

Volume

1

E-TECH INC.

MATERIAL HANDLING SYSTEMS

# Installation Training Manual

E-TECH INC.

# Installation Training Manual

---

E-TECH INC  
1401 West River Road North  
Minneapolis, MN 55411

---

# Introduction

The purpose of this training and manual is to provide a base knowledge of E-Tech, its systems, and installation. E-Tech manufactures, manages and installs a variety of systems. E-Rail being the most prominent will be the focus of this manual and training.

E-Tech Inc. is most well known for our E-Rail. First Installed in 1988, E-Rail has provided a long lasting and very flexible design. E-rail is designed specifically for automated laundry applications. E-Rail has evolved into the premier choice in quality monorail systems. E-Rail is a two inch round diameter track that provides for a minimum trolley wheel to surface contact area. The track is connected together through an internal steel splice. This splice makes E-Rail adaptive for future changes to an existing system. It also makes for a very clean non-welded installation. E-Rail is manufactured in standard and special sections custom made for each job.

E-Tech's systems run with the help of gravity. A system of sensors, pneumatic lifts, stops, switches and indexers control the elevation, speed and location of goods throughout the system. As slings travel through the system they are controlled through a program which keeps track of which product it contains, weight, location and routing. The sensors communicate with the program which controls the pneumatics of the system. *Many of the methods for installing E-Rail are easily applied to other types of system installations.*

 Prints located in  
reference section

---

Picture

---



## JOBSITE SAFETY RULES

1. Access to this site is restricted to employees and those approved by E-Tech Inc.
2. Use and/or possession of intoxicants, alcohol, or drugs are strictly prohibited.
3. Hard hats shall be worn by all employees and visitors when applicable
4. Hard soled shoes are required. No tennis shoes
5. Long pants and shirts with 4" minimum sleeves are required at all times.
6. Eye protection, ear protection, and respiratory protection devices will be worn when required.
7. Full body harness, shock absorbing lanyards, or other fall protection measures will be utilized when working at unprotected heights.
8. No glass containers allowed on site.
9. No radios, tape decks, or earphones allowed onsite.
10. Only authorized personnel are permitted to operate equipment and/or vehicles.
11. All machinery must have operable back up alarms at all times.
12. No riders on machinery or equipment. Seat belt use is required at all times.
13. Only trained, qualified operators will use power actuated tools.
14. All ladders will be secured, top and bottom. Always face ladders when going up or down.
15. Safety rails should be maintained at all times in all openings, stairways, and at the building perimeter
16. Flammable liquids must be kept in approved containers.
17. Be alert for chemical and safety hazards on the jobsite.
18. A complete first aid kit is available in the gang box.
  
19. Report all accidents, unsafe conditions and/or practices to your supervisor. Fill out each form as needed. See your supervisor for appropriate form.

# Installation

## Equipment

- LIFTS

E-tech offers a forklift certification which requires a written and behind the wheel evaluation. There is no current certification required for the use of Aerial lifts.



FIGURE 3.1: Boom Lift

- Common tools- portable band saw, angle drill, angle grinder, welder, whole punch, Laser, Tape measure (measures in Feet and Inches),
- E-Rail components
  - Rail
  - Stops
  - Indexers
  - Switches
  - Sensors

The majority of the installations we do are in industrial laundries. They process anything from healthcare linen to restaurants to hospitality. Most of the facilities that we work in can be broken into two major areas, a soiled and clean. There may be other areas, for now we will stick with just these two. The soiled side of the plant is where the product is sorted and processed. There are a couple types of suspension methods listed below. If we are building our own steel structure this is where we would begin. For example let's assume we will be using existing structure to suspend our system. The first step in start you must determine where the rail is laid out in the plant. Determine how to support if more structure is to be added to suspend directly above our rail. The next step is to determine the height or elevation of the support structure. Let's use 25'-0" for example. There will be a rod drop suspension point dropped from that elevation to support our rail. The elevation to the top of our rail or riding tread is to be 14'-3". We know that our BTOB support channel will be suspended 9" above the rail. The bottom of our BTOB will be at 15'-0". Take the difference of the two elevations and add 4" (This number can fluctuate). We determine that we need a 10'-4" rod to suspend our BTOB. The 4" is added as flex to the rod length for some reason you may have to raise or lower your steel. So you give yourself roughly 2" of adjustment on top and 2" on bottom. The BTOB is set with a specific amount of gravity. Gravities are usually set to around 1/4" per foot (.25). The rail is set parallel to the BTOB usually at nine inches. This number can also fluctuate. After the rail elevation is set riveting may be done. Riveting is usually done in areas or phases, for example once the rail and elevations are set in storage it is riveted. "Lock down" is tightening all of the loose hardware after elevations have been set. This can be done before or after riveting. After riveting and lock down has been completed in an area or throughout the entire system it is sway braced. Sway bracing is done throughout the job and even after completion. Since there may be a spot that was overlooked or just needs a little extra bracing. Air tubing is a process that can be done any time after all of the steel and rail components are in place and the panels have been mounted.

## Suspension

Suspension methods are different for every job. Our systems are usually supported by one or a combination of the following methods. Erecting a system of beams and columns (figure 5.1 Floor Support). from which it is then suspended using a combination of beam clamps, angle iron and 5/8" all-thread.

The other method of suspension is from existing structure (see figure 5.2 Joist Suspension). Usually this consists of joists. Here we use 5/8" all thread from the ceiling to suspend our back to back channel. The rod make up is basically the only thing that changes between the two methods (**see rod chart p.18-20**). The use of angle steel is used to support points that can not be reached by the existing structure. Our back to back channel is a 4" galvanized steel channel. It is manufactured in 20' lengths with an 18" lap on either end. When joining two sections together the lap is bolted together by two splice plates and four- 3/4" bolts.



