1 Tunnel Design

1.1 Cast in Place concrete or Precast concrete shall be provided. Corrugated metal pipe, poly or other prefabricated units are not permitted.

1.2 Precast tunnel systems shall consist of a three-sided, bottom and sides section with a removable top assembled to form a completely enclosed tunnel.

1.3 Precast concrete units shall be tested and conform to the current edition of the American Concrete Institute Standard ACI-711, Section 301.

1.4 Tunnel top should integrate the sidewalk surface where applicable.

1.5 Tunnel lifting hooks for precast tunnels shall be recessed and the joints shall be properly sealed and watertight.

1.6 Pipe support steel and anchor plates shall be provided in the precast tunnel top at regular intervals not to exceed 8'-0" on center.

1.7 Concrete mix designs for tunnels shall include a Crystalline waterproofing admixture (Xypex®) at the dosage specified by the manufacturer.

1.8 All tunnels shall be designed in accordance with AASHTO LRFD Bridge Design Specifications and for AASHTOHL-93 vehicle loading.

2 Soil Conditions

2.1 Soil conditions shall be determined for each application by a Geotechnical Engineer registered in the state of Indiana.

2.2 All backfill adjacent to precast trenches, concrete utility tunnels and other underground concrete structures subject to vehicular loading shall be flowable fill.

3 Tunnel Gaskets

3.1 Manufacturer shall flexible plastic gaskets for all joints in the installation.

3.2 Manufacturer shall also provide a sufficient quantity of primer to adequately prepare joints for installation under wet conditions.

4 Tunnel Manhole Frames and Lids

4.1 Manhole frames and lids shall be selected for each application with Purdue approval.

5 Tunnel Top Waterproofing Standards

5.1 Underground/Buried Tunnel: 60 mil nominal thick Elvaloy KEE based thermoplastic membrane reinforced with a 5.0 oz. weft inserted knit polyester fabric integrally bonded to an Active Polymer Core (APC).

5.1.1 Heat-welded seams

5.1.2 Wrap membrane down sides of tunnel to the top of the footing.

5.1.3 Warranty: Special Manufacturer's Warranty: A written non-prorated waterproofing warranty, covering both materials and labor, in which manufacturer agrees to repair or replace waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

5.1.3.1 Warranty Period: 15 years from date of Substantial Completion.

5.1.3.2 Warranty shall include removal cost, subsequent system repair, and replacement of the overburden, paving, etc. at manufacturer's expense for repairs resulting from the loss of water tightness due to failure of the waterproofing system, if necessary.

5.1.3.3 Warranty shall be a 'no dollar limit' warranty.

5.1.3.4 Contractor is responsible for installing the system as required to achieve the manufacturer's warranty requirements.

5.2 Drainage Panels

5.2.1 A three-dimensional polypropylene drainage core with a woven geotextile adhered to one side to allow water passage while restricting soil particles. Composite includes a thin polyethylene sheet on the back of the drainage core.

5.2.2 Minimum compressive strength of 18,000 psf (ASTM D1621)

5.2.3 Minimum flow of 1.34 gpm/ft width at 3600 psf sustained for 300 hours, and hydraulic gradient of 0.01 (ASTM D4716)

5.2.4 Filter fabric shall have a permeability coefficient of 0.015 cm/sec

5.3 Exposed Tunnel Top: Liquid applied traffic coatings complying with ASTM C 957.

5.3.1 Minimum dry film thickness of 55 mil

5.3.2 Color as selected by the Owner

5.3.3 Provide uniformly graded washed silica sand of particle size, shape and minimum hardness recommended by the manufacturer spread to refusal to achieve a slip-resistant finish

5.3.4 Acceptable manufactures include:

5.3.4.1 Autogard: Neogard

5.3.4.2 Sikalastic: Sika

5.3.4.3 Pecora Deck 800: Pecora