Title:	**Buried Approach Slabs in Integral and Semi-Integral Abutment Bridges**
Division:	Transportation Infrastructure Management Division (TIMD)
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Implementation

This memorandum is effective as of the date of issue.

Background

Integral and semi-integral abutment bridges require less maintenance than conventional abutment bridges equipped with expansion joints and bearings. Consequently, an increasing number of integral and semi-integral abutment bridges have been built over the past decades in Ontario. The movements of the bridge ends caused by creep, shrinkage, and temperature effects are approximately proportional to the length of the bridge and become significant in longer bridges. Generally, on bridges with a total length greater than 40 m, expansion joints are required at the end of the approach slab to accommodate these movements. Additionally, sleeper slabs must be installed for the expansion joints, and an additional construction sequence must be accommodated, often at the end of the construction season. The details of expansion joints with sleeper slabs at the end of approach slabs have become more robust over the years, adding to the time to construct them.

Over the last two decades, the MTO has studied, constructed on trial basis, and monitored the performance of buried approach slab details at integral and semi-integral abutment bridges. The asphalt pavements over buried approach slabs have performed well to date without any major issues. Therefore, the MTO is introducing a standard for buried approach slabs and requirements for their use.

Buried approach slabs (without expansion joints and/or sleeper slabs) transmit moderate bridge movements directly into the earth behind the abutments. The granular backfill between the approach slab and the pavement allows the movement to be distributed across a longer length of pavement. Using a buried approach slab makes it

possible to repave and adjust the grade in response to any settlement of the approach embankment, if required.

Policy

1. Buried approach slabs shall be used for all new integral and semi-integral abutment bridges without sidewalks, within the following limits:
    - In concrete bridges with lengths more than 30 m but not exceeding 125 m;
    - In steel bridges with lengths more than 30 m but not exceeding 100 m;
2. Buried approach slabs may be used on bridge rehabilitation projects when the approach slab is replaced, subject to the same limits as new bridges.
3. The feasibility of using buried approach slab is influenced by the factors described in Appendix A.
4. All bridge designs using buried approach slabs shall incorporate the drawing SS105-18 into the design package.

Appendix A

1. **Use of Buried Approach Slabs in Integral and Semi-Integral Abutment Bridges**

    - The selection of approach slab detail to be used for a bridge depends primarily on the design movement.

    - Integral and semi-integral abutment bridges with lengths less than 30 m shall use an at-grade approach slab with form and fill groove details according to SS105-15 as shown as Figure 1

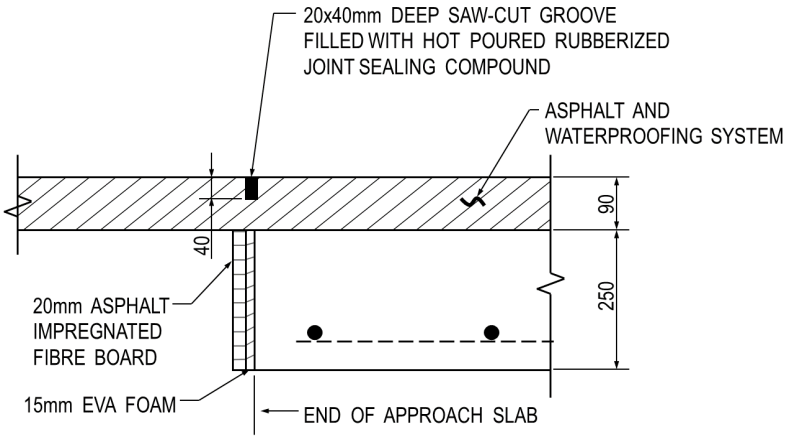

Figure 1. Isolation joint at the end of approach slab for small movement

- Steel integral and semi-integral abutment bridges with lengths greater than 100 m and concrete integral and semi-integral abutment bridges with lengths greater than 125 m shall use an at-grade approach slab with sleeper slab and expansion joint as per SS105-17.

2. **Geometric Constraints**

    - There are no geometric constraints for using buried approach slabs with integral and semi-integral bridges. They may be used in skewed and/or curved bridges.

    - A buried approach slab may be used for bridges with sidewalks and a barrier wall supported on a moment slab over the MSE wall, provided that proper detailing is incorporated and subject to approval by the Head of the Structural Section.

3. **Slab Inclination**

    - A 5% slab inclination is typically recommended for true abutments, with up to 10% inclination considered as a project-specific condition.

- A slab inclination between 2 and 5% is recommended for false abutments with MSE walls when an inclination of 5 to 10% cannot be accommodated due to MSE wall system constraints (e.g. reinforcing strips).
- The crossfall of the approach slab may match the roadway surface crossfall or be detailed to be level across the width of the bridge.

4. **Concrete Slab**

- A typical 250 mm slab thickness is recommended for buried approach slabs. Up to 400 mm thickness may be considered as a project-specific condition.
- Two orthogonal layers of reinforcing steel shall be provided in the slab.
- Cast-in-place concrete is the standard construction method, but precast concrete can also be considered as necessary.
- A typical square deck end connection detail with dowels from the deck end is required.
- Slab end detail (vertical vs. taper): a vertical slab end detail for CIP concrete is recommended, but tapered end details may be considered for precast concrete.

