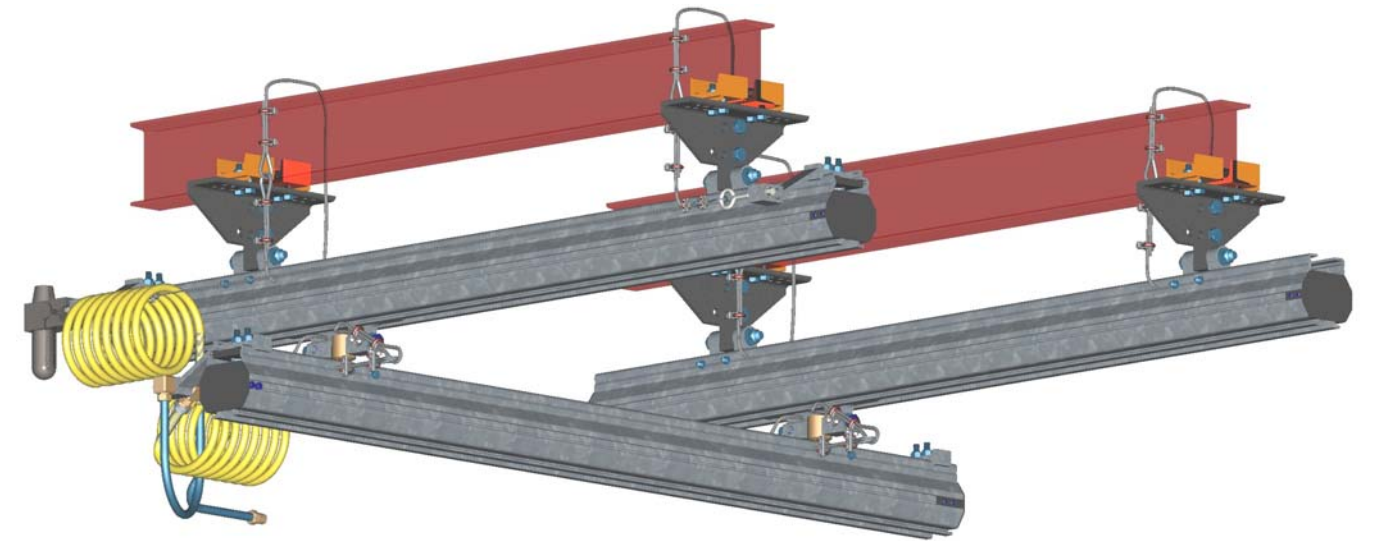


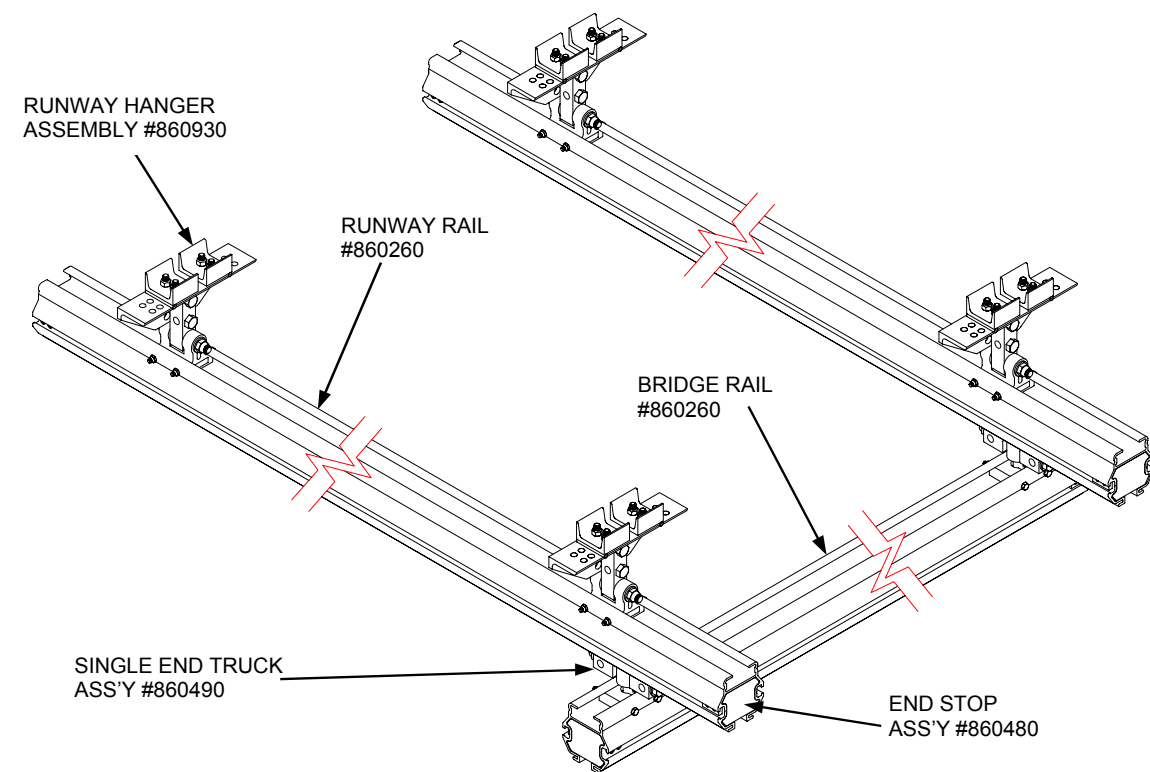
**Installation, Operation & Maintenance
Manual Version 2.0**



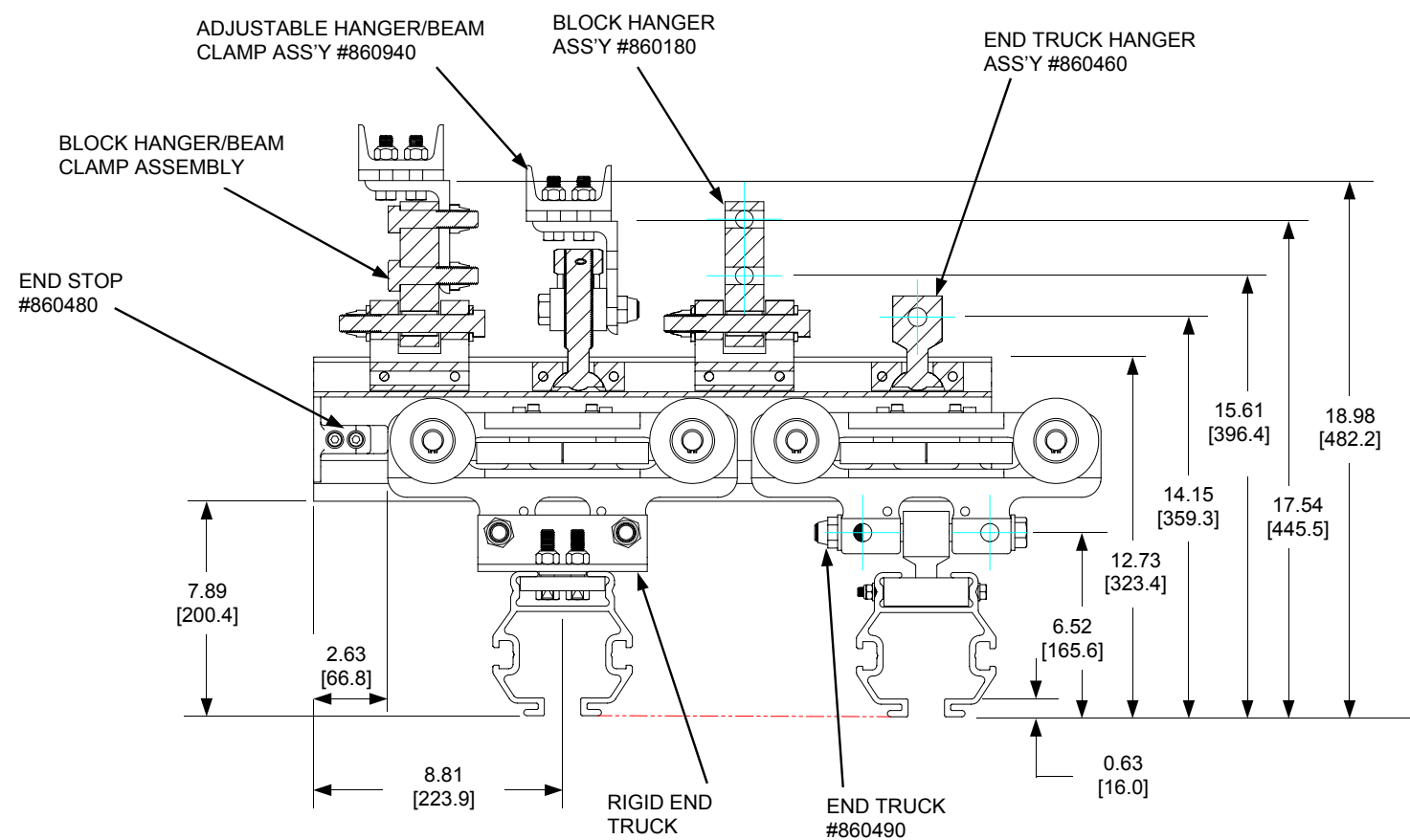
Keep this manual in a convenient place near the installed rail system for future reference. This manual contains:

- **Installation Instructions**
- **Maintenance Schedule**
- **Operation Instructions**
- **General Safety Requirements**

Typical Rail System Parts



Typical Stack Up Dimensions



16. CES LIMITED WARRANTY

CES warrants to the original user its products to be free of defects in material and workmanship for a period of one year from the date of purchase. CES will repair, without cost, any Product found to be defective, including parts and labor charges, or at its option, will replace such Products or refund the purchase price less a reasonable allowance for depreciation, in exchange for the Product. Repairs or replacements are warranted for the remainder of the original warranty period.

If any Product proves defective within its original one-year warranty period, it should be returned to CES transportation prepaid with proof of purchase or warranty card.

This warranty does not apply to Products which CES has determined to have been misused or abused, improperly maintained by the user, or where the malfunction or defect can be attributed to the use of non-genuine CES parts.

IMPORTANT NOTICE

It is our policy to promote safe delivery of all orders.

This shipment has been thoroughly checked, packed and inspected before leaving our plant and receipt for it in good condition has been received from the carrier. Any loss or damage, which occurs to this shipment while in route, is not due to any action or conduct of the manufacturer.

VISIBLE LOSS OR DAMAGE

If any of the goods called for on the bill of lading or express receipt are damaged or the quantity is short, do not accept them until the freight or express agent makes an appropriate notation on your freight bill or express receipt.

CONCEALED LOSS OR DAMAGE

When a shipment has been delivered to you in apparent good condition, but upon opening the crate or container, loss or damage has taken place while in transit, notify the carrier's agent immediately.

CES makes no other warranty, and all implied warranties including any warranty of merchantability or fitness for a particular purpose are limited to the duration of the expressed warranty period as set for the above. CES' maximum liability is limited to the purchase price of the Product and in no event shall CES be liable for any consequential, indirect, incidental, or special damages of any nature rising from the sale or use of the Product, whether based on contract, tort, or otherwise.

Note: Some states do not allow limitations on incidental or consequential damages or how long an implied warranty lasts so that the above limitations may not apply to you.

This warranty gives you specific legal rights and you may also have other rights may vary from state to state.

DAMAGE CLAIMS

You must file claims for damage with the carrier. It is the transportation company's responsibility to reimburse you for repair or replacement of goods damaged in shipment. Claims for loss or damage in shipment must not be deducted from the CES invoice, nor should payment of CES invoice be withheld awaiting adjustment of such claims as the carrier guarantees safe delivery.

You may return products damaged in shipment to us for repair, which services will be for your account and form your basis for claim against the carrier.

14. CRANE OPERATOR INSTRUCTIONS

Overhead cranes and jib cranes generally handle materials over working areas there are personnel. Therefore, it is important for the Crane Operator to be instructed in the use of the crane and to understand the severe consequences of careless operation. It is not intended that these suggestions take precedence over existing plant safety rules and regulations or OSHA regulations. However, a thorough study of the following information should provide a better understanding of safe operation and afford a greater margin of safety for people and machinery on the plant floor. It must be recognized that these are suggestions for the Crane Operator's use. It is the responsibility of the owner to make personnel aware of all federal, state, and local rules and codes, and to make certain operators are properly trained.

Qualifications

Crane operation, to be safe and efficient, requires skill: the exercise of extreme care and good judgement, alertness and concentration, and rigid adherence to proven safety rules and practices outlined in applicable and current ANSI and OSHA safety standards. In general practice, no person should be permitted to operate a crane:

- Who cannot speak the appropriate language or read and understand the printed instructions
- Who is not of legal age to operate this equipment
- Whose hearing or eyesight is impaired (unless suitably corrected with good depth perception)
- Who may be suffering from heart or other ailments which might interfere with the operator's safe performance
- Unless the operator has carefully read and studied this operation manual
- Unless the operator has been properly instructed
- Unless the operator has demonstrated his instructions through practical operation
- Unless the operator is familiar with lifting equipment and practices

Handling the bridge travel motion

Before using the bridge of the system, the operator should be sure the hook is high enough to clear any obstruction. Before a load is handled by the system, the bridge should be brought into position so that it is directly over the load. Start moving the bridge slowly and bring it up to speed gradually. Approaching the place where it is desired to stop the bridge, reduce the bridge speed

Handling the trolley motion

Before a load is handled, the lifting mechanism should be positioned directly over the load that is to be handled. When the slack is taken out of the cable, if the lifting mechanism is not directly over the load, bring it directly over the load before lifting is continued. Failure to center the lifting mechanism may cause the load to swing upon lifting. Always start the trolley motion slowly and reduce the trolley speed gradually.

Handling the lifting mechanism motion

Consult the manufacture's operating instructions

15. GENERAL SAFETY REQUIREMENTS

Know your crane

Operators should be familiar with the principle parts of the system and have a working knowledge of function and movement.

Responsibility

Each operator should be held directly responsible for the safe operation of the system. Whenever there is any doubt as to SAFETY, the operator should stop and refuse to handle loads until: (i)-safety has been assured, (ii)-the operator has been ordered to proceed by the supervisor, who then assumes all responsibility for the safety of the lift.

Do not permit ANYONE to ride on the hook or load

Inspection

Test the movement and any attachments on the system at the beginning of each shift. Whenever the operator finds ANYTHING wrong or apparently wrong, the problem should be reported immediately to the proper supervisor

Operating Suggestions

One measure of proper operation is smoothness. A trained operator should know and follow these proven suggestions for a safe, efficient operation.

- The system should be moved smoothly and gradually to avoid abrupt, jerky movements of the load. Slack must be removed from the lifting mechanism's cable before the load is lifted
- Center the lifting mechanism over the load before lifting to prevent the load from swinging. Loads should not be swung to reach areas outside of the system's area of coverage.
- Be sure everyone in the area is clear or aware of the moving loads
- DO NOT lift loads greater than the rated capacity of the lifting mechanism or rail system
- The bridge rail's capacity is for the load, lifting mechanism and any end tooling or lift assists
- Make sure before moving the load the hook latch is closed
- Check to ensure that the load or hook are high enough to go over any obstacles
- At no time should a load be left suspended while not attended by the operator

Loads should not be transported over individuals

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Deflection and Capacity Chart

SINGLE TRACK SECTION

SPAN BETWEEN SUSPENSION POINTS				DEFLECTION LIMITS				POINT LOAD			
Feet	Inches	Meters	Millimeters	1/450 in	1/450	1/550 in	1/550 mm	1/450 lb.	1/450 kg	1/550 lb.	1/550 kg
5	60	1.52	1524	0.13	3.30	0.11	2.70	3000	1364	2900	1318
6	72	1.82	1828	0.16	4.00	0.13	3.30	2450	1114	2000	909
7	84	2.13	2133	0.19	4.80	0.15	3.80	1800	818	1425	648
8	96	2.43	2438	0.21	5.30	0.17	4.30	1350	614	1100	500
9	108	2.74	2743	0.24	6.00	0.20	5.00	1100	500	900	409
10	120	3.04	3048	0.27	6.80	0.22	5.50	880	400	720	327
11	132	3.35	3352	0.29	7.30	0.24	6.00	710	323	590	268
12	144	3.65	3657	0.32	8.10	0.26	6.60	610	277	490	223
13	156	3.96	3962	0.35	8.80	0.28	7.10	525	239	415	189
14	168	4.26	4267	0.37	9.30	0.31	7.80	440	200	370	168
15	180	4.57	4572	0.40	10.10	0.33	8.30	390	177	320	145
16	192	4.87	4876	0.43	10.90	0.35	8.80	340	155	280	127
17	204	5.18	5181	0.45	11.40	0.37	9.30	300	136	250	114
18	216	5.48	5486	0.48	12.10	0.39	9.90	270	123	220	100
19	228	5.79	5791	0.51	12.90	0.41	10.40	245	111	195	89
20	240	6.09	6096	0.53	13.90	0.44	11.10	220	100	180	82
21	252	6.40	6400	0.56	14.20	0.46	11.60	200	91	160	73
22	264	6.70	6705	0.59	14.90	0.48	12.10	180	82	150	68
23	276	7.01	7010	0.61	15.40	0.50	12.70	165	75	135	61
24	288	7.31	7315	0.64	16.20	0.52	13.20	150	68	125	57
25	300	7.62	7650	0.67	17.00	0.55	13.90	140	64	115	52
26	312	7.92	7924	0.69	17.50	0.57	14.40	130	59	105	48
27	324	8.25	8255	0.72	18.20	0.59	14.90	120	55	95	43
28	336	8.53	8534	0.75	19.00	0.61	15.40	110	50	90	41

