M style floor blocks. When attaching guide wires to structure, both ends of wire must be attached to points which have capacity to carry imposed loads.

DO NOT over tension the guide wires. J.R. Clancy recommends a maximum tension of 100 lbs. (45 kg) per guide.

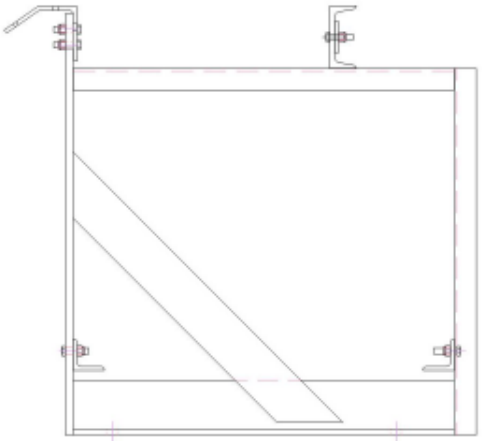

FIGURE 19- 011-518R

b. 011-538R and 011-538D LOCKING RAIL

For J/T-guided counterweight arbors. Double purchase version includes extra angle with provision for tying off ends of hand lines. Typically rails are supplied for counterweight sets on 6" (150 mm) or 8" (200 mm) centers.

This rail is most often used with #6CR-1015 or #6CR-1215 T-guided tension floor blocks.

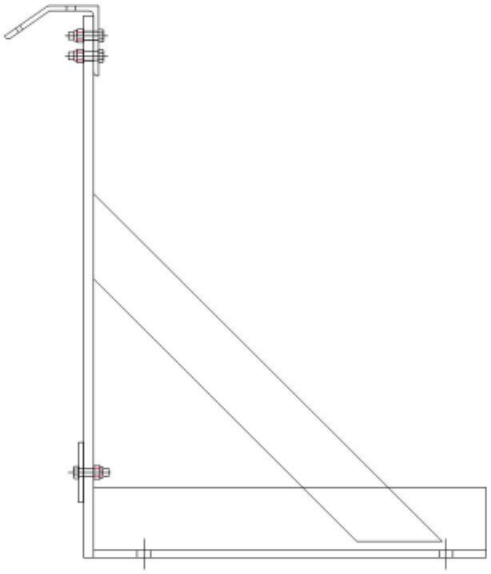

FIGURE 20 – 011-538R

c. 011-558R LOCKING RAIL

Similar to 538 locking rail except designed to mount on the edge of a pit or fly gallery. Vertical leg stanchions may be welded or bolted to concrete or steel edge. This railing is furnished with a wire mesh infill to prevent weights or other objects from falling off of the gallery.

Note: When a portable capstan winch is to be used, a reaction bar must be installed. These are often made a part of the locking rail. If present, special attention must be paid to mounting the rail so that the mounting can withstand the local up loads imposed by the capstan winch.

Check the drawings for the required distance between the finished floor and the bottom of the reaction bar. Shim the locking rail if necessary to achieve this distance.

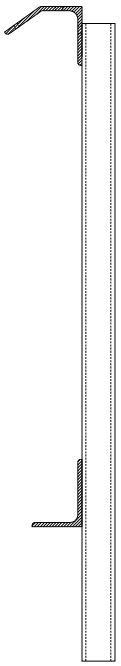

FIGURE 21 – 011-558R

COUNTER WEIGHT ARBORS

a. GENERAL DESCRIPTION

i. COUNTERWEIGHT ARBOR: A carriage or rack which can be filled with weights (usually flame cut steel) in sufficient quantity to balance the weight of a batten and the load hung from it (i.e., curtains, lights, tracks). Arbors are guided in some manner to minimize lateral movement during operation. The weights (called counterweights) are locked in place by some means to prevent them from falling out during an emergency or sudden impact.

ii. ARBOR TYPES: Counterweight arbors are grouped in two ways. They are grouped by type (single purchase or double purchase), and by the guide system employed.

- Single purchase arbors: The weight of the arbor and counterweight should always equal the weight of the batten and load. The arbor requires the same travel distance as the batten.

- Double purchase arbors: The arbor top contains a multigroove sheave for the lift lines and hand line while the bottom contains a rope sheave. The arbors are usually T-guided. They are used when space for the counterweight arbors is restricted or when it is desirable to move the arbor half as far as the batten. The counterweight arbor should be filled with counterweight to equal twice the load on the batten to achieve a balanced system.

iii. GUIDES: Three different guide systems are commonly used.

- T-guided, or J-guided: The arbor has a steel bar along the back side to which a pair of guides are mounted. The guides may be grooved rollers, or plastic or fiber slider plates (usually reinforced with steel backing plates). The guides engage a pair of T shaped guide bars which form a track, vertically mounted true and plumb to the wall. The guide bars are normally steel T's but may also be steel angles or aluminum T's or J's. The guides and guide bars keep the arbor in position and prevent the arbor from hitting adjacent arbors in the system as it is raised and lowered. A minimum clearance of 1" must be kept between the counterweights in adjacent arbors, but 2" is recommended for normal use.

- Wire guided: The arbor top and bottom have holes that engage a pair of lightly tensioned wires which guide the travel path of the arbor. This type of arbor is recommended for single purchase arbors with travels of less than 30 ft. The recommended clearance between the weights in adjacent arbors is 4" or more.

- Lattice track guided: Each end of the arbor top and bottom contains a guide shoe with a slot that engages an angle or T-guide bar. The dual bars and supporting framework provide a semi-protective enclosure along the travel path of the arbor and is a positive guiding method. This type of arbor is useful when a single arbor must be installed or the arbor must be mounted parallel to the set instead of at a right angle.

iv. WEIGHT COMPENSATION: As arbors are raised, they become lighter because some of the lift line weight transfers from the head block to the loft blocks. In smaller systems the change is minor. In systems with long travel or with many lift lines, the change can make it difficult, or impossible, for an operator to maintain control.

- Arbors are sometimes furnished with a chain or cable weight that hangs from the bottom of the arbor and attaches to the guide system at mid elevation or by means of a lightweight cable attaches back to the arbor top.