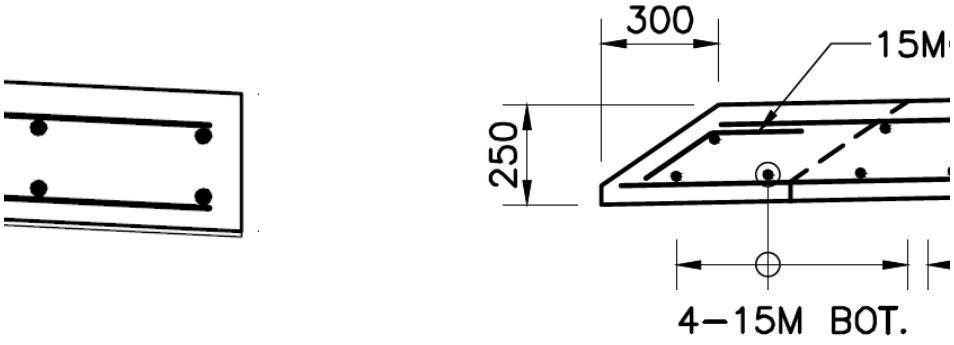

Figure 2. Sample slab end details (vertical vs taper)

- When precast concrete units are considered, the size and number of panels are based on shipping and handling constraints. CIP closure strip connection between panels is not required in typical cases.

5. **Use of Sleeper Slab**

- A sleeper slab shall not be used with buried approach slabs within the length requirements of this policy. Buried approach slabs with a sleeper

slab may be considered for bridge lengths exceeding the limits, with Approval from the Head of Structural Section.

6. **Pavement Over Buried Approach Slabs**

   - For shorter bridges located on paved roadways with total lengths up to 50 m, the pavement over the buried approach slabs shall consist of a minimum of two lifts of asphalt pavement, with a total thickness of 80 to 100 mm. For longer bridges located on paved roadways, up to the limit of the buried approach slab, the pavement over the approach slab and 3 m beyond its end be continuous, consisting of a minimum thickness of 160 to 200 mm. The pavement system beyond the approach slab shall match the thickness of the pavement of the approach roadway.
   - For bridges located on unpaved roadways, the surface system over the buried approach slab shall match the surface type and thickness of the approach roadway pavement.
   - The use of geosynthetic pavement reinforcement materials (e.g. GlasGrid) is not recommended.
   - A form and fill groove (20mm wide by 40mm deep) detail is provided at the deck end.
   - Buried approach slabs are not intended for use with concrete pavements. Contact the Structures Office for standard drawings for a transition from asphalt on the approach slab to concrete pavement.

7. **Backfill over the Buried Approach Slab**

   - Granular backfill shall be placed directly on the buried approach slab concrete below the pavement.
   - The use of geosynthetic backfill reinforcement materials over the buried approach slab is not recommended.

8. **Standard Drawing**

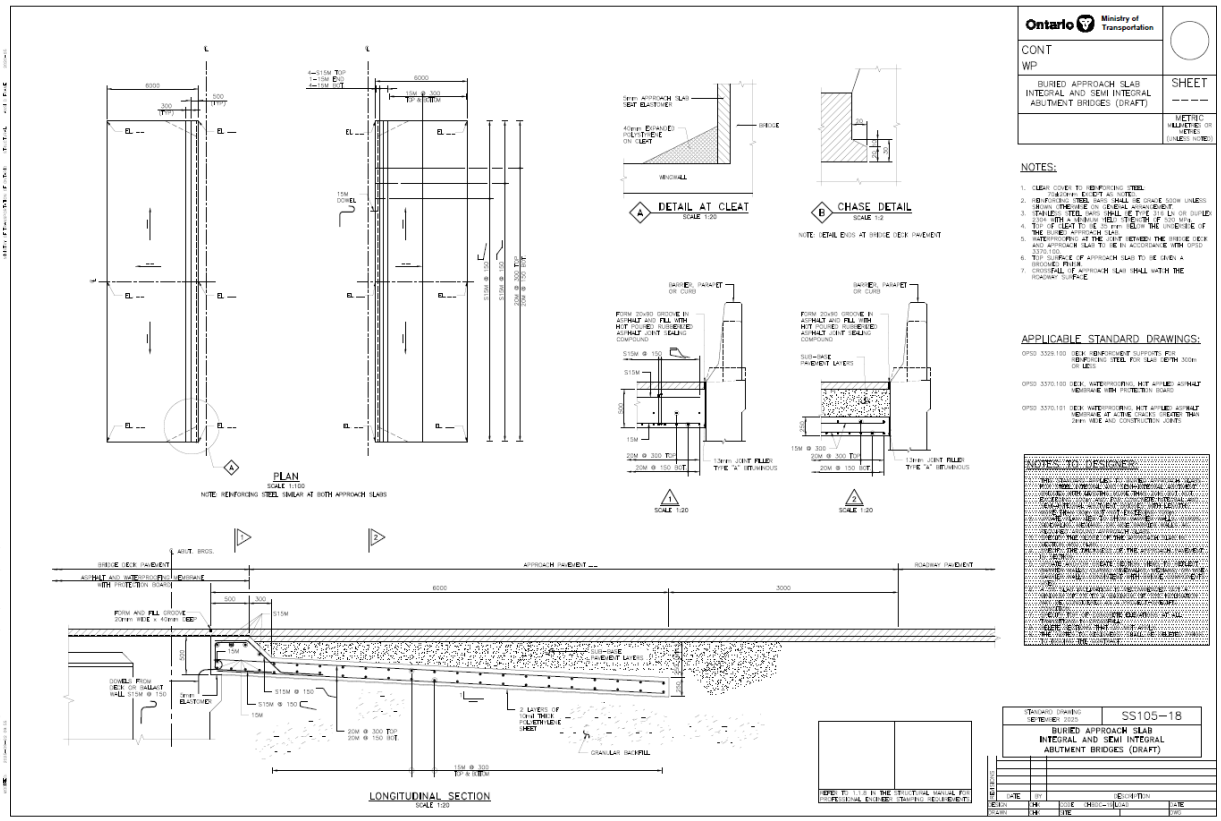

Figure 3: Structural Standard Drawing SS105-18