Design Standards Letter

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Section/Plan No.: **None**

Subject: **Single Point Urban Interchanges**

Body

With the increasing use of the single point urban interchange (SPUI), it is time to address the design of signal head supports for these interchanges. Although the interchange design may be unconventional, SPUI intersections can be designed utilizing our existing mast arm-style signal structures.

For signal designs involving the conventional overpass SPUI, single tube structures have been proposed and used to support the signal heads for all approaches and span the entire roadway. MoDOT has standard plans for single and double tubes for *sign* supports (Tubular Support Steel - Type S). This design was not intended for signal applications.

Many concerns have been raised regarding the signal support system for these types of interchanges. These include the following:

• When the SPUI is designed with the intersection on top of the bridge deck, the signal structure must be attached to the bridge. If a vehicle strikes the support, damage to the bridge structure may occur.
• We do not know the long-term performance of these signal support types. A survey, conducted as a part of NCHRP 17-10(2) showed that eight states have identified fatigue problems associated with non-trussed overhead bridge-type traffic control structures.
• If the overhead structure is knocked down, the traffic control for the entire intersection is lost, and the span would most likely block the entire roadway, virtually closing the road until it can be removed.
• When a mast arm is lost, there are a couple of options available as a temporary fix - a similar arm can be found in the used equipment storage lot, or wood poles and span wire signals can be installed. Since the signals must span a bridge, the wood pole solution is not applicable. Due to the fact that these single-tube structures must be custom-designed for each project, replacement parts would be unavailable from our used equipment storage lots. Therefore, emergency fixes are not feasible and the district would be forced to place this intersection under 4-way stop control in the event that a signal structure was knocked down.
• With a mast arm design, the signal indications are located directly over each lane

approach, where our signal electricians can perform routine maintenance by closing just one or two lanes for a single approach. Routine maintenance on the tube-type structure and signal heads would place MoDOT personnel in the middle of the intersection with traffic approaching from all sides. This places undue hazard on our signal and lighting maintenance personnel and will require more complex traffic control for routine maintenance operations.

We recommend that this design, incorporating signals for all approaches on a single overhead signal structure, be avoided if at all possible. If single tube structures absolutely cannot be avoided, effective July 1, 2001, the districts will be required to submit a design exception to General Headquarters Design for approval to use the tube structures for signal supports. Four complete sets of shop drawings, supporting stress calculations and other required documents must be submitted for approval prior to the fabrication of the posts or installation of the supporting bases in accordance with Sec 902 of the Standard Specifications. The shop drawing approval process can take anywhere from 6 months to a year, so please be advised that this requirement could delay construction or the installation of traffic signals.

Any support located on the bridge deck must be protected by an appropriate type of barrier. Protection is provided for the structure support to decrease the possibility of the signal tube base being struck by a vehicle and causing damage to either the signal support or the bridge structure. The plans shall clearly indicate appropriate barriers.

Information pertaining to SPUI interchange design will be placed into the Project Development Manual in July. Please contact General Headquarters Design if you have any questions.