Landfill Leachate Collection Pipe, SDR 11 vs. SDR 17 HDPE

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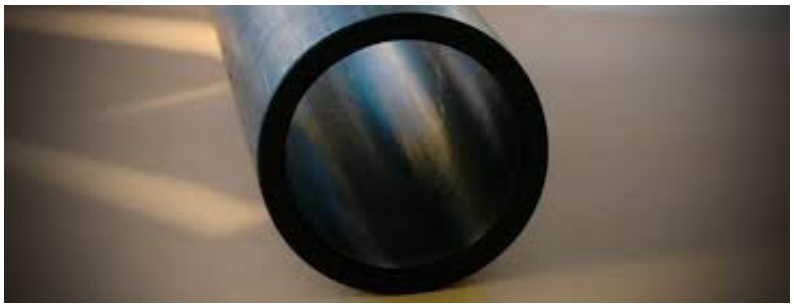
High-density polyethylene (HDPE) pipes have been used for landfill leachate collection and conveyance lines for several decades because of the chemical compatibility of HDPE material with many different types of liquids and chemicals. Designing a leachate collection system for a landfill disposal cell involves numerous engineering analyses of different components involved in collecting and conveying leachate. One of the important engineering evaluations is a determination of structural stability of HDPE leachate collection pipes at the bottom of the landfill.



Structural Stability of HDPE Pipe

Modern landfills are gradually becoming larger and deeper; deeper landfills will naturally impose a higher surcharge loading on the HDPE leachate collection pipes below the waste column. Engineering methodologies for the structural stability evaluation of HDPE pipes with significant surcharge loading have been around as long as HDPE pipes have been in production. There are three criteria used when evaluating the structural stability of HDPE pipes; wall crushing, wall buckling, and ring deflection. Wall crushing can occur when the stress in the pipe wall, due to external vertical pressure, exceeds the compressive strength of the pipe material. Wall buckling, a longitudinal wrinkling in the pipe wall, can occur when the external vertical pressure exceeds the critical buckling pressure of the pipe. Ring deflection is the change in vertical diameter of the pipe as the pipe deforms under the external vertical pressure. Empirical formulas by HDPE pipe manufacturers or other researchers are available to check each criterion.

SDR 11 vs. SDR 17 HDPE Pipe

One of the parameters that HDPE pipes are identified by in the market is the standard diameter ratio (SDR). SDR is the ratio of the outside diameter to the wall thickness. For a specific outside diameter pipe, the thicker the wall thickness, the lower the SDR value, which means a SDR 11 pipe has a higher wall thickness than a SDR 17 pipe of the similar outside diameters. When a structural stability evaluation involves high surcharge loading on the pipe, an engineer may automatically select SDR 11 HDPE pipe without going through an evaluation process. The engineer's reasoning is that the higher wall thickness of SDR 11 pipe, as compared to SDR 17 pipe, is the logical choice because it provides a higher level of structural stability to the pipe. In the case of wall bucking and wall crushing, where the pipe strength in these two criteria is inversely proportional to the SDR value, the engineer is making the right choice. The strength is greater for the lower SDR value that represents thicker pipe wall thickness; making SDR 11 stronger than SDR 17.

However, in the case of ring deflection, the pipe strength is not a function of SDR, but a function of another parameter called allowable ring deflection. The allowable ring deflection value varies from one SDR to another and is generally reported by pipe manufacturers. The allowable ring deflection for SDR 17 pipe is generally greater than all other SDR pipes, which makes SDR 17 pipe stronger when considering ring deflection. SDR 17 pipe is also the most commonly used HDPE pipe in the landfill industry, being lighter in weight per unit length of the pipe than SDR 11, thus making it less expensive than SDR 11 pipe.

Which is Best for My Landfill?

It is recommended that landfill engineers consider SDR 17 pipe as the first choice for use as a leachate collection pipe below the waste column, and then other SDRs if SDR 17 does not pass the three structural stability criteria mentioned above.

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