

May 10, 2024

Mr. Paul Budge
Diversi-Tech Corp - IntegraRack
PO Box 910758
St. George, UT 84791

Subject: Pullout Tests on AnchorSpike Epoxy Earth Anchors

Dear Mr. Budge,

Please find included our test reports for the pullout tests (tensile load) of the two sizes of epoxy earth anchors performed on 3/20/2024 - 03/22/2024 in St. George, Utah.

Tensile pullout (Uplift) tests were performed on the large epoxy anchor. The load was applied by drilling a hole through the upper portion of the anchor and installing a thru bolt and then using a load strap to pull up on the cross bolt. Tensile load was monitored and recorded on a dynamometer. The first anchor pulled out of the ground at 1950 lbf. The second anchor reached 2990 lbf without pullout when the cross bolt bent and the load strap slipped off. Additional test run details are shown in the table below.

LARGE EPOXY EARTH ANCHOR TENSILE UPLIFT FORCE INSPECTION DETAILS		
NO.	MAX FORCE REACHED (lbf)	OBSERVATIONS
1	1,950	Anchor pulled out of the ground (See Photos 2, 4-6)
2a	2,990	The bolt installed through the anchor for the purpose of the test bent and the load strap slipped off the anchor (See Photos 3, 7). The drilled thru hole had elongated.
2b	790	The load strap was reattached and test load was applied to the same anchor tested in test 2a. The drilled thru hole failed under load (Photo 8).

Tensile pullout (Uplift) tests were performed on the small IR AnchorSpikes installed with the IR Solar Racking System Ground Frame. The load was applied using a loading strap run under the ground frame adjacent to the anchor in order to apply a vertical axial load. The average tensile uplift force at failure was 1066 lbf. The lowest uplift force was 780 lbf. Additional test run details are shown in the table below.

IR ANCHORSPIKES TENSILE UPLIFT FORCE INSPECTION DETAILS		
NO.	MAX FORCE REACHED (lbf)	OBSERVATIONS
1	915	
2	1,305	Initial minor pullout of anchor noted at 1135 lbf.
3	1,265	Initial minor pullout of anchor noted at 975 lbf.
4	780	
AVG.	1,066	

Test reports with additional details, photos, and data have been attached.

Respectfully submitted,
PHOENIX NATIONAL LABORATORIES, INC.



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INSPECTION AND TEST REPORT

PNL REF. # 26-240383 S.O. # 001 INDEX 11

INSPECTION DATE 03/22/2024

Epoxy Earth Anchor Tensile Pullout (Uplift) Test

Page 1 of 2

CLIENT	CLIENT PROJECT REFERENCE	CLIENT ORDER NO.
IntegraRack	Large Epoxy Earth Anchors Pullout Test	per S.A.
	SAMPLE DESCRIPTION	TECHNICIANS
	Tensile Uplift Load Test on Epoxy Earth Anchor	Weston A.

TEST DATA & EQUIPMENT INFORMATION

TEMPERATURE:	65 °F ± 10 °F	HUMIDITY:	30% ± 10%
LOAD TYPE:	Simulated Wind - Tensile / Uplift	TEST LOAD:	Record
EQUIPMENT TYPE:	Dyna-Link 2 Dynamometer	EQUIPMENT MODEL:	MSI-7300RF (S/N 100326)

TEST SPECIMEN & COMPONENT INFORMATION

SPECIMEN COMPONENT 1:	Large Epoxy Earth Anchor	SPECIMEN PART NO. 1:	None
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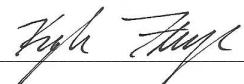
TENSILE UPLIFT FORCE TEST PROCEDURE/DESCRIPTION

The test was performed on the large epoxy earth anchor previously installed and loaded during previous tests of the IR-G Series frame. Anchors had been installed for 1 week per Client. A hole was drilled through the upper portion of the anchor so that a bolt could be slotted through the hole and so a strap could be attached to each end of the strap to apply a tensile pullout force. Load was applied using the forklift and was monitored with the digital dynamometer.

