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<b>Document Name:</b>	<b>M109-17670_RPT</b>	
<b>Document Description:</b>	Formal Report for Testing Under DATASYST Project Number M109-17670	
<b>Document Prepared For:</b> David Klein Metal and Cable Corporation, Inc. 9337 Ravenna Road, Unit C Twinsburg, OH 44087	<b>Document Prepared By:</b> Tony Wagner DATASYST Engineering & Testing Services, Inc. S14 W3511 Hwy 18 Delafield, WI 53018	

Testing Start Date	Testing End Date	Document Date
December 14, 2016	January 11, 2017	January 18, 2017

Description of Unit(s) Under Test (UUT)		
Unit Name	Unit Model Number	Unit Serial or Sample Number(s)
Individual Magnets		15 samples
Unistrut Magnemount	CT1000-24-U-2, CT1000-24-U-4, CT1000-24-U-5	3 samples

Document Outline		
Report Section	Section Description	Test Result
1.0	Equipment List	N/A
2.0	Magnemount Breakaway Load Tests	No Issue

Report Section	Section Description	Sample(s) Exposed
1.0	Equipment List	All

Section	List of Equipment Used for All Testing Described in Report Document			DATASYST Project	
1.1				M109-17670	
Equipment	Manufacturer	Model Number	Serial Number	Calibration	
				Last	Due
Hydraulic Controller	MTS	407	#2	N/A	N/A
Hydraulic Actuator	ReTest	242.04	0275085	N/A	N/A
Load Cell	Lebow	3132-500	13919	19-Dec-2013	26-Jul-2017
Dial indicator	Mitutoyo	999-390	999-390	31-Oct-2015	1-Mar-2017
Decade Resistor	General Radio	1432-P	20915	15-Jan-2016	28-Jan-2018
Data Acquisition	Somat	MSTCB	MSTCB.03-3023	2-Mar-2016	27-May-2018
Data Acquisition	Somat	LoLev_1	MSLLB.03-2046	2-Mar-2016	27-May-2018

Certificates and reports of all calibrations are retained in the DATASYST Engineering & Testing Services, Inc. files and are available for inspection upon request.

Report Section	Section Description	Sample(s) Exposed
2.0	Magnemount Breakaway Load Tests	All

## **2.1 Procedure**

Metal and Cable Corporation, Inc. (M&C) contracted DATASYST Engineering and Testing Services, Inc. to perform breakaway load testing single and multi-magnet mounting systems. The mounting systems were mounted to a painted steel plate. The paint used was a special formulation for water tower applications. The plate used was the same plate used in a previous DATASYST Test, test number M109-17325. This plate was .375" thick with a .003" thickness tolerance. The paint was applied to a thickness of .013", per the previous test's report. There were three types of tests to be performed: Tensile, which was a pull on the mount in the vertical direction; Shear, which was a push on the mount in a horizontal direction in order to get the magnets to slide on the painted plate; and Over-turning Moment (OTM), which was also a load in the horizontal direction attempting to get the mount to roll about itself. Both the shear and OTM tests were done in two ways: with only the shearing or OTM load applied and with an additional 15-pound load applied to the mount perpendicular to the measured load. The purpose of this 15-pound load was to see if the side load affected the breakaway load the mounts could sustain.

M&C provided 15 individual magnets and three pieces of unistrut, each 2 feet in length. Each magnet was numbered for identification throughout testing. The individual magnets were tested for tension and shear. Three of them were also tested for OTM. The moment arm for that test was 6.875 inches from the base of the magnet.

Magnets 11-15 were then used to assemble a 5-magnet strut mount, M&C part number CT1000-24-U-5. Magnets 1 and 2 were used to assemble a 2-magnet strut mount, part number CT1000-24-U-2 and magnets 3, 4, 5 and 6 were used to assemble a 4-magnet strut mount, part number CT1000-24-U-2. The strut mounts were tested in tension, shear and OTM for all units.

