**Identifying Classifications for the M-40a Form**

Form M-40a, *Request for Final Soundings of Structures,* requires two descriptions, as follows.

**Route Classification (Major or Minor)**

This is a broad description of a roadway as defined by MoDOT. It is based on a more narrowly defined functional classification system of roadways. Only two broad classes: Major and Minor, are used to represent three functional classes: principal arterials, collector and local roads. Major Highways (also Roads, Routes or Roadways used interchangeably) are principal arterials only. Minor Highways are collector and local roads only. An example layout of route and route classification is given on Form M-40a for a grade separation. Any description used for Route and Route Classification on Form M-40a should follow directly from the Bridge Memo. The map of Major Highways is available at <http://wwwi/intranet/tp/documents/Major_Highway_System.pdf>.

**Bridge Classification**

This is a description of the bridge in terms of route classification carried, or length and cost of a bridge. It is strictly associated with the final selection and design of the foundation type for a proposed bridge. Foundation types for which this description is necessary are drilled shafts and spread footings as may be found in EPG 751.37 Drilled Shafts, <http://epg.modot.mo.gov/index.php?title=751.37_Drilled_Shafts>, and 751.38 Spread Footings, <http://epg.modot.mo.gov/index.php?title=751.38_Spread_Footings>, (in the future driven piles may be included making all foundation types subject to this criteria). Foundation design is then based on a pre-determined probability-based level of structural foundation performance exceedence (reliability) characterized by a set of geotechnical foundation coefficients of variation and resistance factors using AASHTO LRFD load factors. There are four Bridge Classes: Bridge on Minor Road, Bridge on Major Road, Major Bridge<$100M, Major Bridge>$100M.

Identifying both the route and bridge class on Form M-40a will allow the Geotechnical Section to determine the appropriate geotechnical coefficients of variation and resistance factors both of which are also based on the proposed foundation type.

**Virtual Bridge Classification**

The reliability of the final foundation design can be arbitrarily increased or decreased by selecting an alternative (or virtual) bridge class other than the official bridge class. The notion of using a virtual bridge class for this purpose was not originally considered in the research leading to the exclusive development of the reliability-based geotechnical coefficients of variations and resistance factors for foundation design for MoDOT. Criteria have not been developed for when and where the notion of arbitrarily effecting a change in the reliability of a particular foundation design can and should be implemented. **Consult with the Assistant State Bridge Engineer, Structural Project Manager or Structural Liaison Engineer regarding implementation** after which it can be formally addressed at the Bridge Memo conference. Because the coefficients of variation and resistance factors are related specifically to geotechnical reliability and performance, it is important that consultation with the Geotechnical Section be maintained.

Example 1

Using a virtual bridge classification for the purpose of increasing the reliability of the foundation design, consider a “Bridge on Minor Road” over a major road where the reliability of the foundation is reasonably perceived to be more critical/sensitive than usual because of anticipated settlements and its effects, either differentially or uniformly, on vertical clearance. An objective assessment of the situation should involve both the Bridge Division and the Geotechnical Section whereby agreement is reached that reasonably asserts that in this case either the overpass should have the foundation designed to a greater level of reliability in limiting and controlling settlement and hence a (virtual) bridge classification of “Bridge on Major Road” be used in the determination of the coefficients and resistance factors, or that in this case the actual bridge class be used. In this example’s situation, it is important that the decision be conclusively arrived at by consensus and wholly based on sound and practical reasoning via communication between the appropriate divisions responsibly involved.

Example 2

Perceived increased risk of settlement that could cause differential settlement and greater than anticipated deck cracking due to unknowns

Example 3

Perceived increased risk of vehicular collision to “Bridge on Minor Road” over major road and greater than anticipated loading to foundations due to unknowns

Example 4

Perceived increased risk of other geotechnical factors that could influence structural integrity of “Bridge on Minor Road” over major road and greater than anticipated load effects due to unknowns (or “Bridge on Minor Road” over stream)

Example 5a

Perceived increased risk of seismic loading to foundations and greater than anticipated damage to foundation due to unknowns (or alternatively perceived increased seismic safety level required exceeding existing seismic design criteria)

Example 5b

Perceived increased risk of seismic loading to “Bridge on Minor Road” over major road and greater than anticipated damage to foundations due to unknowns that would directly affect and for the express purpose of preventing traffic interruption on major road with consideration given to the influence and availability of ramps that can be utilized as alternate (bypass) routing for major road