INTRODUCTION

This guide provides the general basic information necessary to properly install an overhead trolley conveyor. The conveyor suspension methods show and illustrate how to typically suspend and hang the system from building trusses or header steel. Floor support systems are also shown where low conveyor elevations in building with very high trusses or beams make it impractical or in buildings not structurally adequate to allow for suspending conveyors.

Because every system will have different hanging conditions it is necessary to analyze each installation separately and carefully. Whenever suspension of a conveyor system is done from ceilings, trusses and beams it should be done in accordance with an architect or engineer's recommendations. Many ceilings are not built to hang loads from and many require special engineered applications to do so.

Building truss or beam spacing will generally necessitate additional horizontal members to suspend supports at required locations. These additional horizontal members are called header steel or stringers and are generally structural channel, wide flange or I-beam sections, sized to suite loads and spans.

Figure "A" shows a typical overhead conveyor layout drawn to scale showing all turns, elevations, drive, guards, building trusses and beams, etc.

Figure "B" is the same conveyor layout but with the support steel and hanger locations for the system shown. Each hanger location on the drawing has a reference number that refers to a detail in this guide showing the recommended method of installation. Some of these details have several options available depending on the situation. Choose the most suitable for your system's size and load.

Please refer to your Webb-Stiles Company General Catalog for overhead design information to assist in proper layout, design and installation of your system.

NOTE: A Layout should be made showing all support steel and hanger locations prior to starting installation of the conveyor.

Other overhead literature available on request.

"DISCLAIMER"

This suspension and installation guide is to be used as a reference guide only. It is not construed as complete for any situation that may be encountered nor for the situations as depicted herein. It is distinctly understood, however, that Webb-Stiles is not responsible, nor be held liable for any failure, loss, claim, expense, or damage caused by, contributed to by, or arising out of any information supplied or omissions, whether negligent or otherwise. Proper consultation of architectural engineer and mechanical engineer is suggested, prior to any installation and supporting of conveyors.

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TYPICAL OVERHEAD TROLLEY LAYOUT

NOTES:
- 4' 6" CHAIN - 4" 7/8" RAIL
- 6" TROLLEY CENTERS-91/50 LOAD EA.
- SPEED 7/2 FPM. MECH. 480/60/3
- 18" RADIUS ROLLER TURNS
- 18" RADIUS ROLLER TURN TAKE-UP
- 8" RADIUS X 30" SINGLE VERTICAL BENDS

PLANT VIEW BAKE OVEN LINE

FIGURE "A"
TYPICAL OVERHEAD TROLLEY CONVEYOR LAYOUT

PLAN VIEW SUPPORT STEEL-TAKE-OFF

FIGURE "B"
OVERHEAD TROLLEY LAYOUT SHOWING SUPPORT STEEL AND HANGER LOCATIONS

Circled numbers refer to detail drawings in this guide.
HIGH CARBON OVERHEAD CONVEYOR TRACK

The Webb-Stiles overhead conveyor track is a specially rolled I-beam section produced from C-1035 steel. The track is available in 3”, 4” and 6” track size. The conveyor track is stacked in 20 ft. lengths and can be cut to any required length.

Refer to Webb-Stiles General Catalog for complete dimensional data on turns, drives, take-ups, vertical bends and other components.

![Diagram of conveyor track]

<table>
<thead>
<tr>
<th>TRACK SIZE</th>
<th>WEIGHT PER FT.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
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<tr>
<td>3”</td>
<td>5.7#</td>
<td>3”</td>
<td>2.33”</td>
<td>.170”</td>
<td>.170”</td>
<td>.350”</td>
<td>1.84”</td>
<td>.270”</td>
</tr>
<tr>
<td>4”</td>
<td>7.7#</td>
<td>4”</td>
<td>2.66”</td>
<td>.190”</td>
<td>.190”</td>
<td>.396”</td>
<td>2.72”</td>
<td>.290”</td>
</tr>
<tr>
<td>6”</td>
<td>12.5#</td>
<td>6”</td>
<td>3.33”</td>
<td>.230”</td>
<td>.230”</td>
<td>.488”</td>
<td>4.47”</td>
<td>.330”</td>
</tr>
</tbody>
</table>

CHART “A”

HANGER ANGLE SIZE

Experience has shown that a common size of hanger and sway brace angle may be used to support a monorail conveyor. The chart below lists the sizes of angle that will typically provide sufficient conveyor support for these size conveyors under average loading conditions.

