

TEST REPORT

REPORT No. (99/2005)

- **CLIENT:** EGYTECH Cable Co. (EL-SEWEDY).
- **Report Date:** May. 2005
- **Place:**
 - Laboratories of Extra High Voltage Research Center.
 - Industrial of EGYTECH Cable Co. (for bending test only)
- **Requirements:**
 - Type tests according to IEC 60840.
- **Standard Specification:**
 - International standard IEC 60840 " Power cables with extruded insulation and their accessories for rated voltages above 30 kV ($U_m = 36$ kV) up to 150 kV ($U_m = 170$ kV).
- **Description of the Specimen :**
 - 38/66 kV Power cable with the following specification:

- Manufacturer	: EL-SEWEDY CABLES (EGC), Cairo, Egypt.
- Type	: 38/66 kV- CU/XLPE/ Overlapped copper tape + Copper wire screen /HDPE /1 x 1600 mm ²
- Year of Manufacture	: 2004
- No. of Phases	: 1
- Insulation	: XLPE
- Conductor Material	: Copper
- Conductor cross-section	: 1600 mm ²
- Screening Material	: Copper
- Sheath Material	: HDPE (ST7)
- Sheath Color	: Black
- Rated Frequency	: 50 Hz
- Internal Code	: TO - AC - 05 - 02 - 02 - 02.



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▪ **Description of the Equipment:**

- High voltage reactor – 400 kV – 5000 KVA – 50 Hz – Type: (RSK) – Serial No. 204322/99.
- PD detector – Type: (TE57).
- Tan δ measurement device – Type 254/321/02 Serial No. 144281.
- Standard capacitor – Type NK400 Serial No. 434321.
- Impulse voltage generator 800 kV – 20 kJ – Type SGSA 800-20.
- Air oven up to 300 °C – Type BINDER - Serial No. 02-32772.
- Universal testing machine up to 25 kN – Type TABLE TOP – Model APEX-T5000 Serial No. 2095.

▪ **Test Samples:**

- Test sample was chosen under the responsibility of the client.

▪ **Tests:**

1- **Electrical Type Tests on Completed Cable:**

- 1.1 Check of insulation thickness of cable before electrical type tests
- 1.2 Bending test on the cable followed by partial discharge test.
- 1.3 **Tan δ** measurement.
- 1.4 Heating cycle voltage test followed by partial discharge test.
- 1.5 Impulse voltage test followed by a power frequency voltage test.
- 1.6 Resistivity of semi-conducting screens.

2- **Non-Electrical Type Tests on Cable Components and on Completed Cable:**

- 2.1 Check of cable construction.
- 2.2 Tests for determining the mechanical properties of insulation before and after ageing
- 2.3 Tests for determining the mechanical properties of non-metallic sheaths before and after ageing
- 2.4 Ageing tests on pieces of complete cable to check compatibility of materials
- 2.5 Hot set test for XLPE insulation.

3- **Verification of Cable Construction:**

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▪ **Test Method and Results:**

1- Electrical Type Tests on Completed Cable:

1.1. Check of insulation thickness before electrical type tests:

- Prior to the electrical type tests the insulation thickness was measured in accordance with clause 11.3.1 of IEC 60480 (1999).
- The measured value of the insulation thickness is shown in the following table

Average thickness (mm)	Specified thickness (mm)	Requirement
17.7	17	The average thickness of the insulation doesn't exceed the specified value by more than 5%

1.2. Bending test on the cable followed by partial discharge test:

1.2.1 Bending test:

- The test cable was subjected to a bending test at ambient temperature in accordance with clause 11.3.4 of IEC 60840 (1999). The test cable was bent around a test cylinder. The diameter of the cylinder was 4200 mm. The test consisted of three cycles. The test object was bent for one complete turn. It was then unwound. The process repeated, except that the bending of the sample was in the reverse direction.

Outer diameter of cable D (mm)	Diameter of conductor d (mm)	Requirement of bending diameter $< 25(D+d)+5\%$ (mm)	Hub diameter of drum (mm)
110	52.7	< 4270	4200

1.2.2 Partial discharge test:

- The test cable was subjected to a partial discharge test in accordance with clause 11.3.5 of IEC 60840 (1999). The test voltage was raised gradually to and held at $1.75 U_0$ for 10 s and then slowly reduced to $1.5 U_0$.

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- The measured value of the partial discharge level is shown in the following table:

Applied voltage (kV)	Duration (S)	Max. partial discharge level (PC)	Measured partial Discharge level (PC)
66.5	10	--	--
57	--	≤ 5	< 1.3

- The Figure of the PD- Scope is illustrated in page (11) of this report.
- The cable passed the test.

1.3. Tan δ measurement:

- Another sample test cable was subjected to a $\tan \delta$ measurement in accordance with clause 11.3.6 of IEC 60840 (1999). The test object was heated by passing a current through the conductor until it reached a steady temperature, which was 96 °C. The $\tan \delta$ was measured at a power frequency voltage of U_0 at the temperature specified above.
- The measured value of $\tan \delta$ level is shown in the following table

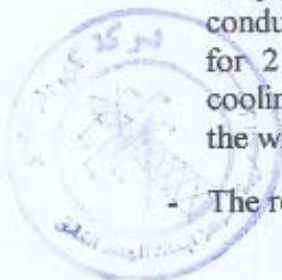
Applied voltage (kV)	Maximum allowable value for $\tan \delta (x 10^{-4})$	$\tan \delta (x 10^{-4})$ [Measured value]
38	10	7.16

- The cable passed the test.