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## **2.2   Results**

Magnet	Tension (lb.)	Shear (lb.)
1	47	24.3
2	60	9.3
3	52	21.5
4	58	16.8
5	59	16.8
6	69	20.1
7	62	14.9
8	68	28.4
9	55	15.4
10	62	22.6
11	45	16.4
12	50	34.3
13	26	20.8
14	55	18.9
15	55	24.5
CT1000-24-U-2 Trial 1	90	57
CT1000-24-U-4 Trial 2	183	93
CT1000-24-U-5 Trial 2	197	147
CT1000-24-U-5 Trial 3	203	N/A
CT1000-24-U-5 Trial 4	187	N/A
CT1000-24-U-5 Trial 5	220	N/A

**Table 2.2.1: Tension and Shear Loads for Individual Magnets and Strut Mounts**



## 2.3 Graphs

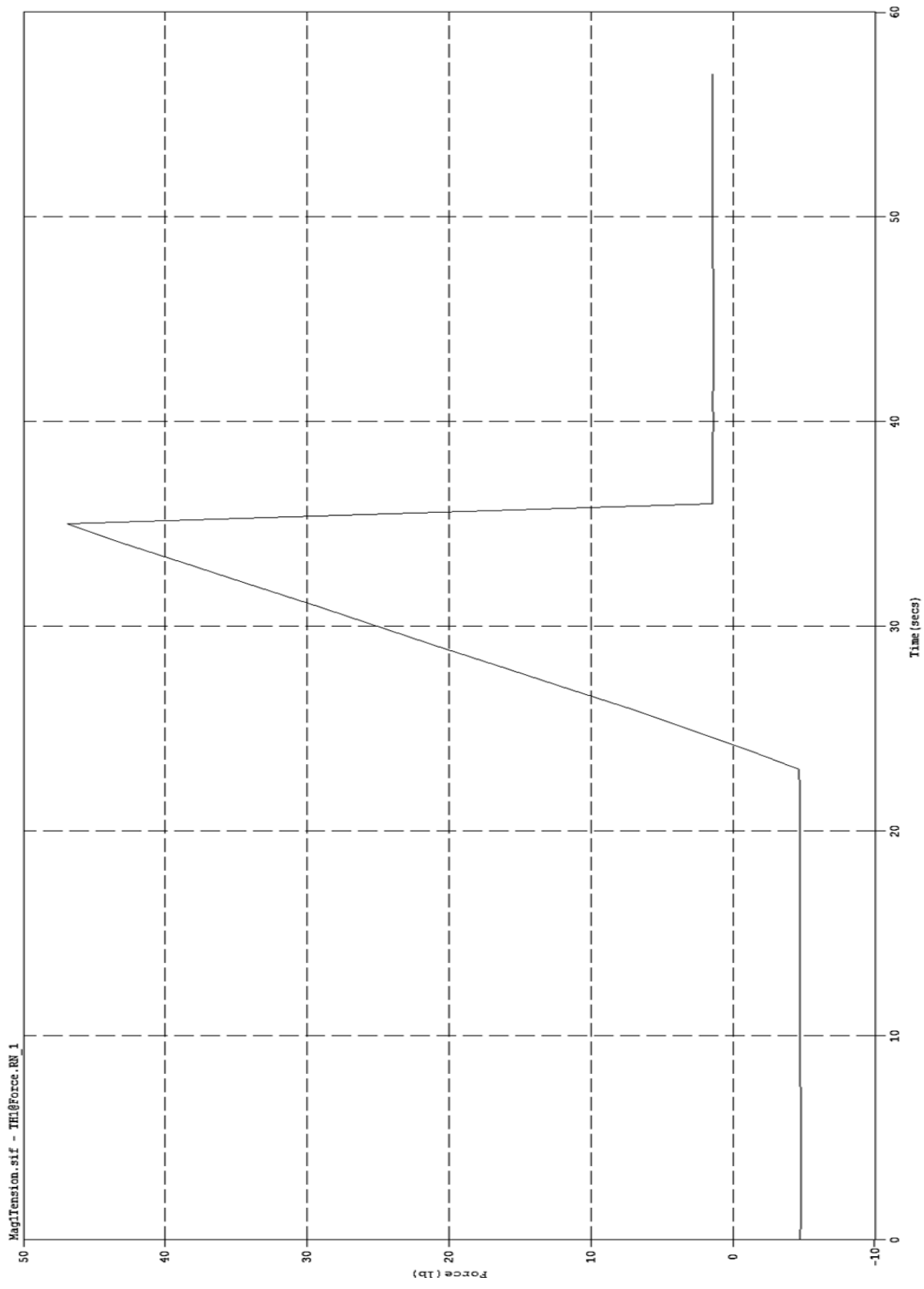