- The system drawings will provide details of the system if one is present.

b. INSTALLATION

i. Before installing an arbor, check for any shipping damage and for nuts which may have become loose. Tighten and adjust as necessary. Any damage should be reported to the freight company when the equipment is received and noted on the freight bill.

NOTICE: Unless requested, arbors are shipped fully assembled. Assemble disassembled arbors by removing the outer two nuts on the bottom end of each rod and all three nuts at the top. Put rods into the arbor bottom and reinstall the nuts. From the top of the rods, install the spreader plates, followed by stop collars, and the inner nuts which should be turned until they hit the end of threads on each rod. This maintains arbor squareness and locks the inner nuts. Install the arbor top followed by hex nuts, and finally by lock washers and nuts at end of each rod.

The back bar furnished on T-Bar arbors is installed using the 3/8" x 2-1/2" bolts which also attach the arbor guide shoes. Note that a completed plastic or fiber shoe assembly will have a steel plate on each side. Roller guides install in a similar manner, but can be rotated to accommodate differing guide spacing.

ii. T-bar arbors are shipped with the guide shoes removed and with temporary bolts attaching the back bar to the arbor top and bottom. Remove the shipping bolts and install the shoes using 3/8" x 2-1/2" bolts on the guide shoes.

iii. Hand screws for the stop collars are shipped separately. Be sure to install them.

iv. Spreader plate location labels for T-bar type arbors (15 Series) are installed on the arbor back bar two feet, four feet, etc. above the bottom of the arbor. Set identification numbers are also provided for the on stage end of the arbor top or bottom. Selection of the top or bottom is dependent on which location is more visible to the operator.

v. Warning and identification labels are also provided. The T-guide arbor (Series 15) label is installed on the back bar just below the formed top. The wire guide arbor (Series 85) label is installed on the up stage side of the top below the punched lift line holes. **The labels contain important information pertaining to safe operation of the sets. Do not remove or obscure labels.**

vi. Check the guide system for straightness and trueness. Guide bars must be consistently spaced the correct distance apart.

vii. Be sure to tighten all guide components as the arbor is installed in the guide system.

viii. **DO NOT OVER TIGHTEN GUIDE WIRES ON WIRE GUIDE SYSTEMS. The maximum recommended tension is 100 lbs. (45 kg).**

ix. Hand lines should be tied to arbors with bowlines or double half hitches. The rope ends should be fixed to the standing part with tape or tie-wraps. Leave the rope long and do not make final adjustments until the rope has had time to stretch under load. It should be noted that polyester ropes will stretch less initially and will not react to changes in temperature or humidity as manila will. Refer to the following section in this manual on Rope, Cables, Fitting & Terminations for more information.

x. Cables should be attached to the arbor using thimbles and Nicopress® sleeves. Cable clips (sometimes known as “Crosby’s” or “u-clips”) can also be used, but these require annual maintenance and reduce the strength of the cable significantly. See page 31 for more information. Shackles or turnbuckles can be used to facilitate installation and adjustment.

xi. Install cables in a pattern that makes the arbor hang plumb and minimizes twisting. Install cables out from the center of the arbor in both directions. Do not twist cables between the head block and arbor top or allow them to be crossed over each other.

(For example: In a set with 8 cables and an 8 line head block, install cables 1-4 on one side of the arbor top starting with #1 at the off stage (back) side or the arbor. Cables 5-8 are installed on the other side of the arbor with #8 at the off stage side. Stated another way, Cables 4 & 5 are paired across the arbor top, as are 3 & 6, 2 & 7, and 1 & 8.) See ***FIGURE 22.***

xii. Double purchase arbors have sheaves at the top and bottom. Lift lines and the hand line wrap around the top sheave and tie off to a bracket on the head block above. The hand line wraps around the bottom sheave and ends at a tie point below on the locking rail or guide system. See the system drawings for further details.

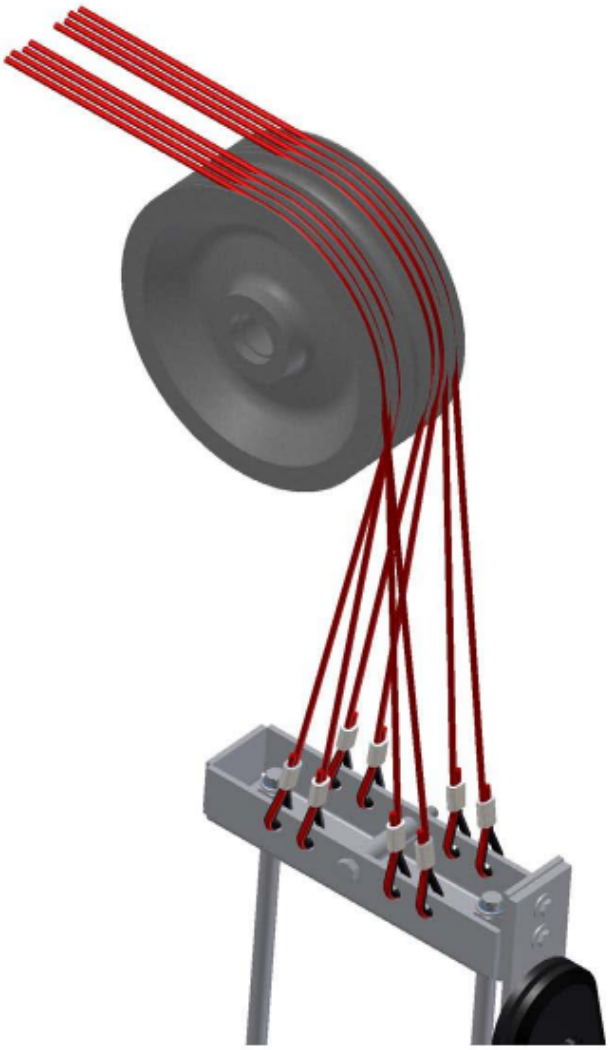

FIGURE 22 – ARBOR TOP

NOTICE: As cables pass from component to component, they should never be allowed to cross each other or rub against any part of the structure

ROPE, CABLES, FITTINGS AND TERMINATIONS

NOTICE: The components listed in this section of the instructions are supplied by, but not necessarily manufactured by J.R. Clancy, Inc.

a. Wire Rope

i. Selection

There are two keys to proper selection of wire rope: the load it will carry and the size of the sheave which will carry it. There is a direct relationship between the tread diameter (D) of a sheave and the cable diameter (d). ***Table A*** lists the minimum and recommended relationships for some typical cables and manila rope.