DOUBLE STRACK SECTION

SPAN BETWEEN SUSPENSION POINTS				DEFLECTION LIMITS				POINT LOAD			
Feet	Inches	Meters	Millimeters	1/450 in	1/450	1/550 in	1/550 mm	1/450 lb.	1/450 kg	1/550 lb.	1/550 kg
5	60	1.52	1524	0.13	3.30	0.11	2.70	3000	1364	3000	1364
6	72	1.82	1828	0.16	4.00	0.13	3.30	3000	1364	3000	1364
7	84	2.13	2133	0.19	4.80	0.15	3.80	3000	1364	3000	1364
8	96	2.43	2438	0.21	5.30	0.17	4.30	3000	1364	2700	1227
9	108	2.74	2743	0.24	6.00	0.20	5.00	2620	1191	2140	973
10	120	3.04	3048	0.27	6.80	0.22	5.50	2110	959	1730	786
11	132	3.35	3352	0.29	7.30	0.24	6.00	1750	795	1435	652
12	144	3.65	3657	0.32	8.10	0.26	6.60	1470	668	1200	545
13	156	3.96	3962	0.35	8.80	0.28	7.10	1250	568	1025	466
14	168	4.26	4267	0.37	9.30	0.31	7.80	1080	491	885	402
15	180	4.57	4572	0.40	10.10	0.33	8.30	950	432	775	352
16	192	4.87	4876	0.43	10.90	0.35	8.80	825	375	680	309
17	204	5.18	5181	0.45	11.40	0.37	9.30	730	332	600	273
18	216	5.48	5486	0.48	12.10	0.39	9.90	660	300	540	245
19	228	5.79	5791	0.51	12.90	0.41	10.40	585	266	480	218
20	240	6.09	6096	0.53	13.90	0.44	11.10	530	241	430	195
21	252	6.40	6400	0.56	14.20	0.46	11.60	480	218	390	177
22	264	6.70	6705	0.59	14.90	0.48	12.10	435	198	360	164
23	276	7.01	7010	0.61	15.40	0.50	12.70	400	182	325	148
24	288	7.31	7315	0.64	16.20	0.52	13.20	370	168	300	136
25	300	7.62	7650	0.67	17.00	0.55	13.90	340	155	275	125
26	312	7.92	7924	0.69	17.50	0.57	14.40	315	143	255	116
27	324	8.25	8255	0.72	18.20	0.59	14.90	290	132	235	107
28	336	8.53	8534	0.75	19.00	0.61	15.40	270	123	220	100

- J. Does the center to center measurement of the runway match the centers of the bridge or fixture that is installed on the runways? Are the trolleys on the carriage or directly in line with each other and the rail?
If yes - Check next condition
If no - See solution 10
- K. Are the trolleys running in the rails without wobbling and are the wheels running true on the axles?
If yes - Check next condition
If no - See solution 11
- L. Have the correct hangers been used for the application? (Rigid hangers for offset or cantilevered loads and block/beam clamp/channel extension on all other applications)
If yes - Check next condition
If no - See solution 12
- M. Is the rail in good condition; free from damage?
If yes - Check next condition
If no - See solution 13
- (1) Clean inside surfaces of the rail. Dirty or greased runways will adversely affect rolling performance. Grease or oil will temporarily relieve binding but only masks the true problem and will eventually cause even greater resistance by attracting dirt and debris to the rolling surface and to the trolley wheels. Also, grease and oil or any petroleum-based product applied to the track will drip on personnel and product.
 - (2) Level and align the system. When a system is installed level and parallel using the proper components, the rolling performance can be as good as six pounds to start the load and four pounds of force to maintain the movement, even for heavier loads. The best to be expected is one to five pounds for loads directly under the trolley or load frame and four to seven for offset or cantilevered loads.
 - (3) Install hangers that pivot between the structure and the runway. Beam clamp, block, and channel types for direct loads and rigid types for offset loads. Rigidly mounted runway hangers will cause binding and friction that can greatly effect "roll-ability". The hanger should pivot or swivel between the structural attachment and the rail hanger bracket. The runway should be able to rock back and forth on the hanger pivot.
 - (4) Free-up resistance from the attached components. Attachments such as pneumatic coiled tubing or electrical cables, tracking systems, control panels, electrical boxes, powered drive systems, assembly trays, etc. can all effect performance. Any three or four trolley carriages should allow pivot at the trolley attachment using a yoke, hinge or bearing. Load trolleys should be linked together with solid connectors or tow bars.
 - (5) Install trolleys or brackets on the trolleys that allow pivot between the trolley and lifting device or carriage frame. Fixtures or bridges that have the load trolleys attached rigidly to the carriage framework will cause binding, side loading and friction between the trolley wheel and the running surface. If the trolley can pivot at the load and the track can pivot at the hanger, the trolley wheels will stay square to the running surface, the trolley bearings will be equally loaded and the trolley wheel tread will be flat on the track running surface. The load will glide farther and run smoother, and the wheel bearings will last much longer.
 - (6) Loosen over tightened bolts for binding at end caps or hangers. The wheels will stick at the end of track sections or at hanger points if the bolts are too tight.
 - (7) Clean the wheels and internal side rollers. A very tight tolerance is maintained and is what allows the rail to be oriented in any attitude.
 - (8) Remove trolleys from the track and inspect for damage, imbedded objects, cracks or bearing wear. If chips or cracks are evident replace the bearing and wheel assembly. The wheel should not wobble on the bearing more than 1/16th of an inch. It should spin freely and smoothly without binding.
 - (9) Loosen nuts on yoke mounting bolts or open cross-holes in yoke attachments. If the trolleys are on yokes that restrict yoke slop in the vertical plane (yaw), the trolleys will dog track (they will not roll in the same line.) This condition will cause friction between the track and trolley wheel.
 - (10) The center distance between runway rails should be equal to the center distance between the end trucks, with a tolerance or +/- 1/16". The bridge should be perpendicular to the runway and the trolleys should be directly in line with each other.
 - (11) Make sure that only CES trolleys are being used. The use of any other trolley is dangerous and could lead to failure.
 - (12) Ensure the proper hangers have been used for a cantilevered system. Rigid mounted style hangers are best suited for offset loads.

Replace the rail.

Problem

PROBLEM	CHECK THE FOLLOWING CONDITIONS
Fixture, lifting device, arm or bridge will not roll well along the entire length of the runway	A-B-C-D-E-F-G-H-I-J-K
Fixture, lifting device, arm or bridge rolls well in certain areas but poorly in others	A-B-C-D-F
Fixture, lifting device, arm or bridge will not glide after the initial push	A-B-D-E-F-G-H-I-K
Fixture, lifting device, arm or bridge binds at a runway splice, hanger or end cap	F
Fixture, lifting device, arm or bridge skews or rotates on the horizontal axis (changes from a rectangle to a parallelogram) and binds up or is difficult to push or pull	B-C-D-E-G-I-K
Fixture, lifting device, arm or bridge bumps or jerks while being pushed or pulled	A-D-F-I-K
Fixture or lifting device on an offset bridge, bridge extension or an offset arm with load teeters on runway to cause the opposite runway to kick-up or the part will not remain upright and square to assembly. The opposing hangers kick-up or twist sideways and bind the trolleys on the fixture or bridge	L
Fixture, lifting device or arm settles in the center span of a bridge or runway and will not remain parked at intervals along the bridge length	B-D
Fixture, lifting device, arm or bridge will not remain parked at intervals along the runway length	B-D
Fixture, lifting device, arm or end trucks are very "loose" in the runway, the load skews or yaws easily and is difficult to push or pull and binds intermittently	J-I
Fixture, lifting device, arm or bridge binds at one area of the rail where no hangers, end caps, stops or splices are present	J
Fixture, lifting device, arm or bridge end trucks continually wear out and/or break or fracture	C-E-F-K-I

Applicable Conditions

- A. Is the trolley running surface clean and free of oil, grease, dirt, etc?
If yes - Check next condition
If no - See solution 1
- B. Are the runways parallel and level to within +/- 1/8" along their length and across their width?
If yes - Check next condition
If no - See solution 2
- C. Are both runways free to pivot along their longitudinal axis (roll) at the hanger attachment points?
If yes - Check next condition
If no - See solution 3
- D. Is the fixture or bridge free of attached equipment such as hoses, coiled tubes, electrical cables, drive systems or tracking devices?
If yes - Check next condition
If no - See solution 4
- E. Are the trolleys on the fixture or bridge equipped with a *functional pivot* attachment bracket or yoke and/or swiveling bracket or yoke on the horizontal axis (yaw) and on the longitudinal axis (roll) between the frame and the trolley?
If yes - Check next condition
If no - See solution 5
- F. Are the spliced sections straight and level? Are the inside running surfaces at the splice flush and aligned? Are the end cap bolts loose enough to turn by hand?
If yes - Check next condition
If no - See solution 6
- G. Do the load trolleys or end trucks run smoothly and quietly?
If yes - Check next condition
If no - See solution 7
- H. Are the visible surfaces of the trolley wheel smooth and unblemished?
If yes - Check next condition
If no - See solution 8
- I. Are the trolleys on the carriage or fixture, in the same track, directly in line with each other and the rail?
If yes - Check next condition
If no - See solution 9

Introduction

Thank you for choosing CES as your enclosed track solution provider. Our systems have been designed for custom-engineered applications with ease of configuration and installation. The innovative design has been created to allow maximum flexibility with a limited amount of components. Due to the superior quality, the system will offer you years of dependable service with limited maintenance requirements.

Standard Safety Precautions

These include but are not limited to:

- Checking for obstructions in the systems travel
- Checking that all fasteners are tight and properly torqued
- Checking that all end stops are in place
- Checking that all festooning is free to travel without snags or kinks

!WARNING!

THE EQUIPMENT HEREIN IS NOT DESIGNED FOR AND SHOULD NOT BE USED FOR LIFTING, SUPPORTING, OR TRANSPORTING HUMANS WITHOUT SPECIAL SAFETY PROVISIONS AND PRECAUTIONS. FAILURE TO COMPLY WITH ANY ONE OF THE LIMITATIONS NOTED HEREIN CAN RESULT IN SERIOUS BODILY INJURY AND/OR PROPERTY DAMAGE. CHECK STATE AND LOCAL REGULATIONS FOR ANY ADDITIONAL REQUIREMENTS.

!WARNING!

BEFORE INSTALLING ANY CRANE SYSTEM IT IS CRITICAL THAT YOU DETERMINE YOUR BUILDING WILL SAFELY SUPPORT THE LOADS. CREATIVE ERGONOMIC SYSTEMS, INC. ASSUMES NO RESPONSIBILITY FOR ADEQUACY OR INTEGRITY OF THE MOUNTING SURFACE.

!WARNING!

SWAY BRACING IS REQUIRED FOR ANGLE DROPS OF 24 INCHES OR GREATER

!WARNING!

REFERENCE THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) MANUAL FOR THE PROPER PROCEDURES TO FOLLOW WHEN USING ANY TORQUE TIGHTENING METHOD

Installation

1. PRE-ASSEMBLY

Read the entire installation manual BEFORE you begin installation

Check the packing list to verify the correct quantity of parts is included

Typical tools required for assembly:

- Hand tools
- Leveling tools
- Ladders/Man lifts
- Steel shims
- Torque wrench (able to torque to 200 ft-lb.)

2. HANGER & RUNWAY INSTALLATION (FIGURES 1, 2, 3, 4, 5)

Standard beam clamp assemblies are designed for flange widths from 3-9 inches

Determine the location on the runway/monorail for the hanger location (NOTE: hangers must be located within 12 inches of the rail ends or 24 inches of a splice joint)

!WARNING!

THE SYSTEM'S CAPACITY IS BASED ON THE SPAN BETWEEN SUSPENSION POINTS. CONSULT THE DEFLECTION CHART FOR VERIFICATION OF RATED CAPACITIES AT PARTICULAR SPANS. PAGE 1

Drill holes for hangers and safety cables, 2.5 inches apart, 8.8 mm through holes

Install runway block hanger or end truck hangers and secure all fasteners until the nut touches the rail surface. Do not over tighten as the rail's performance will be negatively affected.

(NOTE: DO NOT OVERTIGHTEN THE 8MM THROUGH BOLTS, THIS WILL RESULT IN DEFORMATION OF THE RAIL'S RUNNING CHANNEL AND WILL CAUSE THE TROLLEYS TO BIND)

Mark the beam clamp placement on the header steel for the runway/monorail enclosed track rail

Position rail with installed hangers to the support structure and secure the beam clamps (keep the hanger centerline the same as the header steel centerline)

Secure the fasteners to the recommended torque specifications

Bolt Diameter	Torque
8 mm	11 ft-lb.
12 mm	45 ft-lb.
16 mm	95 ft-lb.

11. FINAL OVERVIEW AND INSPECTION

Check to verify that all bolts are installed and tightened to the specification herein. Check to verify all lock washers are installed and flat

Make sure all suspension points have the safety cables installed properly

Make sure all end stops are in place

If necessary, make sure sway bracing is in place

File away all associated paperwork, this manual and any other material associated with the rail system in a safe place

12. INSPECTION & PREVENTIVE MAINTENANCE SCHEDULE

ITEM	COMPONENT	MAINTENANCE	FREQUENCY ¹
	All bolted connections relating to the hanger assemblies	Check that all nuts are tightened to the proper torque specifications noted previously in this manual	Every 2000 hours or yearly
	Splice Plate	Check that all bolts are tightened to the proper torque specifications noted previously in this manual, make sure the tracks are in alignment and rolling surfaces are flush	Every 2000 hours or yearly
	End Stops/Redundant End Stops	Check that all bolts are tightened to the proper torque specifications noted previously in this manual	Every 2000 hours or yearly
	Wheels	Check for cracks, pits, and/or grooves. The presence of these factors greatly increases the required pull force. If any of these factors exist replace the damaged wheels	Every 2000 hours or yearly
	Stack Plates	Check that all bolts are tightened to the proper torque specifications noted previously in this manual	Every 2000 hours or yearly
	All bolted connections relating to the trolleys/end trucks	Check that all nuts are tightened to the proper torque specifications noted previously in this manual	Every 2000 hours or yearly
	All safety cables	Check that all nuts are tightened to the proper torque specifications noted previously in this manual, also confirm the cable clamps have been installed properly	Every 2000 hours or yearly

Federal, State and local codes may require inspection and maintenance checks more often. Please verify the federal, state and local codes for your area.

!WARNING!

ANY CHANGES IN THE ROLLING RESISTANCE OR UNUSUAL NOISES MUST BE IDENTIFIED IMMEDIATELY AND CORRECTED. DO NOT LUBRICATE THE TRACK OR THE BEARING. THIS CAN RESULT IN UNWANTED AIRBORNE PARTICLES AND INCREASE ROLLING RESISTANCE. (DO NOT USE SUBSTANCES SUCH AS WD40, SILICONE SPRAYS, OIL OR GREASE.)

13. TROUBLESHOOTING

System performance can be affected by a number of different factors. If a system is not performing to your expectations, follow the chart to determine the corrective action to take.