1.4. Heating Cycle Voltage Test followed by partial discharge test:

1.4.1 Heating Cycle Voltage Test:

- The test cable was subjected to a heating cycle voltage test in accordance with clause 11.3.7 of IEC 60840 (1999). The test object was heated by passing a current through the conductor until it reached a steady temperature, which was 96 °C. The heating was applied for 8 h. The conductor temperature was maintained within the stated temperature limits for 2 h of each heating period. This was followed by 16 h of natural cooling. The cycle of heating and cooling was carried out 20 times. During the whole of the test period a voltage of $2 U_0$ was applied to the test object.
- The result of the heating cycle voltage test is shown in the following table.



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No. of heating cycles	Required conductor temperature (°C)	Applied heating current (A)	Heating		Cooling time (h)	Applied voltage continuously (kV)
			Total heating time (h)	Duration of heating at 96 °C (h)		
20	$95 \leq t \leq 100$	2600 - 2800	8	2	16	76

- The cable passed the test.

1.4.2 Partial discharge test:

- After the last heat cycle, partial discharge was measured for the test cable at ambient temperature in accordance with clause 11.3.7 of IEC 60840 (1999). The measurement was carried out as mentioned above under item 1.2.2.
- The measured value of the partial discharge level is shown in the following table:

Applied voltage (kV)	Duration (S)	Max. partial discharge level (PC)	Measured partial Discharge level (PC)
66.5	10	--	--
57	--	≤ 5	< 1.4

- The Figure of the PD- Scope is illustrated in page (12) of this report.
- The cable passed the test.

1.5. Impulse voltage test followed by a power frequency voltage test:

1.5.1 Impulse Voltage Test:

- The test cable was subjected to a lightning impulse voltage withstand test in accordance with clause 11.3.8 of IEC 60840 (1999). The test was performed on the sample at a conductor temperature of 96 °C. The cable withstood 10 positive and 10 negative voltage impulses with crest value of 325 kV without failure.



The results were illustrated by the Figures in page No. (13) of this report.
The cable passed the test.

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1.5.2 Power Frequency Voltage Test:

- After the impulse voltage test, the test cable was subjected to power frequency voltage test of $2.5U_0$ for 15 min. in accordance with clause 11.3.8 of IEC 60840 (1999).
- The result of the power frequency voltage test is shown in the following table

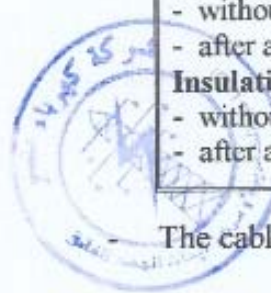
Applied voltage (kV)	Frequency (Hz)	Duration (min)	Observations
95	50	15	No breakdown

- The cable passed the test.

1.6. Resistivity of semi-conducting screens:

- The measurement of the resistivity of the semi-conducting screens were carried out in accordance with clause 11.3.9 of IEC 60840 (1999). The resistivity of extruded semi-conducting screens applied over the conductor and over the insulation was determined by measurements on test pieces taken from the core of a sample of cable as manufactured and a sample of cable which has been subjected to the ageing treatment to test the compatibility of component materials specified in IEC 60840 (1999). The measurements were made at a temperature of 90 °C.
- The results of Resistivity of semi-conducting screens are shown in the following table

Item	Unit	Requirement	Measured/ Determined
Conductor screen			
- without ageing	Ωm	≤ 1000	1.25
- after ageing	Ωm	≤ 1000	1.05
Insulation screen			
- without ageing	Ωm	≤ 500	0.31
- after ageing	Ωm	≤ 500	0.19



The cable passed the test.

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2- Non-Electrical Type Tests on Cable Components and on Completed Cable:

2.1. Check of Cable Construction:

- The examination of the conductor and measurements of insulation and sheath thickness was carried out in accordance with clause 11.4.1 of IEC 60840 (1999).
- The results of examination of the conductor and measurements are shown in the following table:

Item	Unit	Requirement	Measured/ determined
Thickness of insulation			
- minimum	mm	≥ 15.3	17.1
- $(t_{max} - t_{min}) / t_{max}$	-	≤ 0.15	0.065
Thickness of non-metallic sheath			
- average	mm	≥ 4.5	4.8
- minimum	mm	≥ 3.725	4.2

- The cable passed the check.

2.2. Tests for determining the mechanical properties of insulation before and after ageing:

- The mechanical properties of insulation before and after ageing were determined in accordance with clause 11.4.2 of IEC 60840 (1999).
- The results of the mechanical properties of insulation before and after ageing are shown in the following table.

Item	Unit	Requirement	Measured/ determined
Without ageing			
-tensile strength	N/mm ²	≥ 12.5	18.48
-elongation	%	≥ 200	490
after ageing in air oven			
-Min. tensile strength	N/mm ²	---	21.89
-Max. variation with samples without ageing	%	± 25	+ 18.4
-Min. elongation	%	---	553
-Max. variation with samples without ageing	%	± 25	+ 12.8

- The results of insulation before ageing showed in attached figures in pages (14, 15, 16, 17, 18) of this report.
- The results of insulation after ageing are showed in attached figures in pages (19, 20, 21, 22, 23) of this report.
- The cable passed the test.

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2.3. Tests for determining the mechanical properties of non-metallic sheaths before and after ageing :

- The mechanical properties of the outer sheath before and after ageing were determined in accordance with clause 11.4.3 of IEC 60840 (1999).
- The results of the mechanical properties of non-metallic sheaths before and after ageing are shown in the following table:

Item	Unit	Requirement	Measured/ determined
Without ageing			
-tensile strength	N/mm ²	≥ 10.0	21.5
-elongation	%	≥ 300	855
after ageing			
-Min. tensile strength	N/mm ²	---	20
-Max. variation with samples without ageing	%	---	- 7.2
-elongation	%	≥ 300	825
-Max. variation with samples without ageing	%	---	- 3.5

- The results of the outer sheath before ageing are showed in attached figures in pages (24, 25, 26, 27, 28) of this report.
- The results of the outer sheath after ageing are showed in attached figures in pages (29, 30, 31, 32, 33) of this report.
- The cable passed the test.

