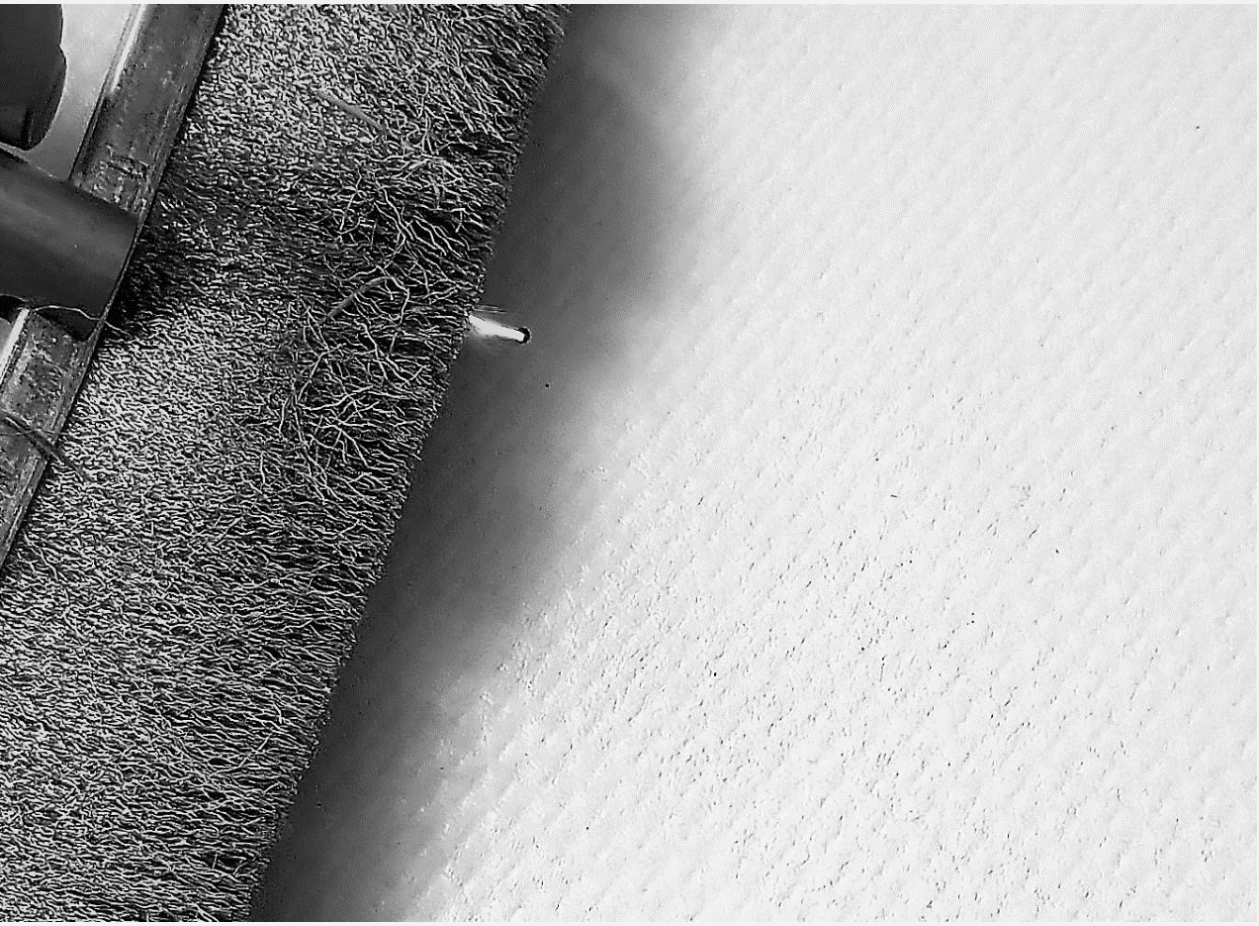
Controlit®

High voltage ELD (Electronic Leak Detection) equipment functionality



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Test data

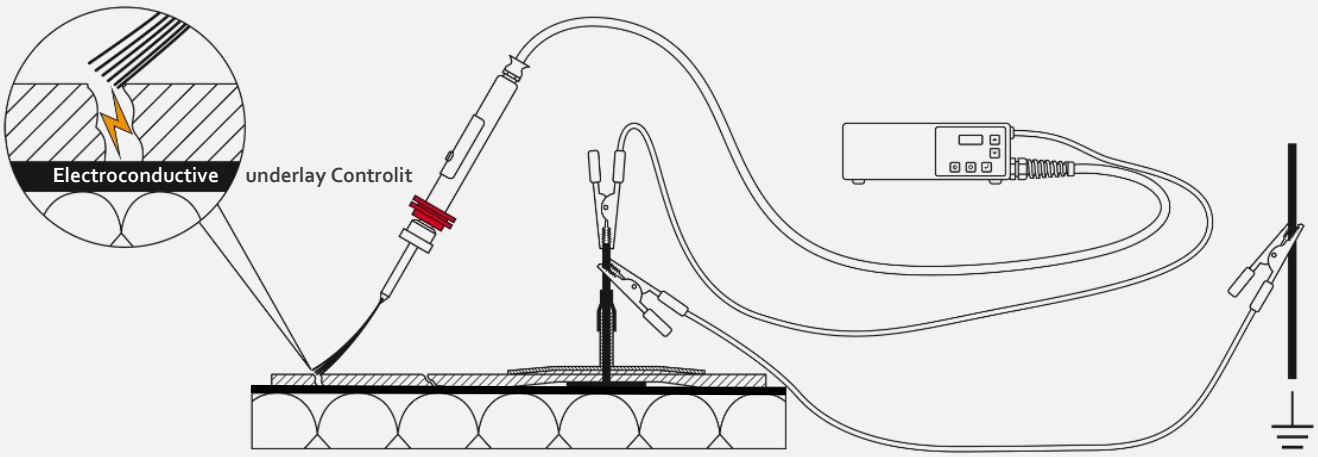
Date of testing:
06.08.2019.

Description of the test:
The purpose of the test was to understand the potential of determining the defects on waterproofing for different types of flat roofs and under different conditions using the high voltage ELD inspection equipment.

Test equipment used for the test:
"DRY ROOF PRO" device produced by the company Buckleys (UVRAL) Ltd.

Waterproofing material:
PVC membrane with a thickness of 1,5mm.

Equipment settings for testing:
"DRY ROOF PRO" according to NACE SP-02-74 (250 x √ thickness in microns = Test Voltage).



High Voltage (ELD) Test Method with Controlit underlay – testing principle

Flat roofs with stone wool thermal insulation

Position	Description

1. Stone wool in dry conditions

““DRY ROOF PRO”

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Polythene vapour barrier.
- Dry stone wool thermal insulation.
- Waterproofing membrane.

Test results:
- “DRY ROOF PRO” – the pinhole was not detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the electrically conductive bearing structure. During the inspection over the pinhole there were no visual or audible signals.

Conclusion:
It was not possible to determine the damage.

2. Stone wool in wet conditions

“DRY ROOF PRO”

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Polythene vapour barrier.
- Wet stone wool thermal insulation (moisture traveled to the electrically conductive bearing structure).
- Waterproofing membrane.

Test results:
- “DRY ROOF PRO” – the pinhole was detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to electrically conductive bearing structure. During the inspection over the pinhole there were both visual and audible signals.
Important: The pinhole was only detected over the wet area. When the pinhole was placed over a dry area, it was not possible to detect it.

Conclusion:
It was possible to determine the damage, but only on conditions that the stone wool under the pinhole is wet.

3. Stone wool in wet conditions and the bitumen vapour barrier

“DRY ROOF PRO”

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Bitumen vapour barrier.
- Wet stone wool thermal insulation (moisture did not travel to the electrically conductive bearing structure, because the bitumen vapour barrier also functions as a waterproofing layer).
- Waterproofing membrane.