FIGURE 6.1 Floor Support

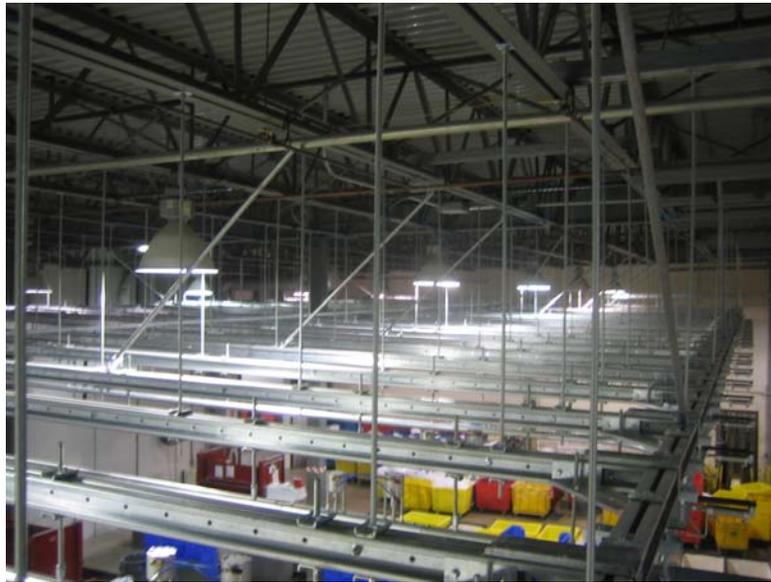


FIGURE 6.2 Joist Suspension

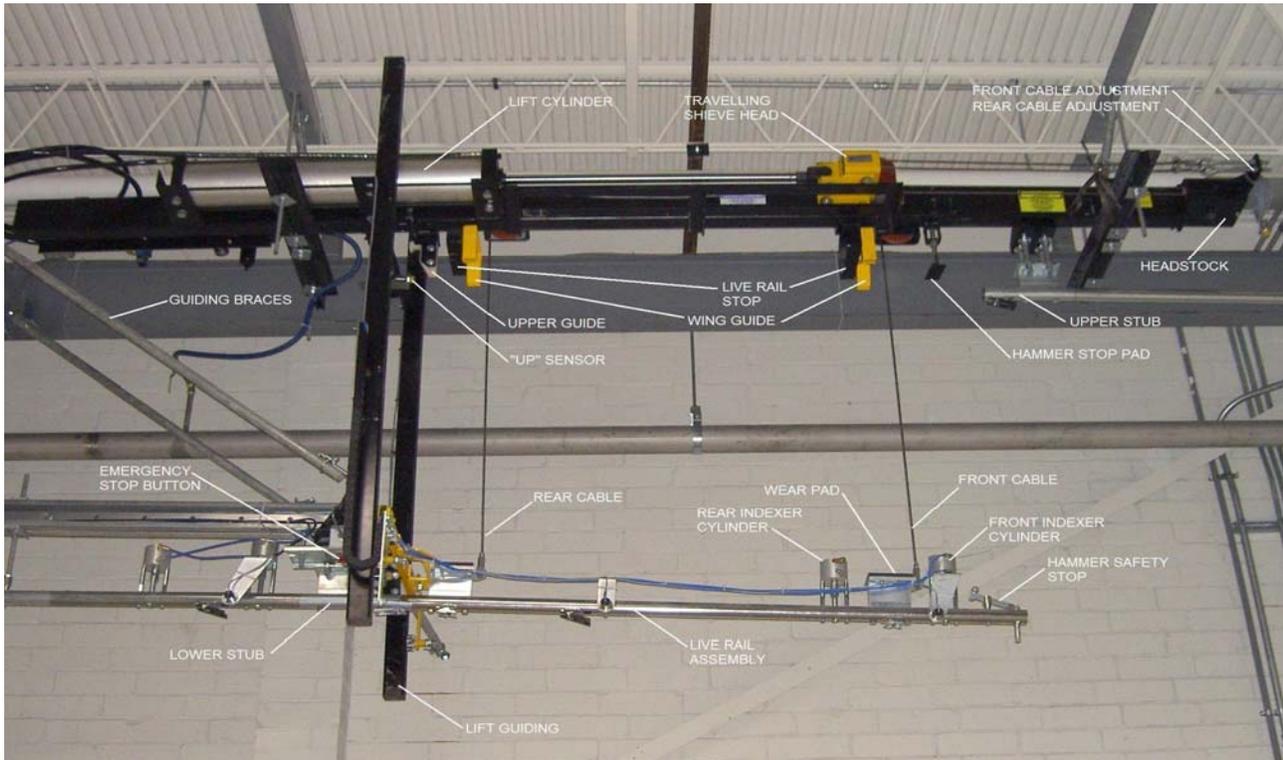
## Switches

A switch is a device used to control location of slings throughout a system. The switch is actuated manually or by automation through a pneumatic cylinder(s). E-Tech's pivot switch has a flexible coupler "slinky" at the rear of the switch. The front of the switch can have two (2-way) or three (3-way) positions. To determine the type of switch, determine the straight position. Right hand switches open to the right when viewing from the top. Left hand switches open to the left. 3-way switches are identified the same way. There is a 3-way wye switch that has the middle position as the straight and curves to the left and right. (See figure p.-14)

When adjusting a switch you should first pull the air lines on the component. There are two different types of adjustments to make to a switch a horizontal and a vertical. Horizontal adjustments are made with using the two set screws on either side of the switch. 3-way switches have the same horizontal adjustment. There is a third adjustment for the middle position. It is a coupler that connects two cylinders back to back. It is adjusted by loosening the set screws and rotating the aluminum coupler to align the middle position. Vertical adjustments are made by increasing or decreasing the distance between the rail and switch plate. There should be a slight drop off in the direction of travel (see diagram on p. 15-16). In some cases trolleys happen to be traveling in both directions. This is the case in most sort gang applications. The switch is set to be level in the curved position so that there is no change in elevation in either direction. The best way to see if the switch is adjusted correctly is to move a loaded sling over the switch.



FIGURE 7.1 3-way left hand switch is shown.



## Lift adjustment

After the lift is hung the high elevation is set to the out bound end of the splice. The lift tube is leveled both width and lengthwise. After the lift has been leveled check that the high stub elevation is still correct. The first step whenever working on a lift is to push the emergency stop. There may be times when the emergency stops are not mounted or functional. Disconnect the two electrical connections located on the valve. A small standard screw driver is needed to remove the connectors. The next step is to turn the air off to the lift. There should be a ball valve located on the air drop for the lift. After this is shut off also turn off the air located on the lifts pneumatic package.