2.4. Ageing Tests on Pieces of Completed Cable to Check Compatibility of Materials:

- Ageing tests on pieces of completed cable were carried out in accordance with clause 11.4.4 of IEC 60840 (1999).
- The results of the mechanical properties of completed cable are shown in the following table:

Item	Unit	Requirement	Measured - determined
Insulation			
-Min. tensile strength	N/mm ²	---	19.92
-Max. variation with samples without ageing	%	± 25	+ 7.7
-Min. elongation	%	---	535
-Max. variation with samples without ageing	%	± 25	+ 9.2
Sheath			
-tensile strength	N/mm ²	---	20.8
-variation with samples without ageing	%	---	- 3.2
-elongation	%	≥ 300	975
-variation with samples without ageing	%	---	+ 14

- The results of insulation after ageing showed in attached figures in pages (34, 35, 36, 37, 38) of this report.



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- The results of the outer sheath after ageing showed in attached figures in pages (39, 40, 41, 42, 43) of this report.
- The cable passed the test.

2.5. Hot set test for XLPE insulation:

- A hot set test for the XLPE insulation was carried out in accordance with clause 11.4.10 of IEC 60840 (1999).
- The results of the hot set test for the XLPE insulation are shown in the following table.

Item	Unit	Requirement	Measured
-elongation under load	%	≤ 175	125
-permanent elongation	%	≤ 15	2.5

- The cable passed the test.

3- Construction:

- The construction of the cable was checked against the manufacturer specification.
- The results are shown in the following table:

Items	Determination
- Marking of the cable	ELSEWEDY CABLES (EGC) 1600 mm ² 66 kV / CU / XLPE / / HDPE.
- Color of the outer sheath	Black
Cable construction	<ul style="list-style-type: none"> - 305 copper wires (61 wires \times 5 segment). - Semi-conducting water blocking tape - Extruded semi-conducting material. - XLPE insulation. - Extruded semi-conducting material. - Semi-conducting water blocking tape. - Overlapped copper tape + Copper wire screen. - Non-conductive water blocking tape. - Aluminum foil tape. - HDPE. ST₇ over sheath.
Outer diameter of the cable (mm)	110 (average)
Outer diameter of the conductor (mm)	52.7



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▪ **Conclusion :**

- The 38/66 kV/CU/XLPE/ Overlapped copper tape + Copper wire screen /HDPE / $1 \times 1600 \text{ mm}^2$ manufactured by EGYTECH Cables Co fulfilled the requirements of tests mentioned in this report according to IEC (60840).

▪ **Notes:**

- Tests were carried out on the above specimen only without any responsibility concerning other untested specimens.
- The tests were carried out without any obligation on Egyptian Electricity Holding Company.
- This test report shall not be reproduced except in full, without written approval of EHVC.

▪ **TEST ENGINEERS:**

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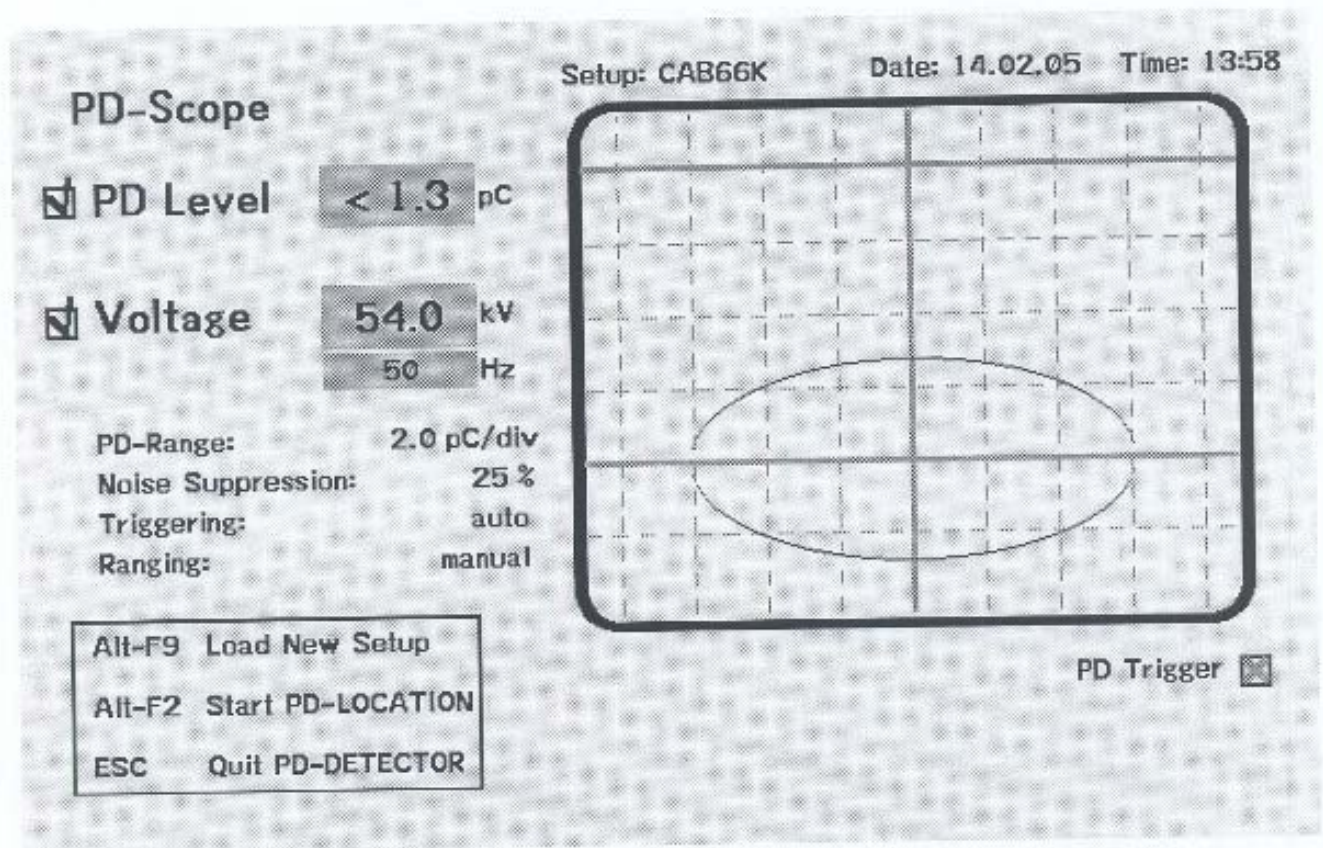
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**Measurement Results of Partial Discharge for
Power Cable 38/66 kV – 1 × 1600 mm²
(EGYTECH Cables)**



