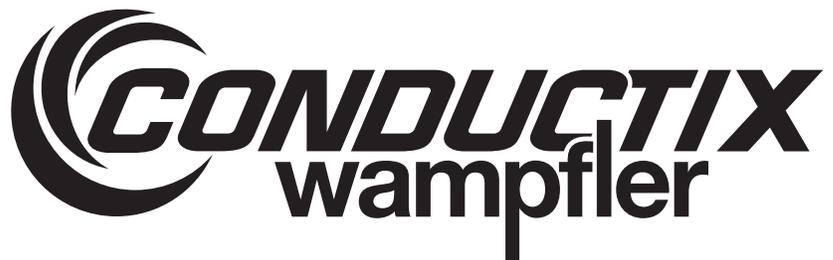


Festoons Manual - Medium Duty Series 200, 250, 300, 350



Conductix Incorporated

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1.0 Safety

1.1 Electrical Warnings

- 1.1.1 Properly ground all electrical connections in accordance with the National Electrical Code and local codes and ordinances.
- 1.1.2 Disconnect the electrical power from the system before any service is performed.
- 1.1.3 Do not use cable for loads greater than the voltage and current rating. The ampacity rating of the cable should be in accordance with the National Electric Code.

1.2 Operational Warnings

- 1.2.1 Exercise care when handling the festoon system during normal operation.
- 1.2.2 Do not use cable different from that for which the system is intended. Changes in diameter, weight per foot, length of cable or flexibility will affect the operation of the system.
- 1.2.3 Mounting hardware and fasteners should be installed to maintain tightness under vibration and checked periodically to insure tightness. (See Torque Specifications Table, page 12.)

1.3 Maintenance Warnings

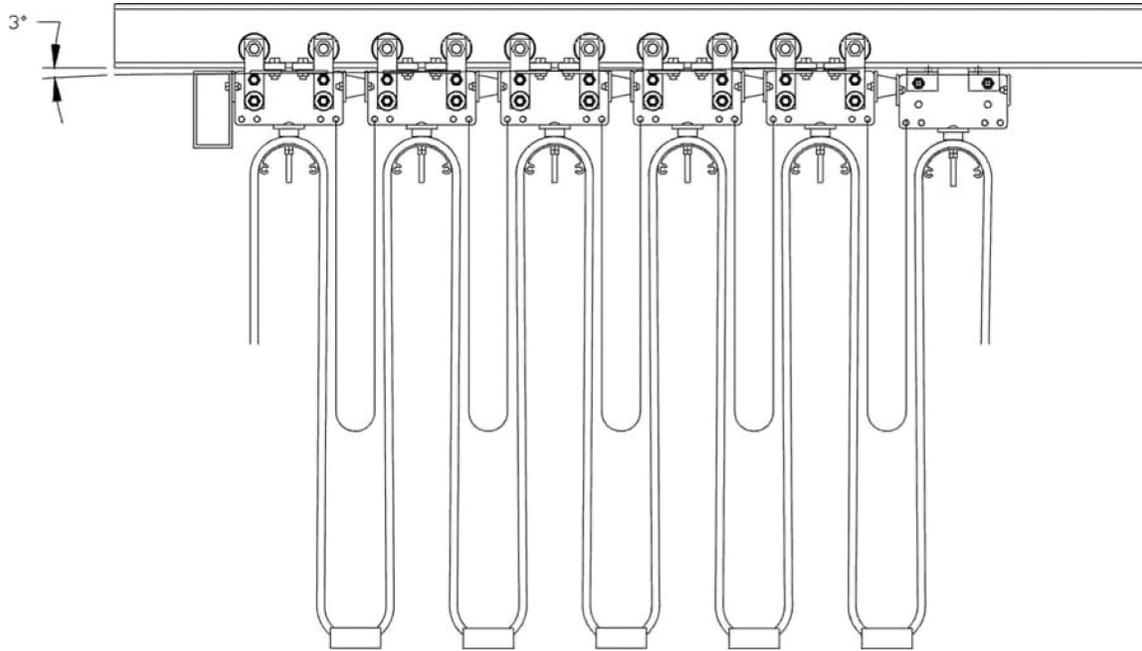
- 1.3.1 **WARNING:** Modification of this equipment may cause excessive wear and will void the warranty. Contact the manufacturer regarding changes or modifications of equipment which could affect reliability or safety.

