

4.5 Types of Bridge Structures

4.5.1 Bridge Superstructures

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Unapproved superstructures or systems

Before an unproven system or product is implemented, bring it to the attention of Engineering Branch for evaluation. If the branch determines that products or systems provide efficiencies and meet stringent performance requirements, those components are incorporated into the Forest Service Bridge Design and Construction Manual as acceptable ministry standards.

Deviation from the requirements of the Forest Service Bridge Design and Construction Manual and the associated standard drawings is not recommended. Where an unapproved structure or system is being considered for a project before the branch has completed its review and acceptance of such structures, contact the Ministry Engineer for input into the implementation requirements.

Approved superstructures or systems

Approved ministry superstructure configurations, identified in the Forest Service Bridge Design and Construction Manual, provide for numerous construction options such as:

- timber decks on steel;
- precast concrete slabs;
- non-composite concrete decks on steel girders;
- composite concrete decks on steel girders;
- all steel portable bridges;
- Compo-Girders™; and
- steel-free decks (precast concrete arch panel composite deck).

Generally, use the following “rules of thumb” to help guide estimating or evaluating conceptual designs for typical single-lane, simply supported, permanent single-span bridges. Note that these rules of thumb are for completed in-place structures which consider both the materials and installation costs for the finished product. For example, materials for an application may be cheaper than some others, but the finished structure may cost more due to higher installation costs:

- For spans 12m or less, concrete slab structures are typically most economical. They are particularly conducive where there are alignment issues such as skews or extra width is required to accommodate vehicle tracking on curves. Precast concrete slabs are extremely heavy, and as

such are expensive to ship and difficult to launch. The equipment that will be used to launch and place them **must** be considered when selecting component size in the design phase.

- For spans between 12 and 18m, non-composite concrete decks on steel girders are typically most economical. They can be set up to allow for bolted deck connections, providing for bridge removal and use elsewhere.
- For spans greater than 18m, composite concrete decks on steel girders are typically most economical. Concrete composite deck panel installation involves grout work that requires attention to quality control, is labour-intensive and time-consuming, and the deck panels are not easy to dismantle.
- In addition to the above, for some configurations, an economical solution might be timber deck on steel girder superstructures, or less likely, all steel portable superstructures. Generally, all steel portable superstructures are much more expensive than other options. All steel portables are recommended only where they are being utilized for temporary situations and moved from site to site.

4.5.2 Bridge Substructures

Several types of substructures are available to support bridge superstructures. When determining the substructure options for a particular site, base the selection on the type of superstructure, operational requirements, and specific-site conditions.

Substructure types range from simple log sills to driven piles. The Forest Service Bridge Design and Construction Manual presents numerous permanent bridge substructures standards. The standard design drawings in the manual typically consist of precast concrete spread footings and are suitable where adequate soil bearing can be obtained. The standard drawings also provide for “T” footings, suited to concrete slab girder superstructures requiring shallow abutments; and steel pipe columns on precast footing standards, suited to steel girder superstructures and concrete slab superstructure requiring higher abutments.

Consult the Forest Service Bridge Design and Construction Manual for the standards on cap and bearing details for pile foundations.

The following structures are examples of those not captured in standard design drawings in the Forest Service Bridge Design and Construction Manual:

- log cribs (suited to temporary usage);
- interlocking concrete block abutments (typically limited to three blocks high); and
- steel binwalls (numerous steel binwalls exist, but few new ones are being installed).