The tools you will need for the rest of the adjustment are a 3/4" wrench, adjustable wrench, ratchet strap, one 9/16" wrench, a 9/16" socket and ratchet with a small extension. Using the adjustable wrench slowly loosen the air hose connected on the air cylinder side. The first one you should loosen should be the one nearest the traveler or front of the cylinder. Loosen slowly until all of the air has leaked out.

Locate a good place to attach your ratchet strap to the stationary part of the lift. Make sure that you don't wrap the strap around the cables. Attach the end of strap with out the ratcheting mechanism leaving the opposite end hanging. Next loosen the other air hose from the cylinder. As this is loosened the live rail will drop slowly. You will need to apply some pressure to move the traveler. It is critical that the cylinder is fully extended before any adjustments are made. Once the live rail has been lowered use the ratchet strap to support the end of the live rail. The other end of the live rail will be supported by the lower stub. Once the live rail is in the lower position use the ratchet strap to elevate the front of the live rail, it should have approximately the same amount of gravity as the line coming in. Next reconnect the air hoses to each end of the cylinder. The next step is to slip the cables. To do this use a proper wrench usually a 9/16" wrench to remove one of the cable clamps. Loosen the other cable clamp as much as possible without having the nuts come completely off. Pull the slack out of the cable. You should tension the cable as much as possible to a point just before you will be raising the live rail. Tighten the cable clamp and attach the second and tighten (never saddle a dead horse) so the saddle of the clamp is on the doubled over part of the cable that supports the load. Repeat the process for the other lift cable. Now you may remove the ratchet strap.

Turn the air on to the lift. Listen for any air leaks from the hoses you have just re-installed. With the e-stop still depressed, you may manually run the lift up and down at the valve. The first time you run air into the lift you must bleed in the cylinders. The cylinder should still be full extended and in the down position. Fire the lower of the lift valves this will bleed air into the back of the cylinder. Hold it in until you do not hear any air from the exhaust port. Now you may fire the lift in the up position. Now is a good time to control the speed of the lift. There are to brass set screws in the exhaust port. Loosen the 1/4" lock nut so you can turn the brass screw easily. Turning counter clockwise will increase the speed. Turning clockwise will decrease the speed of the lift. After the speed is set hold the screw in place while you tighten the lock nut. Run the lift in the up position stopping just short of seating approximately 2"-3". Measure from each of the live rail stops to the ware pad on the live rail. Adjust the front of the lift with the eye bolt so it has the same amount of space as the rear. Run the lift in the up position so it seats completely. Adjust the upper stub so there is a 1/8" drop off in the direction of travel. After full slings are on the system lifts more adjustment may be required. Adjust as needed. There should be an approximate gap of 1/16"- 1/8" between the stubs and live rail. To increase or decrease the gap between live rail and stub, adjust the upper or lower guides that contact the yellow tube frame on the live rail both located at the rear of the lift.

### Riveting

Rivets are what couple our rail sections together with the use of a splice. A splice is a of steel insert that fits in the i.d. of E-Rail. It is placed half way into a piece of rail and riveted through the top. Rail comes pre-fabricated with the splice and rivet in one end of the rail. The rivet is placed roughly 1" from the splice connection. When the rail has been set in place, elevation set, and hardware locked down. Riveting is usually done as one of the last steps in completing an area. When riveting you want to eliminate gaps in the rail. If there are gaps left it leaves a crevice where a trolley will not roll. It is very important to close gaps in the rail. It is difficult to close these gaps after riveting has been done. Once a rivet hole has been drilled it can not be re-drilled with out replacing the splice, or drilling a second hole in the rail. Closing gaps is done by one of two methods. Always working in the same direction. 1. Using a dead blow

hammer knocking the coupler to close the gap. 2. Use a ratchet strap between hanger points where the dead blow is not sufficient or it is that hard to close the gap.. When riveting, you should also have a torpedo level with to level out stops and indexers to assure that they will run straight up and down.

### Sway Bracing

Sway bracing is used to reduce the movement of our support structure and rail. Sway bracing maybe done with different types of material. Most common being our schedule 40 pipe and sway brace brackets. 2x2x1/8" angle iron is also used often. Since the lifts experience both horizontal and vertical movement, they require more bracing than most other pieces of equipment. The guiding should be braced level. Generally there are two braces running parallel and one perpendicular to the vertical guides. This will insure that the lift runs straight up and down. This will limit the amount of adjustments you will have do to the lift. Each of the lift support back to backs should be braced parallel and perpendicular to the lift tube. Sway bracing is dependent on many factors. The length of hanger rods, full or empty slings, speed of slings. Generally bracing is used around areas that see increased speed, stops, curves, and high impact areas. It often comes down to whether or not the rail is secure some areas will require additional bracing.

### Air Tubing

The air must be run from the air drop provided by the customer. The air dryer is connected to a female coupler which is connected to a ball valve. Lifts have a pneumatics package attached to them, including an air dryer. 1/2" flexible rubber hose is run from an air drop to the lift. There are a few general rules to doing air tubing. There are two colors of air lines, blue and black 1/4" flexible hose. Blue is normally run as the constant or main air line. So the normal position of the device should receive air from the blue air line in normal position and when actuated receive from the black air line. We use a two position valve. There is always air pressure on the device in one direction or the other. This is why you must take caution when working on devices with pneumatics. A 5/16" wrench is a good tool to use whenever work is being done on air tubing. Use the wrench to release the tubing from the compression fitting. Much like the lift valve the adjustment on the panel valves is adjusted by two very small brass screws on the face of the valve. Turn counter clockwise to increase air flow and clockwise to decrease air flow.