Figure 2.3.1: Tension Force Trace-Typical Individual Magnet

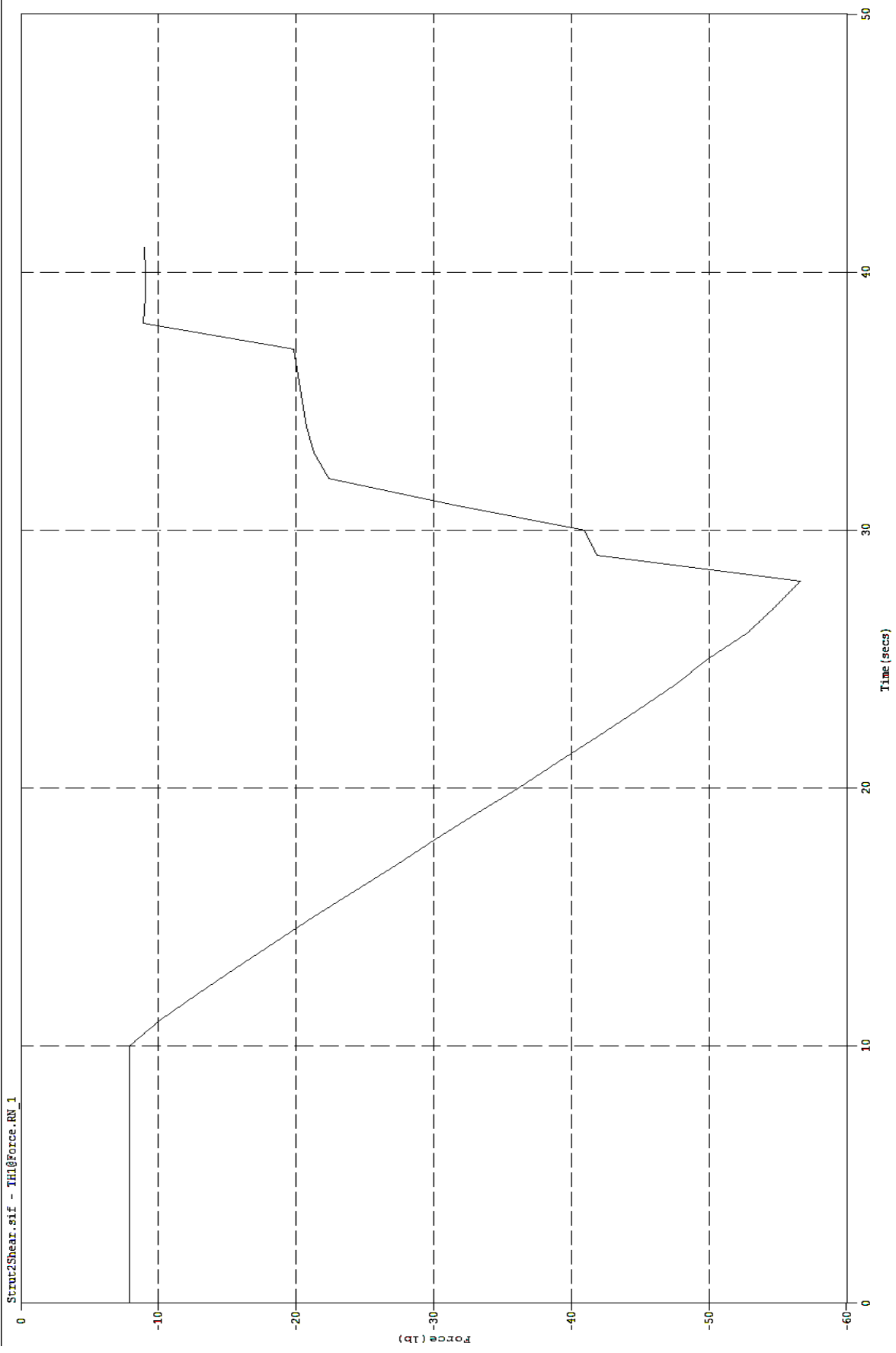


Figure 2.3.2: Shear Force Trace-Typical CT1000-24-U-2

**2.3**    **Photographs**

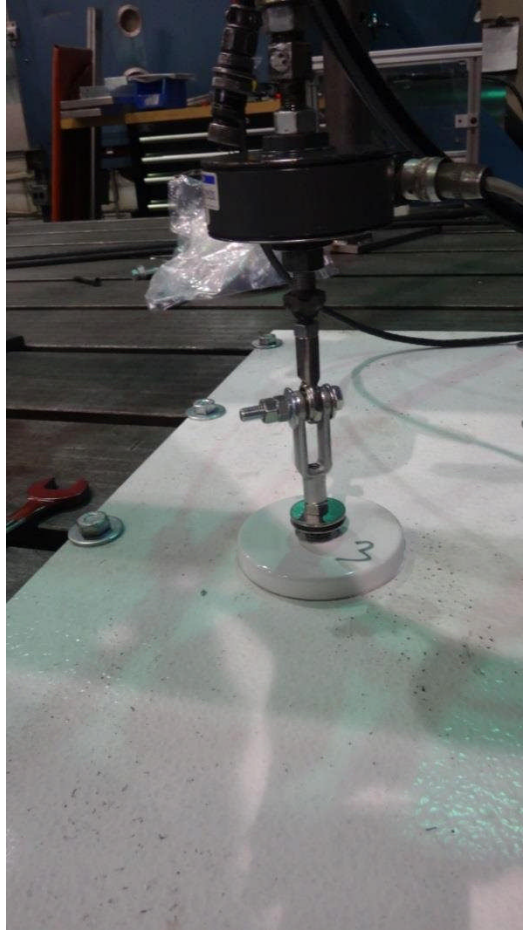


**Photograph 2.4.1: Individual Magnets as Shipped to DATASYST**



**Photograph 2.4.2: CT1000-24-U-5 