D/d RATIOS (Sheave diameter/Cable diameter)		
Cable Type	**Minimum**	**Suggested**
6x7	43	72
6x19	30-34	45
7x19	26	35
6x37	23	35
Manila Rope		8

Table A

Depending upon the material in the sheave, there is a maximum recommended radial or tread pressure which limits the maximum load as described by the following formula. Refer to ***Table B*** for allowable tread pressures for various materials:

p=2xT/dxD

D=sheave tread diameter (in.)
T=Tension (load on cable in lbs.)
d=cable diameter (in.)
p=allowable tread pressure (psi)

Allowable Tread Pressures for 7X19 GUC	
Sheave Material	**Pressure (psi)**
Cast Iron	500
Steel	1000
Nylatron	900

Table B

A properly grooved sheave will support the cable over approximately 135 to 150 degrees of its circumference. The groove should be in deep enough to encompass the cable and its throat must be wide enough to keep the cable from scrubbing on its side. The fleet angle is the angle between the centerline through the sheave and the centerline of the wire rope leading over the sheave. **This angle should not exceed 1-1/2 degrees (See FIGURE 23)**

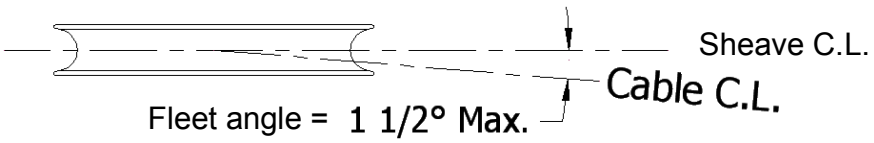

FIGURE 23

ii. Breaking Strength

7 x 19 galvanized utility cable has become the stage rigging industry standard, but other wire ropes types may also be used providing they meet the strength and serviceability requirements. The most common cables and their strengths are listed in ***Table* C**.

Cable Breaking Strengths					
Cable Dia	**Nominal Break Strength (lbs)**				
Nom	7X19 GUC.	6X19 IWRC IPS	6X19 fiber core	Dyform - 6	Dyform - 18
1/16	480	-	-	-	-
3/32	1000	-	-	-	-
7/64	1400	-	-	-	-
1/8	2000	-	-	-	-
5/32	2800	-	-	-	-
3/16	4200	-	-	-	-
7/32	5600	-	-	-	-
1/4	7000	5880	5480	-	-
9/32	8000	-	-	-	-
5/16	9800	9160	8520	-	-
3/8	14400	13120	12200	17600	15600
7/16	-	17780	16540	23800	20400
1/2	22800	23000	21400	30600	26999
9/16	-	29000	27000	38400	33600
5/8	35000	35400	33400	45400	42000
3/4	-	51200	47600	64400	58800
7/8	-	69200	64399	87600	79600
1	-	89800	83600	113800	103400

Table C

iii. Derating Factors

Wire Rope gradually loses its strength due to factors which include, but not limited to; wear, rusting, shock loading, fatigue, abuse, abrasion, and kinks or bending. For this reason we recommend a **MINIMUM SAFETY FACTOR of 8** after the other specific derating factors are considered. This means that the available working strength of the cable should be at least eight times the expected load on the cable. Common derating factors are given in ***Table D***.

FACTORS FOR DERATING CABLE	
Factor	**Retained Strength**
Terminations:	
U-Bolt Clips	80%
Nicopress Sleeves	95-100%
Swaged Fittings	100%
D/d ratio:	
40	95%
30	93%
20	91%
10	85%
Multiple Part Reeving:	
2 Part	96%
3 Part	92%
4 Part	88%
Per Deflector Sheave	92%

Table D

iv. Installation

- Cable reels should be put in a rack and revolved to unwind wire rope. Coils should be rolled along the ground. Do not pull from the side because the rope is likely to kink.

- Before cutting wire rope it should be seized with a soft wire on either side of the cut. Small diameter rope may be seized with electrical tape and the cut made at the center of the wrapped portion. Do NOT cut wire rope with a torch because it weakens the cable and prevents the individual strands from adjusting themselves within the rope to achieve full life and strength.

- Newly installed rope should be run for a period under no load to allow the strands to adjust and relieve points of stress.

- See the following paragraphs on common types of terminations hardware. Exposed ends of wire should be trimmed after termination, if necessary, and taped to the standing portion of the line with electrical tape to protect the ends from fraying and to prevent injury to personnel.

v. Handling

Handling and maintenance of wire rope is simple and consists of the following:

- Do not allow the cable to become kinked.
- Keep cables away from water and dirt.
- Clean cables occasionally and inspect for defects at a minimum annually.

vi. Inspection:

Inspection of wire rope includes looking for rust, damage, wear, and broken strands. Look for the following and replace the cables as necessary:

- A significant change in the cable diameter means wear or breakdown of the core. Investigate further and replace if needed.
- A reduction of 1/3 of the outer wire diameter means the cable needs replacement.
- Look for broken strands, especially at the end fittings. If more than three broken strands are found, replace the cable.

Serious kinking or other deformation of cables is cause for replacement.

Wire rope inspection guidelines are available by calling J.R. Clancy.

b. Termination Hardware

i. Wire Rope Clips

Drop forged wire rope clips are widely used for making terminations. Clips are available in two designs: the U-bolt and the fist grip (which is not in common usage in theatrical installations) as shown in ***FIGURE 24***. Both types of clips develop the same efficiency when properly applied.

When Using U-Clips, extreme care must be used so that the clips are not installed backwards. See ***Table E*** and ***FIGURE 25*** for the proper installation procedure.

CAUTION! Danger of suspended load falling! Do not use malleable wire rope clips are in theatrical rigging. Use only forged wire rope clips.