10. CURVE TRACK RUNWAY & MONORAILS

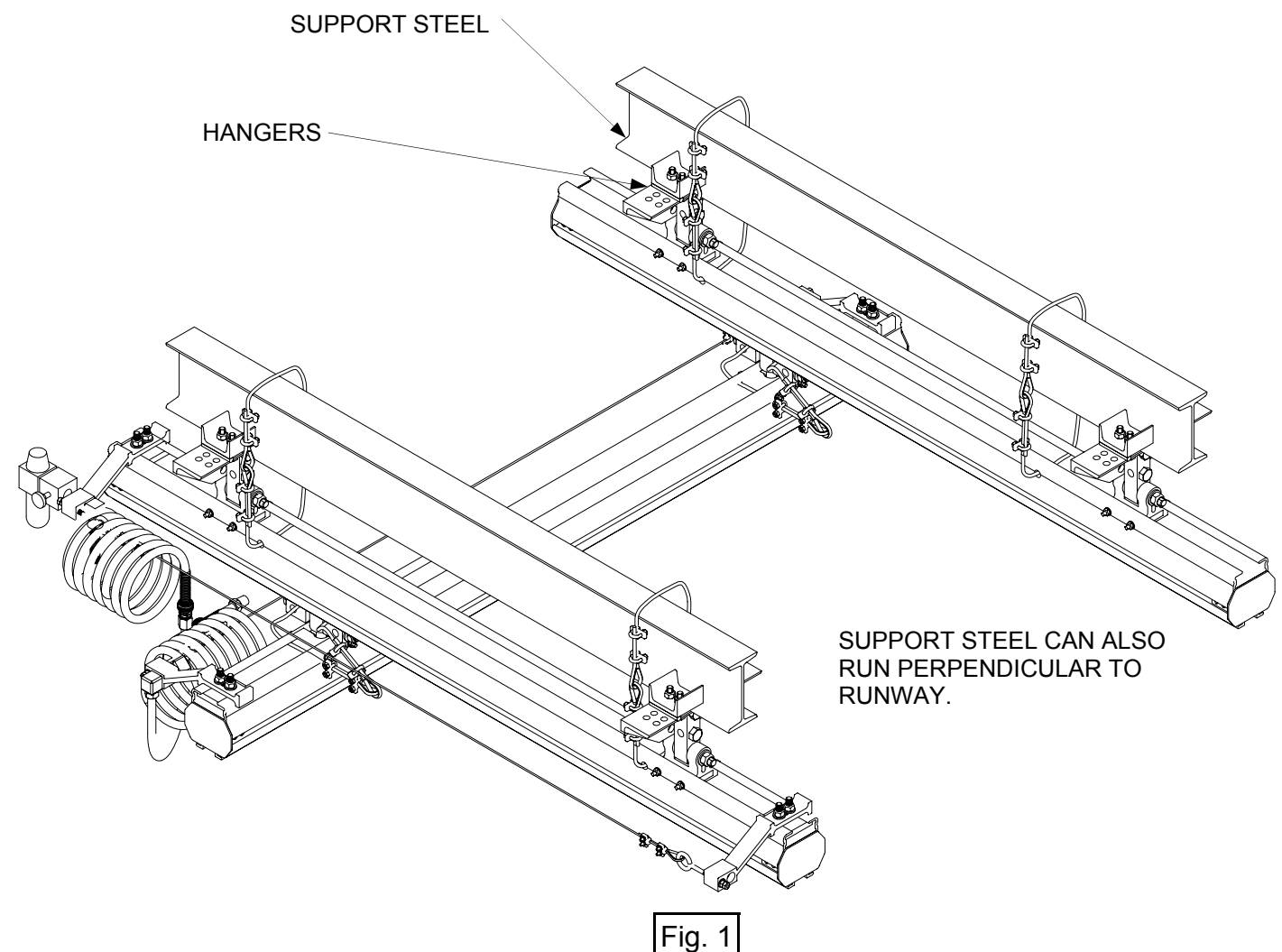
1. The enclosed track curved runways are all preassembled at the factory. They may include rail stabilizer blocks located to insure proper installation of the section. These block locations should not be modified without approval from the manufacturer.
2. Each radius must be evaluated to determine the required spacing of hangers and stabilizer blocks. Spacing should never exceed 3 ft from hanger or stabilizer block.
 3. Hanger locations may fall between the stabilizer blocks and may be either drilled at the factory or left for the installer, depending on the structure at the plant. If the second is required, the installer must be certain to torque the hanger and not deform the rail to cause binding of the load trolley or festoon trolleys (Refer to page 3). **THIS IS EXTREMELY CRITICAL IN THE MINIMUM RADIUS UNITS.**
 4. Each curve will have a straight section (min. 1 ft.) at each end. These sections are required for the attachment of the splice kit. A hanger is required within 12" of the splice joint.
 5. A minimum of (3) hangers is required for any curve. Hangers or stabilizer blocks will be added as required depending on the calculated load requirements. This could also be affected by the momentum of the load created by the operator through the curve.
 6. All non-articulating hangers **MUST** be installed true to the running centerline of the rail.
 7. Depending on the type of machinery, apparatus, or lifting unit etc., being hung from the curved runways, a variety of festooning and trolleys can be ordered. The performance of the trolleys is dependant on the type of tubing, hose or wire used to power the lifting source. Generally pulling the trolleys through a section is fine however pushing it back might cause a problem.

Install the safety cable, make sure to follow the instructions for installation in section 7 (Figure 18, 19, 20, 21)

Check to make sure that the lower flange of the track is level (within +/- 1/8") and parallel to the opposite runway (within +/- 1/8") over a 20' distance.

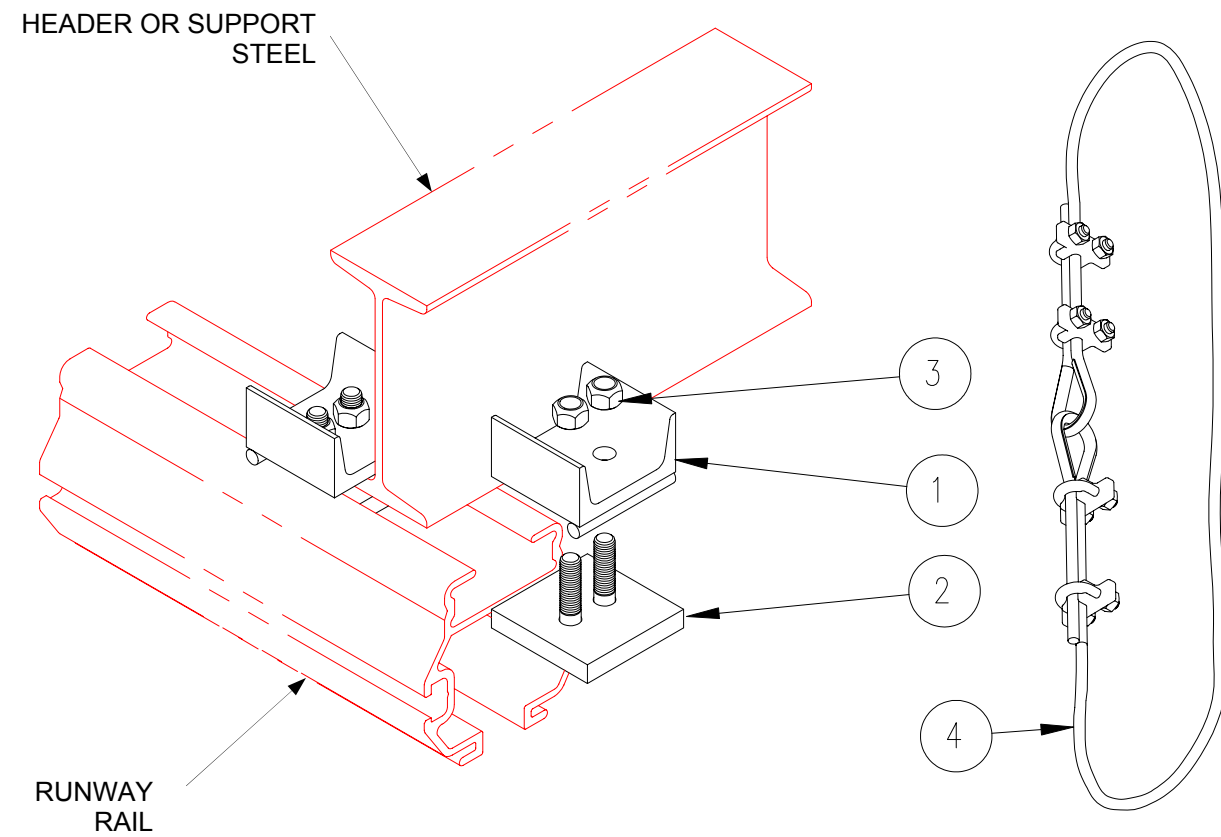
!WARNING!

DO NOT REUSE THE PREVAILING TORQUE NUT. THESE NUTS CAN ONLY BE USED ONCE, IF DISASSEMBLED, THE NUT SHOULD BE REPLACED



RUNWAY RIGID MOUNT HANGER #860920

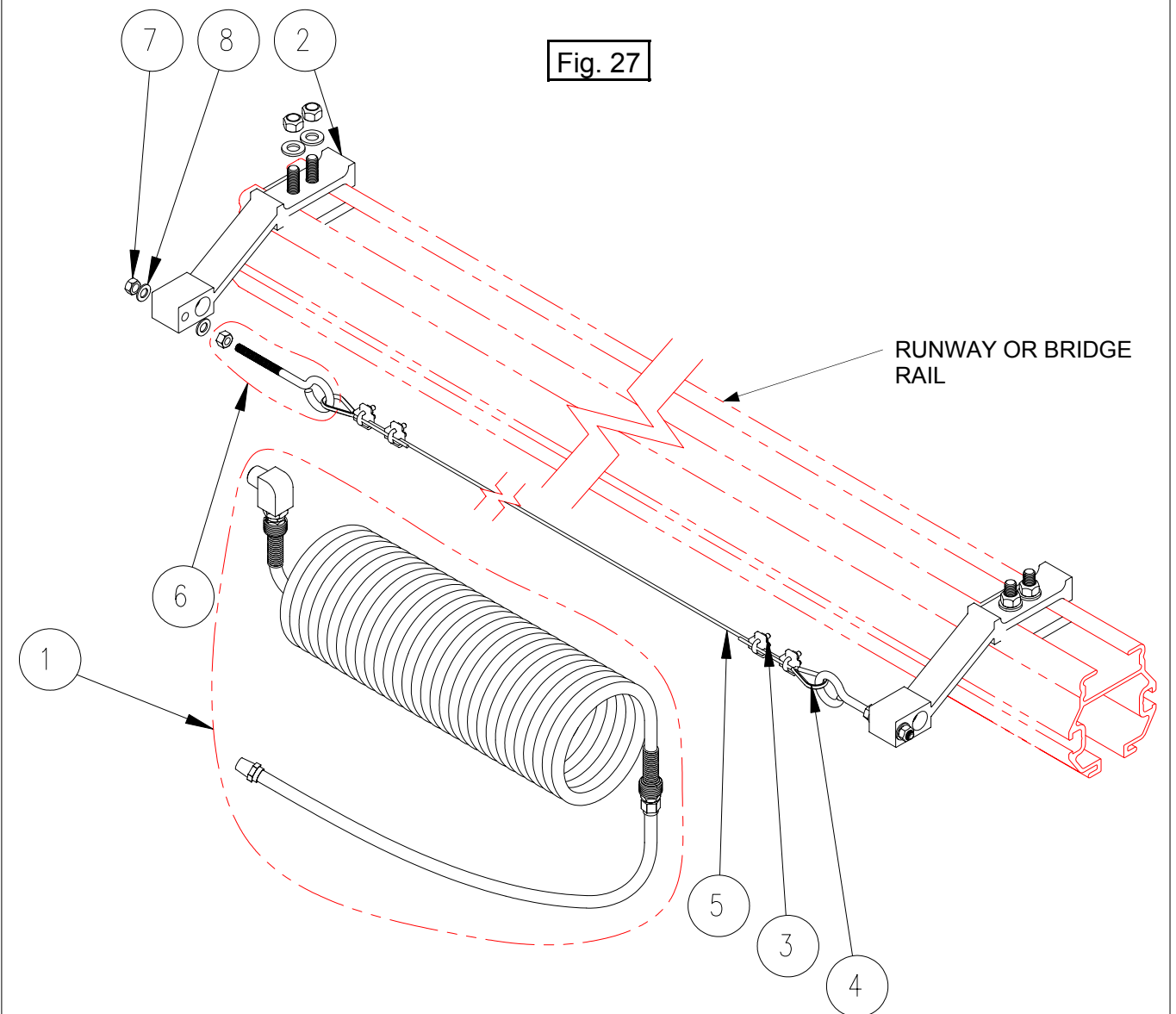
Fig. 2



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	2	860880	TOE CLAMP
2	2	860910	HANGER T-NUT
3	4	663685	M12-1.75 PREVAILING TORQUE HEX NUT
4	1	860660	SAFETY CABLE ASSEMBLY

3/8" x 50' FESTOONING KIT #861180

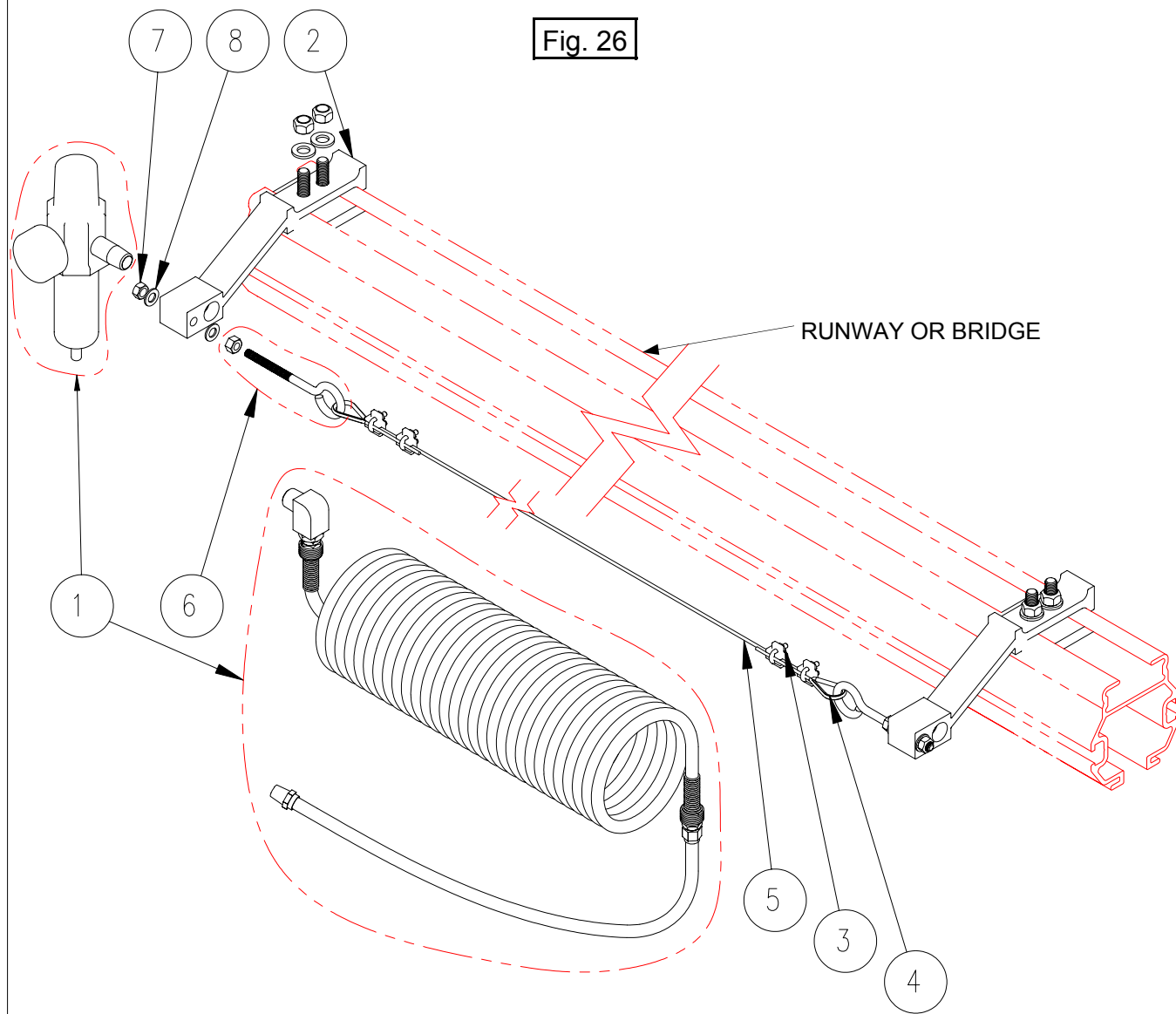
Fig. 27



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	693001	3/8" x 50' BOXED AIR KIT
2	2	860970	AIR SUPPLY BRACKET ASSEMBLY
3	4	669005	WIRE ROPE CLAMP ASSEMBLY
4	2	669004	WIRE ROPE THIMBLE
5	1	669026	3/16" x 52' NYLON COATED WIRE ROPE
6	2	665010	3/8"-16 x 5 1/2" LG. EYE BOLT W/ NUT
7	2	663761	3/8"-16 ALL METAL LOCK NUT
8	4	663536	3/8" WASHER