2.0 Installation

2.1 I-Beam

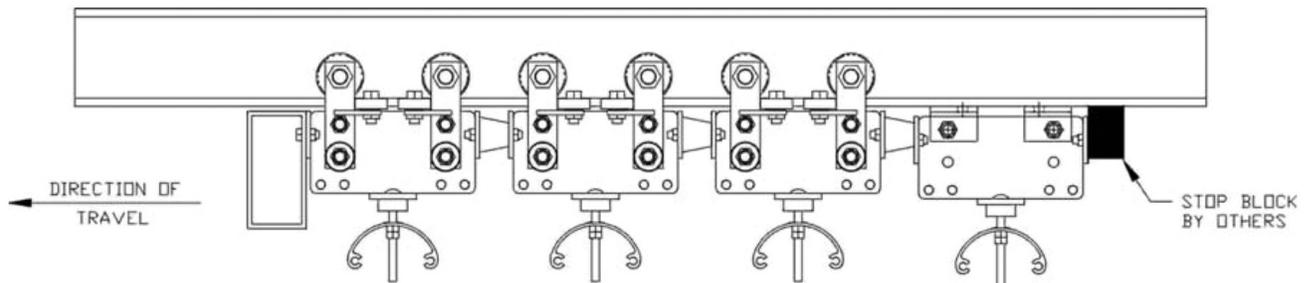
- 2.1.1 Festoon trolleys are designed to run on most standard S and W shaped I-beams. The type and size of beam must be adequate for the application.
- 2.1.2 For uniformity and dimensional tolerances, purchase I-beams from the same production runs.
- 2.1.3 Weld and grind smooth all beam joints, especially around the lower flange where the rollers run. Avoid splice plates and bolts since they can interfere with trolley movement during operation.
- 2.1.4 We recommend elevating, approximately 3 degrees, the section of the system I-beam where the festoon system is stored, as shown in the diagram. This facilitates movement of the system out of the stored position.
- 2.1.5 The support structure for the I-beam must be adequately designed for the system loads. Install the system I-beam parallel to the crane bridge runway/trolley support beam with sufficient clearance to avoid any interference with the moving trolleys and/or possible cable sway.

2.0 Installation



2.2 Installation of System on I-Beam

2.2.1 A typical festoon system is comprised of one **tow trolley** several **trolleys** and one **end clamp**. Install on the I-beam as shown in the following diagram:



2.2.2 **Tow Trolley:** Connect to the crane/trolley via customer supplied tow arm. The end of the tow arm must fit centrally into the rectangular opening of the tow trolley and protrude through the opening such that it will not become disengaged during operation. **Note:** The tow arm should never be physically attached to the trolley. The tow trolley is set from the factory for the beam size specified when ordered. See trolley section below if adjustment is required.

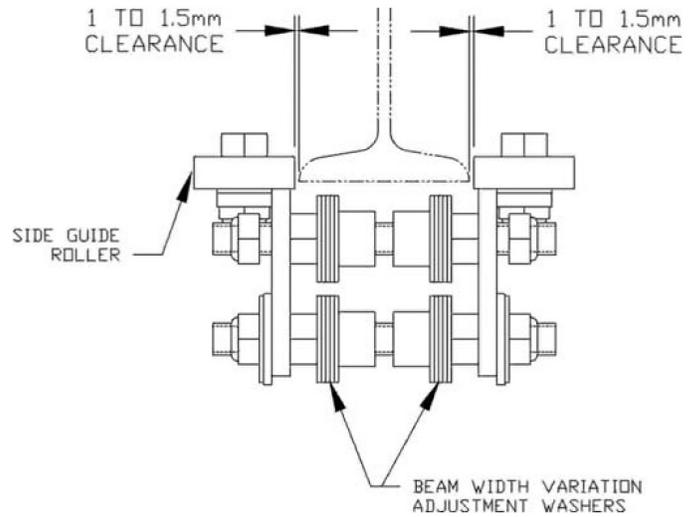
2.2.3 **Trolley:** Set from the factory for the beam size specified when ordered. The rollers are set for the nominal dimensions of the beam; however, if required, adjust to fit the beam properly. The side guide rollers should have a maximum clearance of 0.06" (1.5 mm) on each side of beam. As needed, increase or decrease this space by adding or removing adjustment washers as shown in the diagram.

- No adjustment required on 300 series trolleys
- For 200 series, adjust the slide bar with flanged rollers to fit the beam allowing 0.06" (1.5 mm) of clearance on each side of beam.

2.0 Installation

2.2.4 **End Clamp:** Bolt to the underside of the I-beam using 3/8" diameter high strength (Grade 8) bolts. Torque nuts to 44 ft-lbs. (60N*m). (Make sure bolt threads are clean and dry.) Drill a minimum of four 7/16" diameter holes in the lower flange for mounting of the end clamp. After mounting, verify that the bumper of the adjacent trolley contacts the end clamp bumper plate. If required, add shims between the beam and the end clamp so that the bumper makes proper contact. Minimum contact is approximately one half of bumper height.