FIGURE 24 Wire rope clips types (U-bolt, left, and fist grip, right)

CLIP INSTALLATION PROCEDURE

1. Turn back specified amount of rope from thimble or loop. Apply first clip one base width from dead end of rope. Apply U-Bolt over dead end of wire rope – live end rests in saddle (Never saddle a dead horse!) Tighten nuts evenly, alternate from one nut to the other until reaching the recommended torque**.**

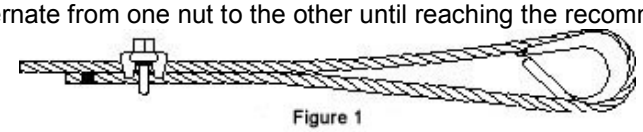

Figure 1

2. When two clips are required, apply the second clip as near the loop or thimble as possible. Tighten nuts evenly, alternating until reaching the recommended torque. When more than two clips are required, apply the second clip as near the loop or thimble as possible, turn nuts on second clip firmly, but do not tighten. Proceed to Step 3

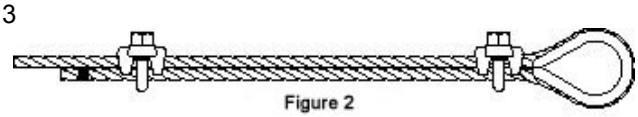

Figure 2

3. When three or more clips are required, space additional clips equally between first two - take up rope slack - tighten nuts on each U-Bolt evenly, alternating from one nut to the other until reaching recommended torque.

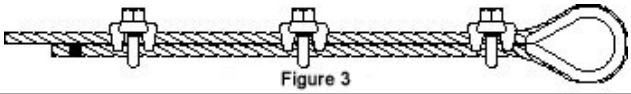

Figure 3

FIGURE 25

Clip Size (Inches)	Rope Size (Inches)	Minimum No. of Clips	Amount of Rope to Turn Back in Inches	* Torque in Ft. Lbs.
1/8	1/8	2	3-1/4	4.5
3/16	3/16	2	3-3/4	7.5
1/4	1/4	2	4-3/4	15
5/16	5/16	2	5-1/4	30
3/8	3/8	2	6-1/2	45
7/16	7/16	2	7	65
1/2	1/2	3	11-1/2	65
9/16	9/16	3	12	95
5/8	5/8	3	12	95
3/4	3/4	4	18	130
7/8	7/8	4	19	225
1	1	5	26	225
1-1/8	1-1/8	6	34	225
1-1/4	1-1/4	7	44	360
1-3/8	1-3/8	7	44	360
1-1/2	1-1/2	8	54	360
1-5/8	1-5/8	8	58	430
1-3/4	1-3/4	8	61	590
2	2	8	71	750
2-1/4	2-1/4	8	73	750
2-1/2	2-1/2	9	84	750
2-3/4	2-3/4	10	100	750
3	3	10	106	1200
3-1/2	3-1/2	12	149	1200
If a pulley (sheave) is used for turning back the wire rope, add one additional clip.				
If a greater number of clips are used than shown in the table, the amount of turnback should be increased proportionately.				
*The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.				

Table E

ii. Nicopress Sleeves: Inspection of cable terminations made with Nicopress® Sleeves and Tools.

Nicopress cable sleeves are one of the fundamental tools of our trade and a critical element of almost every system we install. It is important that our installers know how to use these tools and gauges properly, and equally important that we understand the swaging process and how to use the gauges required to inspect their work. The following is a brief description of how to use the Nicopress documentation and gauges to inspect newly installed swages in the field.

NOTICE: This is designed to be a summary and guide for use of the manufacturers' instructions. For specific information regarding this topic it is important that the reader review the Nicopress documents. The references for this paper are listed following *Table G*.

To be installed correctly, a Nicopress swage must include the following:

1. The correct sleeve for the cable and application.
2. The correct tool for the sleeve.
3. The correct groove in the tool.
4. The correct number of presses for the tool/groove combination.
5. The correct arrangement of the fittings and proper inspection after crimping.

1. Choosing the correct sleeve for the cable and application:

   a. Sleeves for use on galvanized steel cable in rigging systems should be solid copper. This is the Nicopress 18 series oval sleeve and 871 series stop sleeve. Tin plated copper sleeves are for use with stainless steel cable. Aluminum sleeves are not to be used for rigging applications.

2. Choosing the correct tool for the sleeve:

   a. There are a variety of tools available for crimping Nicopress sleeves. Our shop typically uses the 635 series hydraulic bench tool for "pre-made" lift lines. Swages on ¼" cable from this machine can be recognized because the entire length of the sleeve is pressed instead of a number of discrete presses. Our installers may use any number of hand tools, some of which feature multiple grooves. Hydraulic tools are available in both hand pump, electric models, and battery operated models and must be used for cable sizes of 3/8 and greater. There is a part number plainly marked on each tool that can be used along with the sleeve part number and tool groove letter to look up the number of presses required on the sleeve. This information is found in the instruction sheet for the tool. Note that there are other manufacturers of copper sleeves and crimping tools. Nicopress sleeves must be used with the Nicopress tools in order to maintain a rated connection.

3. Choosing the correct groove in the tool:

   a. Some tools feature single interchangeable dies or jaws, while others such as the number 63 and number 64 feature multiple grooves on one set of jaws. Marked on each die, or next to each groove on a tool there is an identifying letter that must be matched to the tool number and sleeve size in order to determine the number of presses required in a given sleeve.