The below sizes are for straight runs, horizontal bends, vertical dips and rises and may also be used on take-up units. Conveyor drive hanger angle must be increased in size.

3” trolley conveyor 1-1/2” x 1-1/2” x 3/16” angles
4” trolley conveyor 2” x 2” x 3/16” angles
6” trolley conveyor 2-1/2” x 2-1/2” x 1/4” angles

(Minimum recommended sizes)

CHART “B”
TROLLEY LOADS AND SPACING OF HANGERS

RECOMMENDED HANGER SPACING FOR VARIOUS CONVEYOR LOADS

<table>
<thead>
<tr>
<th>TRACK SIZE</th>
<th>POUNDS PER FOOT OF CONVEYOR TOTAL LOAD</th>
<th></th>
<th></th>
<th></th>
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<td>50</td>
<td>75</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>300</td>
<td>400</td>
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<tr>
<td>3” - 1</td>
<td>18'-0''</td>
<td>13'-0''</td>
<td>11'-0''</td>
<td>10'-0''</td>
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<td>4” - 1</td>
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<td>10'-0''</td>
<td>8'-6''</td>
<td>7'-6''</td>
</tr>
<tr>
<td>6” - 1</td>
<td>20'-0''</td>
<td>20'-0''</td>
<td>20'-0''</td>
<td>18'-0''</td>
<td>16'-0''</td>
<td>14'-6''</td>
<td>13'-0''</td>
<td>11'-6''</td>
</tr>
</tbody>
</table>

CHART "C"

The chart is based on an evenly distributed load, i.e. closely spaced loads. For long loaded trolley spacing (more than 1/4 of the span) the loading must be analyzed as a simply supported beam and supported to limit the deflection to 1/360 - 1/450 of the span.

The following formula may be used:

The allowable stress in the compression flange shall be determined by the following formula:

\[ F = \frac{12 \times 10^6}{1d/Af} \]

but not more than .6 of the yield strength of the material

\[ \frac{1}{d/Af} \]

Where:

- \( 1 \) = Span between track supports in inches (mm) or twice the length of a cantilever not fully stayed at its outer end.
- \( d \) = Depth of track in inches (mm)
- \( Af \) = Area of compression flange in square inches (sqmm)

For other conditions, refer to AISC Specifications, Paragraph 1.5.1.4.6a.

TRACK HANGING METHODS

The conveyor track suspension methods shown are suggestions to illustrate how a conveyor system may be suspended from building trusses or header steel. Because every system has different hanging conditions, it is necessary to analyze each installation separately.

In all cases, the conveyor header steel and hanger assembly should be clamped by means of a heavy steel clamp to the building steel. Only under special considerations should hangers be welded to any building superstructure.

The conveyor hanger angles are usually bolted to clip angles welded onto the track and welded to clamp assemblies attached to building trusses or superstructure. In most cases all connections are welded except those to building members which are clamped. Hangers can also be bolted to header channel and components if desired. This permits a high degree of salvage should the conveyor path be changed.

Special anchor bolts are usually used for concrete ceilings and long or through bolts are usually used for connections to wooden building members and the superstructure framing must be designed to suit the ceiling conditions.
CLAMPING HEADERS TO BUILDING STEEL AND TRUSSES

Figure 11, Clamping header angle to superstructure or building steel.

TYPICAL DETAILS CLAMPING HEADER TO TRUSS

CLAMPING TO BOTH ANGLES OF CHORD

TYPICAL TRUSS CONNECTION

ALWAYS CLAMP HEADERS AT PANEL POINTS

Figure 12, Clamping headers to trusses.

Figure 13, Clamping headers to trusses.
HANGING COMPONENT SUPPORTS

Horizontal roller and traction wheel turns, take-ups and drives must all be specially suspended. These components are all subject to the reaction of chain pull and component weight and must be supported accordingly.