3/8" x 50' FESTOONING KIT #861170
WITH FILTER / REGULATOR

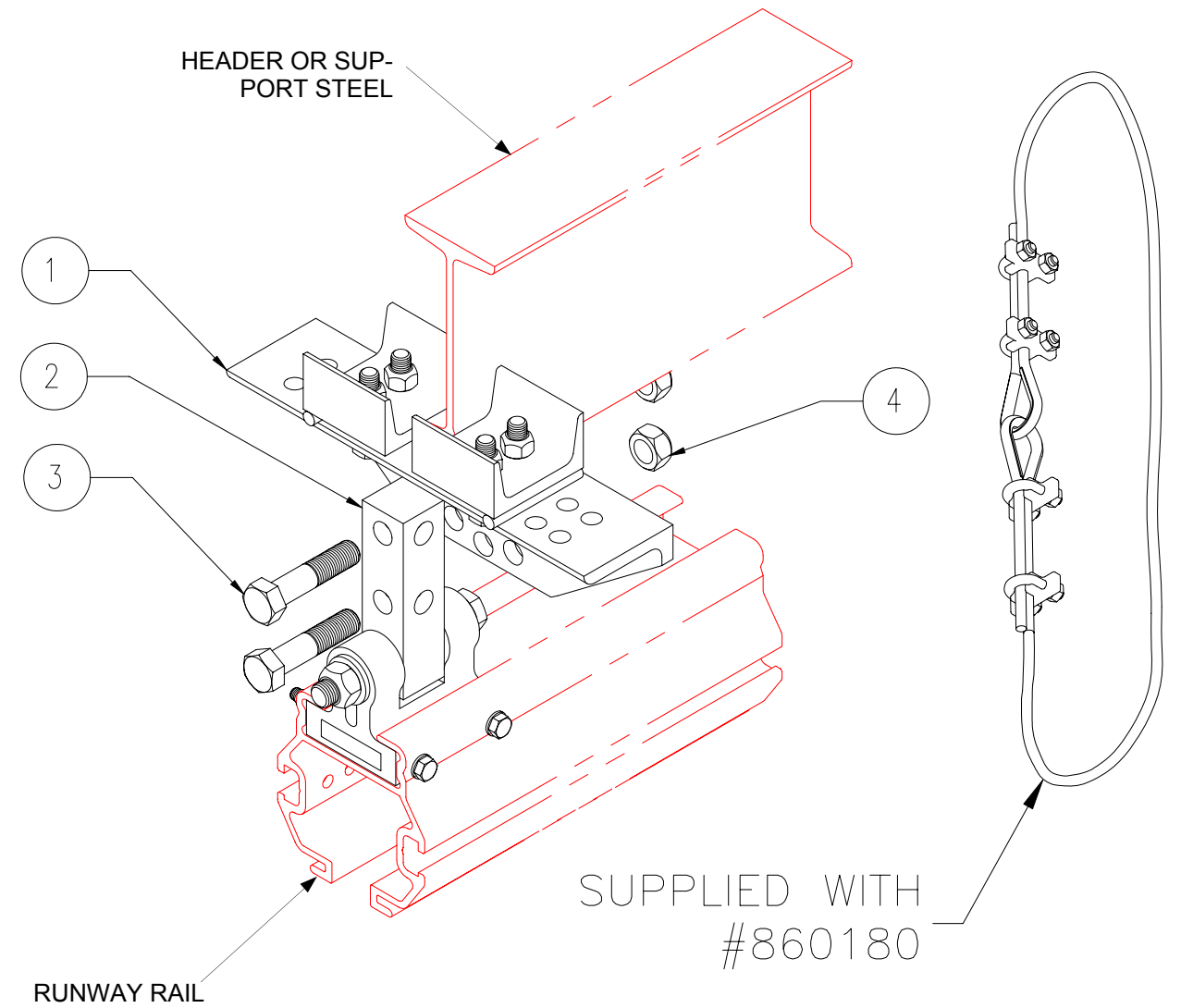
Fig. 26



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	693000	3/8" x 50' BOXED AIR KIT W/ F & R
2	2	860970	AIR SUPPLY BRACKET ASSEMBLY
3	4	669005	WIRE ROPE CLAMP ASSEMBLY
4	2	669004	WIRE ROPE THIMBLE
5	1	669026	3/16" x 52' NYLON COATED WIRE ROPE
6	2	665010	3/8"-16 x 5 1/2" LG. EYE BOLT W/ NUT
7	2	663761	3/8"-16 ALL METAL LOCK NUT
8	4	663536	3/8" WASHER

I-BEAM HANGER ASSEMBLY #860930

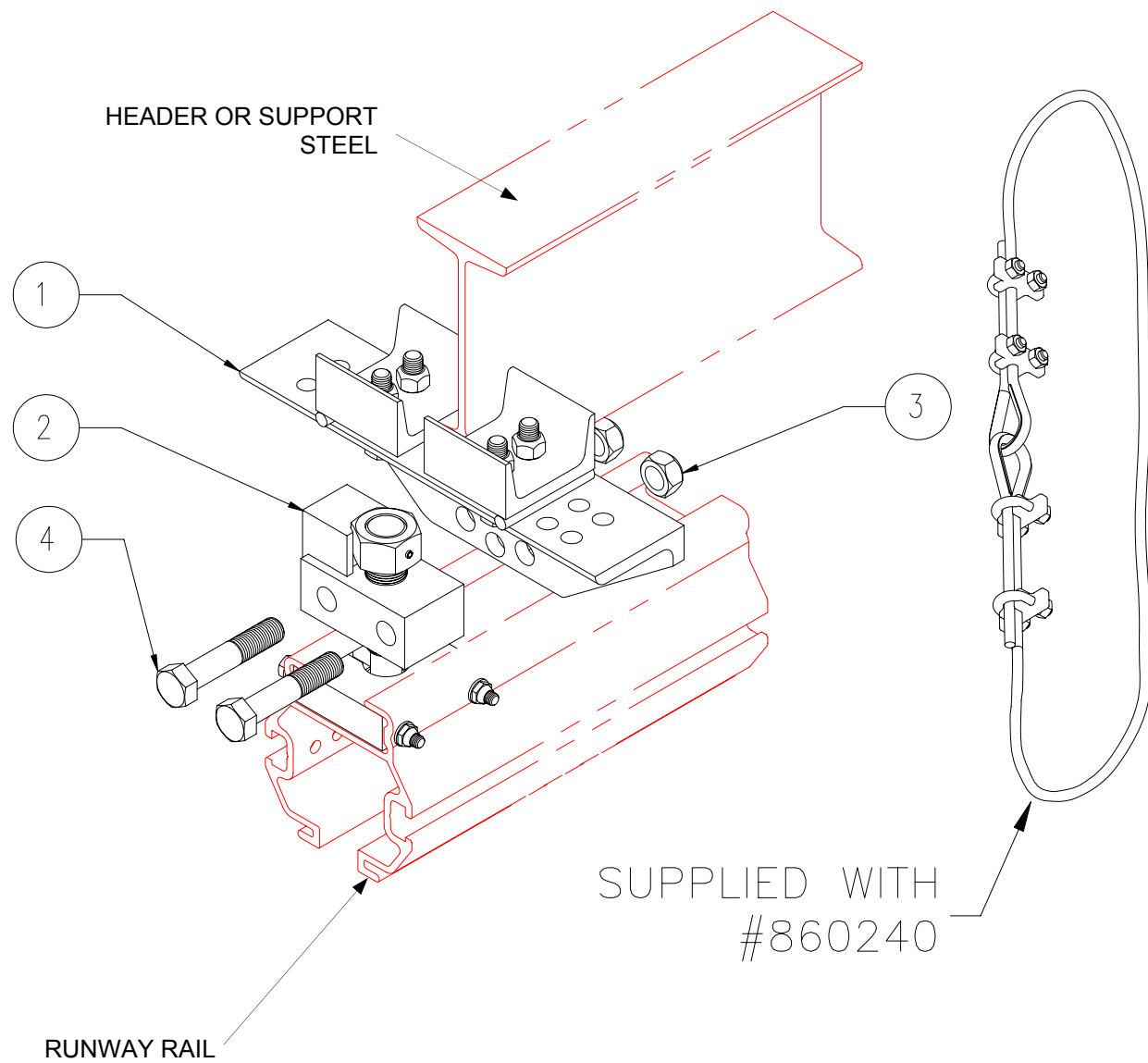
Fig. 3



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860900	BEAM CLAMP ASSEMBLY
2	1	860180	RUNWAY BLOCK HANGER ASSEMBLY
3	2	663036	M16-2.0 X 70MM LG. HHCS
4	2	663687	M16-2.0 PREVAILING TORQUE HEX NUT

ADJUSTABLE I-BEAM HANGER ASSEMBLY #860940

Fig. 4

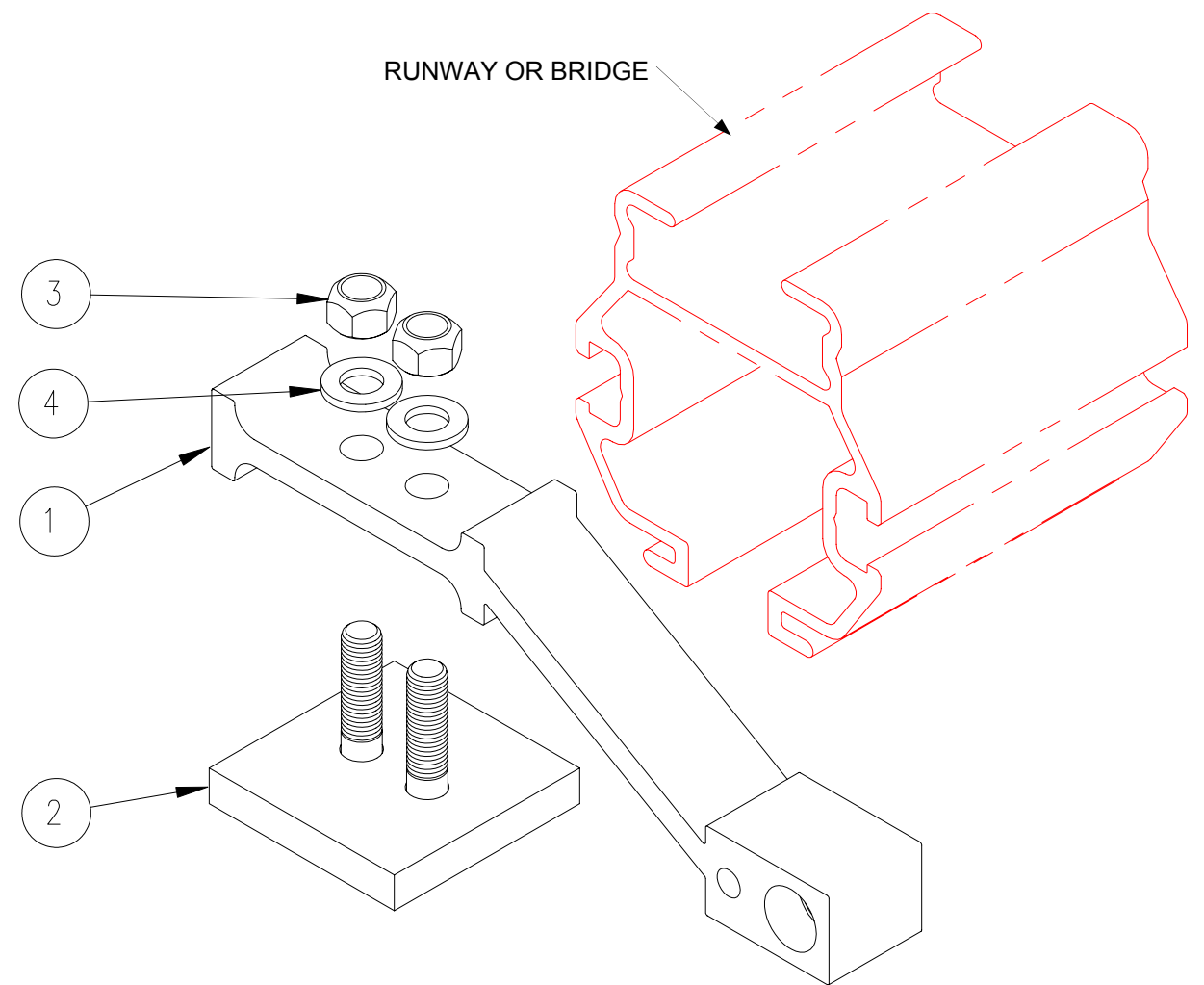


SUPPLIED WITH #860240

ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860900	BEAM CLAMP ASSEMBLY
2	1	860240	ADJUSTABLE HANGER ASSEMBLY
3	2	663687	M16-2.0 PREVAILING TORQUE HEX NUT
4	2	663038	M16-2.0 X 80MM LG. HHCS

FESTOONING BRACKET ASSEMBLY #860970

Fig. 25



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860980	FESTOONING BRACKET
2	1	860910	HANGER T-NUT
3	2	663685	M12-1.75 PREVAILING TORQUE HEX NUT
4	2	663435	M12 NORMAL FLAT WASHER

9. AIR MANAGEMENT (FIGURE 24, 25, 26, 27)

There are two styles of air management kits. The runway air management kit typically is supplied with a filter/regulator for the system. The bridge air management kit typically does not have a filter/regulator. The determination of whether or not the filter/regulator is required is based on the system requirements.

The air management kits are attached to the rail using a festooning bracket (**Figure 25**) at both ends of the runway and bridge. These kits can be assembled to allow plant air to be connected at either end. A 1/4" wire rope nylon plastic coated to 3/16" OD, wire rope thimbles and clamps are supplied. The wire rope is connected to both of the festooning brackets and allows the supplied precoil hose to be suspended out of the way.

NOTE: For ease of installation, thread the wire rope through the center of the precoil hose prior to installing on the festooning brackets.

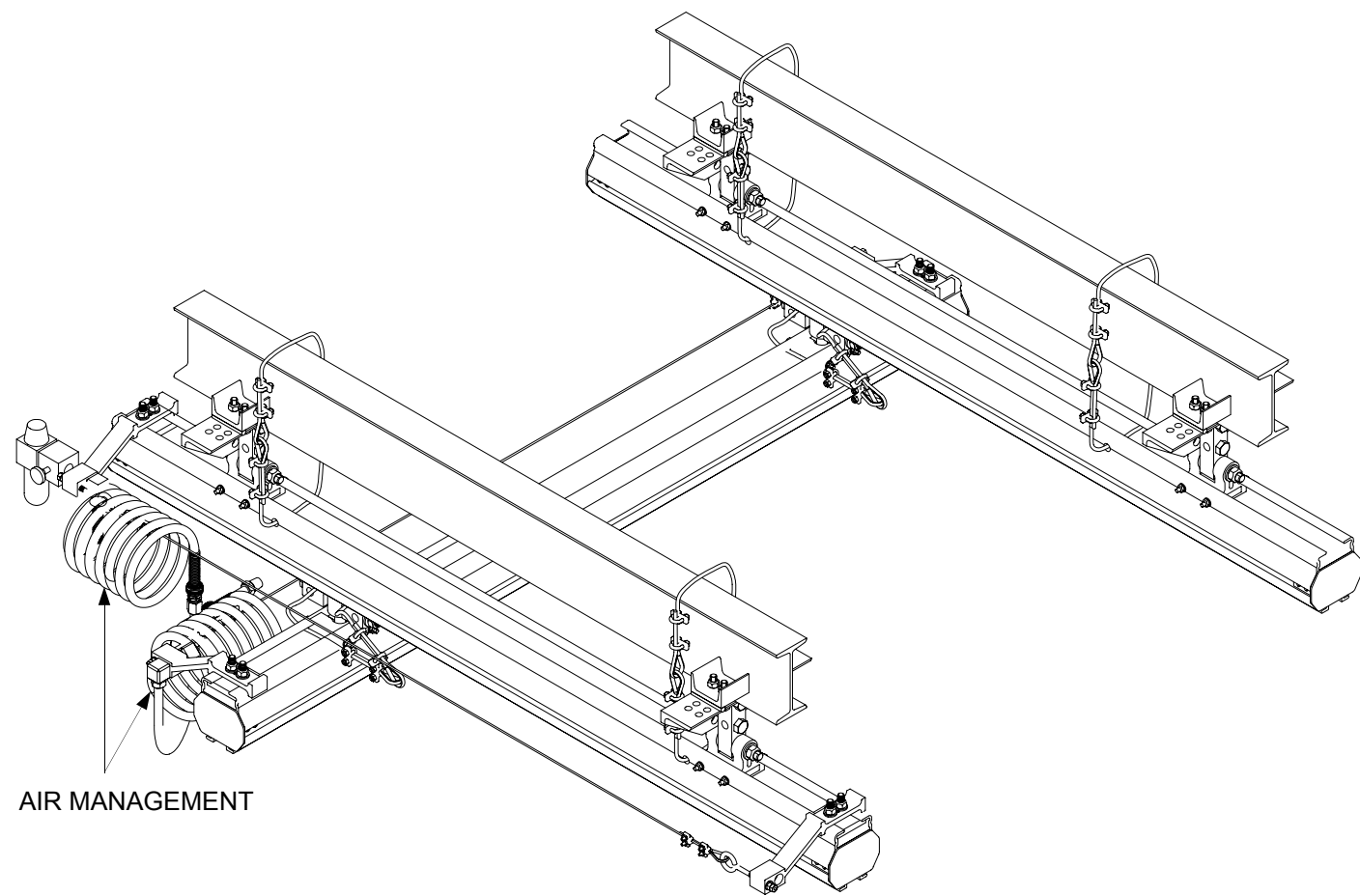
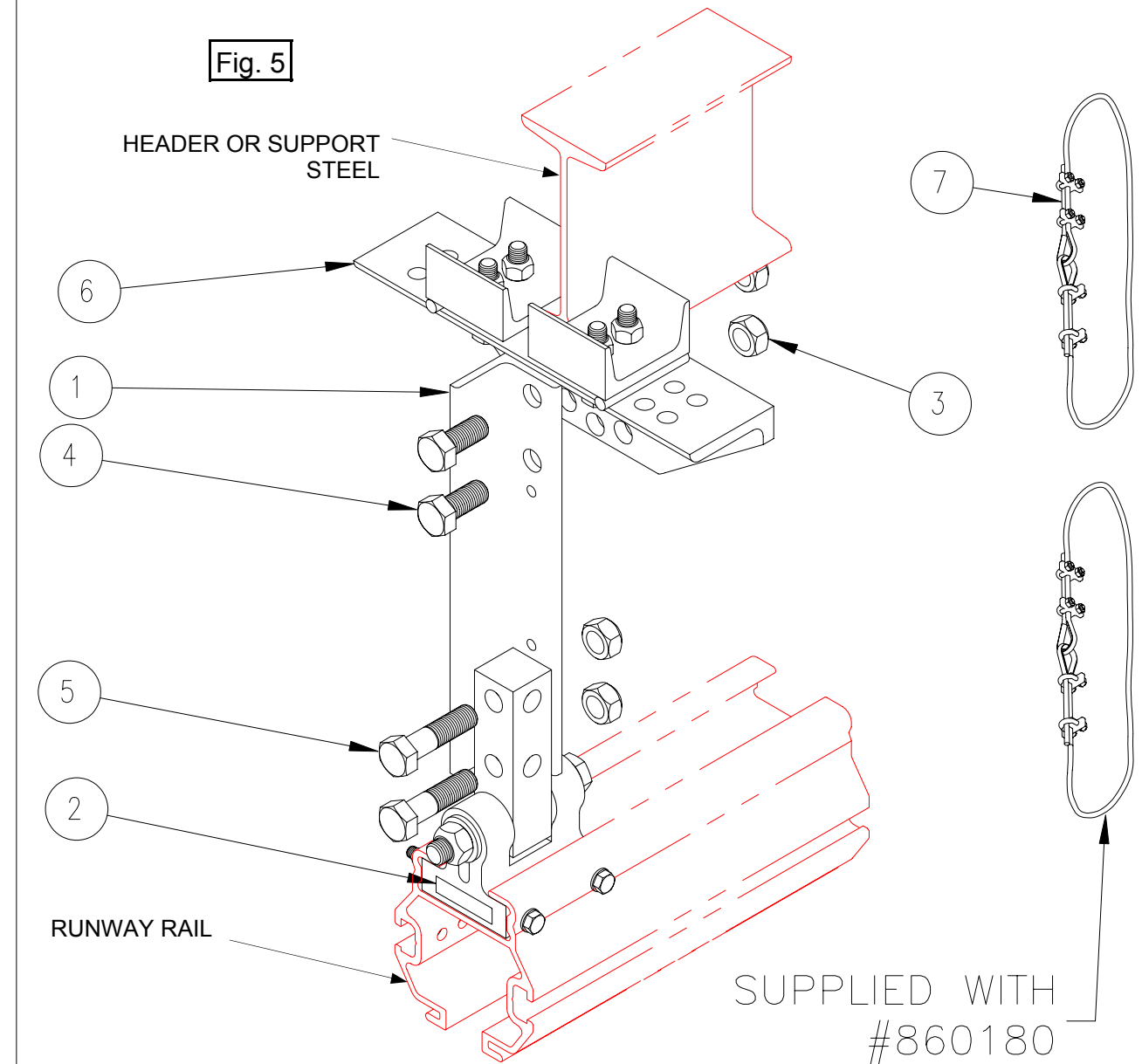