4. Choosing the correct number of presses for the tool/groove combination:

   a. Although the profile of each tool groove is unique, the width of the tool jaw can vary for a given groove. This is why the number of presses varies for a given groove in different tools. For instance, on 1/8" cable the Oval M groove on a number 3V-XPM tool requires two presses, but the Oval M groove on a number 63V-XPM tool requires 3 presses. This is why you must know the tool and the groove in order to find the right number of presses. The Nicopress catalog does not specify how many presses are required for each tool/groove/sleeve combination. This is found only on the engineering drawing of the sleeve and in the specific instructions for each tool. Table G summarizes the combinations of tools, grooves, and presses for the sizes of

galvanized steel cable we most often employ. The chart is for solid copper sleeves only. The sources of this data are the Nicopress instruction sheets listed following ***Table G.***

5. Finally, the hardware and terminations must be inspected:

   a. Make sure that the dead end of the cable protrudes slightly from the end of the crimped sleeve.

   b. In an eye splice there should be a small space between the cable thimble and the Nicopress sleeve to allow the thimble to "self align" without pushing on the sleeve.

   c. Identify the tool and tool groove that was used to make the crimp, and verify that the correct number of presses was used.

   d. Use the correct notch in the Nicopress inspection guage to verify that the crimp is the correct depth. The crimp should pass into the correct part of the gauge without being forced.

   If the presses are found to be not deep enough, the tool must be adjusted and the sleeve may be re-crimped *in the same locations as the existing presses.* Do not re-crimp the sleeve more than once. The tool should be checked every 50 presses or as required to keep the presses within specifications. Finally, although a properly installed Nicopress connection is certified to be equal to the strength of the cable, it should be noted that the manufacturer does call for all critical applications to be proof load tested.

Nicopress® Gauge Description	
2930	"Nicopress Oval & Stop Sleeve Gauge" Grooves: VX,VP,VG,VB4,VC,VM,VF2,VF6 & G9 5/32" Diameter Hole Finish: Black Oxide
2931	"Nicopress Sleeve Gauge" Groove E-J-M-P-T-X 5/32" Diameter Hole Finish: Clear Chromate
3375	"635 Oval Sleeve Gauge" Grooves: J8,H5,G9,F6,F2 & X 1/16" Diameter Hole Finish: Black Oxide
3376	"635 Oval Sleeve Gauge" Grooves: N5,M1,K8,P,M,G,C & B4 3/16" Diameter Hole Finish: Black Oxide
3377A	"3512 Oval Sleeve Gauge" Grooves: k8,J8,H5,G9,F6,F2 & X Punched Hole Finish: Black Oxide
3377B	Single Groove Gauges: "12-OVAL B4", "12-OVALC","12-OVAL G","12-OVAL M" & "12-OVAL P" Finish: Black Oxide
12-1M GAUGE	Single Groove Gauge: "12-1M" Finish: Black Oxide

Table F

Nicopres® Tool, Groove, and Crimp Combinations					
Cable Size	**Application**	**Copper Sleeve** Note 1	**Tool Number**	**Tool Groove**	**Crimps Req**
1/8	Eye Splice	18-3-M	51-M-850	Oval M	3
1/8	Eye Splice	18-3-M	64-CGMP	Oval M	3
1/8	Eye Splice	18-3-M	63V-XPM	Oval M	3
1/8	Eye Splice	18-3-M	51-MJ	M	2
1/8	Eye Splice	18-3-M	3-M-850	Oval M	1
1/8	Eye Splice	18-3-M	3V-CGMP	Oval M	2
1/8	Eye Splice	18-3-M	3V-XPM	Oval M	2
1/8	Eye Splice	18-3-M	3V-F6:X:M	Oval M	2
1/8	Eye Splice	18-3-M	3V-MJ	M	2
1/8	Stop	871-18-J	51-MJ	J	1
1/8	Stop	871-18-J	3-MJ	J	1
3/16	Eye Splice	18-6-X	51-X-850	Oval X	4
3/16	Eye Splice	18-6-X	3-X-850	Oval X	2
3/16	Eye Splice	18-6-X	3V-XPM	Oval X	2
3/16	Eye Splice	18-6-X	3V-F6:X:M	Oval X	2
3/16	Stop	871-20-M	51-MJ	M	1
3/16	Stop	871-20-M	3-MJ	M	1
1/4	Eye Splice	18-10-F6	3-F6-950	OVAL F6	3
1/4	Eye Splice	18-10-F6	3V-F6-X:M	OVAL F6	3
1/4	Stop	871-23-F6	3-F6-950	OVAL F6	2
1/4	Stop	871-23-F6	3V-F6-X:M	OVAL F6	2
5/16	Eye Splice	18-13-G9	3-G9-950	OVAL G9	3
5/16	Stop	871-26-F6	3-F6-950	OVAL F6	2
5/16	Stop	871-26-F6	3V-F6-X:M	OVAL F6	2
3/8	Eye Splice	18-23-H5	12-OVAL-H5 Note 2	OVAL H5	4
3/8	Stop	871-27-F6	3-F6-950	OVAL F6	2
3/8	Stop	871-27-F6	3V-F6-X:M	OVAL F6	2
1/2	Eye Splice	18-25-K8	12-OVAL-K8 Note 2	OVAL K8	6
	Notes:				
	1. Only solid copper sleeves are appropriate for rigging applications with galvanized steel cables				
	2. This die set may be used in a hydraulic tool only				
	3. Other tool and groove combinations may exist. Consult Nicopress.				

Table G

References:

1. Nicopress catalog No. 4 dated 6/00/WT
2. Nicopress Instruction number 32, revised 1/31/95: “Instructions for splicing flexible steel cables with Nicopress sleeves and tools”
3. Nicopress Instruction number 50, revised December 1996: “Nicopress No. 635 Hydraulic Tool”
4. “Nicopress Products No. 3512 Hydraulic Hand Compressor Operation, Service Instructions & Parts List"

iii. Swaged Fittings:

Swaged fittings come in a variety of styles and sizes. They are 100% efficient and permanent for the life of the cable. However, they generally must be installed on to the cable by the cable manufacturer or supplier in the factory. If a fitting or any part of the cable assembly is damaged the entire assembly must be replaced.

iv. Turnbuckles & Shackles:

- Do not overload above the manufacturer's recommended working load.
- Replace all safety fittings (lock nuts, cotter pins, mousing wire, etc.) after installation and adjustment.
- Screw pins in turnbuckle jaws and shackles are designed to be tightened by hand. Over tightening REDUCES the load capacity of the device and can cause failure of the component. If a tool is required to remove a screw pin the device should be discarded.
- NEVER replace clevis pins and shackles or turnbuckle jaws with any other item of hardware. It will weaken the assembly and can lead to failure of the item.
- Do not over tighten locknuts (if provided) on turnbuckles.
- Turnbuckles and shackles which lack locknuts or cotter pins must always be safety wired to prevent loosening. Safety wires should start at the eye end, loop through the yoke, and end at the jaw end. Wiring should be done so none of the three parts of a turnbuckle can rotate more than a fraction of a turn.