Generally the number of suspension points are determined by the size of the turn and the load on the conveyor. The larger the radius of the turn and the conveyor load, the more suspension points should be used. Normally, the design of the component provides the appropriate number of suspension points, but the following rules of thumb may be used:

1. On drives and take-up units a 4 point suspension should always be used.
2. On all Webb-Stiles box frame traction wheels a 4 point suspension should always be used.
3. On 180 degree roller turns or "T" frame traction wheel turns a 3, 4 or 5 point suspension may be used.
4. On 90 degree roller turns or "T" frame traction wheel turns a 2, 3 or 4 point suspension may be used.
5. On 30 degree, 45 degree and 60 degree roller turns or "T" frame traction wheel turns a 2 or 3 point suspension may be used.

Note that on most hangers it is necessary to provide a knee-brace back to a truss or other secure point to help prevent conveyor surge and sway.

Conveyor drives, due to their weight and chain pull reaction, require heavier hanger angle and should be sturdily braced as shown in Figure 20.
HANGING COMPONENT SUPPORTS

TYPICAL SUPPORT FOR 180 DEGREE TURN - DETAIL 4
SEE PAGE 3 FOR DETAIL LOCATIONS

Figure 18, Typical 5-point 180 degree roller or traction wheel turn suspension.
Figure 19, Typical 3-point 180 degree roller or traction wheel turn suspension.

(Note: On most hangers it may be necessary to provide a knee-brace back to a truss or other secure point to help prevent conveyor surge and sway.)
HANGING COMPONENT SUPPORTS

TYPICAL SUPPORT FOR 90 DEGREE TURN - DETAIL 5

BOX FRAME TRACTION WHEEL TURN - DETAIL 9

SEE PAGE 3 FOR DETAIL LOCATIONS

Figure 16, Typical 90 degree roller or traction wheel turn suspension.

Figure 17, Typical 30 degree, 45 degree, 60 degree roller or traction wheel suspension.

Figure 17a, Optional 30 degree, 45 degree, 60 degree roller or traction wheel turn suspension.

(Note: On most hangers it may be necessary to provide a knee-brace back to a truss or other secure point to help prevent conveyor surge and sway.)
HANGING COMPONENT SUPPORTS

TYPICAL DRIVE AND TAKE-UP SUPPORT - DETAIL 7

Figure 20, Typical suspension for conveyor drive or take-up. All drive hangers should be made of heavier angle than rest of system suspension to take increased weight and torque.

SEE PAGE 3 FOR DETAIL LOCATIONS

Figure 30, Typical side elevation with channel headers and supports.

CONVEYOR GUARD - DETAIL 10

*Size may vary due to size and load on overhead conveyor.
BRACING

Inadequate bracing is the single greatest cause of conveyor surge. If there is discernible movement in any turns and take-ups during conveyor operation the bracing is inadequate. The need for bracing is proportional to the cube of the hanger length. Figure 15 shows typical support elevations for hanger cross and sway braces.

![Diagram](image)

**Figure 15. Typical support elevations for hanger steel cross and sway braces.**

VERTICAL CURVES

Vertical curves are supported in the same manner as straight track. Generally though at least three support hangers are provided for each curve; One at the upper and lower tangent points and one in the middle of the dip if conditions warrant. In any case the span between supports on a vertical curve should not exceed that recommended for straight runs of track. Vertical bend hangers must all be sway braced because of the added loads due to chain pull. Chart "D" contains formulas for critical dimensions needed when installing vertical curves.

**VERTICAL CURVE FORMULAS**

![Diagram](image)

**TO FIND “M”**
- 20 degree \((2.924 \times D) - (0.353 \times R)\)
- 30 degree \((2.000 \times D) - (0.536 \times R)\)
- 40 degree \((1.596 \times D) - (0.728 \times R)\)
- 45 degree \((1.414 \times D) - (0.828 \times R)\)

**TO FIND “L”**
- 20 degree \((2.748 \times D) + (0.353 \times R)\)
- 30 degree \((1.732 \times D) + (0.536 \times R)\)
- 40 degree \((1.192 \times D) + (0.728 \times R)\)
- 45 degree \((1.000 \times D) + (0.828 \times R)\)

CHART "D"
SUSPENDING STRAIGHT TRACK

The spacing of supports for straight track is determined by the total load per foot of conveyor, including weight of chain and trolleys and conveyor live load. Refer to charts "B", "C" and "D". Diagonal sway braces are usually provided on all or alternate supports on straight runs. Figures 21 thru 27 and 37 thru 39 show typical arrangements of supports and superstructure for straight runs.
SUSPENDING STRAIGHT TRACK

Figure 21, Straight track hanger.