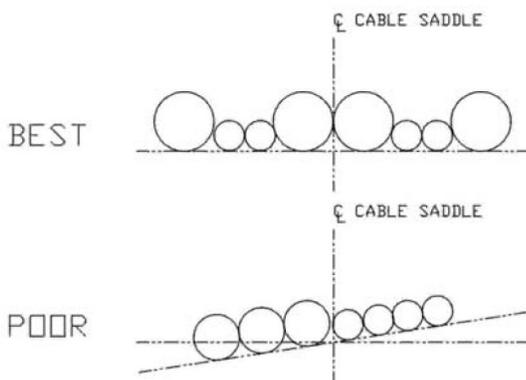
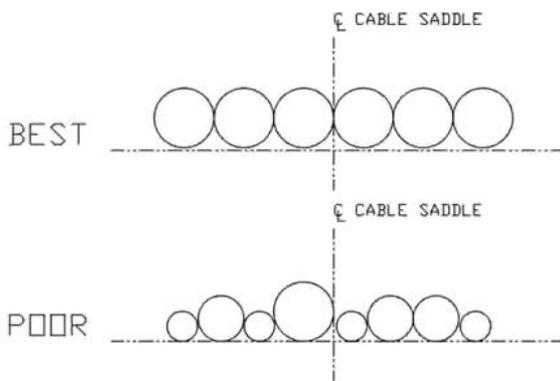
2.2.5 After installing and positioning the system properly, it is recommended to weld a stop block to the underside of the I-beam adjacent to the back of the end clamp to help resist the impact on the mounting bolts during operation (see diagram 2.2.1).



2.3 Installation of Cables

2.3.1 Before beginning the installation of cables, lower the cable saddle to allow cable space between the cable clamp pad and the cable saddle.

2.3.2 Install cables on the equipment per the pre-designed arrangement or the following rules:



2.3.2.1 Round Cables

- Keep diameter variation between adjacent cables to a minimum. Large variations in diameters make clamping difficult and cables may not remain secure during operation (see diagram). A maximum of 5/8" height difference between adjacent cables is permissible. For larger differences consult factory.

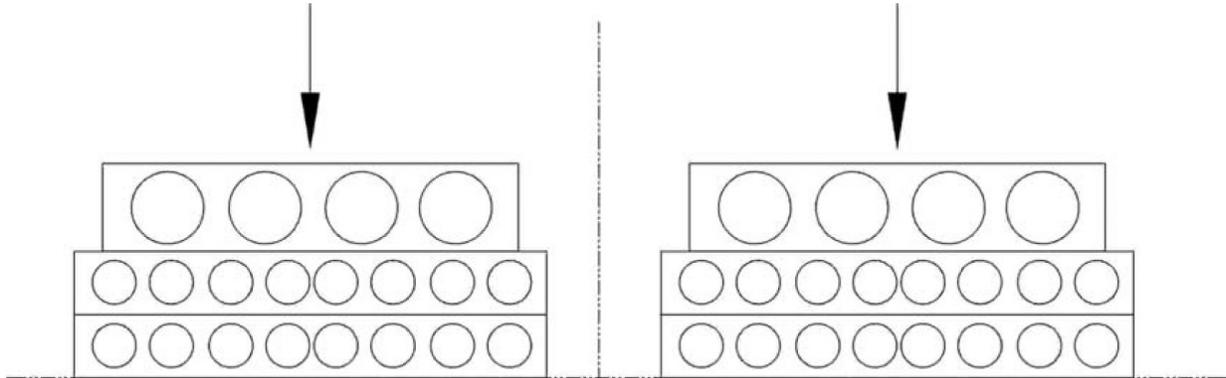
- Arrange cables in the following order:

- a) Place the two largest cables in the outer-most positions of the support saddle.
- b) Arrange the remaining cables between these two cables, taking care to place the heaviest cables near the centerline of the trolley and the lighter cables to the outer positions (see diagram). It is important to balance the cable load about the trolley center point for smooth running and longer bearing life.

