(f) Blows for each 6 inches of penetration for the standard penetration test described in ASTM D 1586. Blows for lesser penetrations should be recorded.

(g) Percent recovery and Rock Quality Designation (RQD) for all rock cores.

(h) Depth to ground water while sampling and when it has stabilized in the bore hole.

ii) The location of the carrier pipe and/or casing pipe shall be superimposed on the boring logs before submission to CSXT.

E) Additional Information

i) When directed by CSXT, additional borings may be required for the purpose of taking undisturbed thin-wall piston samples or Dennison type samples for laboratory testing to determine the index and engineering properties of certain soil strata.

Design Requirements

A) Design Loads

i) General Requirements

(a) All pipes, manholes, and other facilities shall be designed for the external and internal loads to which they will be subjected.

(b) To allow for placement of additional track(s) or shifting of the existing track(s), all proposed pipelines or structures shall be designed as if a railroad loading is directly above the facility.

ii) Earth Load

(a) The dead load of the earth shall be considered as 120 pounds per cubic foot unless soil conditions warrant the use of a higher value.

iii) Railroad Load (live load and impact)

(a) The railroad live load used shall be a Cooper E-80 loading. This loading consists of 80 kip axle loads spaced 5 feet on centers.

(b) An impact factor of 1.75 (multiply live load by the impact factor) shall be used for depth of cover up to 5 feet. Between 5 and 30 feet, the impact factor is reduced by 0.03 per foot of depth. Below a depth of 30 feet, the impact factor is one.

(c) The values shown in Table 1 shall be used for the vertical pressure on a buried structure for the various heights of cover.

Table 1
Live loads, including impact, for various heights of cover for a Cooper E-80 loading.

Height of Cover	Load	
Feet	Pound per square feet	(kPa)
2	3800	(162.8)
3	3150	(150.8)
4	2850	(136.5)
5	2550	(122.1)
6	2250	(107.7)
7	1950	(93.4)
8	1700	(81.4)
9	1500	(71.8)
10	1300	(62.2)
12	1000	(47.9)
14	800	(38.3)
16	625	(29.9)
18	500	(23.9)
20	400	(19.2)
25	250	(12.0)
30	150	(7.2)

(d) To determine the horizontal pressure caused by the railroad loading on a sheet pile wall or other structure adjacent to the track, the Boussinesq analysis shall be used. The load on the track shall be taken as a strip load with a width equal to the length of the ties which is typically, 8.5 feet. The vertical surcharge, q (psf), caused by each axle, shall be uniform and equal to the axle load divided by the tie length and the axle spacing, 5 feet. For the E-80 loading this results in;

$$q = 80{,}000 / (8.5 \text{ X } 5) = 1882 \text{ psf}$$

The horizontal pressure due to the live load surcharge at any point on the wall or other structure is p_h and can be calculated by the following:

$$p_h = (2q/\pi)(\beta - \sin\beta(\cos 2\alpha))$$

(e) The vertical and horizontal pressures given above shall be used unless an alternate design method is approved by CSXT. Proposals to use an alternate design method must include acceptable references and a statement explaining the justification for choosing the alternate method.