- Case : Before heating cycle.
- Ambient temp. : 13 °C.
- Calibration at : 10 PC.
- Test Engineers :

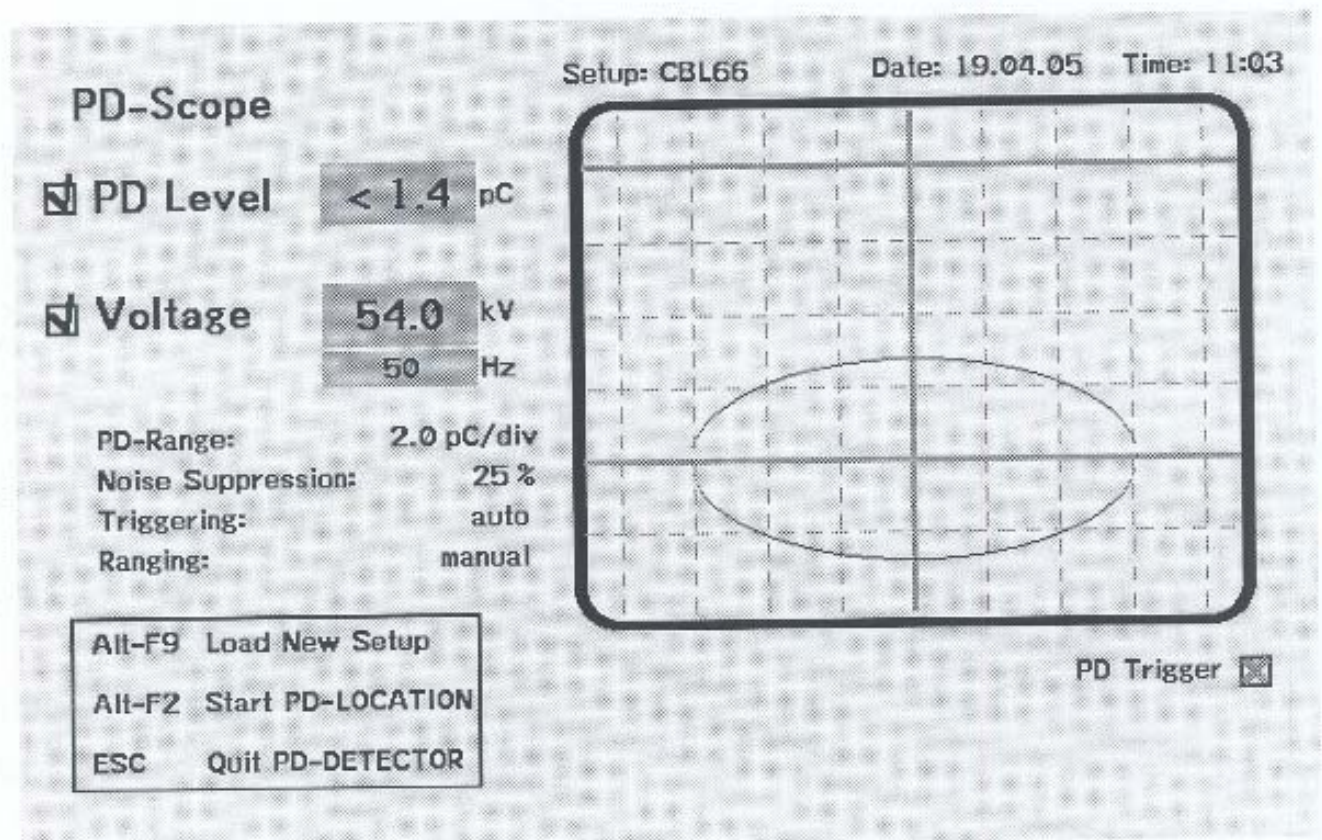
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Measurement Results of Partial Discharge for Power Cable 38/66 kV – 1 × 1600 mm² (EGYTECH Cables)



- Case : After heating cycle (conductor at ambient temp.)
- Ambient temp. : 27 °C.
- Calibration at : 10 PC.
- Test Engineers :