c. Trim Chains

i. Installation:

- Attach one end of the chain to a thimble at the end of the lift line using forged cable clips or a copper Nicopress sleeve.
- Wrap the chain one and a half turns around the batten to prevent batten rotation.
- Insert the body of a forged shackle into the thimble at one end of the lift line.
- Attach a link of the chain, on the return side, to the shackle body with the shackle pin.

ii. Inspection & Maintenance

Routine inspection procedure should include looking for proper connections, rust or wear on the links, and deformed links. Wear, deformation, and heavy rust are cause for replacing the trim chain.

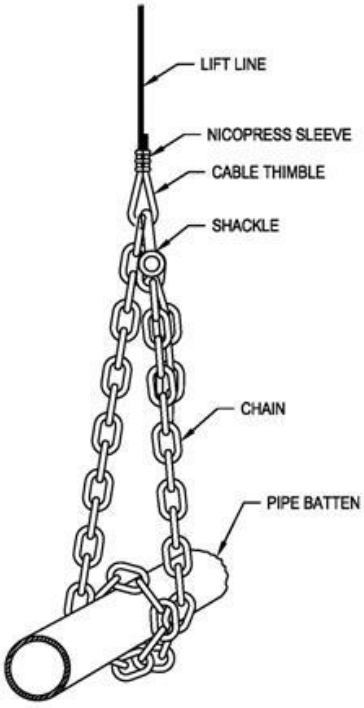

FIGURE 26 – TRIM CHAIN

d. Batten Clamps

Full and Half Clamp:
Place Clamp halves over the pipe and install 3/8" diameter bolts with locking style nuts or lock washer and nuts in the two holes (1 hole in each clamp) closest to the pipe. Thoroughly tighten to prevent the batten from rotating in the clamp. The large hole should be above the batten. Use this hole to insert a shackle, turnbuckle jaw, or cable thimble. DO NOT INSERT cable directly into the clamp hole. On straight lift fire Curtains Pipe clamps are installed over the curtain fabric and the lower clamps bolts pierce the fabric.

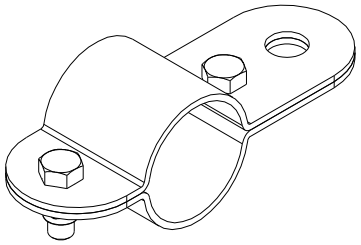

FIGURE 27A – BATTEN CLAMP

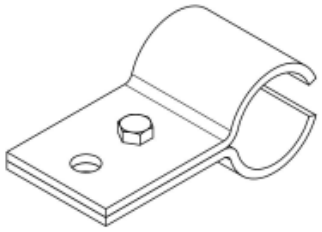

FIGURE 27B – BATTEN HALF CLAMP

WARNING ! Danger of the suspended load falling! Do not use half clamps in high load applications or where security is an issue.

e. Batten Trim Clamp

Batten trim clamps permit accurate adjustment to batten trim with a minimum sacrifice in vertical travel. They also allow much greater vertical adjustment than is permitted by turnbuckles or trim chains. They are designed to function only on 1 ½" schedule 40 or schedule 80 pipe.

Installation consists of attaching the two parts to the batten. Securely attach the fixed part with small sheave to the batten directly under the pick point. Then attach the adjustable pipe clamp part 6" to 10" away from the small sheave leaving it loose for adjustment.

Pass wire rope around small sheave and fasten it to the upper hole in the sliding half using thimble and Nicopress sleeve or forged cable clips. Slide the clamp half along the batten until the desired trim is achieved and securely tighten the bolts.

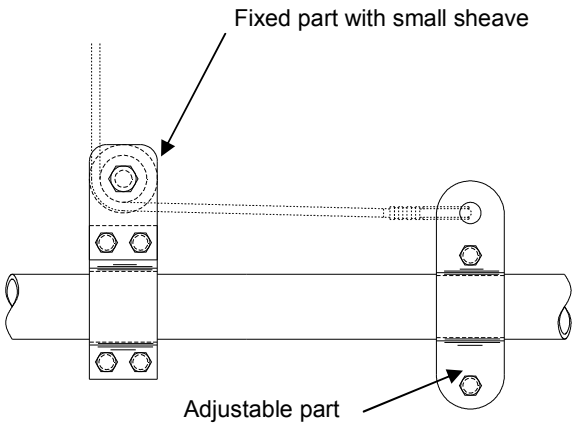

FIGURE 28 – TRIM CLAMP

f. Handline (Rope)

i. Selection

Select a rope with a suitable capacity for the intended use. A minimum safety factor of 8 is recommended. When in doubt, contact the manufacturer or distributor for assistance.

ii. Installing rope:

- Removing rope from coils and reels: If the new rope is in a coil it should always be uncoiled from the inside per the manufacturers instructions. If it is on a reel, the rope should be unwound from the outside with the reel free to rotate on a shaft or in a rack.
- Minimum sheave diameter: The minimum sheave diameter for use with rope should be 8 times the rope diameter in order to avoid serious wear on the rope. Sharp bends reduce tensile strength significantly.
- Avoid creating kinks when installing and using rope since kinks can severely damage and weaken to rope. Rope should be allowed to hang out before the ends are fixed and before a load is applied to relieve twists and stresses caused by storage.
- Tape or whip the rope ends before using to prevent the strands from becoming un-laid, as this will cause uneven stress distribution and shorten the rope's life.
- Splice rope when possible because knots, depending on type, may lessen the rope's strength by as much as 60%.
- Pad the rope over sharp corners.
- Putting end or eye splices into synthetic ropes requires special tools and procedures. Contact J.R. Clancy for special instruction sheets before attempting to splice "Stage Set-X", "Multline II" or J.R. Clancy's "SureGrip" polyester ropes.