**Trolley**-consisting of wheels, yoke, and a load bar. This is the link between goods and the monorail system.

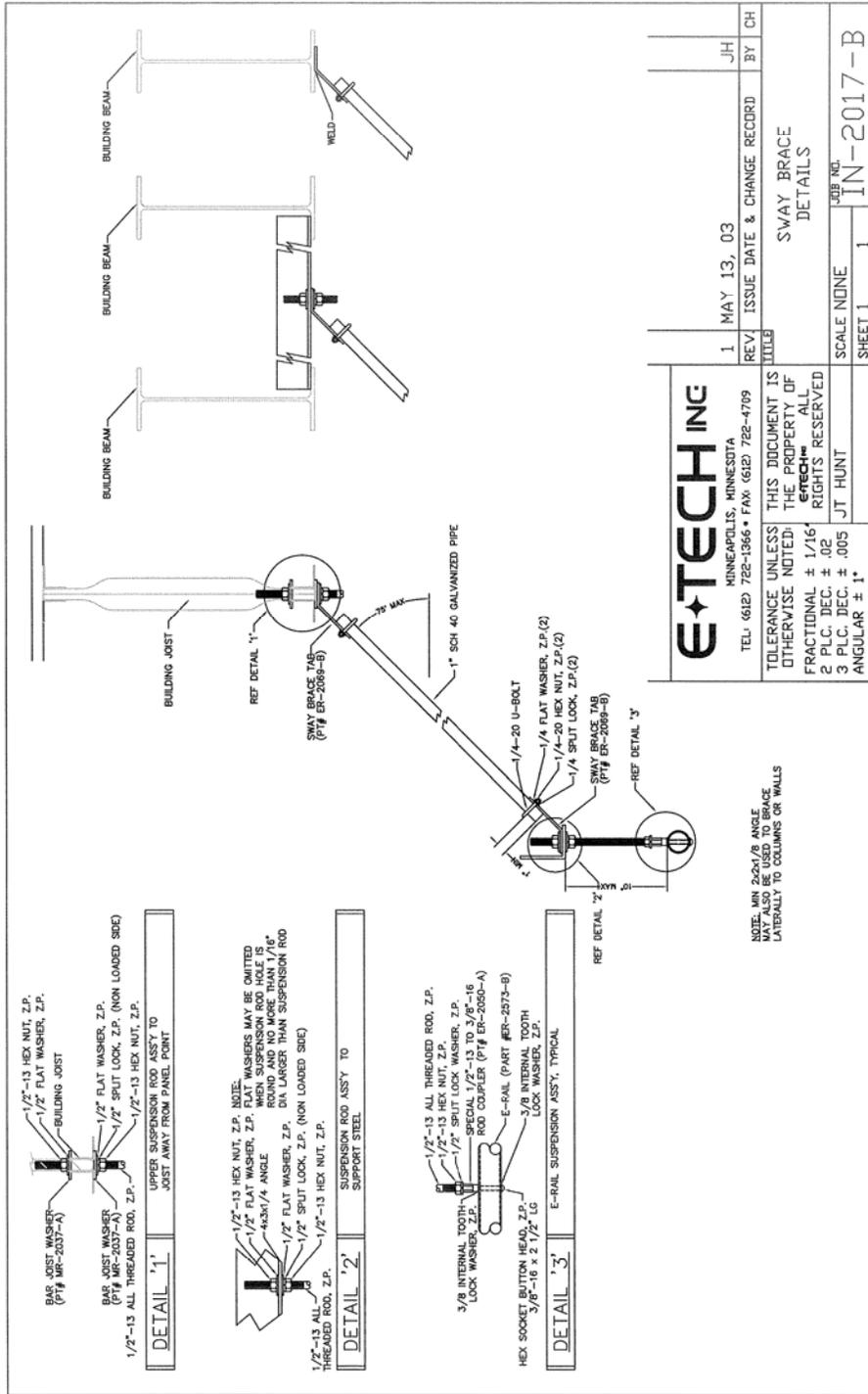


**Stops**- single cylinder that controls speed and location of slings. If there is a sensor bracket it is normally aired in the down position. If there is no sensor bracket it is normally aired in the up position.