Test results:
- **“**DRY ROOF PRO” – the pinhole was not detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the electrically bearing structure.
During the inspection over the pinhole there were no visual or audible signals.

Conclusion:
It was not possible to determine the damage.

4. Stone wool in dry conditions and the Controlit electrically conductive underlay

“DRY ROOF PRO”

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Bitumen vapour barrier.
- Dry stone wool thermal insulation.
- Controlit electrically conductive underlay.
- Waterproofing membrane.

Test results:
- “DRY ROOF PRO” – the pinhole was detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the Controlit electrically conductive underlay through special connection points. During the inspection over the pinhole there were both visual and audible signals.

Conclusion:
It was possible to determine the damage.

Flat roofs with EPS thermal insulation

Position	Description

5. EPS in dry conditions

“DRY ROOF PRO”

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Polythene vapour barrier.
- EPS thermal insulation.
- Dry geotextile.
- Waterproofing membrane.

Test results:
- “DRY ROOF PRO” – the pinhole was not detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the electrically bearing structure. During the inspection over the pinhole there were no visual or audible signals.

Conclusion:
It was not possible to determine the damage**.**

6. EPS in wet conditions

“DRY ROOF PRO”

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Polythene vapour barrier.
- EPS thermal insulation.
- Wet geotextile (moisture traveled to the electrically conductive bearing structure).
- Waterproofing membrane.

Test results:
- “DRY ROOF PRO” – the pinhole was detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the electrically bearing structure. During the inspection over the pinhole there were both visual and audible signals.
Important: The pinhole was only detected over the wet area. When the pinhole was placed over a dry area, it was not possible to detect it.

Conclusion:
It was possible to determine the damage, but only on the conditions that the geotextile is wet under the pinhole.

7. EPS in dry conditions and the bitumen vapour barrier

"DRY ROOF PRO"

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Bitumen vapour barrier.
- EPS thermal insulation.
- Dry geotextile.
- Waterproofing membrane.

Test results:
- "DRY ROOF PRO" – the pinhole was not detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the electrically bearing structure. During the inspection over the pinhole there were no visual or audible signals.

Conclusion:
It was not possible to determine the damage.

8. EPS in dry conditions and the Controlit electrically conductive underlay

"DRY ROOF PRO"

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Bitumen vapour barrier.
- EPS thermal insulation.
- Dry geotextile.
- Controlit electrically conductive underlay.
- Waterproofing membrane.

Test results:
- "DRY ROOF PRO" – the pinhole was detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the Controlit electrically conductive underlay through special connection points. During the inspection over the pinhole there were both visual and audible signals.

Conclusion:
It was possible to determine the damage.

Flat roofs with PIR thermal insulation

Position	Description
9. PIR without electrically conductive coating "DRY ROOF PRO" 	**Roof structure:** • Electrically conductive bearing structure (metal or concrete). • Polythene vapour barrier. • PIR thermal insulation. • Waterproofing membrane. **Test results:** • "DRY ROOF PRO" – the pinhole was not detected. **Description**: The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the electrically bearing structure. During the inspection over the pinhole there were no visual or audible signals. **Conclusion:** It was not possible to determine the damage.
10. PIR with electrically conductive coating (aluminum) "DRY ROOF PRO" 	**Roof structure:** • Electrically conductive bearing structure (metal or concrete). • Polythene vapour barrier. • PIR thermal insulation with aluminum. • Waterproofing membrane. **Test results:** • "DRY ROOF PRO" – the pinhole was detected. **Description:** The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the electrically bearing structure. During the inspection over the pinhole there were both visual and audible signals. **Important:** Aluminum has perfect electrical conductivity, therefore the inspection was possible. However, aluminum tends to oxidize very rapidly under the influence of oxygen and moisture, thus losing its electrical conductivity eventually. **Conclusion:** It was possible to determine the damage. *while the aluminum hasn't oxidized.

11. PIR without the electrically conductive coating and with the bitumen vapour barrier

"DRY ROOF PRO"

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Bitumen vapour barrier.
- PIR thermal insulation.
- Waterproofing membrane.