FIGURE 30 (Bowline, Girth Hitch, and 2 Half Hitches)

iii. Using Rope:

- Never stand in line with rope under tension. If a rope attachment fails it can recoil with sufficient force to cause physical injury. Synthetic rope has higher recoil or snapback tendencies than natural fiber rope.
- Avoid sharp edges, rough edges and dirt. Dirt and grit picked up by the rope will work into the strands and cut inside fibers.

- Avoid excessive heat and chemicals
- Attach rope using the appropriate knot or splice. The use of half hitches or a bowline is recommended for attachment to an arbor. On arbors, remember to fix the tail to the standing part with tape or tie wrap once the final adjustment has been made (See ***FIGURE 30*** for knot types).

iv. Inspecting Rope

- Reverse rope ends regularly, especially when used in tackle. This allows the rope to wear evenly for longer life. When using tackle or slings, apply a steady, even pull to maintain full strength since shock loads reduce the strength. For maximum safety, use slings with an angle of 45° or less.
- Repeated hauling of 3 or 4 strand twisted line over a winch drum in a counterclockwise direction will extend the lay of twisted rope and change the twist of each strand. Over time, this will cause hockles or back turning to develop. Once this happens the rope is permanently damaged. If the line is hauled over the winch in a clockwise direction the rope lay is shortened and the rope becomes stiff and easily kinked. To avoid these conditions and extend useful life, the direction of turns over the winch should be alternated regularly.
- Inspect frequently and discard bad rope. Examine for breaks in the outside fibers and excess wear.
- Open the rope by untwisting the strands carefully to allow observation of the inside. If the interior is not bright and clean the rope is questionable. Sawdust like accumulations in the interior of the rope indicates excessive wear of interior fibers. Broken interior fibers indicated that the rope has been overloaded. A heavily used rope will often become compacted or hard which indicates reduced strength. If any of these conditions are observed, replace the rope.
- Look for distortion, brittleness or weakness of exterior fibers. In synthetic rope, also look for melted strands. Use in high temperatures, high friction (capstan winches), and storage in high temperatures can all reduce the strength and shorten rope life. If these conditions are observed, replace the rope.
- Store rope in a clean, dry place. Avoid excessive heat. Rope should be neatly coiled and either supported off the floor or hung from pegs to permit air circulation and to avoid kinking.
- If a rope needs to be discarded because of flaws or old age it is recommended to cut rope into unusable lengths to prevent the accidental reuse of the rope. If rope is dirty it should be washed in clean water and thoroughly dried before storing.
- Do not store rope in direct sunlight. Some synthetic ropes (especially polypropylene and polyethylene) may be severely weakened by long exposure to ultraviolet light. Ultraviolet degradation is indicated by discoloration and the presence of splinters and slivers on the surface of the rope.

NOTICE: The temperature at which a 50% loss in strength can occur in new and unused rope is:

150°F- Polypropylene
350°F- Nylon
390°F- Polyester

BATTENS & BATTEN EXTENSIONS

INSTALLATION

i. Battens should be installed so that they center on the proscenium line and have approximately equal overhangs beyond the outer lift lines.

ii. Sleeves should never be bolted and fastened with lock nuts. NEVER connect batten sections with threaded pipe couplings. If there is a short section of pipe in the batten, it is generally best to place it near the center of the batten. It is also best to arrange batten splices so that they occur near lift lines when possible. Yellow vinyl caps are supplied by J.R. Clancy for the batten ends to make them visible and protect personnel against sharp edges.

iii. If batten extensions are installed, they should be marked so that they are not accidentally pulled too far out of the batten end and they should always be locked into position in the batten so they cannot fall out during use.

INDEX LIGHTS

a. GENERAL DESCRIPTION

Index lights are intended to hang above a locking rail at the stage and/or gallery levels to provide a low level of directed illumination for the operators of the counterweight or rope rigging. Index light sections are generally joined together end to end to run the full approximate length of the locking rail or T-bar battery.

Index lights are available wired in one or two circuits. The second circuit will often contain blue colored lamps for use when the stage needs to be very dim and no offstage light must be visible.

b. INSTALLATION

i. The index light sections are hung from chains or cables attached to the T-bar outrigger batten or the under side of a gallery or walkway. They should be mounted 8-10 feet (2.5-3 meters) above the floor and just on stage of the locking rail so they will not interfere with the operation of the counterweight rigging.

ii. The housings have a long side and a short side. Mount sections with the long side toward the stage to block stray light while illuminating the locking rail and arbors.

iii. The sections should be mounted end to end with short sections of conduit, etc. connecting them. 14 gauge leads are provided at each end of each section for interconnecting the fixtures and wiring to the source of electricity. All sections must be grounded in accordance with local codes.

AVAILABLE INDEX LIGHTS		
PRODUCT	CIRCUITS	LAMPS PER CIRCUIT
015-051405	1	3
015-514052	2	3 + 2
015-051410	1	5
015-514102	2	5 + 5

Table H

iv. The wires on the second circuit in 2-circuit lights are connected with tie wraps at each end for circuit identification.

v. The fixtures may be controlled by conveniently located switches or they may be wired to incandescent dimmers for increased control over the light output.

vi. Use a 15 ampere circuit breaker for protection.

NOTICE: Use medium screw base, Type A, incandescent lamps, 40 watts maximum per lamp. Interconnect sections so the total wattage is within the capacity of a 15 ampere circuit. Lamps and fittings, except as noted above, are not provided with index lights.

ROPE LOCKS

a. GENERAL DESCRIPTION

Rope locks are designed to maintain a balanced counterweight set in position by clamping the hand line to prevent unwanted up or down movement. Each is equipped with an oval ring on the hand line that loops over the handle when it is closed to prevent accidental release. A counterweight set should be kept in balance, or very close to balance, except when equipment is being changed.

NOTICE: The recommended working load for J.R. Clancy rope locks operated by routine operators is within 50 lbs. (20 kg) of neutral balance. Under special conditions and under the control of highly trained operators the rope lock may be adjusted to 150 lbs. (70 kg).