## REFERENCE

**Indexers**-a two cylinder system that meters slings through our system while controlling speed and location of slings.

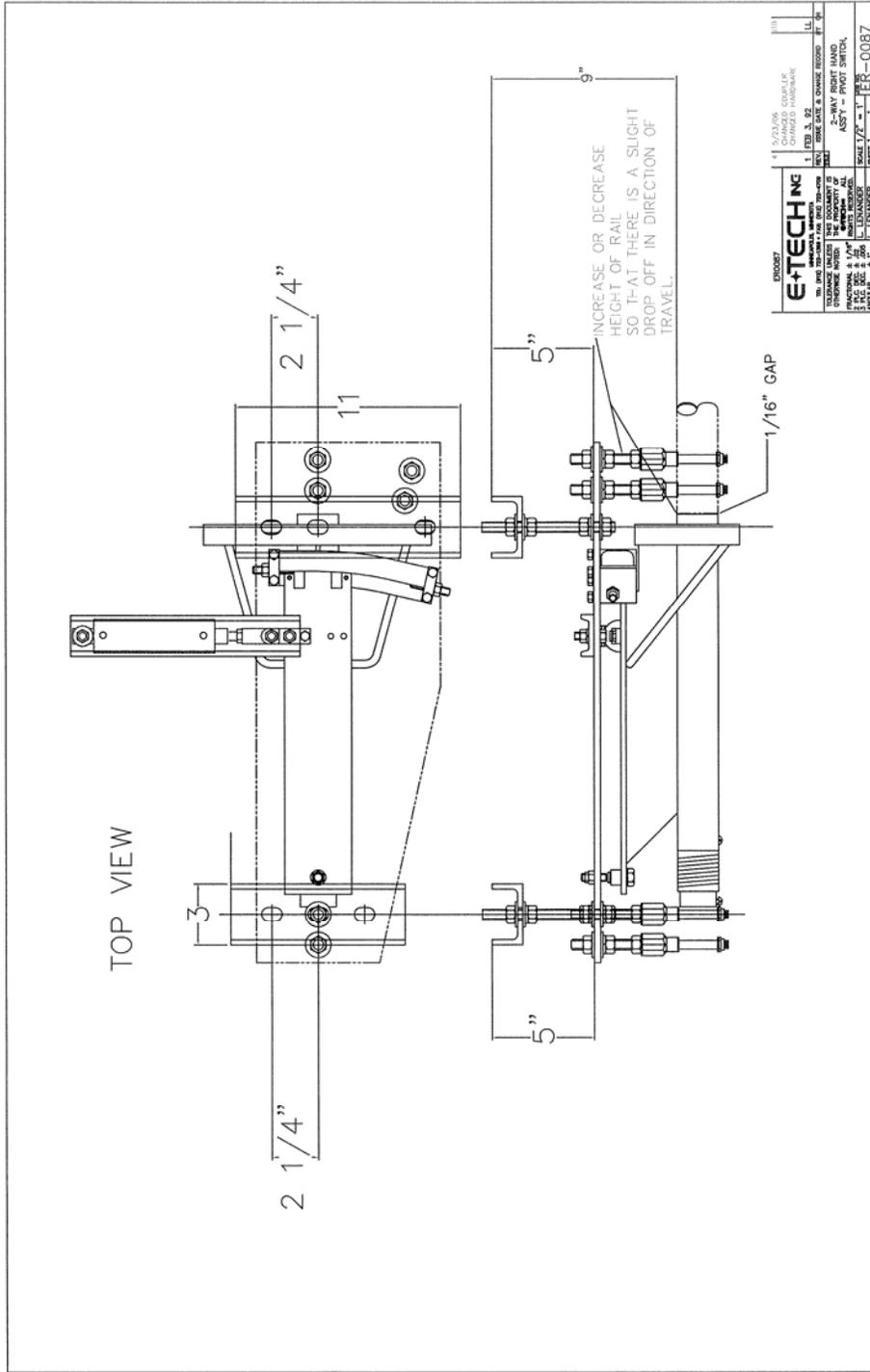




<b>E-TECH INC</b>		1 MAY 13, 03	
MINNEAPOLIS, MINNESOTA		ISSUE DATE & CHANGE RECORD	
TEL: (612) 722-1366 • FAX: (612) 722-4709		JH	
THIS DOCUMENT IS THE PROPERTY OF ETECH INC. ALL RIGHTS RESERVED.		BY CH	
TOLERANCE UNLESS OTHERWISE NOTED: FRACTIONAL ± 1/16" DEC. ± .02 P.L.C. DEC. ± .005 ANGULAR ± 1°		REV	
JT HUNT		SCALE NONE	
JOB NO. IN-2017-B		SHEET 1 1	

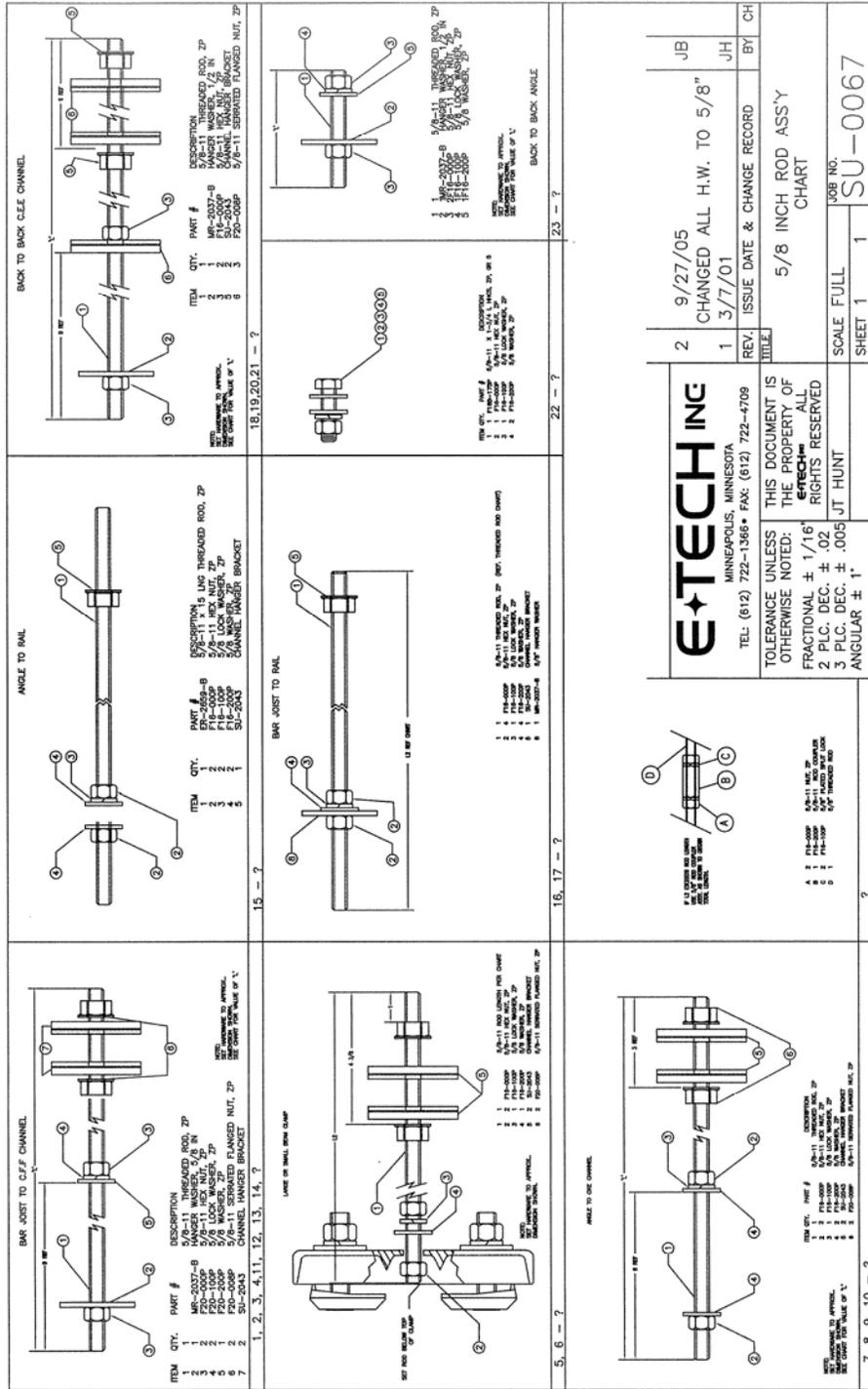


REFERENCE









**E-TECH INC**  
 MINNEAPOLIS, MINNESOTA  
 TEL: (612) 722-1366 • FAX: (612) 722-4709

THIS DOCUMENT IS THE PROPERTY OF E-TECH INC. ALL RIGHTS RESERVED.