as Shipped to DATASYST**





**Figure 2.4.3: Tensile Individual Magnet Test Setup-Close View**



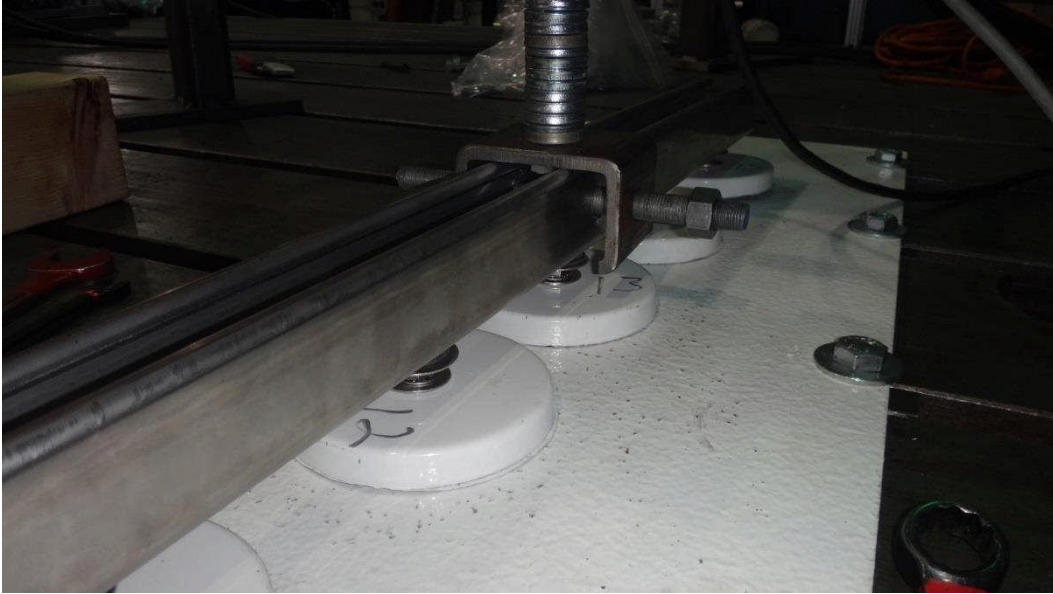
**Figure 2.4.4: Tensile Individual Magnet Test Setup-Overall View**



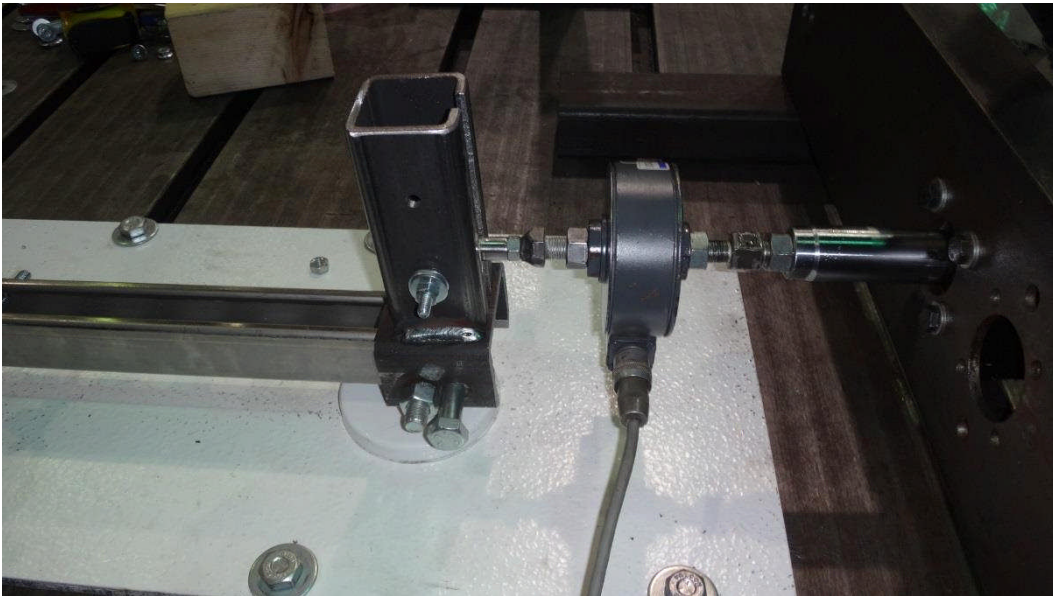
**Figure 2.4.5: Test Control/Recording Equipment**