Signature

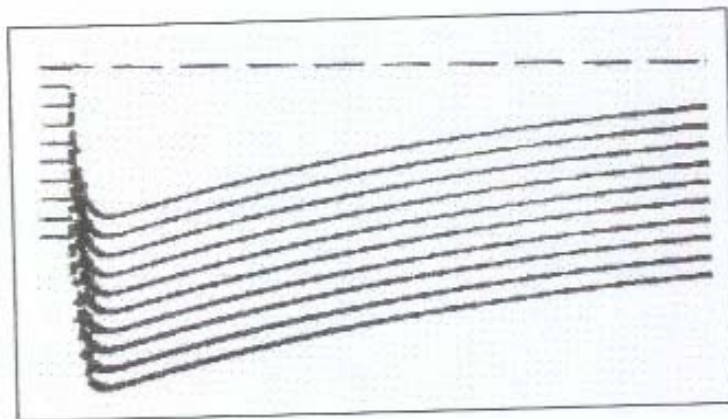
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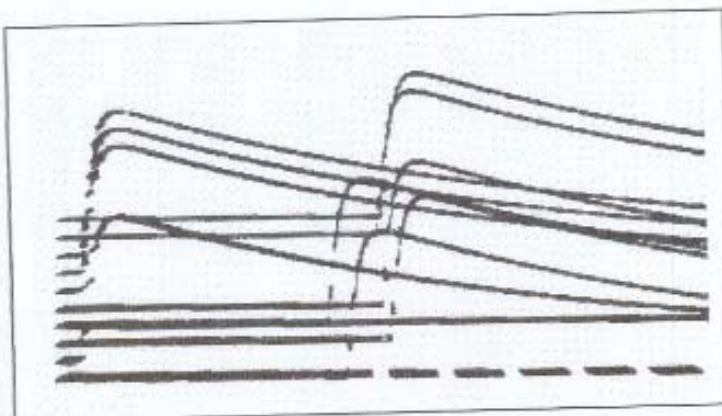
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lightning Impulse test results

38/66 kV power cable copper conductor
1x1600 mm² XLPE insulation, HDPE sheath



Test voltage 325 kV (-ve)
Pic No. (312)



Test voltage 325 kV (+ve)
Pic No. (311)

Ambient Condition :

T = 32 °C

p = 996 MPE

H = 65 %

Atmospheric Correction Factors: (IEC 60060-3)

Air density correction Factor $K_d = N/A$

Humidity correction Factor $K_h = N/A$

Atmospheric Correction Factor $K = K_d \cdot K_h = N/A$

Test voltage

T.V value before correction = 325 kv

T.V value after correction = 325 kv

Test Voltage Tolerances :

peak = $\pm 3\%$

Overshoot = $+5\%$

Wave Time Tolerances

Front Time..... = $\pm 30\%$

Time to half value = $\pm 20\%$



Test engineers

M. El-Dars



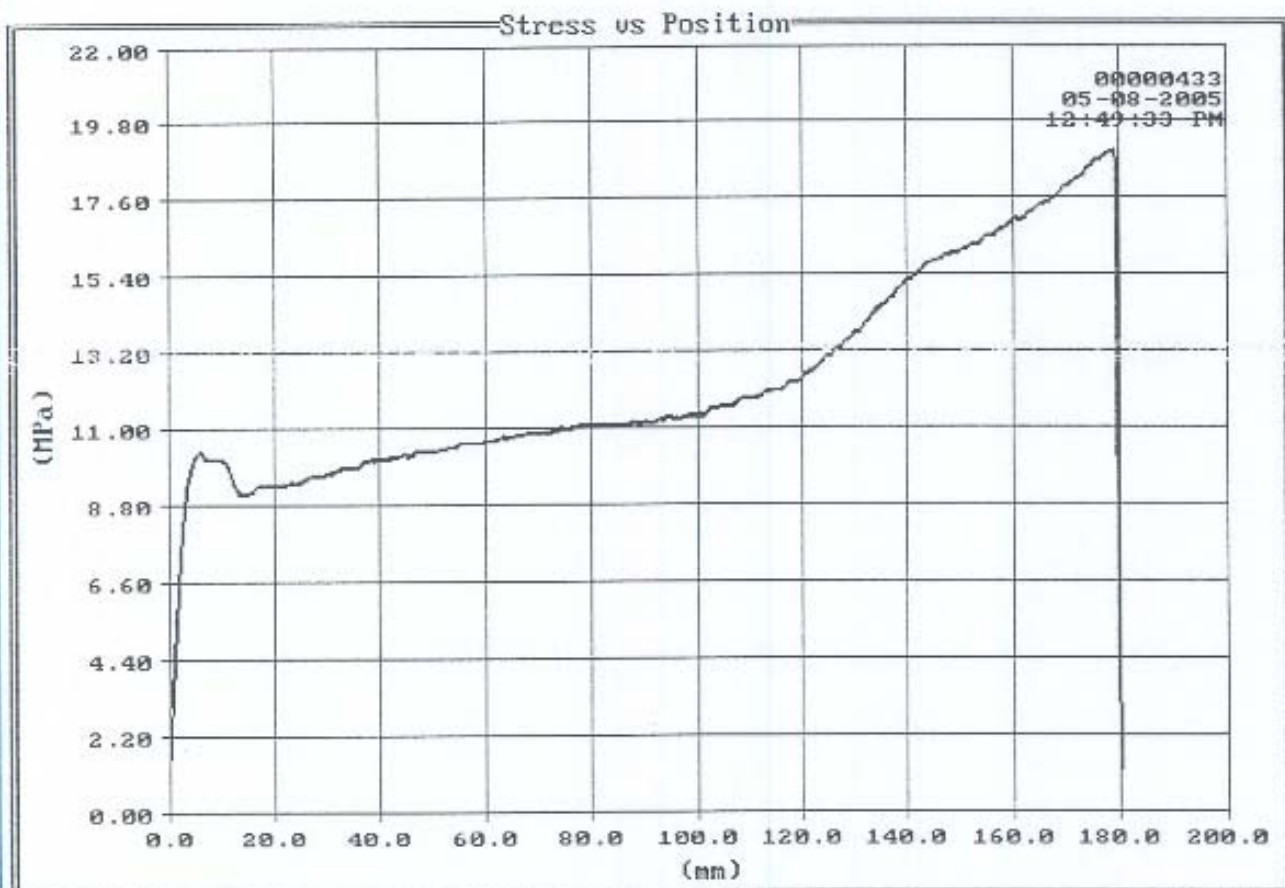
Test Tensile Test
Procedure Tensile test