2 9/27/05 CHANGED ALL H.W. TO 5/8" JB  
 1 3/7/01 JH

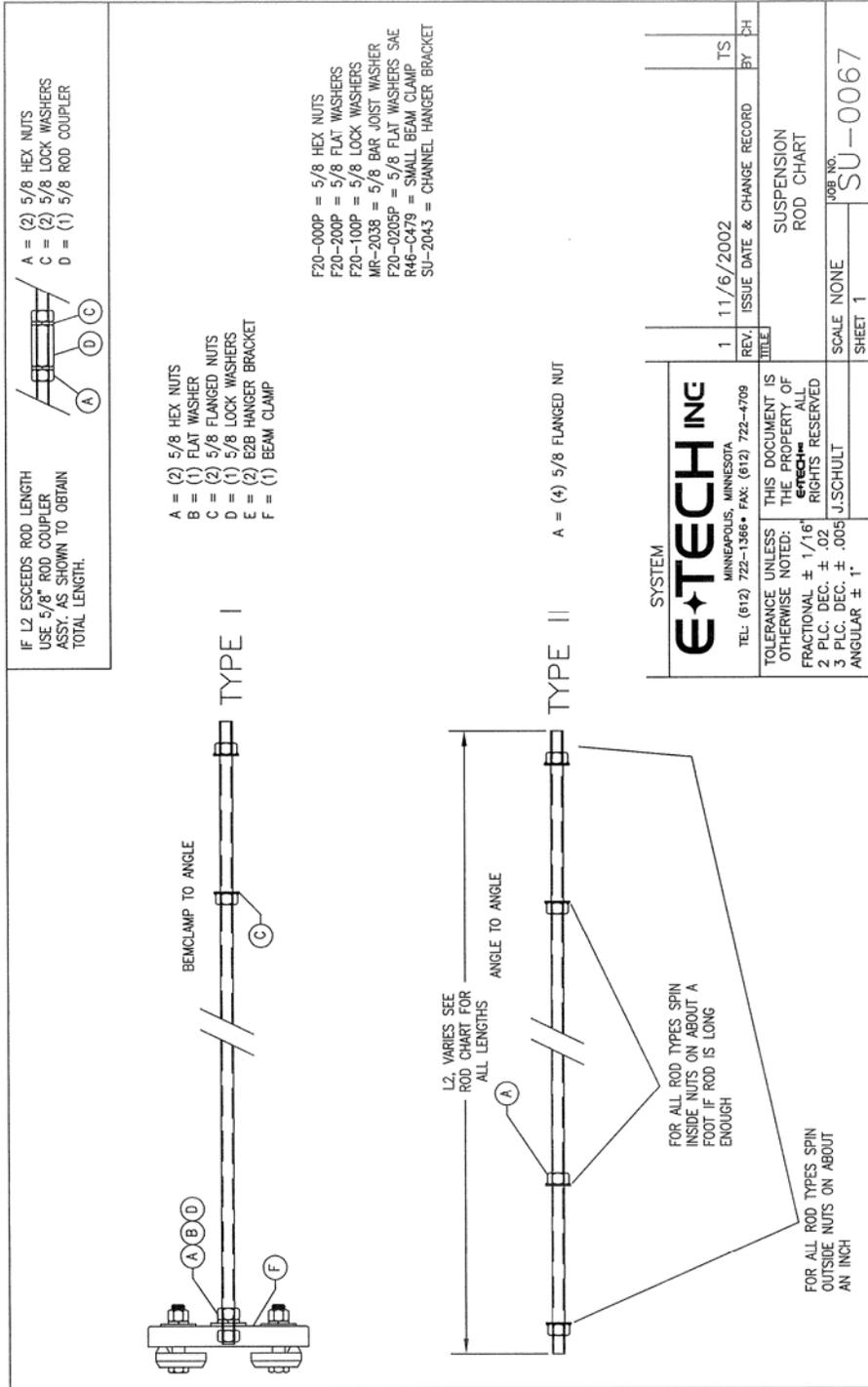
REV. DATE & CHANGE RECORD BY CH

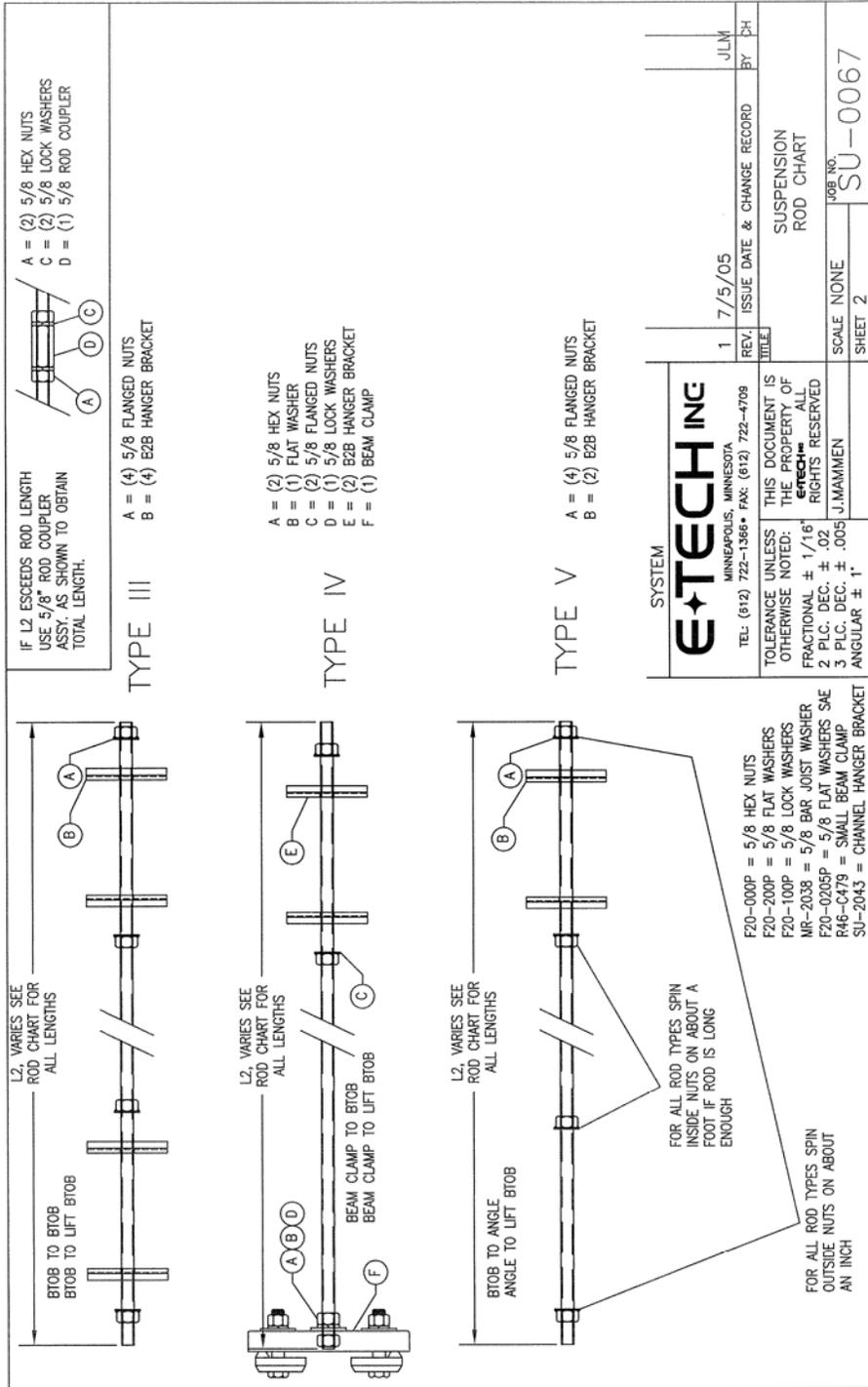
TITLE 5/8 INCH ROD ASS'Y CHART

SCALE FULL JOB NO. SU-0067

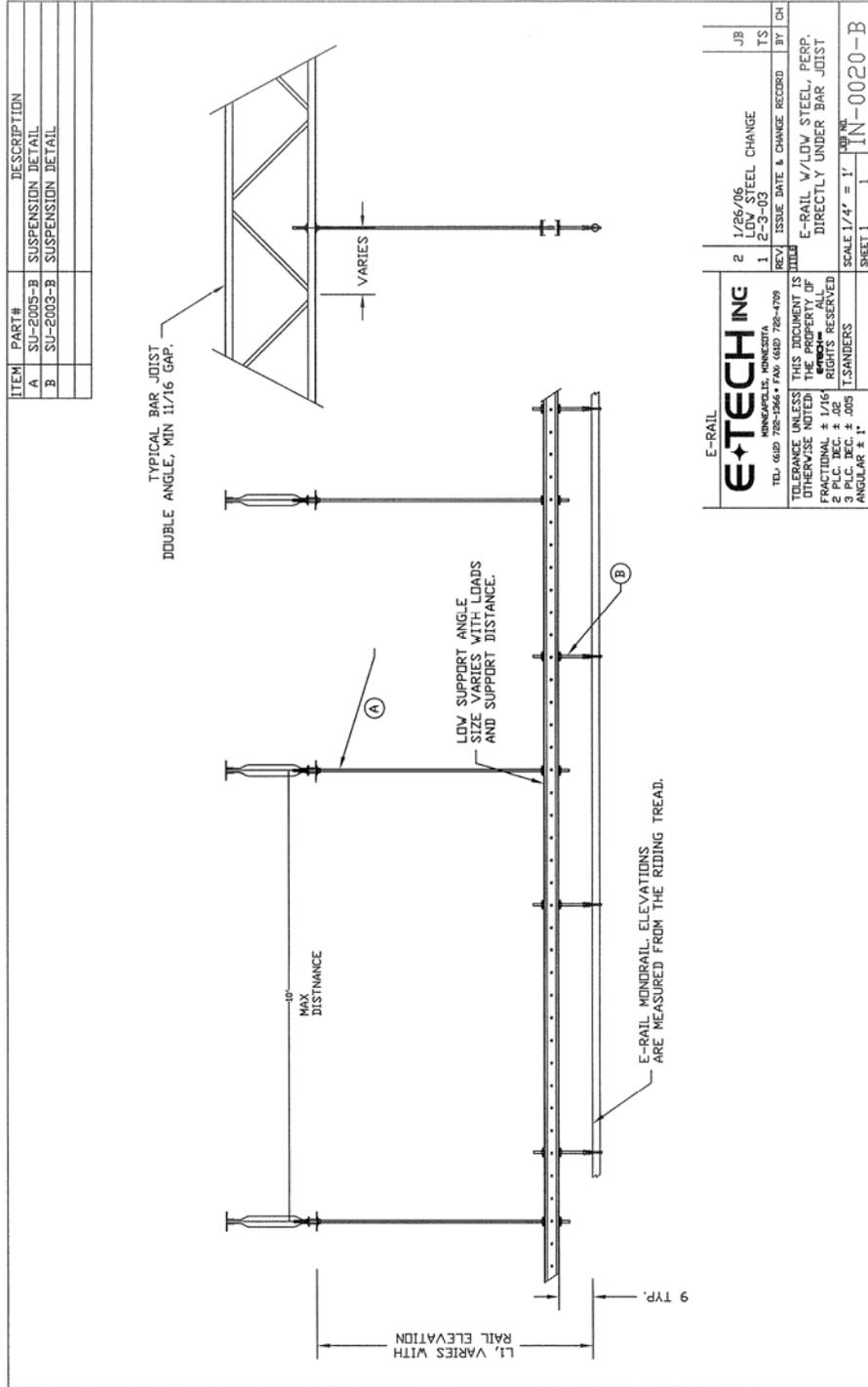
SHEET 1 1

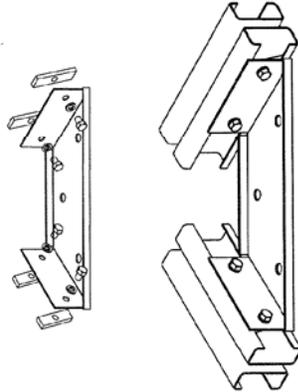
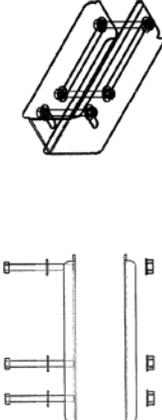
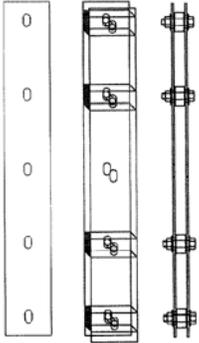
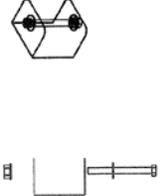
REFERENCE





REFERENCE



<p>CORNER BRACKET SU-0053</p> 	<p>CHANNEL WASHER SU-2043</p> 	<p>90 DEG. BRACKET SU-0054</p> 	<p>SPLICE PLATE(CASSY)</p> 	<p>END CAP SU 0052</p> 	<p><b>E-TECH INC</b> MINNEAPOLIS, MINNESOTA TEL: (612) 722-1266 • FAX: (612) 722-4799</p> <p>THIS DOCUMENT IS THE PROPERTY OF E-TECH. ALL RIGHTS RESERVED.</p> <p>SCALE: NTS SHEET: 1</p> <p>1 1/1/07 REV. ISSUE, DATE &amp; DRAW'G RECORD BY CH</p> <p>SUPPORT CHANNEL PIECES</p>
--	---	--	--	--	--

## Rail

The rail is a 2" diameter steel with an electroplated finish. There are sections of our rail that are hardened such as stops, indexers, openers, and closers. Hardened and chromed sections of rail are not easily modified in the field. The electroplated non-hardened sections are easily cut and drilled. There is normally very little field modification done to the rail.

The rail is suspended with a through bolt and coupler. The rail has a 3/8" hole drilled through the center and is connected with a 5/8 to 3/8 rod coupler to a 12pt bolt. E-Rail is fabricated in house and then sent off for finishing. After it comes back from finishing it is assembled. There are suspension points spaced at no more than 5'6" apart. There also must be a suspension point within 6" of either side of a splice. A splice is a 5-1/2" long insert that fits to the I.D of our rail. Its purpose is to align the rail so there is a smooth transition between sections of rail and provides strength. It also is used to couple the rail together through the use of steel rivets.