Figure 22, Straight track hanger from truss.

Figure 23, Straight track hanger with sway brace.

Figure 24, Straight track hanger with parallel tracks

Figure 27, Typical straight track from column.

Figure 28, Typical straight track from column.

Figure 29, Typical offset from hanger.
JOINING I-BEAM TRACK

Joining I-beam track is effected by welding together finished ends of track. Generally alignment devices are clamped to the rails being connected leaving approximately a 1/8" gap between the tracks for welding. Two alignment devices should be used to achieve proper rail alignment - 1 clamped to the web of the rail and 1 clamped to the bottom of the rail flange. A strongback angle clip, generally made of extra hanger angle, is welded to the top of the track. One side of the track and the bottom is then welded and ground smooth. Both sides of the track can also be welded if so desired. See Figure 28.

![Typical track weld splice.](image)

**Figure 28, Typical straight track weld splice.**

TRACK HANGER CONNECTION

Hanger angles are connected to track and components by means of a rail clip. Rail clips are usually made from 3 1/2" x 2 1/2" x 1/4" structural angle. The clip is welded to the track and the hanger angle can be either bolted or welded as customer desires. Figure 29 shows a typical track hanger connection.

![Typical track hanger connection.](image)

**Figure 29, Typical track hanger connection.**
FLOOR SUPPORTED CONVEYORS

The suspension of conveyors are sometimes impractical when the building structure is not adequate to support the additional weight of the conveyor and its load, or very high ceilings and trusses make it impractical. Drawings 25 thru 27 show different methods of floor supported conveyors. Columns are usually pipe, wide flange or channel selected for the individual loads and heights involved. Components are supported similarly to ceiling hung methods. Two, three or four columns are used to properly support turns, take-ups and drives.

Figure 25, Typical floor support for straight track or turns.

Figure 26, Typical floor support for parallel straight track.

Figure 27, Typical floor support for parallel straight track.
OVERHEAD CONVEYOR GUARDS

For employee safety, we recommend, and in many cases safety codes require, guards to be installed. The guards and other precautions listed here are not all-inclusive. Specific requirements for individual operations or industries must be satisfied by the customer. Nip points at traction wheels, sprockets, drives and roller turns should be guarded unless guarded by location. Guards should be provided to restrict unauthorized personnel from entering loading, unloading and transfer areas. When guarding is not feasible, clear and legible warnings should be provided. Flashing lights should be used to indicate the conveyor is in operation. Loads should be hooked or securely attached to the carrier to prevent accidental unloading at inappropriate locations.

Guards under high elevation conveyor runs, over work areas, machinery and aisles must be employed. Usually guards are field constructed to meet the particular conditions present.

A wide variety of materials are available for guard construction including woven wire mesh, expanded metal and sheet metal. Size and weight of parts being handled determine the correct choice. Support steel and headers are usually structural angles. Vertical heights should permit loaded carriers to clear any objects that may have fallen.

Construction can be all welded or all bolted as desired. Panels can be welded, bolted or clipped to support frames as desired. Figures 30 thru 34 show typical guards.

WIRE MESH TYPE

Wire mesh type conveyor guards, initially with higher material costs, are the least expensive to erect. The side and bottom panels have the lower corners spirally bound to form a light and strong assembly. Adjacent sections are field connected with helices. Standard sections are available in a large variety of widths to suit application. Hangers are usually spaced on 8 ft. centers, but may vary with load conditions. Figure 32.

EXPANDED METAL TYPE

The expanded metal guards are available in a large variety of gauges and sizes. 13 GA - 1 1/2" size mesh opening is Webb-Stiles standard, but the correct choice should depend on the size and weight of the load. Expanded metal guards are field fabricated. Structural angle is provided for bottom support and top and bottom stringers. Figure 33.