Fig. 24

DROP ANGLE HANGER
BEAM CLAMP ASSEMBLY #860850



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860830	DROP ANGLE BRACKET
2	1	860180	RUNWAY BLOCK HANGER ASSEMBLY
3	4	663687	M16-2.0 PREVAILING TORQUE HEX NUT
4	2	663029	M16-2.0 X 35MM LG. HHCS
5	2	663034	M16-2.0 X 60MM LG. HHCS
6	1	860900	BEAM CLAMP ASSEMBLY
7	1	860660	SAFETY CABLE ASSEMBLY

3. END STOPS (FIGURE 6, 7, 8)

Install the redundant end stops (if ordered) and then the standard end stops. If there is a bridge crane only install the stops on the end opposite of where the bridge is to be installed.

NOTE: DO NOT OVERTIGHTEN THE 8 MM THROUGH BOLTS, THIS WILL RESULT IN DEFORMATION OF THE RAIL'S RUNNING CHANNEL AND WILL CAUSE THE TROLLEYS TO BIND

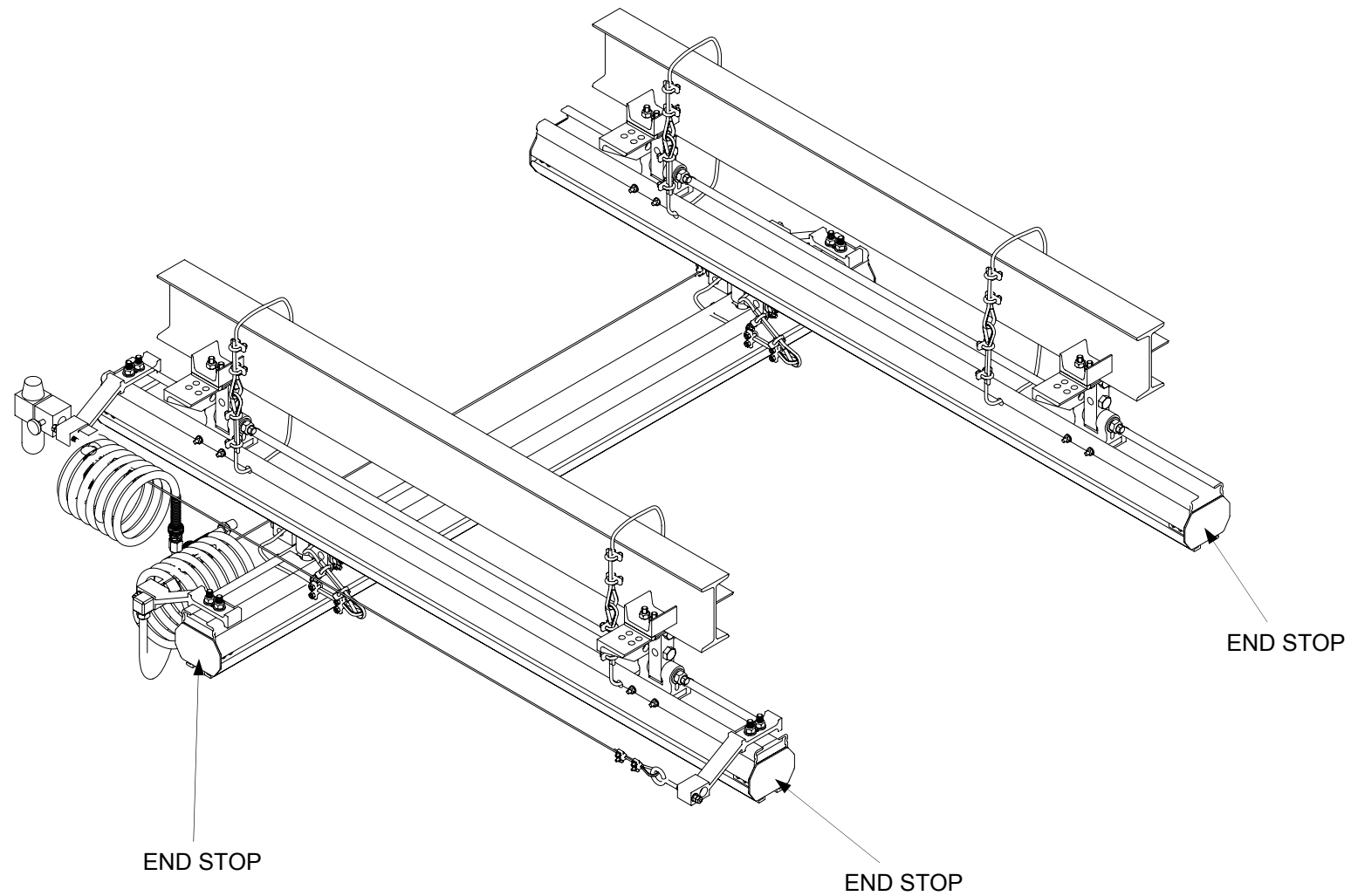
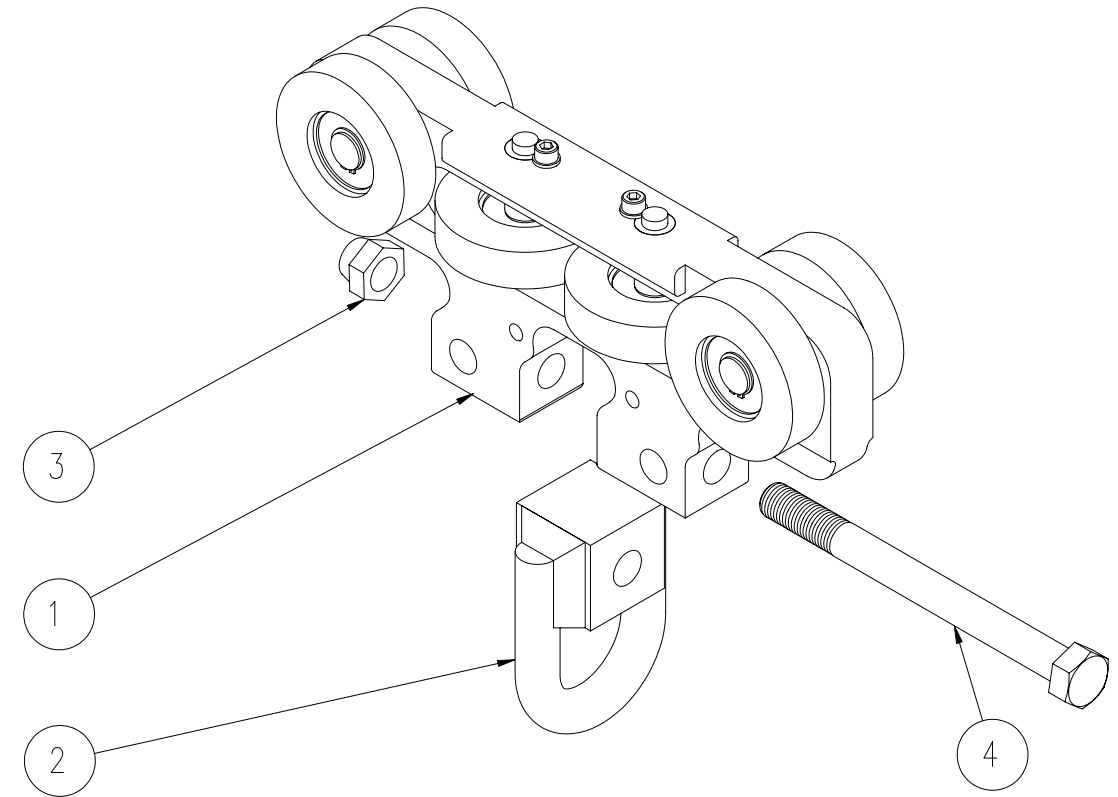


Fig. 6

HOOK MOUNT TROLLEY ASSEMBLY #860750

Fig. 23



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860140	TROLLEY ASSM'Y
2	1	860720	HOOK BLOCK
3	1	663687	M16-2.0 PREVAILING TORQUE HEX NUT
4	1	663047	M16-2.0 X 180MM LG. HHCS

8. INSTALLING A TROLLEY (FIGURE 22, 23)

Install the redundant end stops (if ordered) and then the standard end stops on one end of the bridge.

Wipe the internal running surface of the rails with a clean, dry cloth to remove any debris that may have collected during shipping, storage, or installation.

Install the trolley, immediately install the remaining end stops and ensure that it rolls smoothly.

Install your lifting equipment as recommended by the manufacturer.

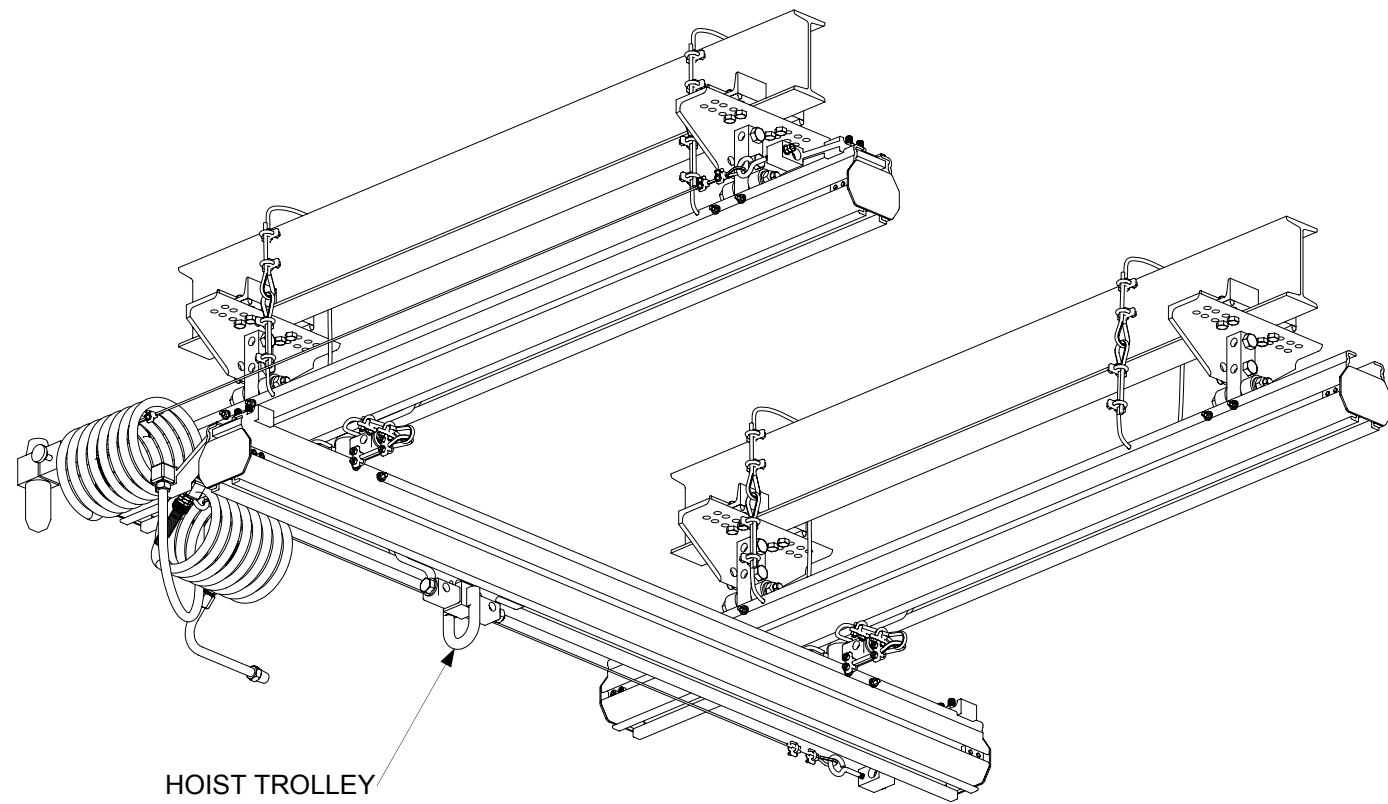
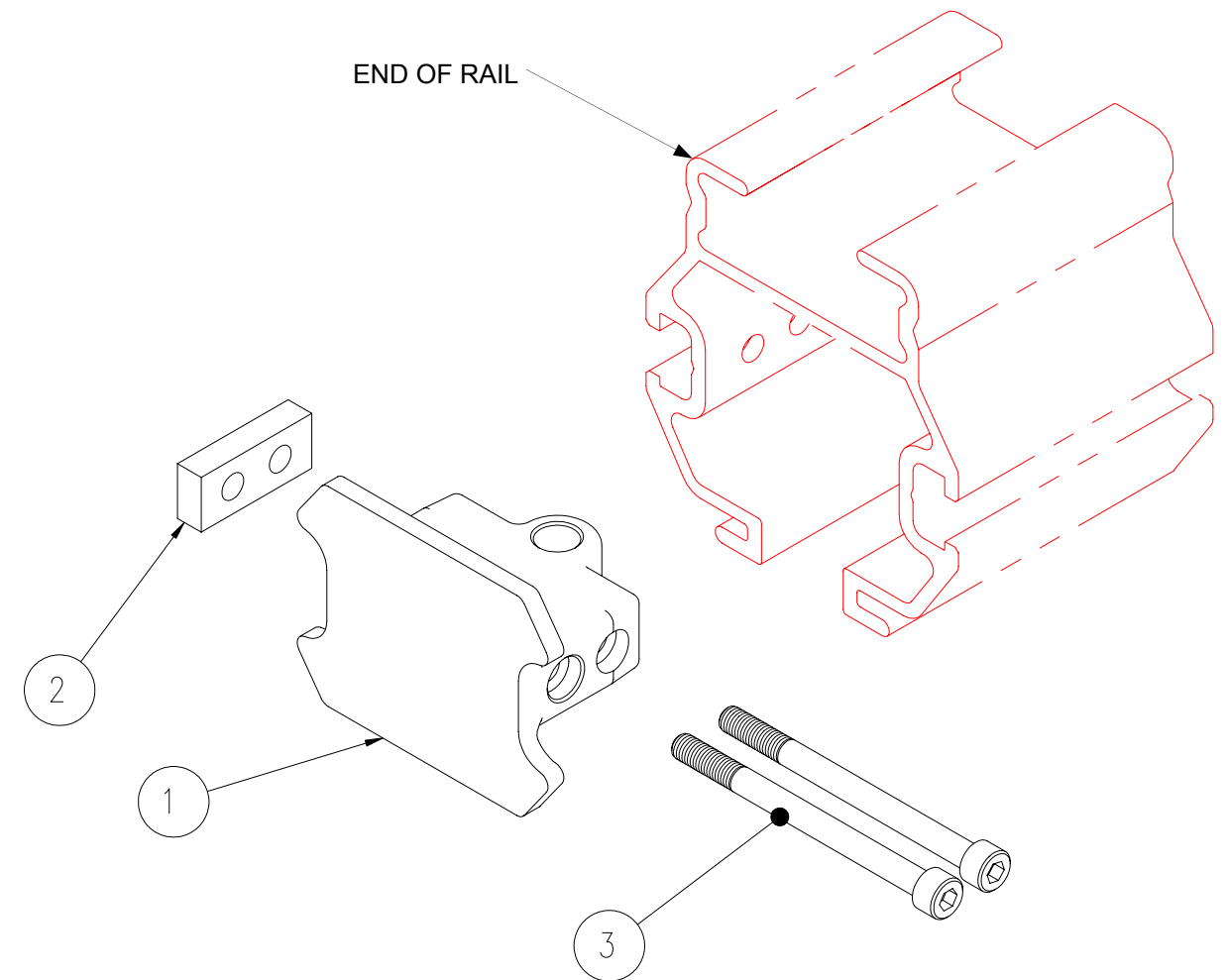


