

## **Design Flow Guideline for Local Road Bridge-Size Structures**

### Introduction

Some concern has been expressed that optimization of stream crossing sizing on the local road system is not consistently being obtained, resulting in over-sizing of structures. As a result, interest has been expressed in providing a separate practice for sizing local road structures based on a reduction in design flow.

### Background

Hydrotechnical design parameters for bridge-sized stream crossings on the provincial highway system are determined as per the published AT Hydrotechnical Design Guidelines. These parameters are intended to be used to evaluate a range of structure sizing options, with the optimal size selected based on evaluation of cost, risk and performance. Some guidance on performance factors to consider is presented in the published document “Culvert Sizing Considerations”. Based on this approach, structure options on a busy provincial highway and a low volume local road crossing the same reach of stream would be evaluated using the same hydrotechnical parameters, but different sizes may be selected as optimal based on the evaluation procedure. The large, design-worthy flood event is independent of the category of infrastructure crossing the stream, but varying levels of performance and risk may be deemed acceptable for different infrastructure categories.

Currently, AT provides funding for design of these crossings, but does not participate directly in the engineering design. It is believed that this may result in many stream crossings on local roads being over-designed.

As a result, a study was undertaken to assess the sensitivity of structure sizing to design flows and to assess some options for mandating a reduced design flow for local road structures. The resulting report entitled “Evaluation of Risk Study – Local Road Culvert sizing Sensitivity Analysis” concluded that designing for 75% of the full design flow would result in a small reduction in structure size while maintaining performance that is likely to be acceptable at most sites. However, it was found that designing for 50% of the full design flow would result in structure sizes that could result in unacceptable risk of failure at many sites. The report recommended continued application of the process used on the provincial highway system.

### Recommendation

At the direction of BPMC, the practice of designing local road bridge-size stream crossing structures for 75% of the design flow calculated based on the published Hydrotechnical Design Guidelines has been adopted. However, for high velocity channels ( $V > 2.5\text{m/s}$ ) with flood-sensitive property upstream, flooding impacts should be evaluated at the full design flow. In addition, fish passage considerations during the DFO authorization process

may affect structure sizing in some cases. Consideration should also be given to sizing a structure to allow for future lining at sites with relatively high traffic volumes and/or high fills.

### Contact

Questions or further information on this guideline may be directed to the Bridge Planning Specialist in the Bridge Engineering and Water Management Section of Technical Standards Branch or the Bridge Manager in one of the Department's regional offices.