TENSILE UPLIFT FORCE INSPECTION DETAILS

NO.	MAX FORCE REACHED (lbf)	OBSERVATIONS
1	1,950	Anchor pulled out of the ground (See Photos 2, 4-6)
2a	2,990	The bolt installed through the anchor for the purpose of the test bent and the load strap slipped off the anchor (See Photos 3, 7). The drilled thru hole had elongated.
2b	790	The load strap was reattached and test load was applied to the same anchor tested in test 2a. The drilled thru hole failed under load (Photo 8).

TECHNICIAN 

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INSPECTION AND TEST REPORT

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INSPECTION DATE 03/22/2024

Epoxy Earth Anchor Tensile Pullout (Uplift) Test

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CLIENT	CLIENT PROJECT REFERENCE	CLIENT ORDER NO.
IntegraRack	Large Epoxy Earth Anchors Pullout Test	per S.A.
SAMPLE DESCRIPTION		TECHNICIANS
Tensile Uplift Load Test on Epoxy Earth Anchor		Weston A.

PHOTOS



PHOTO 1: Test setup



PHOTO 2: First anchor under load



PHOTO 3: Second anchor under load



PHOTO 4: Anchor before test



PHOTO 5: First anchor pullout



PHOTO 6: First anchor pullout with drilled thru hole deformed



PHOTO 7: Second anchor - first pull where the thru bolt bent and load strap slipped off



PHOTO 8: Second anchor - second test where anchor failed at drilled thru hole



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INSPECTION AND TEST REPORT

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INSPECTION DATE 03/22/2024

Small IR AnchorSpike Tensile Pullout (Uplift) Test

Page 1 of 2

CLIENT	CLIENT PROJECT REFERENCE	CLIENT ORDER NO.
IntegraRack	IR-30 Solar Racking System w/ Small IR AnchorSpike	per S.A.
SAMPLE DESCRIPTION		TECHNICIAN
Tensile Uplift Load Test on Small IR AnchorSpike		Weston A.
TEST DATA & EQUIPMENT INFORMATION		
TEMPERATURE:	65 °F ± 10 °F	HUMIDITY: 30% ± 10%
LOAD TYPE:	Simulated Wind - Tensile / Uplift	TEST LOAD: Record
EQUIPMENT TYPE:	Dyna-Link 2 Dynamometer	EQUIPMENT MODEL: MSI-7300RF (S/N 100326)
TEST SPECIMEN & COMPONENT INFORMATION		
TEST COMPONENT 1:	Small IR AnchorSpike System	SPECIMEN PART NO. 1: None
TEST COMPONENT 2:	IR-30 Frame Ground Rail Clamp	SPECIMEN PART NO. 2: IRP-30BT 1000-T
TENSILE UPLIFT FORCE TEST PROCEDURE/DESCRIPTION		
The IR-30 Solar Racking System Ground Frame was installed using the small IR AnchorSpikes (Photo 3) and a two part epoxy system. The AnchorSpike installation consists of pounding the anchors into the ground, filling with the two part epoxy system, and then clamping the anchors to the frame with the built in clamps. Anchors had been installed for 1 week per Client. Load was applied via a lifting strap run underneath the ground portion of the frame. The strap was positioned adjacent to the AnchorSpike to apply the pullout force in a vertical direction. The forklift was used to apply the load and load was monitored with the digital dynamometer.		
TENSILE UPLIFT FORCE INSPECTION DETAILS		
NO.	MAX FORCE REACHED (lbf)	OBSERVATIONS
1	915	
2	1,305	Initial minor pullout of anchor noted at 1135 lbf.
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AVG.	1,066	

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SAMPLE DESCRIPTION		TECHNICIAN
Tensile Uplift Load Test on Small IR AnchorSpike		Weston A.

PHOTOS



PHOTO 1: Test setup



PHOTO 2: Test setup under max load