Fig. 22

END STOP ASSEMBLY #860480

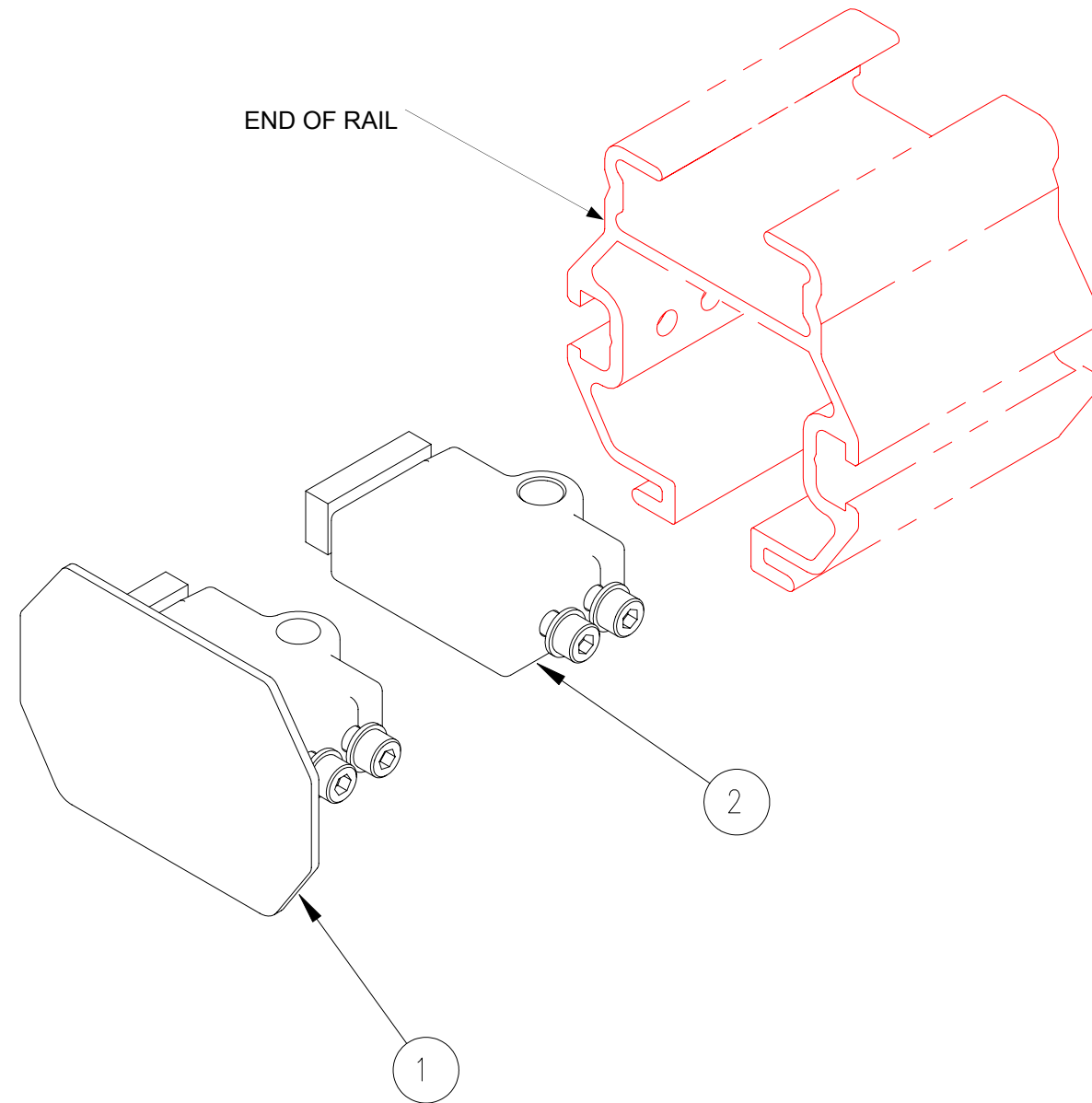
Fig. 7



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860030	END STOP
2	1	860040	END STOP NUT
3	2	662371P	M8-1.25 X 100MM LG. PATCH LOCK SHCS

REDUNDANT END STOP ASSEMBLY #860760

Fig. 8



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860480	END STOP ASSEMBLY
2	1	860740	REDUNDANT END STOP ASSEMBLY

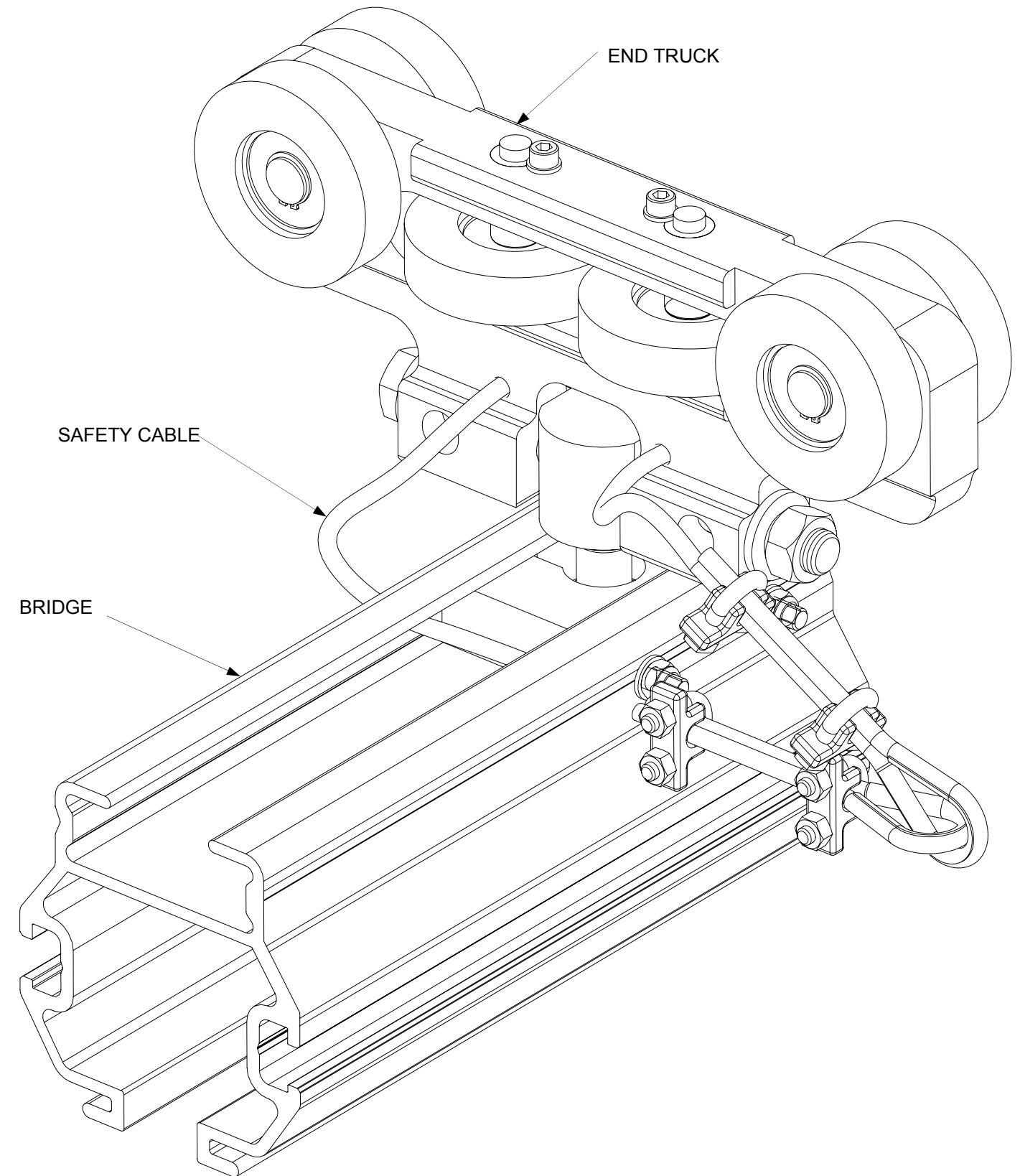


Fig. 21

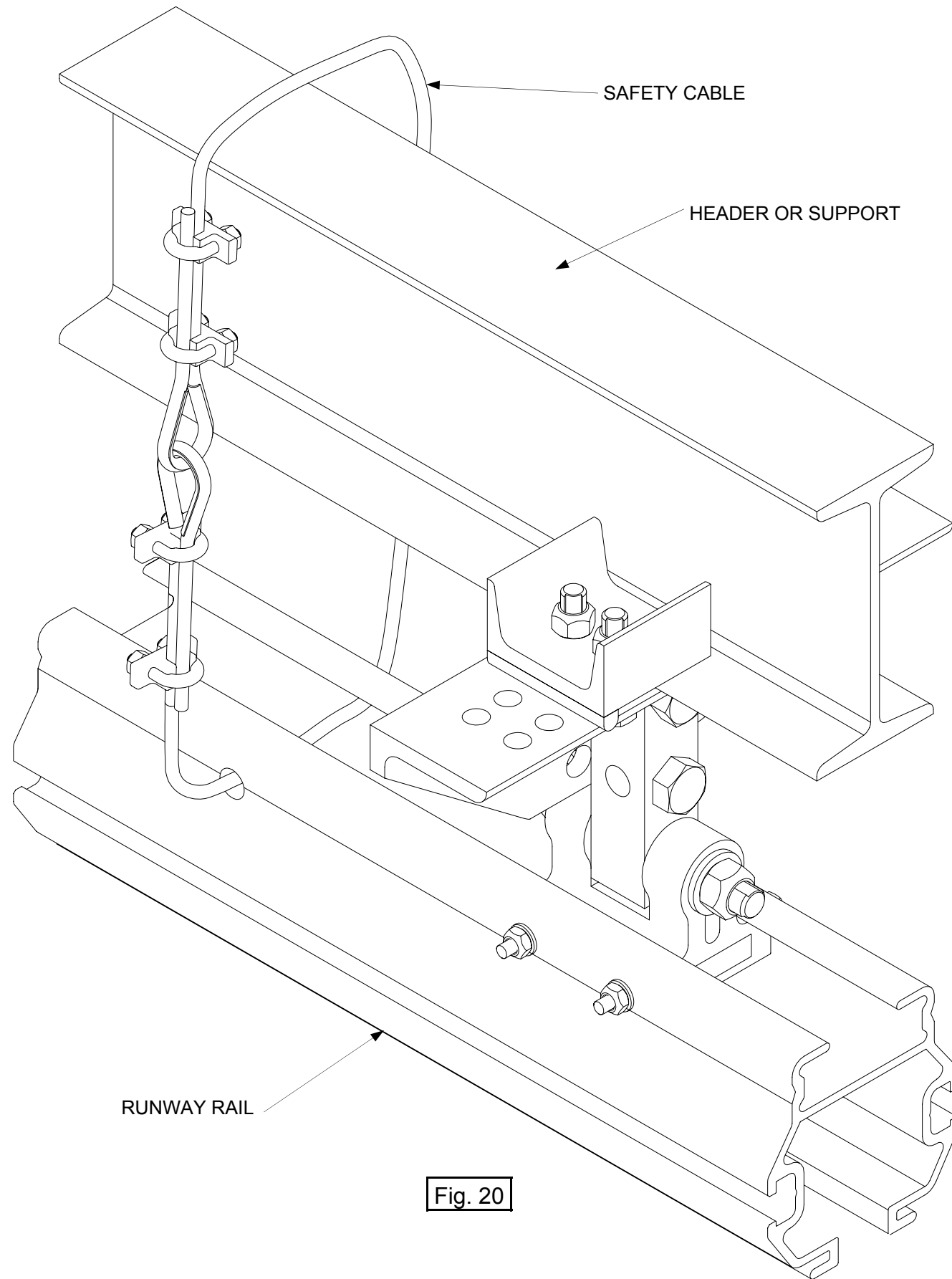


Fig. 20

4. INSTALLING SPLICE JOINTS (FIGURE 9, 10)

**!WARNING!
A HANGER MUST BE WITHIN 24 INCHES OF THE SPLICE JOINT**

NOTE: A hanger can be located in the center of a splice

Put washers on bolts, insert bolts through center holes of the splice plate, thread T-Nuts onto the bolts

Insert the T-Nuts into the slot on the side of the rail, make sure that the splice plate is centered on the joint with half of the splice plate on one rail and half on the other

Torque the bolts to the recommended torque value – 11 ft/lb.

Using the top holes on the splice plate as a template, drill holes through the top of the runway beam, 8.8 mm through holes

Put washers on bolts, insert bolts through center holes of the splice plate, thread T-Nuts onto the bolts

Torque the bolts to the recommended torque value – 11 ft/lb.

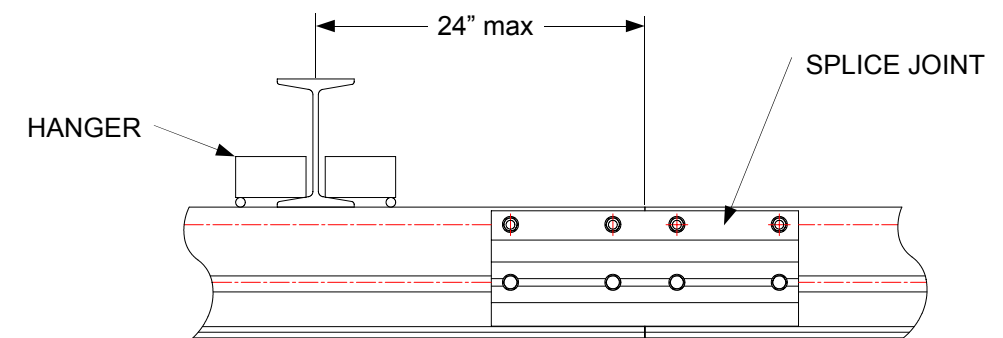
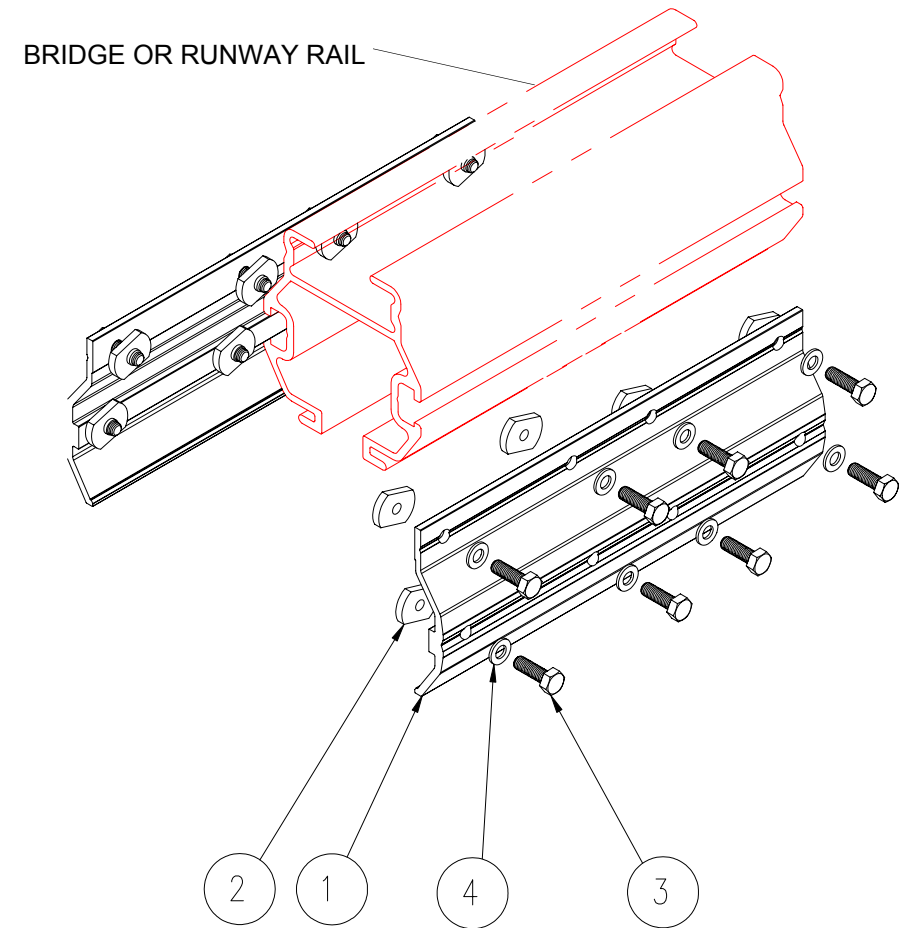