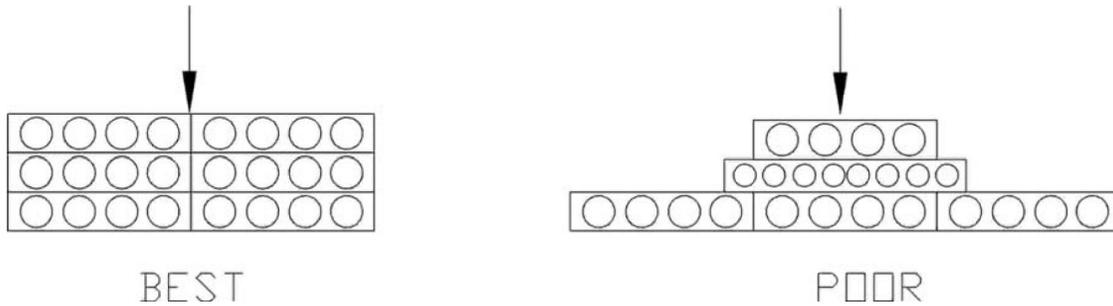
2.0 Installation

2.3.2.2 Flat Cables

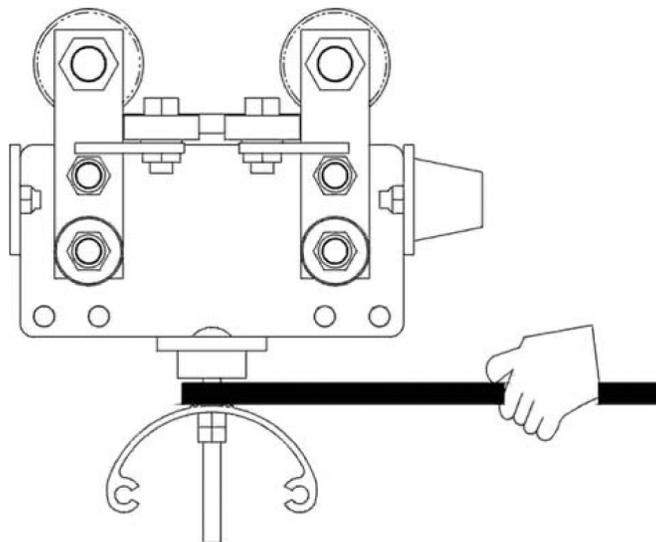
- Arrange cables with the larger cables (power cables) on top of the stack (see diagram below). This provides a larger bending radius as well as improved heat dissipation. Since the top cable also takes more pulling force during operation, the larger conductor is better suited to handle this force.



- Arrange cable packages with a width to height ratio of 3 or 4 to 1. Tall narrow cable stacks can be unstable during operation.
- Arrange cables with a minimum of 50% of each cable surface under clamp pressure (see diagram below).



2.3.2.3 After setting the cables to their proper loop depth and arranging the cables as designed, tighten the double nuts on the drop bolts to clamp the cables between the cable saddle and clamping bar. Be sure the cables do not move when pulled (see diagram).



2.0 Installation

2.4 Installation of Cable Organizers

2.4.1 We recommend cable organizers for systems in order to prevent adjacent cables within each loop from becoming tangled during operation. Depending on the loop depth, either one or two per loop may be required. The recommended guidelines are as follows:

2.4.1.1 For flat cable, it is recommended to use two organizers per loop. Position the organizers in the lower third of the loop making sure to stagger the organizers on each side of the loop and allow 6-8" of distance between the upper and lower organizer. (See Figure 1)

