



GEOMEMBRANE WAVE PROPAGATION MANAGEMENT & SCORING



FIGURE 1



FIGURE 2

The Geosynthetic industry from designers, manufacturers, contractors to geosynthetic installers have over the last 10 years debated in-depth the understanding of Geomembrane wave / wrinkles and the management thereof. The Geosynthetic Institute released a White Paper #27 in June 6, 2013 by Robert Koerner & George Koerner specifically addressing in-depth Geomembrane wave (wrinkle) Management in particular the Coefficients of Thermal Expansion / Contraction of various Geomembranes which included a major laboratory wave study.

Application, installation practices and methodology often carry the blame for membrane failure but often downright poor engineering design is to blame, especially where design does not take cognisance of the risks attendant on site with specific reference to installation risk and practice. One such labour practice or technique employed by technicians on site during geomembrane installations to speed up their productivity especially employed while installing geomembrane panels of irregular size, is to cut off the un-wanted material by simply "scoring" the surface with a blade, then folding the geomembrane over ever so slightly and then proceeding to simply "tear" the unwanted piece off. This phenomena dictates that one reconsiders the application of finishes above and below the geomembrane. Mechanically induced "scoring", is a reality on possibly more projects than one would care to entertain. Scientific and engineering stature can be unceremoniously questioned when failures present themselves on a project where such evidence is uncovered.

To illustrate you are referred to a photograph taken clearly showing the "scoring" (Fig. 2) as a result of the distribution method of the aggregate by "skidsteers" with "low ground pressures" (Fig. 1) Evidently this creates a "push/accumulate/cut/seam" which is commonly practised to speed up production, this obviously places even further induced stress on the particular geomembrane / geosynthetic and risk of occurrence is elevated. This is further exacerbated by the placement of aggregate directly in contact with a geomembrane as can be seen in (Fig. 1). Many sites inspected revealed "scoring" of the top surface of the Geomembrane directly ascribed to aggregate placement by mechanical means. This action is very similar to the induced action of technician practices during panel placement.

Proper wave (wrinkle) management must be taken into account during the design phase and specifications, making sure that the coefficients of thermal expansion / contraction are duly noted. This includes design elements taking into consideration aggregate sizes and proper protection

systems. The placement of a Geosynthetic of sufficient calibre not only reduces surface temperature substantially but also offers the necessary protection. Installers and QA/QC Management companies need to make sure that during installation the design limitations are taken into consideration and due diligent QA/QC are followed. As illustrated by the authors of the GSI White Paper #27 *"Clearly their lifetimes were shortened in comparison to the same geomembranes lying flat without waves"*

It is important to note the angle of the "skidsteer" in (Fig. 1), this practice will most decidedly induce "scoring" of the geomembrane. Forensic work into several applications revealed an abundance of top surface "scoring" and the conclusion of the investigative team was that this was a contributing factor to the general failure of the membrane.

The point here is simply that the exclusion of protective geosynthetics below and above geomembranes must be approached with circumspection and the resultant cost savings must be compared to the increased risk of failure, which might not be a risk but possibly a given. Duty of care must be properly documented by both engineer and contractor when dealing with "budget" specifications to mitigate and reduce unnecessary "scoring" including proper aggregate distribution to minimize any unwanted waves / wrinkles and / or management thereof.

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