

# Maximize liner lifetime by minimizing stresses on liner

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**ABSTRACT:** Wrinkles, bridging and ballasting have to be managed during installation. However, this process – manage to achieve a good flat laying liner system – starts with the design of the entire liner system, which requires an understanding of the application, the specific conditions and the products.

The selection of the product should follow acc. to the specific needs.

For selection of products, but also for the practical works on site the acceptability of wrinkles or bridging needs to be determined first. A highly stress crack resistant liner might accept higher stresses. In a cold climate a wrinkle and even more bridging is more critical than in a moderate climate. Opposite to that - in an extreme hot climate – is a bridge critical at all? Moreover, the most severe conditions – extreme changes of temperatures and high loads – which wrinkles or bridging issues are acceptable and how could they be avoided? Flat laying, ballasting or additional slag – what needs to be addressed? A well-designed bearing layer – does it allow wrinkles to be uncritical?

Manufacturers sell their products frequently to very detailed and high quality product specifications; but is the same high quality addressed in the specification to the quality of the entire liner works and thus the finished liner system?

Does a proper requirement on the earth works allow managing wrinkling and bridging? Could well described installation specifications support flat laying liner systems? Would the sequence of installation support the flat laying? Could the storage conditions of liners support smooth liners?

Measures to achieve the highest quality liner system should be determined at an early stage – which could be allowable wrinkle size, ballast requirements, allowable environmental conditions for the different installation steps – e.g. welding works itself, placing of mineral layers, kind of placing soil materials or other top layers. In addition, the layout drawing prior to the works should address laying directions and the lowest amount of welds, which supports a smooth liner system.

Earth works, liner works and the third party measures need to be aligned to allow achievement of a flat laying liner. There are avoidable wrinkles, bridges. Thus they do not need to be managed when they occur. And there are tolerable wrinkles, bridges – thus avoidable patches, and welds.

The question, which always comes up at the end – how can geomembrane liners differ so dramatically – is wrinkling only a cost driven problem?