

## Summary of Skewed Bridge Issues

Issue	Policy Change
If girders are going to rotate during deck placement, in what position should they be erected?	<p>All girders shall be erected with the webs plumb under steel dead load only.</p> <p>ODOT will not allow erection schemes that attempt to erect girders out-of-plumb and rotate to vertical under deck placement loadings.</p>
What is the maximum out-of-plumb rotation allowed under deck placement loading?	<p>For structures where a “Line Girder” analysis is permitted, the maximum out-of-plumb rotation due to placement of the deck may be estimated from the differential deflection between adjacent girder lines measured at the ends of each crossframe.</p> <p>The differential deflection (<math>\delta</math>) under deck placement loading shall be less than <math>S/100</math> where S equals girder spacing (ft.).</p> <p>For structures that require a “Refined” analysis, the out-of-plumb rotation due to the total deck placement loading shall not exceed <math>0.6^\circ</math> or 1/8 in. per ft.</p>
When should a “Refined” analysis be considered?	<p>For steel superstructures with skews between <math>30^\circ</math> and <math>45^\circ</math>, a “Refined” analysis may be required. Designers should compare the “Line Girder” differential deflections due to deck placement loading at each crossframe location with <math>S/100</math>. Excessive differential deflections may require a “Refined” analysis.</p> <p>For steel superstructures with skews <math>&gt; 45^\circ</math>, a “Refined” analysis of the superstructure is required.</p> <p>For prestressed I-beam superstructures, a “Refined” analysis of the superstructure is not required.</p>
What is the maximum amount of steel that can be added to a design to stiffen the superstructure?	<p>The maximum amount of steel that can be added to stiffen a steel superstructure shall not exceed 125% of the weight of the primary members from an optimized line girder analysis.</p>
What is the maximum amount of stiffening permitted for a prestressed I-beam superstructure?	<p>The Department will allow the addition of one beam line and/or the addition of beam depth up to the maximum depth permitted on PSID-1-99.</p>
When should the “Internal Lean-on” construction method be considered?	<p>The “Internal Lean-on” construction method should be considered only when a refined analysis indicates the out-of-plane rotations due to deck placement loading on a stiffened superstructure exceed the allowable twist.</p>

## Summary of Skewed Bridge Issues

Issue	Policy Change
When should the “External Lean-on” construction method be considered?	The “External Lean-on” construction method should be considered only when a refined analysis indicates the out-of-plane rotations due to deck placement loading on a stiffened superstructure with “Internal Lean-on” construction exceed the allowable twist for a stiffened superstructure.
Will the Department permit shoring of the superstructure during deck placement?	The Department will allow shored construction only upon approval of the Office of Structural Engineering.
When should designers investigate non-skewed or lesser skewed alternatives?	<p>For skewed alternatives that require a “Lean-on” method of construction, designers should also consider alternatives with longer spans that eliminate or reduce skew and straddle bents that span the under-bridge feature.</p> <p>For alternatives with similar costs, ODOT will prefer reduced skews over “Lean-on” construction methods.</p>
What is the role of BARS-PC for a structure designed using a “Refined” analysis?	For non-curved structures regardless of analysis method, the final design of a superstructure shall be rated with BARS-PC. The inventory rating factor shall be equivalent to HS25 or higher. Loading for future wearing surface should not be considered for rating.
What are important detail changes to remember for intermediate crossframes?	<p>Intermediate crossframe connections shall not contain slotted holes.</p> <p>Intermediate crossframe connections shall be fully welded or designed to prevent slip during the deck placement operations.</p> <p>For structures that require a “Refined” analysis, the intermediate crossframe members shall be designed for the calculated loads.</p> <p>For structures that permit a “Line Girder” analysis, standard intermediate crossframe designs are sufficient.</p>
What are important detail changes to remember for end crossframes?	<p>For skews <math>&gt; 30^\circ</math>, do not install end crossframe diagonals until deck placement in adjacent span is complete.</p> <p>Designers should investigate temporary bracing to resist the overturning load from overhang brackets acting on fascia beams/girders between ends and first intermediate crossframe.</p>

## Summary of Skewed Bridge Issues

Issue	Policy Change
<p>What are important detail changes to remember for end diaphragms?</p>	<p>For steel superstructures with skews <math>&gt; 30^\circ</math>, place end diaphragms after deck placement in adjacent span is complete.</p> <p>Designers should investigate temporary bracing to resist the overturning load from overhang brackets acting on fascia beams/girders between ends and first intermediate crossframe.</p>
	<p>For prestressed I-beam superstructures with skews <math>&gt; 10^\circ</math>, place end diaphragms after deck placement in adjacent span is complete.</p>
<p>What are important detail changes to remember for bearings?</p>	<p>Elastomeric bearings are preferred.</p>
	<p>Design bearings to accommodate the out-of-plane rotations.</p>
	<p>Do not bevel bearing load plates in the transverse direction.</p>
	<p>For structures that require a “Refined” analysis, design bearings to accommodate the varying end reactions.</p>