Welding of Polymeric Geomembranes in Arctic Conditions

By Eric Blond

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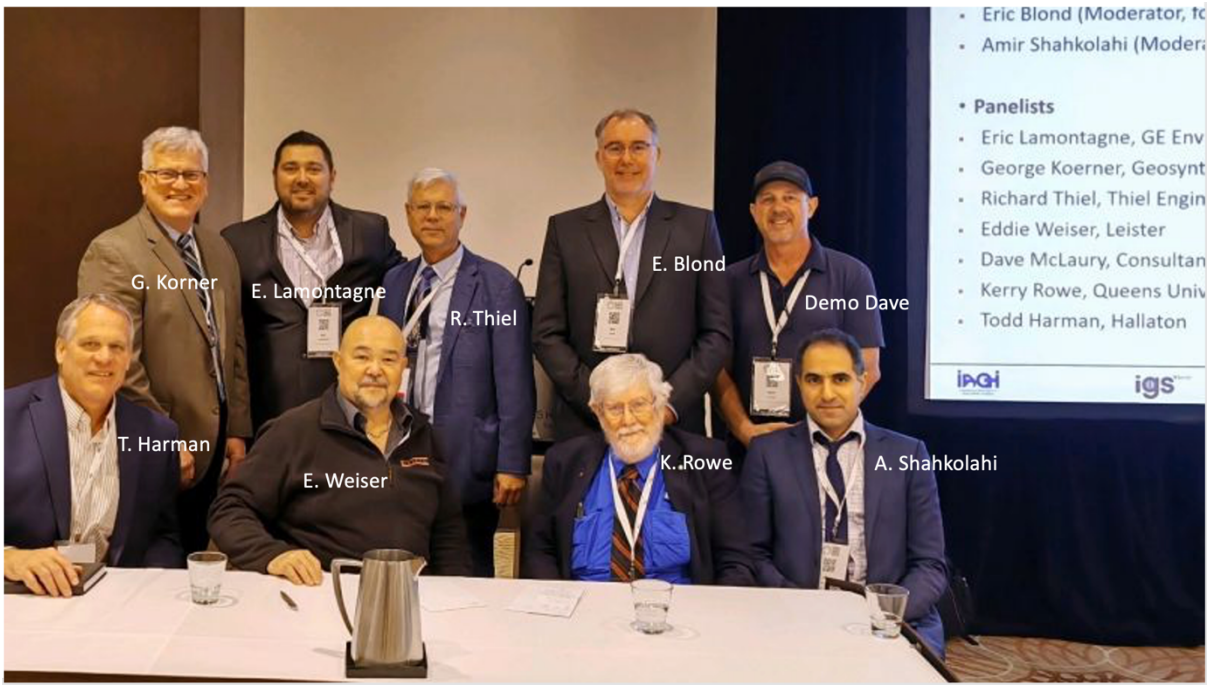
A discussion panel on welding of polymeric geomembranes in arctic conditions held on Tuesday 30th April, 2024 at the Toronto GEOAMERCIAS 2024 CONFERENCE.



Eric Blond organized this panel on behalf of ASTM D35, with the support of IAGI and the technical Committee on Barriers of the IGS. Distinguished contributors included Amir Shahkolahi, Eric Lamontagne, Richard Thiel, George Koerner, Edward Weiser, Demo Dave McLaury, Kerry Rowe and Todd Harman, representing experienced installers, engineers, researchers and equipment suppliers.

A consensus was reached on several points, and will lead to the update of technical guidances in the near future. In particular:

- Geomembranes should be welded at a temperature above - 15 to – 20 deg.C
- Excessive moisture is a bigger problem than low temperature.
- Wind barriers should be used instead of tents covering the seamed area, as tents may favour the capture of humidity.
- Welding too fast at a too high temperature is not recommended.
- Increasing a little bit the length of the wedge may facilitate using lower welding temperature.
- Data recording should be used to monitor the entire welded length.
- Extrusion bead should be maximum 2x the thickness of the sheet.
- Thickness reduction should be documented, but more research is needed to define a criteria,

i.e., maximum thickness reduction.
- The EPA report from 1991 describing how to weld geomembranes must be revisited and updated.

Cold Weather Seaming of Polyethylene Geomembranes

There will always be a need for Geomembrane deployment over a wide range of temperatures and environmental conditions. The panel discussion was focused on the question of how to tackle Geomembrane welding at extreme cold temperatures. Typically, most geomembranes can be installed at temperatures down to 5°C without adaptions to installation methods. The Panel discussion concentrated on the necessary requirements needed to be observed when welding below these temperatures with a range of suggestions made as to lessen the problems associated with Cold Weather Seaming.

Take home messages from the panel discussion.

- Subgrade preparation will be more challenging and planning for these difficulties must be considered.
- At temperatures below zero there will be a loss of Geomembrane flexibility, and this must be considered as deployment will be more difficult.
- Rub or drag sheets should be used as rocks and sharp stones are more likely to cause damage under cold harsh conditions. Snow and frost must be removed before any welding is to take place.
- Winds must be considered as wind damage is a real concern with cold stiff membranes. Under windy conditions a wind break may be preferable as a tent may promote a humid environment which could then cause dew point issues.
- The thickness of the geomembrane must be considered due to the harsher prevailing conditions.
- The Panel determined that a lower temperature limit between -15/ -20 °C be established.
- No seaming during precipitation or snowfall.
- More trial welds and subsequent testing will be required and must be incorporated.
- Profile of extrusion welds need to be optimised with the panel recommendation of a maximum height of 2 times the thickness of the membrane being deployed.
- Longer wedges could be used during fusion welding as this would allow more energy to be used during the welding process without the use of excessive welding temperatures. Conservative welding speeds would also most likely be needed.
- It was considered that the use of welders with data acquisition systems was necessary. Fusion welders with these abilities display all 3 welding parameters (temperature, speed and pressure). This then also enables post welding analysis to take place.
- Weld thickness reduction should be documented, but more research is needed to define if and how useful such data is under these conditions.
- It was considered prudent that documents such as "The EPA report from 1991 describing how to weld geomembranes" could be revised and used. ASTM is also developing a Guide to welding of Polymer Geomembranes.