Rope locks may be equipped with key locks to prevent unauthorized access to the counterweight set.

J.R. Clancy produces two different rope locks:

1. 010-533R ROPE LOCK (Malleable housing with 9" long coated handle.)
2. 010-600R SURELOCK® (Load sensing Rope Lock)

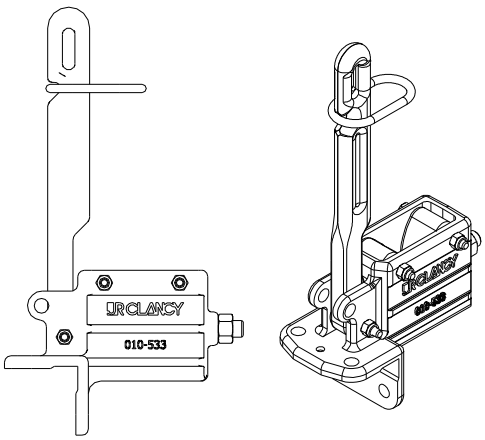

FIGURE 31 – 010-533R

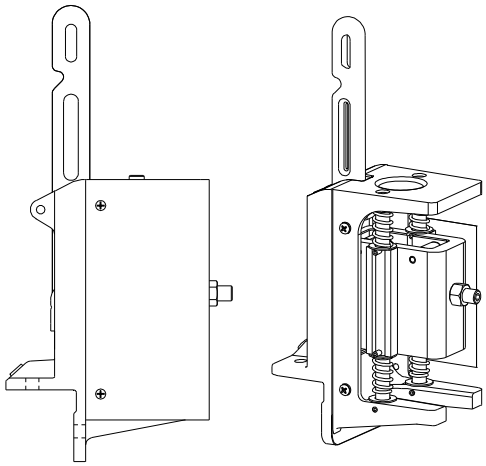

FIGURE 32 – 010-600R

b. INSTALLATION

- **NOTICE: Check the locking rail for its condition and strength before the installation and use of rope locks.**

i. Rope locks are mounted to the locking rail with four, Grade 5, 3/8" (10 mm) diameter by 1-1/4" long bolts and lock nuts. The bolts should be tightened evenly so that the rope lock is pulled squarely into the locking rail. Check to see that the rope lock is in line with the counterweight arbor and floor block.

ii. Next, install the counterweight set hand line, running it through the rope lock and the oval safety ring.

iii. Tighten the bolt at the rear of the rope lock until the hand line is clamped without being crushed when the rope lock is closed.

iv. After the handline has had time to stretch under a load and tighten up, the rope lock should be readjusted. Do not over tighten so that it is difficult to close the handle. After final adjustment, tighten the locking nut on the adjustment bolt.

v. If there are any questions, contact J.R. Clancy at 1-800-836-1885 before proceeding with the installation.

STAGE CURTAIN TRACKS

a. General Information

Traverse curtains may be hung from a variety of track styles chosen according to weight, length, and operating requirements. A basic complement of masking curtains is usually required regardless of how the performance area is used. When scenery is used to enhance a performance, it may also be hung from tracks in lieu of counterweight rigging or other methods of moving scenery, provided scenery does not exceed the manufacturer's recommended maximum load rating on the track and carriers.

b. General Installation Instructions

See Manufacturer Documents and Contract Drawings for Specific Tracks:
This document is not intended for a complete guide to the installation of tracks. Please refer to any included instruction sheets which refer to specific track types and curtain machines.

i. Lay out track channel on floor. If the track is to be bi-parting, lap the channels in the center by the desired amount, usually 2 to 3 feet (600mm to 1m). Attach lap clamps at each end of the lapped section. All tracks should be lapped in the same direction. Install splice clamps if the track has more than one section. Make sure the sections butt tightly together and that there are no burrs or dents at the ends.

ii. Determine from which end the track is to be operated and install the live end pulley at that end. Install the dead end pulley at the other end, oriented so the outer side of the sheave lines up with the open end of the off side track. Then install the single carriers and the master carriers. Finally install the eye bolt end stops at the center ends of the track.

iii. Starting at one master carrier, the operating cord threads through the holes in the single carriers, over one sheave in the live end pulley, around the floor block pulley, over the second live end pulley sheave, through the dead end stop and the second master carrier, through the holes in the rest of the single carriers, around the dead end pulley, through the other dead end stop and back to the first master carrier to close the loop. Rubber spacers will quiet the operation. These may snap on the edges of each carrier or rubber washers may be placed between carriers by inserting the operating cord through each spacer as the cord is installed. Back packs also must be installed in this manner.

iv. Install hangers on Automatic Devices Co. (ADC) tracks or H& H Specialties Inc. track according to the following chart (Table 1). If heavy loads are to be supported reduce the hanger spacing. Each end of the track must be supported by one, or more, hangers to carry the weight of the curtain when it is open. Splice clamps should also be support and have holes for that purpose.

TRACK DATA						
ADC Model #	280	170	500	420	140	132
H&H Model #	400	100	500	600	300	700
Max Load Per Ft	20 lbs	10 lbs	30 lbs	15 lbs	15 lbs	6.5 lbs
Carrier Spacing	12"	12"	12"	12"	12"	12"
Max. Hanger Span	7'	6'	5'	6'	4'	4'
Approx Stacking Space per ft of track	2.4"	1.5"	2.4"	1.8"	1.8"	1"

Table I

v. The track can now be raised to its permanent location and hung from cables with suitable fittings at each hanger location or attached to a pipe batten using full pipe clamps at each hanger and splice location.

NOTICE: J.R. Clancy recommends that tracks be hung from battens, where possible, to reduce the number of structural hanging points. Suitably sized cable or welded link chain should be used for hanging support. Do not use open link chain such as jack chain.

vi. Attach the floor block directly beneath the live end pulley.

vii. Move the master carriers to the center of the track and attach to ends of the operating cord. The cord should be taut but not over tight. The cord length can change under different temperatures and humidity and the track will be hard to operate if the cord is too tight.

viii. Curved and straight I-beam style tracks and other styles have special requirements for installation. Look for specific instructions or drawings which show the location of the idlers, extra hangers, and other requirements.