## Riveting

Riveting is what couples our rail sections together. There are pre-drilled holes on top of the rail 1-1/2" in from the end of the rail. Since one end of the rail has a splice and rivet inserted, only one hole is needed to be drilled to connect the rail sections. There should "no" gap between sections of rail. There are two ways to close a gap in rail. One is to strike the rod coupler with a dead blow hammer to close the gap. If the gap will not close use a ratcheting strap to pull the rail together and close the gap. When riveting it is good practice to always rivet in one direction. This way you will be working all the gaps out in one direction. Also one hole should be drilled at a time. Insert the rivet and then move on to the next splice. A torpedo level should be used when riveting components such as stops, indexers, openers and closers. These need to be installed straight up and down to function properly. Rivets are normally inserted straight down through the top of the rail. If a second rivet needs to be inserted it may be put in from directly underneath the rail.

## Back to Back support channel

Back to back support channel is a 4" formed galvanized steel channel bolted back to back. After the channel is bolted together it forms a 3/4" slot through the center. This channel is used to support our rail. It comes in 20' long sections and is bolted offset with an 18" lap on either side. The back to back is joined together with two splice plates and four spacers and bolts. The splice plates are a flat plate inserted on both sides, then bolted through each section of channel and spacers. The 3/4" spacer is used to create an opening for suspending our rail and back to back. The support channel is suspended 9" above the riding tread of our rail. The maximum span for supporting back to back is 10' between suspension points. There are several different types of brackets that are used with the back to back. (SU-0053) Corner brackets are used to pick up hanger points that aren't directly underneath the channel such as curves. They also help brace and keep the channel square. (SU-0054) 90 degree brackets connect the back to back sections where a perpendicular connection is made between back to backs. (SU-0052) End caps are used

