3.1 Type-1: Pavement Bridge System

The ‘bridge’ is the simplest concept of continuous hard pavement surface over the root zone. Two bridge options have been designed: reinforced cast-in-place concrete panels (Type-1A) and precast panels (Type-1B). Soil cells can also be used to support the panels.

Type-1A: Cast-in-place structural concrete panel ‘bridge’

Construction

A concrete slab is cast in place and spans the root and soil zone and around the tree opening. The concrete requires reinforcement. See S-1 Construction Drawing in Appendix A). The structural concrete slab rests on the back saddle of the curb at the roadside and a grade beam (concrete shoulder) at the back of the sidewalk. Soil is backfilled prior to pouring the structural slab using biodegradable foam board on top of the soil as the concrete form. See T-1A Construction Drawings in Appendix A.

Utility access

The slab must be broken open in order to access utilities below. The slab can also be core drilled at corners and hooks inserted to lift it out. To avoid core drilling into internal reinforcing, the reinforcing bars should be located by conventional scanning prior to core drilling. Utility is accessed by excavation of planting soil or granular.

Repair

If the concrete slab must be broken open to access the utility, the slab must be repoured with reinforcing to reinstate it as a walkable surface. In this case, a two-stage repair is not possible.

If the slab is core drilled and lifted out, it could be replaced after utility work, the core drill holes grouted and the inevitable unevenness between the replaced slab and existing condition feathered smooth with asphalt. In this case, a two-stage repair is possible, but not recommended.

Recommended compatible utilities

Recommended compatible utilities are those that are generally only accessed in planned repairs, i.e. unlikely

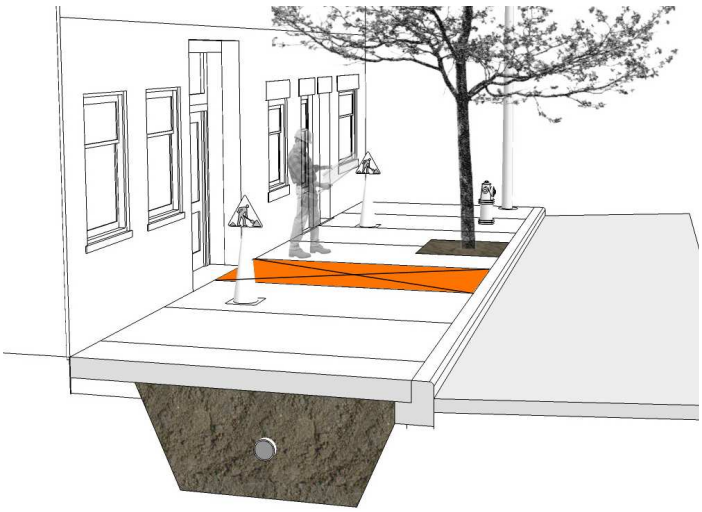
Type 1A -Cast-in-place structural concrete panel ‘bridge’

to fail in an emergency situation, except by damage via other utility works in the area:

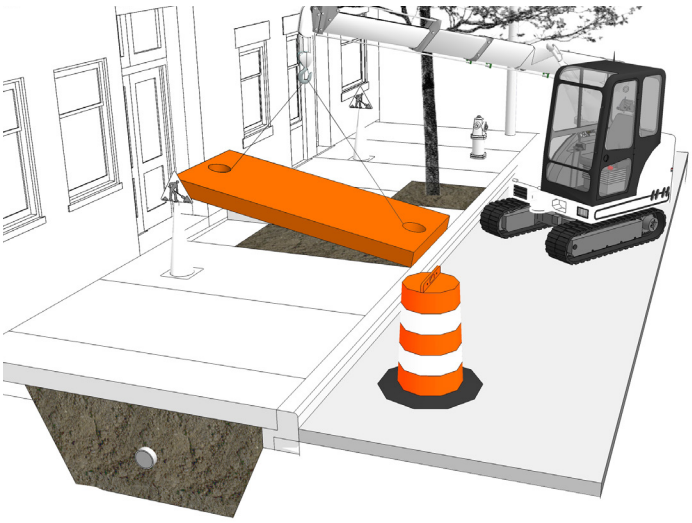
- New generation storm line (concrete)
- New generation sanitary line (concrete)
- Concrete-encased hydro duct, combined data
- District energy

Not generally recommended:

- Pressurized water main
- Gas (main or lateral)
- Bare conduit (street lighting, telephone, etc.)



