

SUBJECT: Structural Steel - Alignment of Bridge Shoes and Rockers

GENERAL:

The Section on Metal Structures in the Specifications indicate expansion shoes with slotted holes or rockers will be set with proper offset so they will be in normal position at 68°F as indicated on Plans. Grouting, welding and final tightening is to be completed after all adjustments are completed and approved.

PURPOSE:

To emphasize importance of setting expansion shoes and rockers on structural steel in proper positions and establish procedure for implementation and Inspection.

PROCEDURE:

A. Checking Bearing Lines, Anchor Bolts Holes and Masonry Plates:

1. Begin at fixed bearing locations, use steel tape to check layout of bearing lines on abutments and piers, correcting tape measurements to 68°F. (See Examples under B.3).
2. Centerline of each beam or girder is checked by measuring along bearing line. From each centerline point, check the anchor bolt locations. Anchor bolt holes shall be drilled to provide a diameter of at least 1 in. larger than the bolt diameter.
3. Masonry plates are to be checked for center on bearing lines which are normally at right angle to stringer lines.

B. Checking Adjustments of Structural Steel: It is best for the Contractor to make adjustments early in the morning on a cloudy or overcast day. This avoids dealing with changes in length of structural members due to variable temperature of steel exposed to direct sun light.

1. After the structural steel is erected, check each member at the fixed location. Adjust structural steel to match bearing lines of steel to masonry.
2. Next check relationship of bearing lines at expansion ends. If temperature of each beam or girder is constant, relationship between bearing lines of steel to masonry will be constant. At 68°F, center of slotted holes in expansion plates will coincide with center of anchor bolts and rockers will be plumb. Other than 68°F, bearing lines of structural steel will vary from bearing lines of masonry (See Examples under 3). To reiterate, make examination of bearing lines when steel temperature is constant to avoid complicating procedure.

Any additional variations in relationship between bearing lines of steel and masonry

CONSTRUCTION DIRECTIVE 07220.400.02

PROCEDURE: (continued)

indicate problems in fabrication. When this variation is not more than 1/2 " structural steel should be jacked forward or backward to bring bearing lines into required relationship in accordance to steel temperature. The 1/2" allowance results from extra wide holes drilled for anchor bolts. Although this can result in a variation of fixed end bearing, it is acceptable if clip angles for joint seal assembly are properly located in accordance with temperature requirements and not set according to ends of steel. When variation between expansion end bearing lines cannot be corrected by jacking, Project Engineer will request assistance from the Office of Bridge Development before proceeding further.

3. Determination of changes in length due to changes in steel temperature is necessary when steel is not at 68°F. The coefficient of expansion or contraction of steel is 0.0000065 per unit length per °F change above or below 68°F. The following examples are to illustrate proper position for expansion shoe plate and rockers.

Example 1 - Constant: If span length is one hundred 100' and steel temperature is 68°F then centers of slotted holes of expansion plates are to coincide with center of anchor bolts, and centerline of bearing or rockers are to be plumb.

Example 2 - Expansion: If span length is one hundred feet (100') and steel temperature is 90°F, then centers of slotted holes of expansion plates are to be one-hundredth foot (0.01') off center away from center of anchor-bolts and centerline of bearing or rocker will tilt one-hundredth foot (0.01') in direction away from fixed end of member.

Calculation: $0.0000065' \times 100' \times (90^{\circ}\text{F} - 68^{\circ}\text{F} = 22^{\circ}\text{F}) = 0.0143'$ or 0.01'

Example 3 - Contraction: If span length is one hundred feet (100') and steel temperature is 20°F, then centers of slotted holes of expansion plates are to be three-hundreds foot (0.03') off center towards the fixed end of member from centerline of or rockers will tilt three-hundreds (0.03') toward fixed end of member.

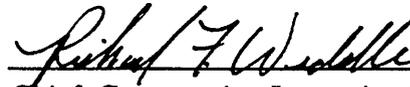
Calculation: $0.0000065' \times 100' \times (68^{\circ}\text{F} - 20^{\circ}\text{F} = 48^{\circ}\text{F}) = 0.0312'$ or 0.03'

4. When fabrication, erection and centerline layouts have all been correctly completed, adjusted and checked as previously described, the plates or rockers on expansion ends of all beams in a given unit will have the same offset in slotted hole or tilt to rocker. This is an essential requirement before anchor bolts are grouted in place. Final welding and tightening of bolts is not be made until after all readjustments of beams is completed.

CONSTRUCTION DIRECTIVE 07220.400.02

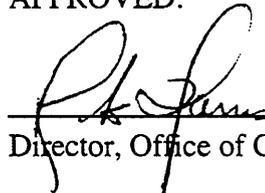
PROCEDURES: (continued)

NOTE: Some Plans establish normal temperature at 60°F instead of 68°F for setting expansion dams, and/or sliding plates and rockers of bridge shoes which then will require a normal of 60°F for calculations instead of 68°F.



Chief, Construction Inspection Division

APPROVED:



Director, Office of Construction