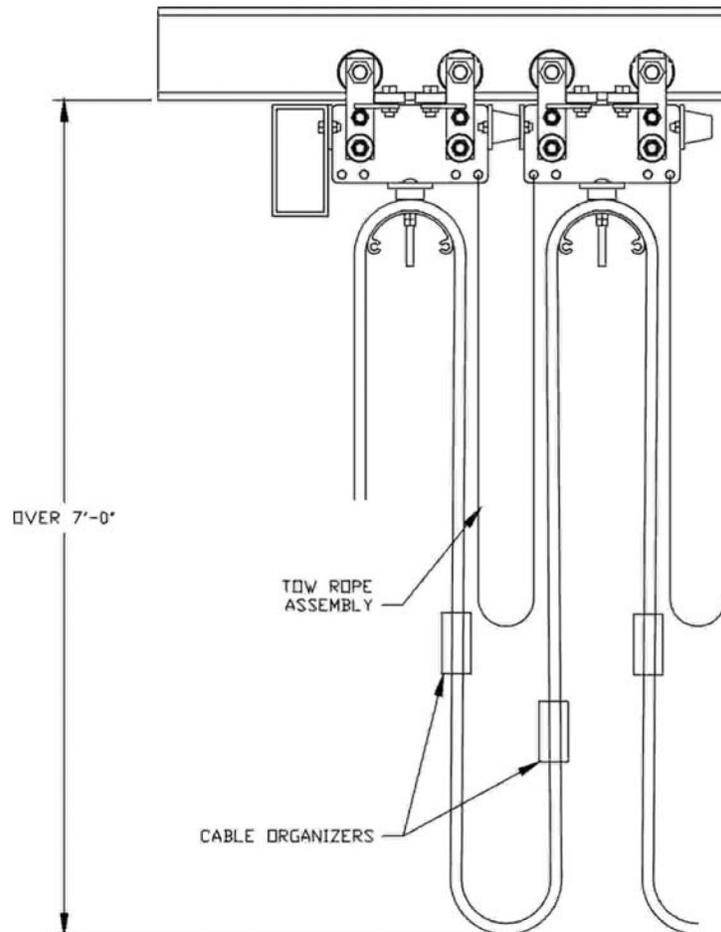


FIGURE 1

2.4.1.2 For round cables with loop depths up to seven feet, use one organizer per loop. Position the organizer in the lower apex of the loop. (See Figure 2 on page 9.)

2.4.1.3 For loop depths over seven feet, use two organizers per loop. Position the organizers in the lower third of the loop, making sure to stagger the organizers on each side of the loop. (See Figure 1)

2.0 Installation

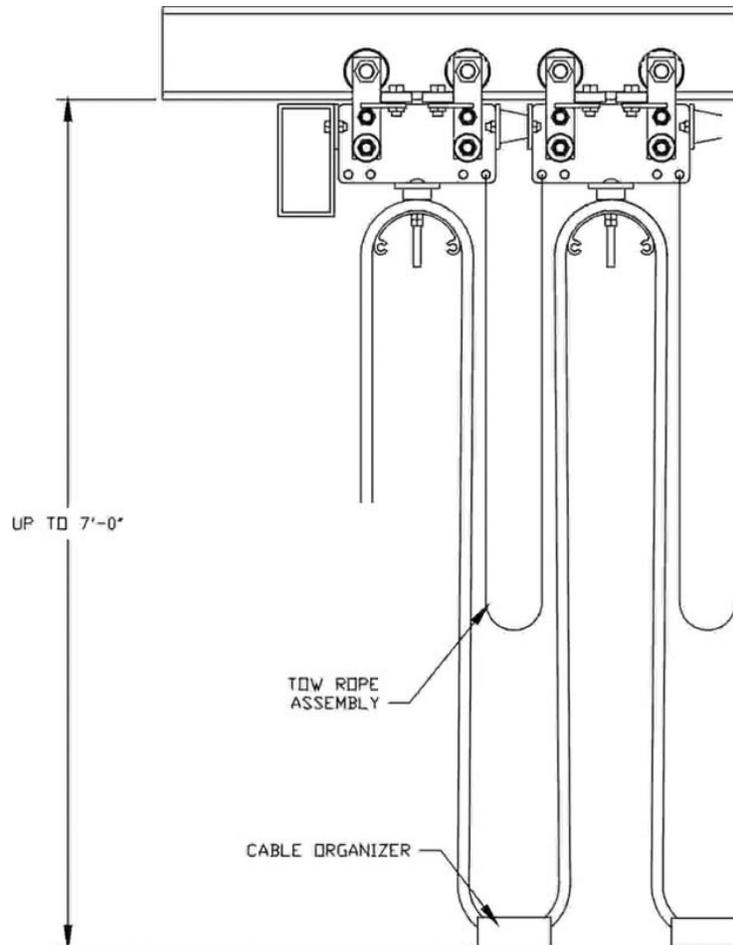
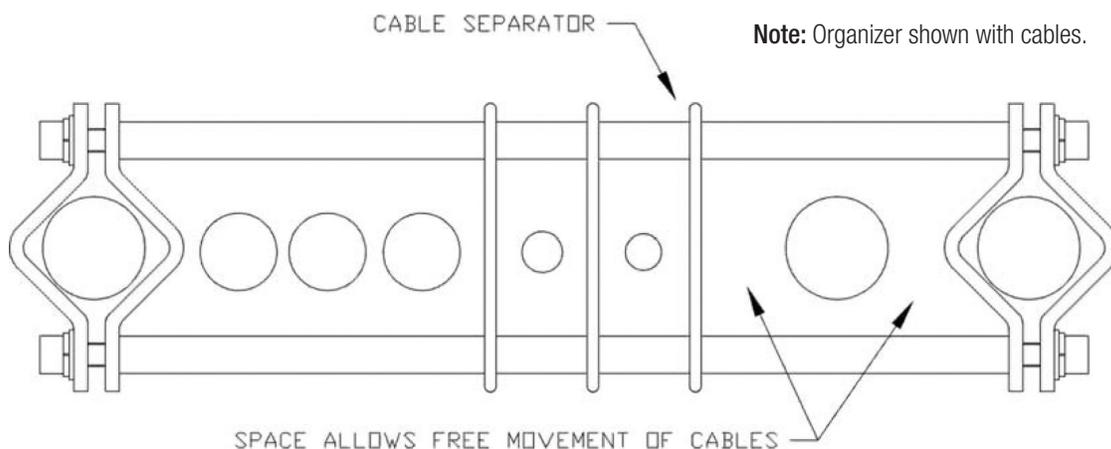