Utility access, step 1



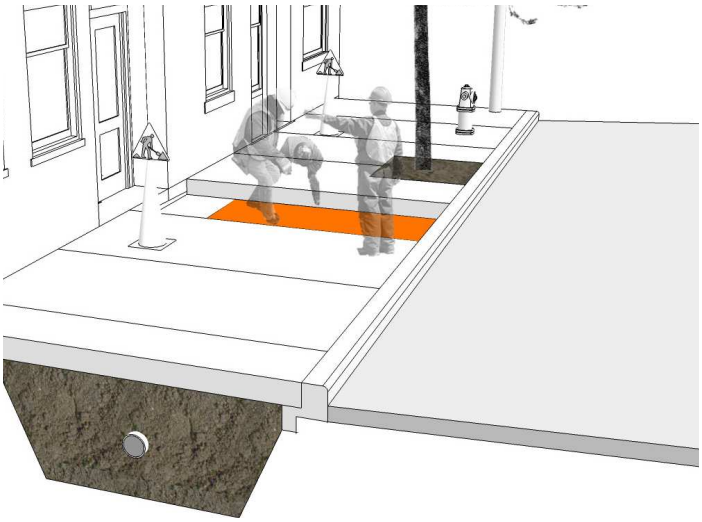
Utility access, step 2

Surface finish

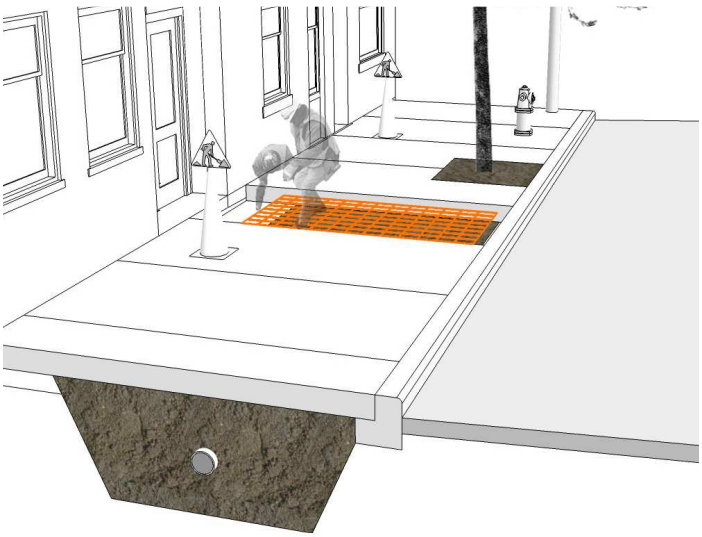
The concrete surface of the structural slab provides the finished sidewalk surface when poured in place. This could be used as a base for unit paving. The precast option is easier for repair work. See next section on Type-1B.

Pros and Cons

The cast-in-place structural concrete panel ‘bridge’ is fairly cost-effective as it does not need to be covered with unit paving to provide a finished surface. Options for utility access and pavement repair are limited, though.



Utility access, step 3



Utility access, step 4

Type-1B: Precast structural concrete panel ‘bridge’

Construction

A precast structural concrete panel forms the base for unit paving. See T-1B and S-2 Construction Drawings in Appendix A. The panel spans between the back saddle of the curb at the roadside, and a grade beam (concrete shoulder) at the back of the sidewalk. Soil is backfilled prior to placing the precast structural slab. Once the slab is in place, filter fabric is laid down over the precast panels in order to prevent migration of fines. Setting bed and unit pavers are installed on top.

Utility access

Unit pavers are removed and set aside. In an emergency situation where a two-stage repair is absolutely necessary and the crew is not capable of replacing unit paving, the unit pavers would be removed from site for future installation. Filter fabric is cut and peeled back, precast concrete panel is lifted out and set aside. Utility is accessed via excavation of planting soil / granular below.

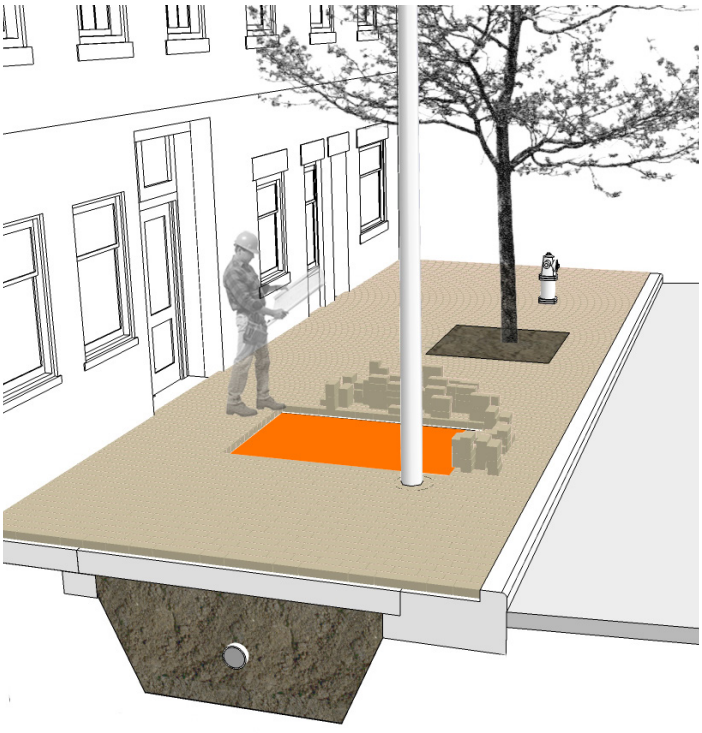
Repair

After utility is backfilled with granular to underside of root zone, planting soil is backfilled and precast concrete slab is laid. Filter fabric is laid back on top of the precast panels. When a one-stage planned repair is possible, unit pavers should be replaced. When this is not possible, the finish surface could be replaced with asphalt until permanent repair. This is not recommended under normal circumstances.