Test Date 05-08-2005
Test Time 12:49:33 PM
Elapsed Time 00:00:43

Tensile Strgth 19.1600 MPa
Total Elong 475.00 %

Tested By E.H.V.R.C
Test Counter 00000433
Area 5.8200 mm²

Peak Load 112 N
Init Punch Len 20.000 mm



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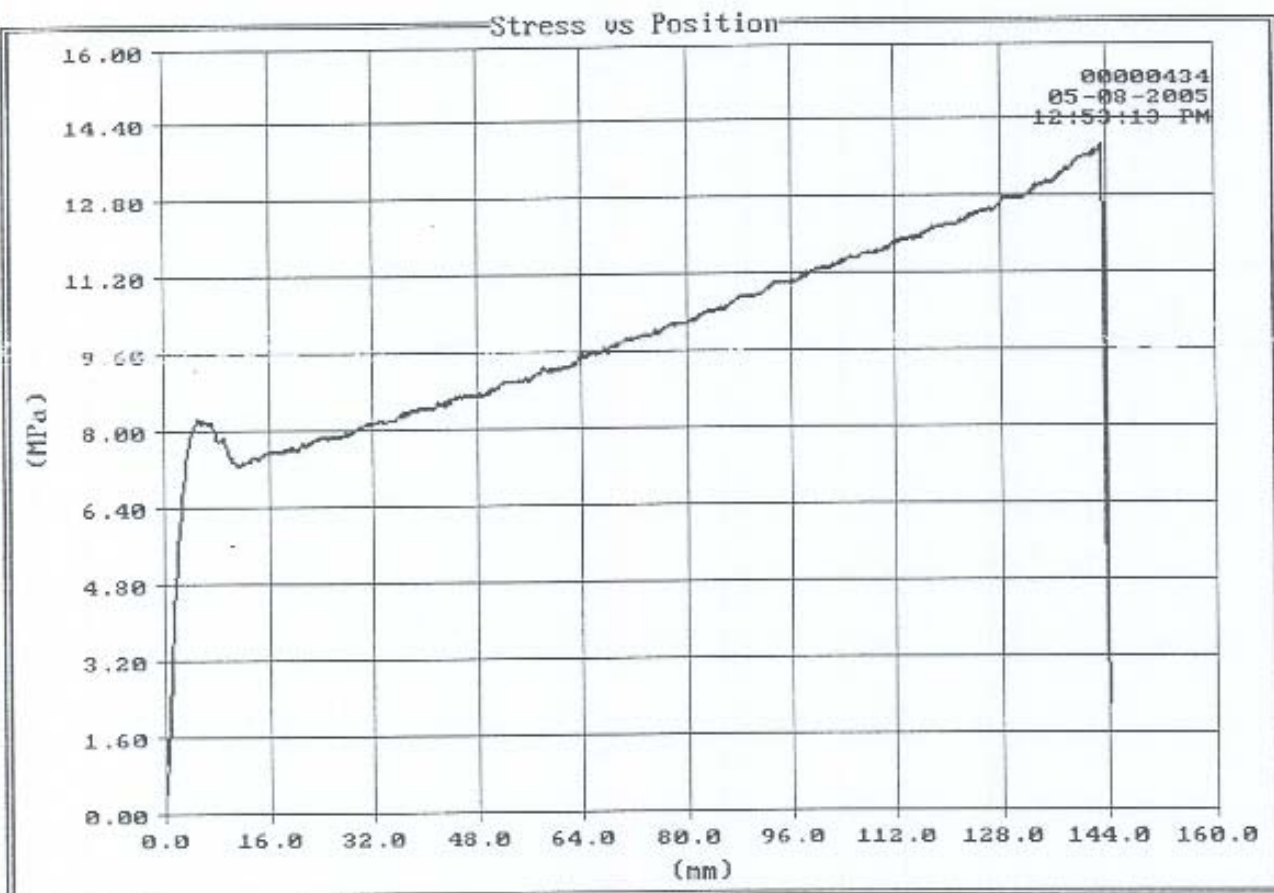
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Procedure Tensile test

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Tested By E.H.V.R.C
Test Counter 00000434
Area 4.9400 mm²