Fig. 9

SPLICE KIT #860640

Fig. 10



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	16	663433	M8 NORMAL FLAT WASHER
2	16	662408P	M8-1.25 X 25MM LG. PATCH LOCK HHCS
3	2	860650	SPLICE STRAP
4	16	860990	DOBULE TAB NUT

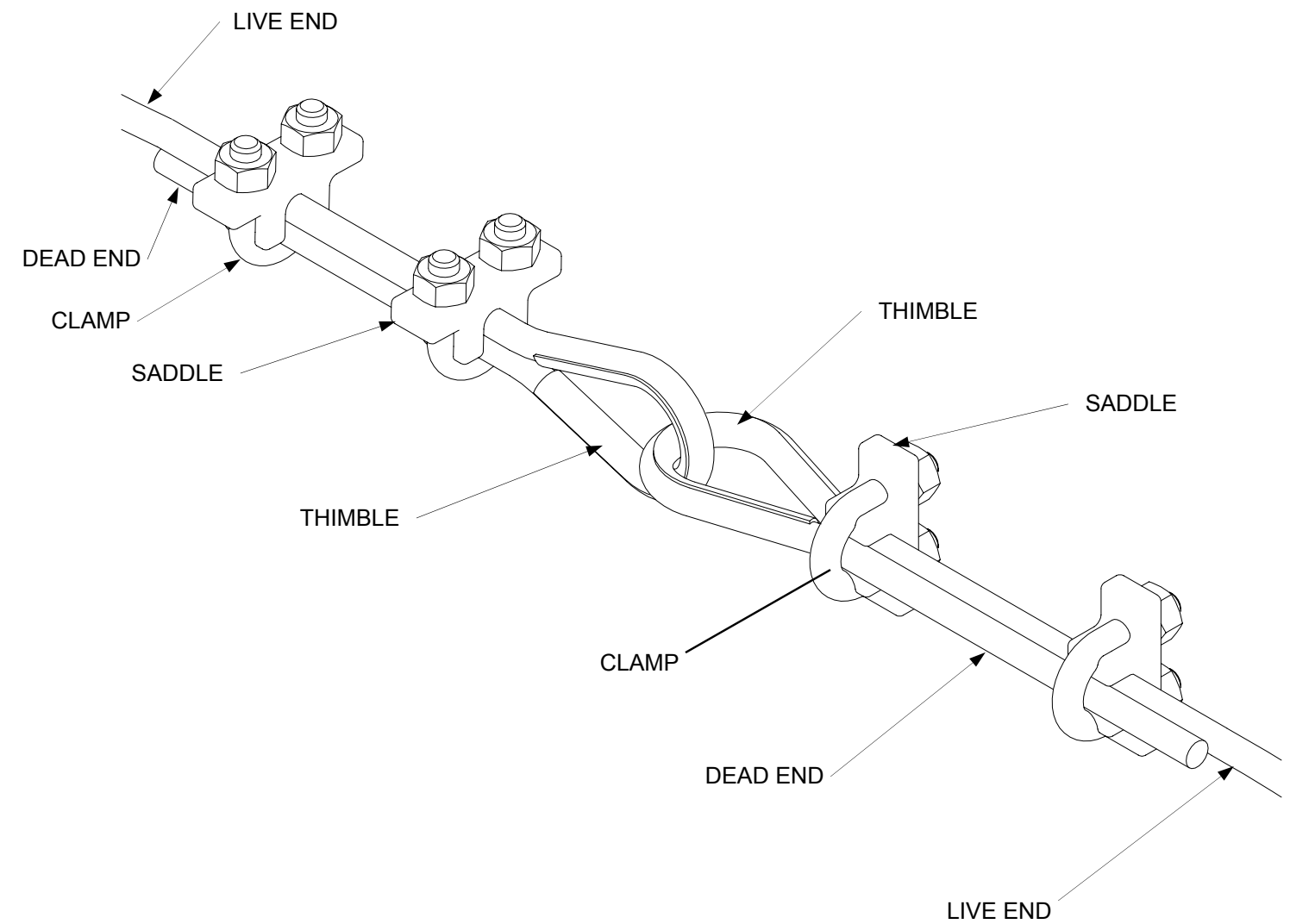


Fig. 19

7. INSTALLING SAFETY CABLES (FIGURE 18, 19, 20, 21)

CES requires a safety cable at all suspension points (Runway Hangers and Bridge End Trucks), all suspension hardware is supplied with a complete assembly

Route the wire rope through the hole in the rail and around the header steel (for hangers) (**Figure 20**) or the end truck safety cable hole (for end trucks) (**Figure 21**)

Use the two thimbles to make an interlocked connection and route the wire rope around the thimbles

Apply the first clamp one width from the dead end of the wire rope, snug the nuts

Apply the second clamp adjacent to the thimble, snug nuts

Maximum holding power is achieved when the distance between the clamp at one end is 6-7 times the diameter of the wire rope apart

Take up the slack by applying tension to the thimble and cable, tighten all nuts to the recommended torque value

NOTE: If your bridge was assembled at the factory, your safety cables should be swaged in place on the end trucks and bridge rail. If this is the case your bridge is ready to install.

CAUTION

When assembling wire rope clamps to the wire rope be sure the saddle part of the clamp is on the live end of the wire rope. The U-Bolt part of the clamp should be on the dead or short end of the rope (Figure 19)

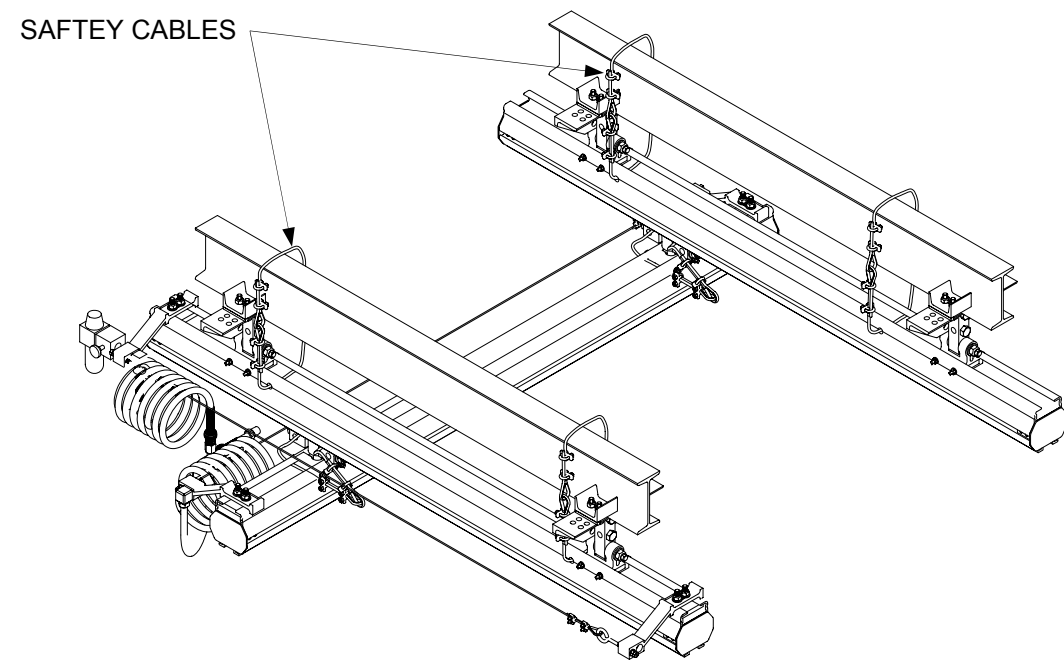


Fig. 18

5. INSTALLING THE STACK PLATES (FIGURE 11, 12)

Three stack plates are required on each side of a stacked beam, one plate on each end and one in the center

Put washers on bolts, insert bolts through the (4) holes of the stack plate, thread T-Nuts onto the bolts

Insert the T-Nuts into the slot on the side of the rail, make sure that the stack plate is in position on the rail

Torque the bolts to the recommended torque value 11 ft/lb.

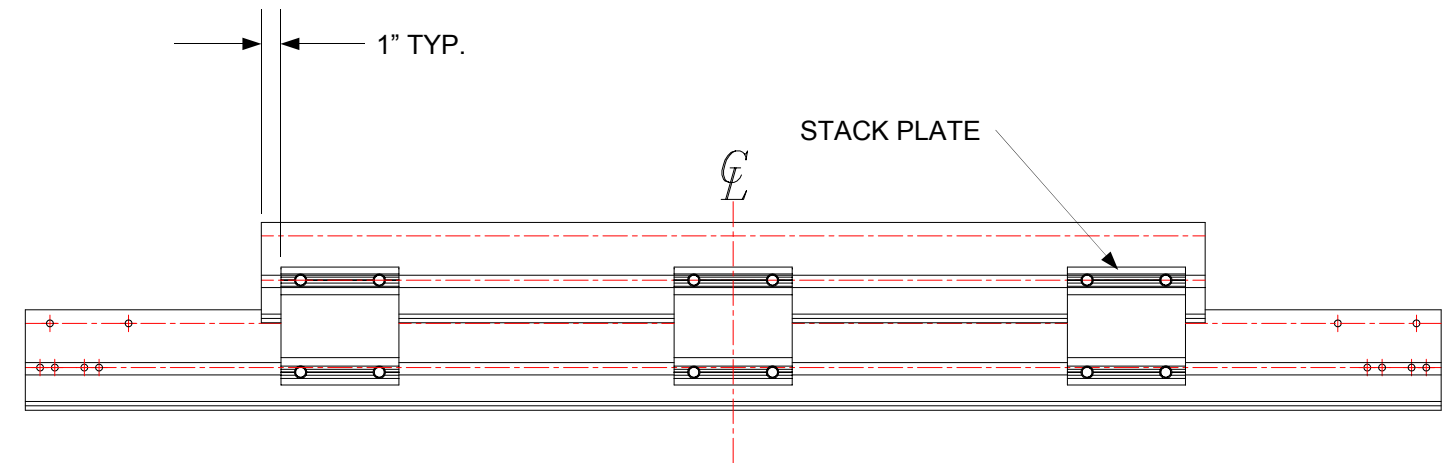
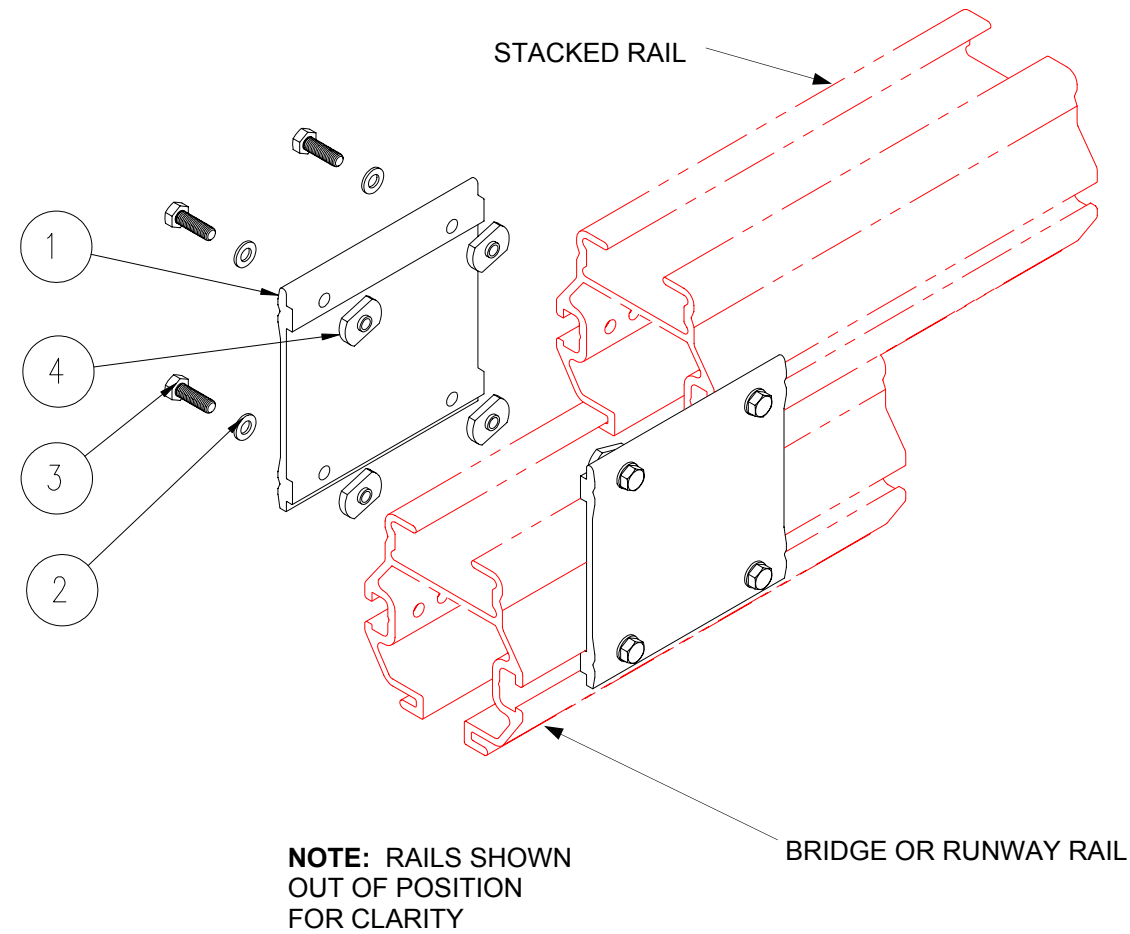


Fig. 11

STACK PLATE ASSEMBLY #860540

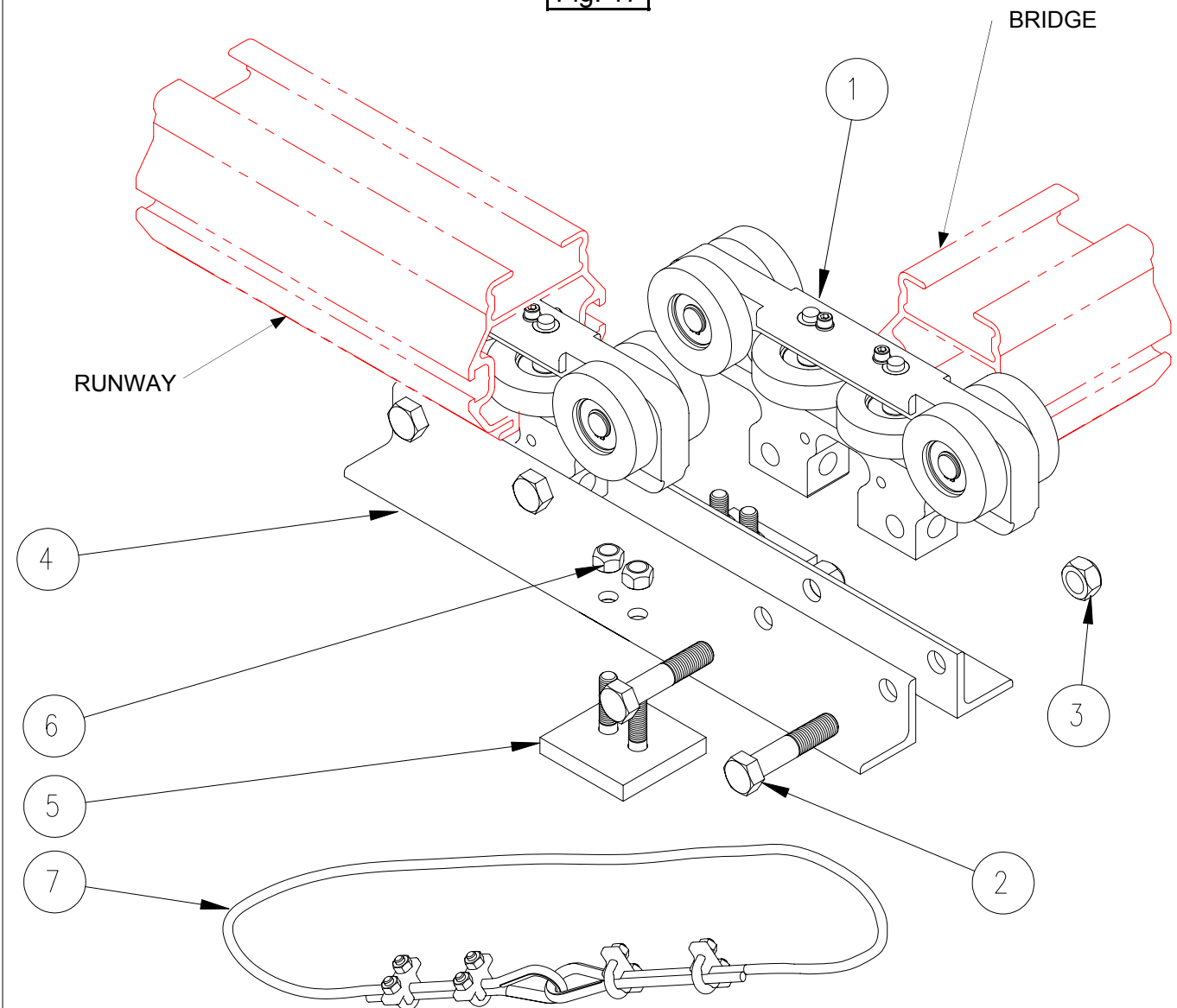
Fig. 12



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	2	860550	STACK TRAK STRAP
2	8	663433	M8 NORMAL FLAT WASHER
3	8	662408P	M8-1.25 X 25MM LG. PATCH LOCK HHCS
4	8	860990	DOUBLE TAB NUT