Recommended utilities compatible with root zone

This system is generally compatible with utilities listed below since the panels can be lifted out. Procedures / agreements would need to be negotiated in order to facilitate the additional scope of the panel removal / replacement:

Type 1B - Precast structural concrete panel ‘bridge’



Utility access, step 1

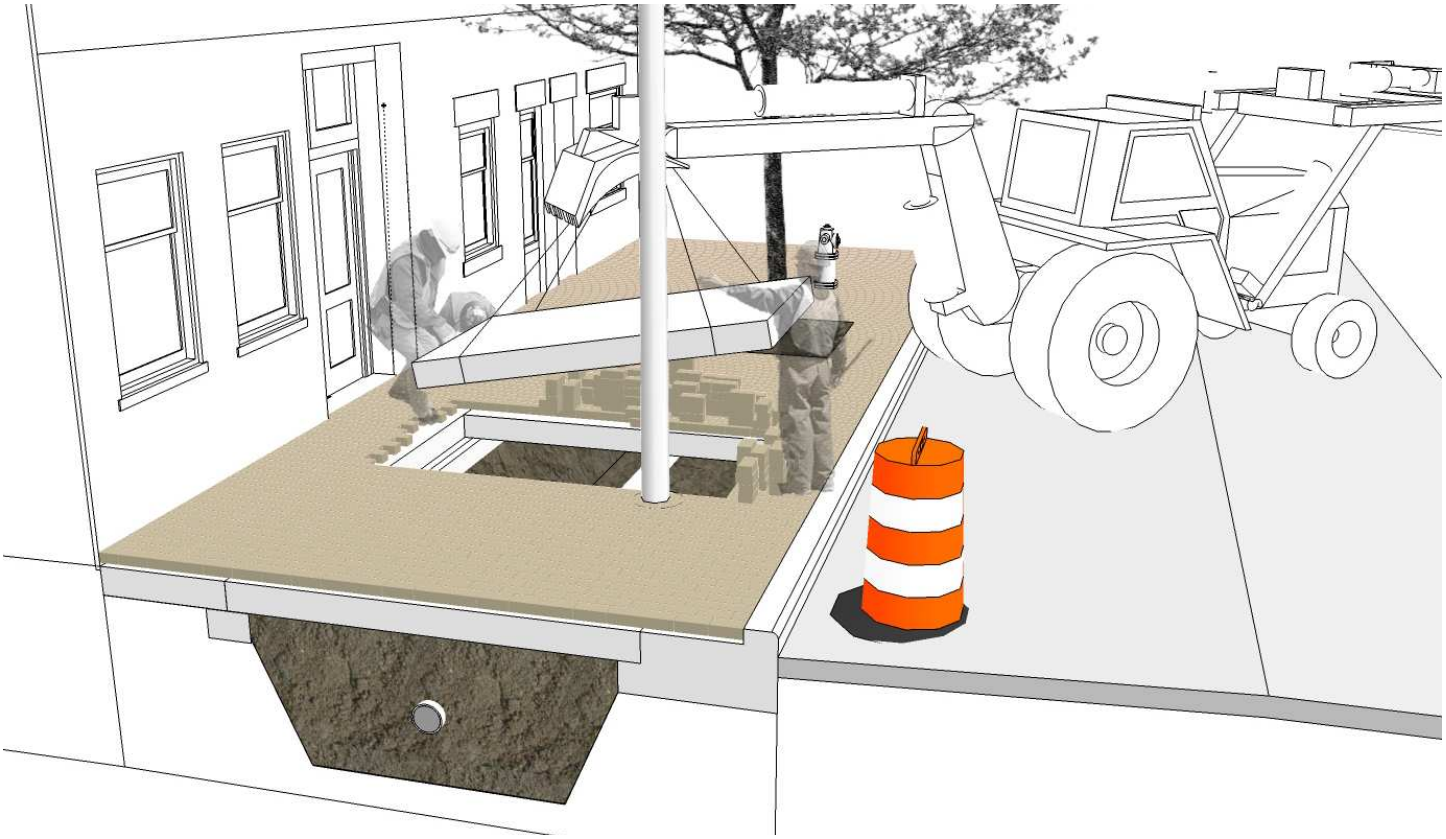
- New generation storm line (concrete)
- New generation sanitary line (concrete)
- Concrete-encased hydro duct, combined data
- District energy
- Pressurized water main
- Gas (main or lateral)
- Bare conduit (street lighting, telephone, etc.)

Surface finish

Since the precast panels are designed with notches as lifting points, and would not be reliably flush to each other due to on-site construction tolerances, a surface finish of unit paving is required to be installed on top.

Pros / cons

Two pavement systems are required: the precast concrete base and unit paving finished surface. This system is fairly efficient for dismantling and repairing and revising components.



Utility access, step 2