FIGURE 2

2.4.2 Round Cable Organizers

2.4.2.1 Install organizer with the outer-most cables of the loop securely clamped between the end brackets. Position the remaining cables between the organizer rods, thereby permitting free movement of the cables. **Note:** If the sum of the diameters of two adjacent cables is less than the distance between the two rods of the organizer, install a cable separator to prevent the cables from becoming tangled during operation (see diagram below). Please check the catalog for the proper separator required.

2.4.2.2 Apply Locktite #290 and torque bolts of round cable organizer to 15-22 ft-lbs (20-30 N*m).

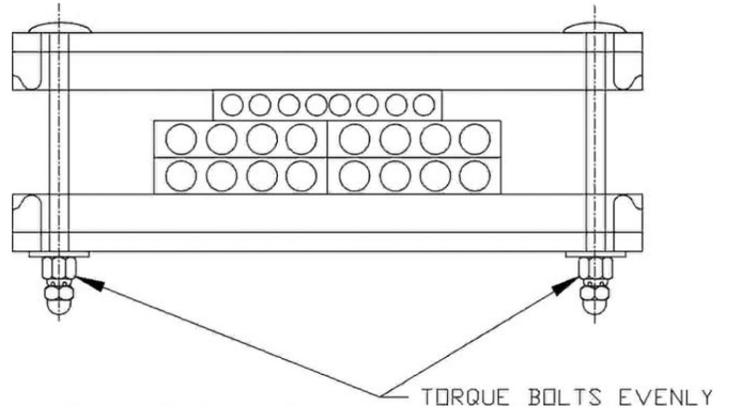


2.0 Installation

2.4.3 Flat Cable Organizer

2.4.3.1 Install organizer with the cable package setup as noted on page 7 in Figures 1 and 2, and tighten the bolts to the correct setting as indicated in Sec. 2.4.3.2 (See diagram below).

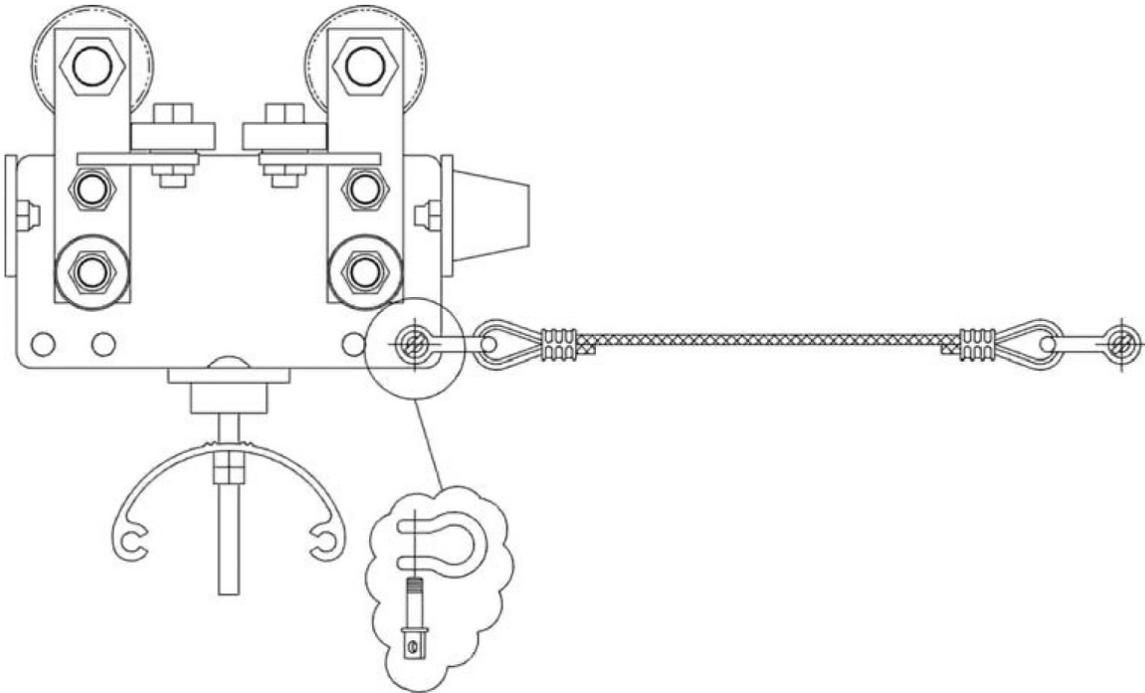
2.4.3.2 Torque 5/16" bolts of flat cable organizer to 17 ft-lbs (23 N*m).