Tensile Strgth 13.9000 MPa
Total Elong 425.00 %

Peak Load 69 N
Init Punch Len 20.000 mm



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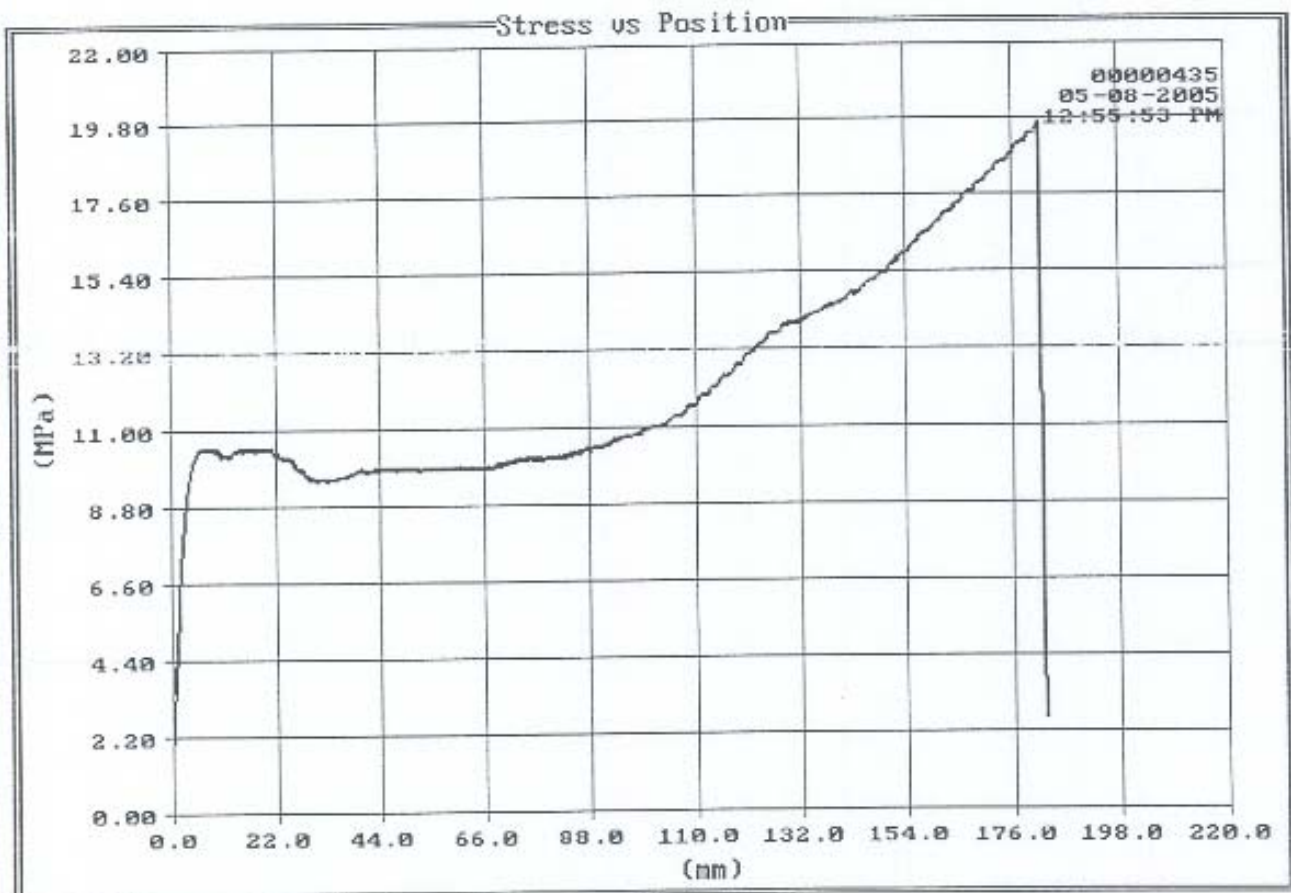
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Tested By E.H.V.R.C
Test Counter 00000435
Area 4.9400 mm²

Tensile Strgth 19.6770 MPa
Total Elong 500.00 %

Peak Load 97 N
Init Punch Len 20.000 mm



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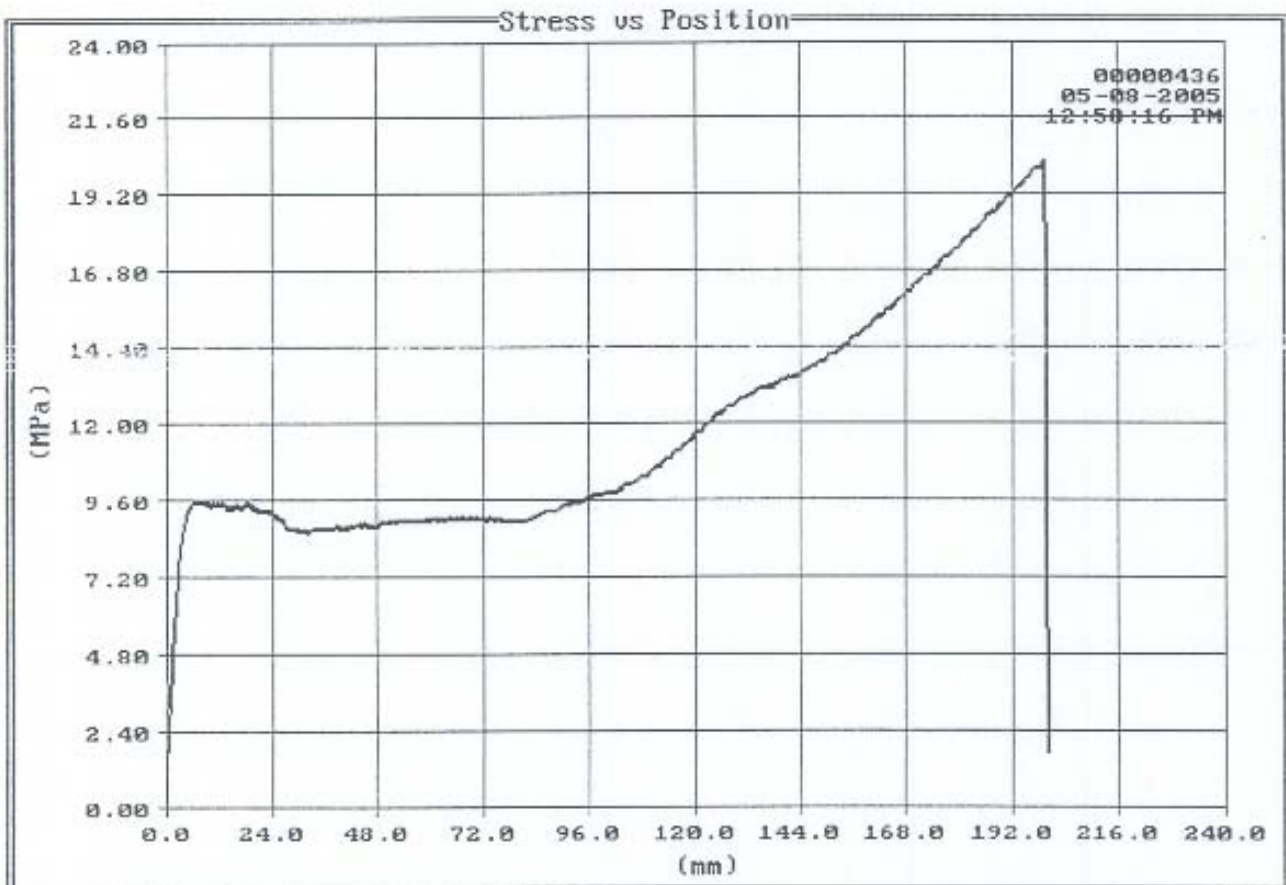
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Tested By E.H.V.R.C
Test Counter 00000436
Area 5.1800 mm²