SHEET METAL TYPE

Sheet metal type guards normally are furnished on conveyors after washers or dip tanks where drippage may cause problems. Sheet metal guards are also often used on conveyors carrying small parts that normally would pass through expanded metal or wire mesh. Figure 34.
ORDER OF INSTALLATION

Horizontal turns, take-ups, drives and vertical curves should all be located, erected and installed first. All components and track should be located, leveled and aligned as exactly as possible. Straight track can then be erected between the components. Leave open a low point in the track at a convenient location so the trolley and chain can be introduced to the track. All wiring and piping required for drives and take-ups should then be done.

INSTALLATION OF TROLLEY AND CHAIN

A low, convenient point on the conveyor should be left open so the trolleys and chain sections can be threaded onto the track and joined together. The conveyor take-up should be fully collapsed. The trolley and chain must be walked around the system. Rope can be used to help pull the chain and trolley through the system. The conveyor drive can be operated to pull the trolley and chain through (be extremely careful and do not be introducing chain or trolleys to the conveyor when doing this.)

When all the trolleys and chain are installed on the track the open section of the track can then be welded and spliced together. A come-along can then be used to pull the chain ends together. The take-up may have to be adjusted out if chain does not match-up link wise.
OVERHEAD CONVEYOR SYMBOLS

These symbols are used by the overhead conveyor industry for overhead conveyor and Power & Free. The use of these symbols will aid others in reviewing your conveyor layout.

OVERHEAD TROLLEY SYMBOLS

HORIZONTAL STRAIGHT CONVEYOR VERTICAL CURVES

DIRECTION OF TRAVEL EXPANSION JOIN HANGER LOCATION

LOAD UNLOAD

SAFETY STOPS

TURNS DRIVES

UP DWN

ROLLER TRACTION WHEEL SPROCKET CATERPILLAR

TAKE-UPS

ROLLER TRACTION WHEEL

POWER & FREE SYMBOLS

POWER LINE FREE LINE

POWER-AND-FREE

AIR OPERATED STOP

MANUAL STOP

STOP & PUSHER

POWER ONLY EXPANSION JOINT

POWER AND FREE EXPANSION JOINT

LOWERATOR

COMPOUND VERTICAL CURVES

POWER RAIL

POWER-AND-FREE INCLINE or DECLINE

(Dimensions from floor to bottom of free rail)

FREELINE UPHILL SAFETY STOP

FREELINE DOWNHILL SAFETY STOP

POWER ONLY UPHILL SAFETY STOP

POWER ONLY DOWNHILL SAFETY STOP

POWER ONLY INCLINE SAFETY AND FREELINE INCLINE SAFETY DRIVES

PROKET 90° OR 180° CATERPILLAR (R.H. SHOWN, L.H. OPPOSITE)

ROLLER TURN TAKE-UP TRACTION WHEEL TAKE-UP

ROLLER TURNS

TRACTION WHEEL TURN

UNLOAD SWITCH LOAD SWITCH

POWER THRU R.H.

POWER THRU L.H.

POWER OUT R.H.

POWER IN L.H.

L.H. OPPOSITE R.H. OPPOSITE
At Webb-Stiles We Help Translate Our Customers Needs Into Reality Through Rugged Material Handling and Conveying Equipment

Webb-Stiles Company, main plant and corporate offices in Valley City, Ohio.

Webb-Stiles of Alabama, southern division in Gadsden, Alabama.

THE WEBB-STILES COMPANY

The Webb-Stiles Company was founded in 1956 and specializes in custom designed material handling equipment and systems. The company has grown and expanded over the past 30 years culminating with our main plant and corporate headquarters in Valley City, Ohio (just south of Cleveland) and our Southern division in Gadsden, Alabama.

We maintain engineering staffs at both locations with many years of conveyor experience in the mechanical, structural and electrical disciplines. The two plants consist of over 300,000 square feet enabling Webb-Stiles to handle all its fabrication work in-house.

The volume and diversity of conveyors manufactured by Webb-Stiles continually expands. It now includes many standard items, as well as a wide variety of specialty units.

Webb-Stiles also manufactures and installs all types of overhead trolley and Power & Free conveyors along with a complete range of floor conveyors of all types. We maintain sales engineers in our Valley City and Gadsden plants with sales offices in Atlanta and Detroit. For more information or assistance, please feel free to contact any of our offices.