2.5 Installation of Tow Cables

2.5.1 Install tow cables in each loop of the system by attaching the steel shackles provided with each rope/chain assembly to the trolleys, tow trolley, or end clamp. During installation of the tow rope or tow cable, make sure each cable is not twisted or tangled and hangs freely within the loop (see diagram for 2.4.1.2, page 8.)

2.5.2 When installing two cable with shock cord assemblies, the shackle pin and cotter pin may not be required (see diagram in Sec. 2.6). Install cotter pin after inserting pin through center plate and shackle.



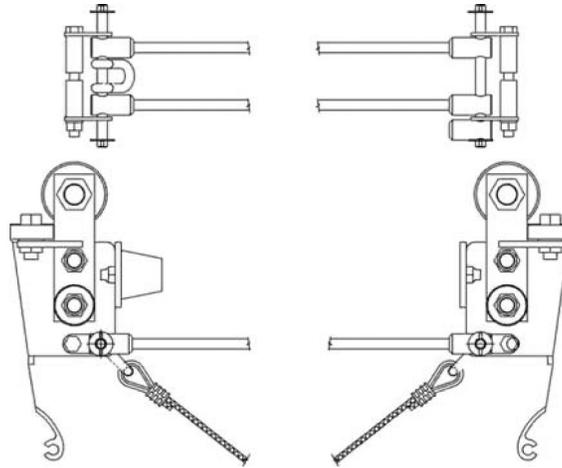
2.6 Installation of Shock Cords

2.6.1 If required, install shock cords to trolleys, tow trolleys, and end clamps with the tow cable assembly. Install the shock cord bracket per the diagram. Torque the nuts to 77-81 ft-lbs (105-110 N*m). During installation, make sure the shock cords are not twisted or tangled and hang freely within the loop. Please note that the shock cord loop must be shorter than both the electrical cable and the tow cable.

2.6.2 To replace a worn or broken shock cord, remove the pin from the shock cord mounting bracket. Remove the worn shock cord and replace with the new shock cord. Again, make sure the shock cord is not twisted or tangled within the loop.

2.6.3 **Note:** If one or more cords within a loop are worn or broken, replace all the cords within that loop.

2.0 Installation



2.7 Installation Instructions for Pre-Assembled Festoon System

- 2.7.1 Pre-assembled festoon systems are typically built and shipped on steel shipping frames. To install the system onto the beam at the joist please follow these steps:
- 2.7.1.1 Upon arrival at the job-site, inspect the festoon system to insure electrical cables and festoon components have not been damaged during transit.
 - 2.7.1.2 To insure easy transfer from shipping frame I-beam onto permanent I-beam, prepare end of beams by eliminating any burrs or rough edges and drill holes in the lower flange at the fixed end to accept end clamp.
 - 2.7.1.3 Attach hoisting cables at each end of the shipping frame (depending on the length of the shipping frame, intermediate hoisting locations may be required) and lift shipping frame into position. I-beam on shipping frame must line-up with permanent festoon I-beam.
 - 2.7.1.4 **CAUTION:** Load may shift to the mobile end of the shipping stand while transferring the festoon system onto the permanent I-beam.
 - 2.7.1.5 Once the I-beams are aligned, clamp the beams together to insure that they do not separate while transferring the festoon system from the shipping frame to the permanent I-beam.
 - 2.7.1.6 After the I-beams are clamped together, remove the hardware on the shipping frame so that the tow trolley can be rolled onto the permanent I-beam.
 - 2.7.1.7 Roll the tow trolley and succeeding trolleys onto the permanent I-beam. Remove the end clamp from the shipping stand I-beam and attach it to the permanent I-beam using the holes drilled as specified in Section 2.2.5 of the installation instructions.
 - 2.7.1.8 Make mechanical connection of customer supplied towing arm to crane and festoon system per Section 2.2.2 of the installation instructions.
 - 2.7.1.9 Make electrical connections as required.

