

Comparative Life-Cycle Assessment of Greenhouse Gas Emissions for Plastic and Concrete Manholes

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Executive Summary

This study compares the **life-cycle greenhouse gas (GHG) emissions for plastic and concrete manholes**. These emissions are calculated in terms of carbon dioxide (CO₂) equivalents; therefore, the results can be interpreted as the **carbon footprints** of the two types of manholes. The analysis is based on a streamlined life-cycle assessment (LCA) methodology, focusing on all the critical life-cycle stages and contributors for GHG emissions, and considers a 100-year time horizon for the analysis.

Annualized GHG emissions for the manholes consist of two parts:

- The manufacture, transport and maintenance of a single concrete manhole produce GHG emissions of 33.43 Kg of CO₂-eq per year. The same steps for a plastic manhole produce 2.42 Kg of CO₂-eq per year. Thus, a plastic manhole would have a carbon footprint of less than 10% of a comparable concrete manhole, without considering infiltration.
- Water infiltration through a concrete manhole adds to the volume of wastewater that must be treated. For a minimum average infiltration rate of 1440 gallons/day, the energy required to treat this additional wastewater results in additional GHG emissions of 389.95 Kg of CO₂-eq per year for each concrete manhole in a typical US location. This is an order of magnitude larger than the emissions from manufacture, transport and maintenance.

Combining both parts, the total annual GHG emissions attributable to a plastic manhole are 2.42 Kg of CO₂-eq, whereas the total annual GHG emissions attributable to a concrete manhole are 423.38 Kg of CO₂-eq. Thus, **a concrete manhole has an annual carbon footprint that is nearly 175 times that of a plastic manhole.**