RIGID DUAL END TRUCK ASSEMBLY #860570

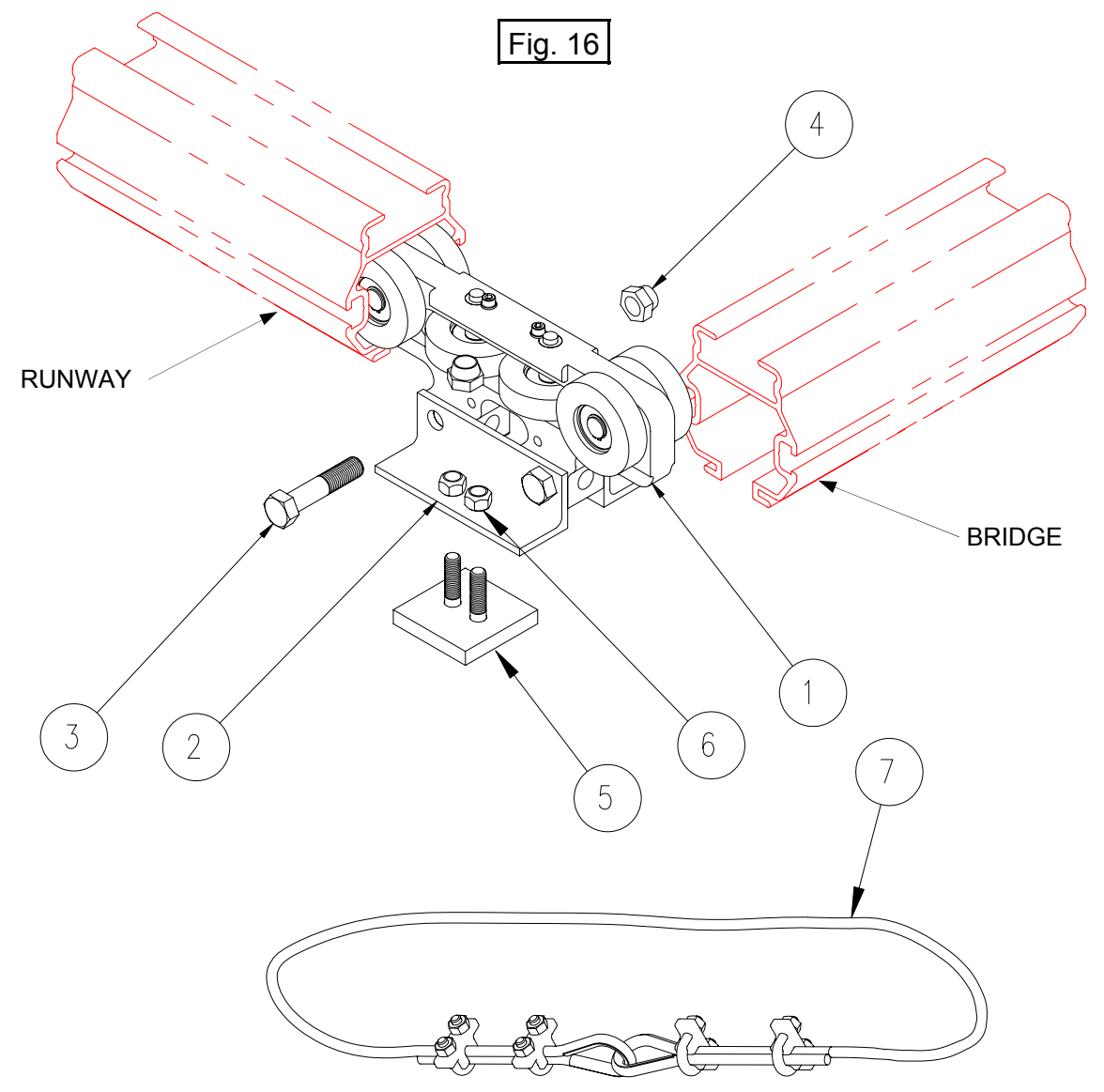
Fig. 17



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	2	860140	TROLLEY ASSM'Y
2	4	663037	M16-2.0 X 75MM LG. HHCS
3	4	663687	M16-2.0 PREVAILING TORQUE HEX NUT
4	2	860560	DUAL RIGID END TRUCK BRACKET
5	2	860910	HANGER T-NUT
6	4	663685	M12-1.75 PREVAILING TORQUE HEX NUT
7	1	860660	SAFETY CABLE

RIGID SINGLE END TRUCK ASSEMBLY #860950

Fig. 16



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860140	TROLLEY ASSM'Y
2	2	860960	RIGID END TRUCK BRACKET
3	2	663037	M16-2.0 X 75MM LG. HHCS
4	2	663687	M16-2.0 PREVAILING TORQUE HEX NUT
5	2	860910	HANGER T-NUT
6	4	663685	M12-1.75 PREVAILING TORQUE HEX NUT
7	1	860660	SAFETY CABLE ASSEMBLY

6. BRIDGE AND END TRUCK INSTALLATION (FIGURE 13, 14, 15, 16, 17)

Make sure that the opposite end of the runways have the end stops installed

Wipe the internal running surface of the rails with a clean, dry cloth to remove any debris that may have collected during shipping, storage, or installation

Some bridges are shipped already assembled. This varies based on application. If yours is not:

Install end trucks, determine the span of the centers of the runways and transfer to the bridge beam for the centerlines of the end trucks

Drill holes for hangers and safety cables, 2.5 inches apart, 8.8 mm through holes

Install end truck hangers and secure all fasteners to the recommended torque value

Install the safety cable, make sure to follow the instructions for installation in section 7

If end trucks are already assembled to the bridge beam, raise the beam and slide the end trucks into the runway rails, immediately install the remaining end stops

Test the bridge for rolling smoothness. If it is not smooth double-check the runways to ensure they are level and parallel. Binding in the movement of the bridge is typically caused by the runway centers not being the same as the bridge centers

NOTE: DO NOT OVERTIGHTEN THE 8 MM THROUGH BOLTS, THIS WILL RESULT IN DEFORMATION OF THE RAIL'S RUNNING CHANNEL AND WILL CAUSE THE TROLLEYS TO BIND

**!WARNING!
DO NOT REUSE THE PREVAILING TORQUE NUT. THESE NUTS CAN ONLY BE USED ONCE, IF DISASSEMBLED, THE NUT SHOULD BE REPLACED**

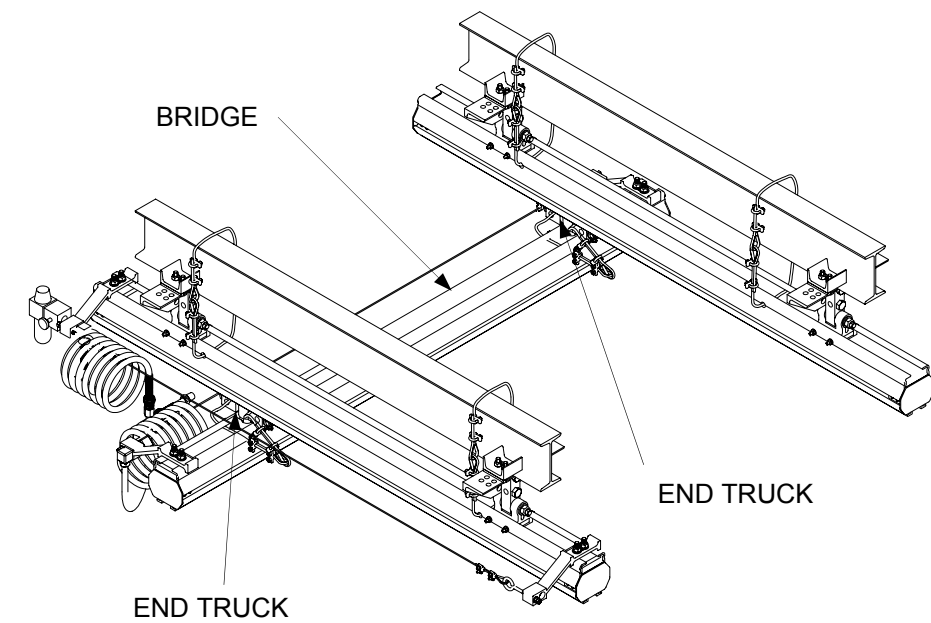
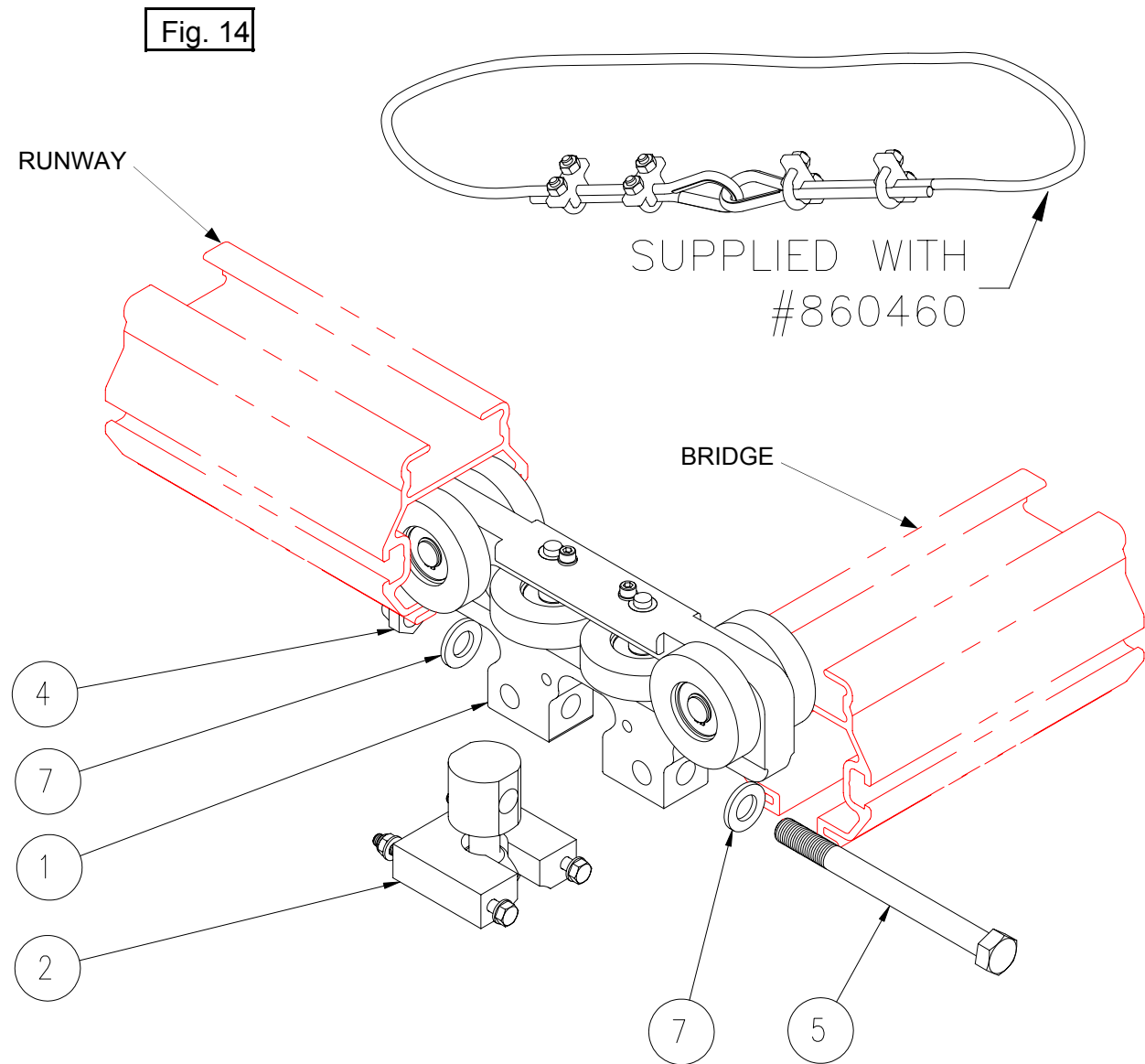


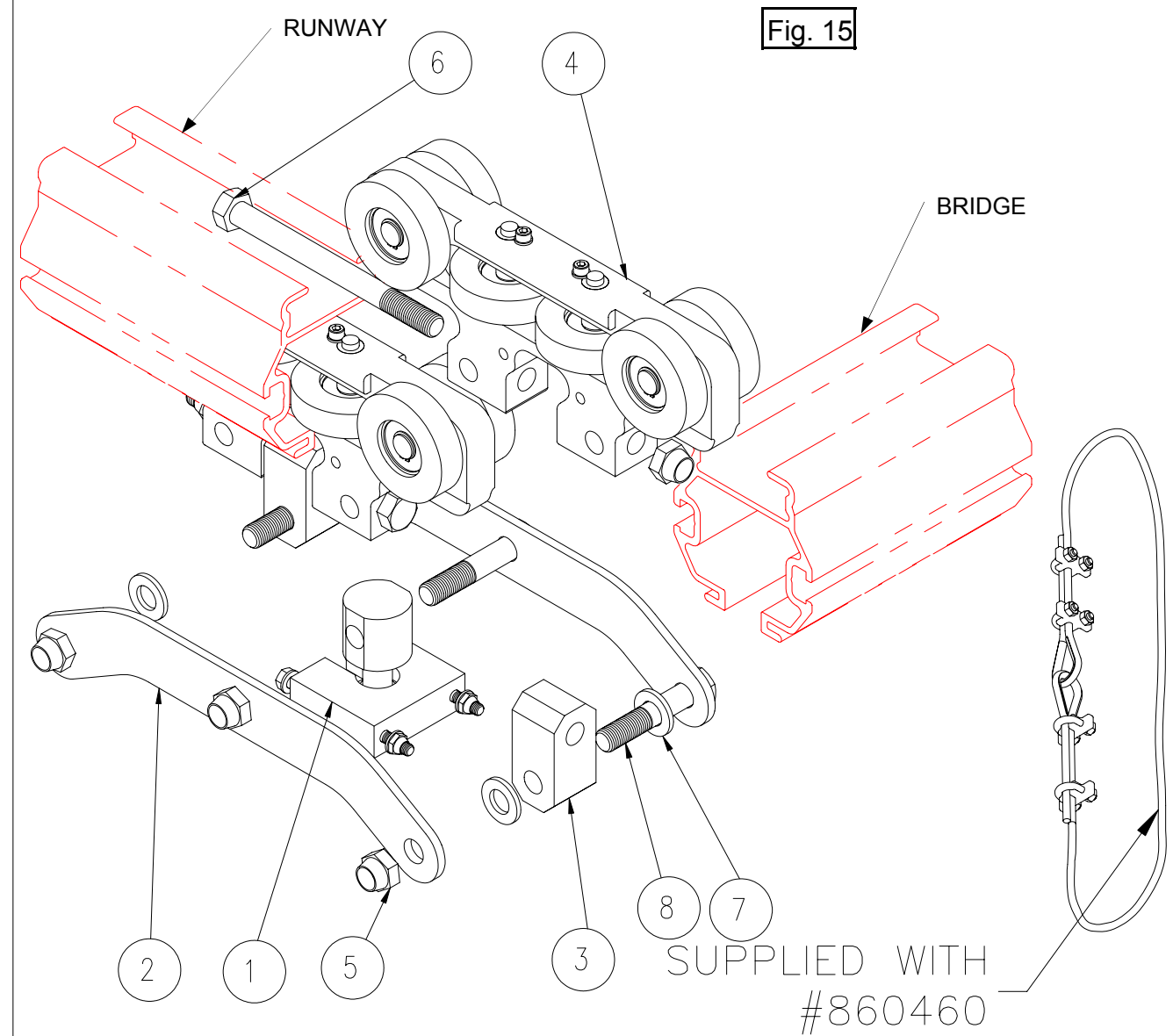
Fig. 13

SINGLE END TRUCK ASSEMBLY #860490



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860140	TROLLEY ASSM'Y
2	1	860460	END TRUCK HANGER ASSEMBLY
4	1	663687	M16-2.0 PREVAILING TORQUE HEX NUT
5	1	663047	M16-2.0 X 180MM LG. HHCS
7	2	663437	M16 NORMAL FLAT WASHER

DUAL END TRUCK HANGER ASSEMBLY #860590



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	860460	END TRUCK HANGER ASSEMBLY
2	2	860580	DUAL END TRUCK BRACKET
3	2	860610	90 DEG BLOCK
4	2	860140	TROLLEY ASSM'Y
5	5	663687	M16-2.0 PREVAILING TORQUE HEX NUT
6	2	663047	M16-2.0 X 180MM LG. HHCS
7	4	663437	M16 NORMAL FLAT WASHER
8	3	663038	M16-2.0 X 80MM LG. HHCS