Test results:
- "DRY ROOF PRO" – the pinhole was not detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the electrically bearing structure. During the inspection over the pinhole there were no visual or audible signals.

Conclusion:
It was not possible to determine the damage.

12. PIR without the electrically conductive coating and with the Controlit electrically conductive underlay

"DRY ROOF PRO"

Roof structure:
- Electrically conductive bearing structure (metal or concrete).
- Bitumen vapour barrier.
- PIR thermal insulation.
- Controlit electrically conductive underlay.
- Waterproofing membrane.

Test results:
- **"**DRY ROOF PRO" – the pinhole was detected.

Description:
The inspection equipment was adjusted in accordance to the manufacturers instructions. The device was connected to the Controlit electrically conductive underlay through special connection points. During the inspection over the pinhole there were both visual and audible signals.

Conclusion:
It was possible to determine the damage.

Test summary

	Roof structure	"DRY ROOF PRO"
1	• Electrically conductive bearing structure (metal or concrete) • Polythene vapour barrier • Dry stone wool thermal insulation • Waterproofing membrane	No
2	• Electrically conductive bearing structure (metal or concrete) • Polythene vapour barrier • Wet stone wool thermal insulation • Waterproofing membrane	Yes/No
3	• Electrically conductive bearing structure (metal or concrete) • Bitumen vapour barrier • Wet stone wool thermal insulation • Waterproofing membrane	No
4	• Electrically conductive bearing structure (metal or concrete) • Bitumen vapour barrier • Dry stone wool thermal insulation • Controlit electrically conductive underlay • Waterproofing membrane	Yes
5	• Electrically conductive bearing structure (metal or concrete) • Polythene vapour barrier • EPS thermal insulation • Dry geotextile • Waterproofing membrane	No
6	• Electrically conductive bearing structure (metal or concrete) • Polythene vapour barrier • EPS thermal insulation • Wet geotextile • Waterproofing membrane	Yes/No
7	• Electrically conductive bearing structure (metal or concrete) • Bitumen vapour barrier • EPS thermal insulation • Dry geotextile • Waterproofing membrane	No
8	• Electrically conductive bearing structure (metal or concrete) • Bitumen vapour barrier • EPS thermal insulation • Dry geotextile • Controlit electrically conductive underlay • Waterproofing membrane	Yes
9	• Electrically conductive bearing structure (metal or concrete) • Polythene vapour barrier • PIR thermal insulation • Waterproofing membrane	No
10	• Electrically conductive bearing structure (metal or concrete)	Yes*

	• Polythene vapour barrier • PIR thermal insulation with aluminum • Waterproofing membrane	
11	• Electrically conductive bearing structure (metal or concrete) • Bitumen vapour barrier • PIR thermal insulation • Waterproofing membrane	No
12	• Electrically conductive bearing structure (metal or concrete) • Bitumen vapour barrier • PIR thermal insulation • Controlit electrically conductive underlay • Waterproofing membrane	Yes

Conclusion and suggestions

Not all existing flat roofs are inspectable today by using the high voltage ELD equipment. In order to perform an inspection by using the high voltage ELD equipment it is required to have an electrically conductive substrate under the waterproofing. In some cases this electrically conductive substrate is moisture, which connects to the electrically conductive bearing structure, in other cases it is the thermal insulation panels with an electrically conductive cover.

Based on the test results, we strongly recommend to use a high-quality electrically conductive underlay that not only allows to find leakages, but also provides the possibility to carry out preventive inspections in completely dry conditions already starting from a construction phase and to prevent any water leakage before it has appeared. Doing so will prevent the roof from leaking and all the other expensive problems that come with it.

Controlit Factory, SIA
Managing Director
Kristaps Draudiņš

Controlit tools: extensions for curved hook

for overlap welding seams inspection

Extension for seam inspection hook with accesories - for testing and checking welded seams in heat fused roofing membranes.

Product is 100% hand made from the highest quality stainless steel with high density rubber handles.
Net weight: 2,155 kg
Hook holder length: 160mm

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