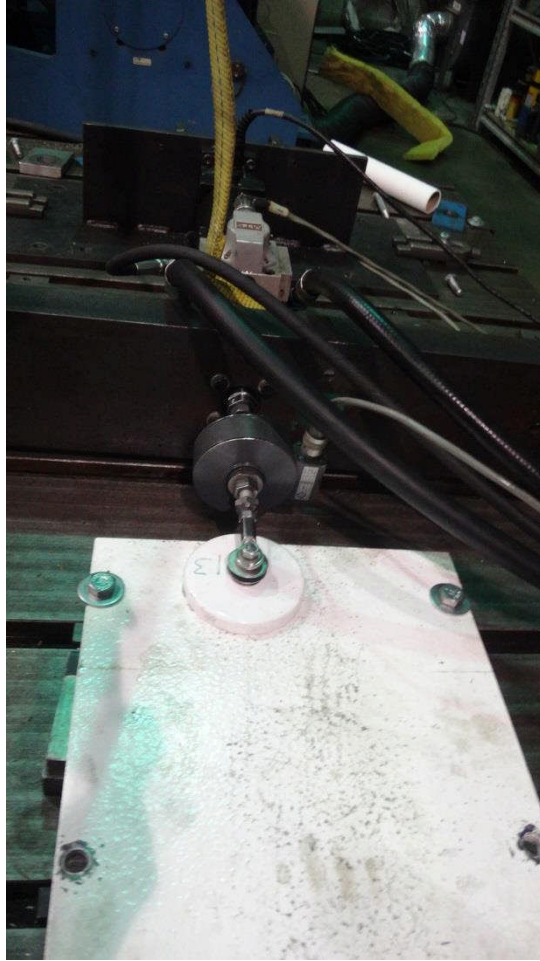
**Figure 2.4.6: Tensile Uniaxial Magnemount Test Setup-Typical**



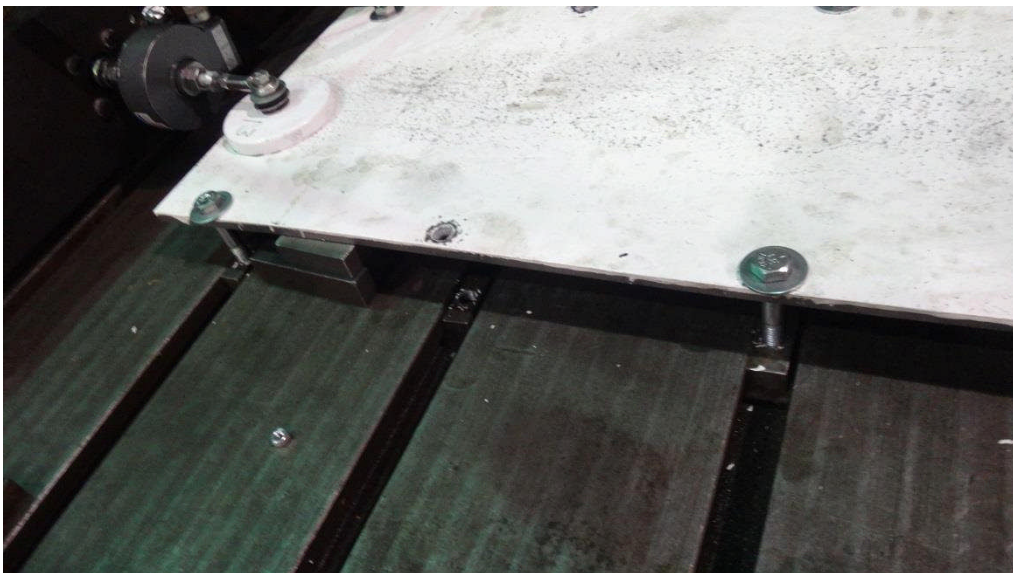
**Figure 2.4.7: Unistrut Magnemount Tensile Clevis**



**Figure 2.4.8: Unistrut Magnemount Shear Test Setup-Typical**



**Figure 2.4.9: Individual Magnet Shear Test Setup-Typical**



**Figure 2.4.10: Individual Magnet Shear Test Setup-Spacers Under Painted Plate**