at the end of runs of back to back where the ends are exposed. (SU-0062) T-brackets are used when back to backs meet perpendicular and run all directions. Channel washers are designed specifically for use in spanning across the ¾' gap in the back to back rail sections.

### Sway Bracing

Sway bracing is used to reduce the movement of our support structure and rail. Sway bracing maybe done with different types of material. Most common being our schedule 40 pipe and sway brace brackets. 2x2x1/8" angle iron is also used. Sway bracing with the schedule 40 piping and brackets. First the brackets are bolted in place (sometimes welded). Then a measurement is taken (see figure XX) from the back of tab and add 2-1/4". This will give you the overall length of pipe you will need. Bracing is strongest when it is kept short and at a 45 degree angle vertically and a 90 degree angle horizontally. The vertical braces are run so that the flow of gravity is pushing into the sway brace. Since the lifts experience both horizontal and vertical movement, they require more bracing than most other pieces of equipment. The guiding should be braced level. Generally there are two braces running parallel and one perpendicular to the vertical guides. This will insure that the lift runs straight up and down. This will limit the amount of adjustments you will have do to the lift. Each of the lift support back to backs should be braced parallel and perpendicular to the lift tube. Sway bracing is dependent on many factors. The length of hanger rods, full or empty slings, speeds of slings. Generally bracing is used around areas that see increased speed, stops, curves, and high impact areas. Often the test to see an area is braced well enough is to shake it. Once slings start moving around the system is the real test.

### Rods

There many types of suspension rods. There is a chart listed on (figure XXXX) this covers the basic types of rods that we use. Here are a few, basic rules lock washers can never support weight. Flat washers must be used on an oversized hole. There are pre-fabricated, pre-assembled rods used for suspending the rail.