3.0 Operation

3.1 Pre-Operation Inspection

- 3.1.1 Check for proper mounting of end-clamp.
- 3.1.2 Check for obstructions of beam joints.
- 3.1.3 Check cable clearances, that cables are hanging properly and are not tangled.
- 3.1.4 Check that tow arm is not disengaged from tow trolley during test operation and remains within the confines of the tow box.
- 3.1.5 Check the position of tow arm to make sure there is sufficient storage space for the festoon system. Failure to do so could result in system damage.

3.2 Operation Instructions

- 3.2.1 Do not exceed the voltage or ampere rating of the cable. Overheating, fire, damage to equipment or personal injury could result.
- 3.2.2 Operate the festoon system within the electrical and mechanical limits for which it was intended.

4.0 Maintenance

4.1 Maintenance Instructions

4.2 Inspection Checklist

In general, since all trolley rollers are lubricated and sealed for life, no re-greasing is required. However, customer should conduct periodic inspections of the system. Determine the inspection intervals based on severity of duty cycle and environment. We recommend the following checks during inspection:

- 4.2.1 Check all rollers for wear.
- 4.2.2 Check tightness of all hardware. (See torque specifications table below.)
- 4.2.3 Check cable clamp of all trolleys, making sure cables remain secure.
- 4.2.4 Inspect cable insulation for any cuts or cracks.
- 4.2.5 Check bumper condition.
- 4.2.6 Check all accessories, tow ropes, tow chains, shock cords and cable organizers for wear.
- 4.2.7 Inspect running beam for wear, clean running surface of any debris.

TORQUE SPECIFICATIONS			
Running Gear Kits		Trolley	
Part Description	Torque	Part Description	Torque
Main Roller	30 ft-lbs / 40 N*m	Flat Cable Organizer	17 ft-lbs / 23 N*m
Auxiliary Roller	50 ft-lbs / 68 N*m	Bumper	13 ft-lbs / 17 N*m
Spacer Kit Assembly	50 ft-lbs / 68 N*m	Cable Clamp Pad Assembly	13 ft-lbs / 17 N*m
Shock Cord Assembly	77-81 ft-lbs / 105-110 N*m	Round Cable Organizer	15-22 ft-lbs / 20-30 N*m

Note: Apply anti-seize compound (DISCO 902 or equivalent) to all stainless steel hardware.

5.0 Troubleshooting

5.1 Troubleshooting Applications

5.1.1 Thoroughly review each installation. The following is a general list of factors to consider:

- 5.1.1.1 The influence of wind and other ambient conditions.
- 5.1.1.2 The alignment of track beams.
- 5.1.1.3 The installation or beam in storage area (2-3 degree slope).
- 5.1.1.4 The types of cables installed.
- 5.1.1.5 The operating conditions which include:
 - Main travelling area or crab.
 - Travel cycles.
 - Approximate cycle speeds.
 - Various crab positions during operation.
 - Influence of the crane operator.

5.1.2 The main step necessary is to observe the system in operation and to record and measure the reaction of the loops and trolleys. The following table is a list of typical problems and possible solutions:

Problem	Probable Cause	Solution
Uneven trolley roller wear.	Uneven/unbalanced cable package arrangement.	Re-arrange cables on trolleys to balance load.
Cable package arrangement is not correct.	Check cable clamps on saddle.	Re-arrange cables on trolleys to make sure all clamping pressure is sufficient on all cables.
Cable loops are not the same length.	Cable saddle bolts have become loose.	Re-adjust cables so loops are at the correct length and tighten bolts to correct torque settings.
Tow trolley is "ramming" into the intermediate trolleys when returning to storage position.	Two device is set for an incorrect storage length.	Calculate storage length of festoon system and adjust tow device/tow bar to accommodate the storage length.
Cables are "catching" during operation.	Obstructions along operating length of festoon system are snagging the cable or tow cables are snagging on loop organizers.	Review festoon at slow operating speed and watch for potential obstructions along operating length, adjust/remove obstructions. If tow cable is catching on loop organizers, move organizer down on the loop.
Loops at end clamp are whipping.	Cable reserve length is insufficient. Cable loop weight Speed is too fast.	Installation of shock cords in the last 2 to 3 loops.
Loops at tow trolley end are whipping.	Very high acceleration. Installation of shock cords in the first 2 to 3 loops. Verify length of tow cable per calculations. Very high speed. Weight of cable trolleys is too heavy compared to weight of cable loop. Tow cables are too short.	
Loops in middle are whipping.	Operation cycle varies (e.g. bulk handling crane.)	Install shock cords in every loop.
All loops are whipping. (Typically on high-speed systems with either light cable loops or short loop depth.)	Cable loops impart only small force components for the acceleration of the trolleys. Towing cables are too short.	Install shock cords in every loop to assist in the acceleration of the trolleys.

Notes

Notes

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