Tensile Strgth 20.2430 MPa
Total Elong 540.00 %

Peak Load 105 N
Init Punch Len 20.000 mm



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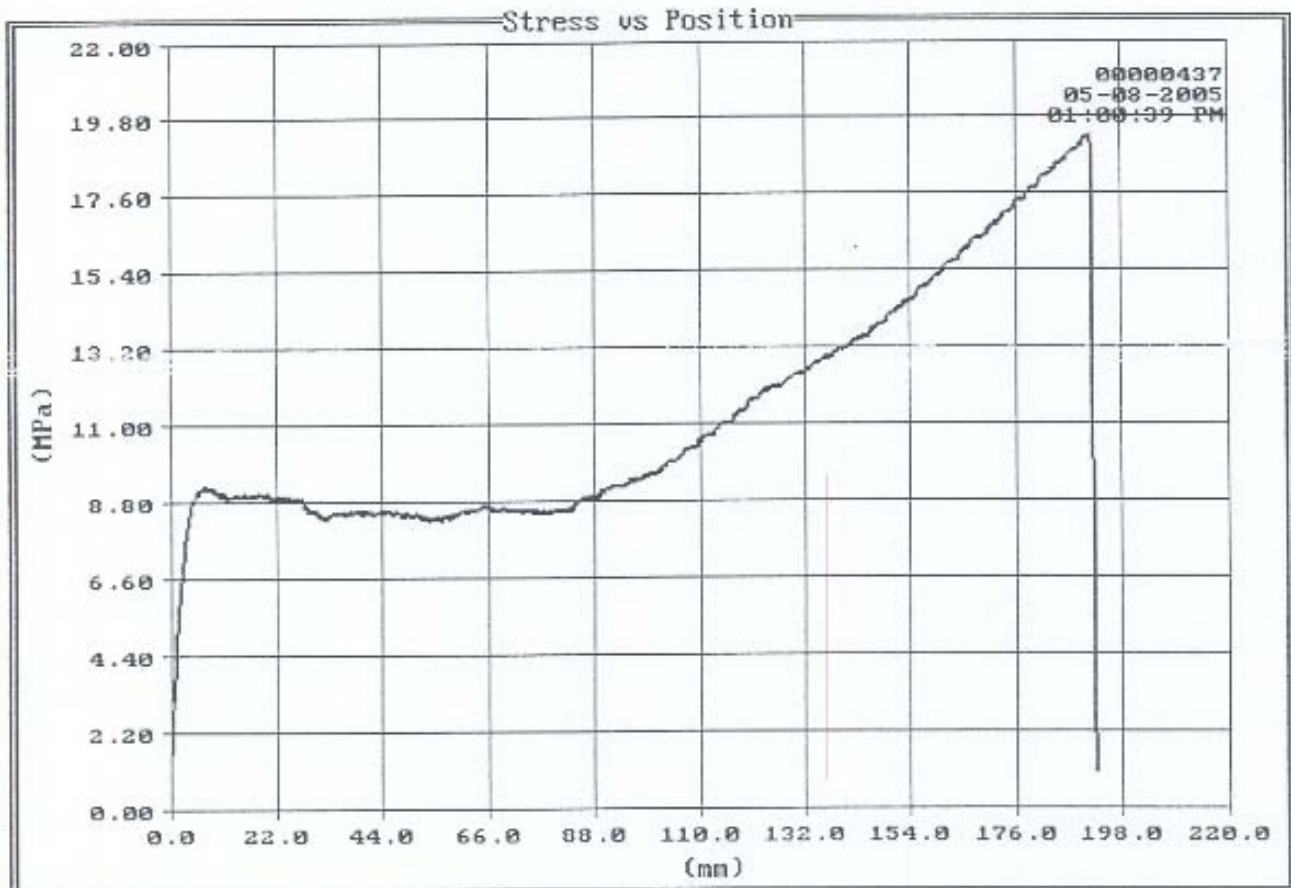
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Procedure Tensile test

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Tested By E.H.V.R.C
Test Counter 00000437
Area 4.0200 mm²

Tensile Strgth 19.5240 MPa
Total Elong 510.00 %

Peak Load 78 N
Init Punch Len 20.000 mm



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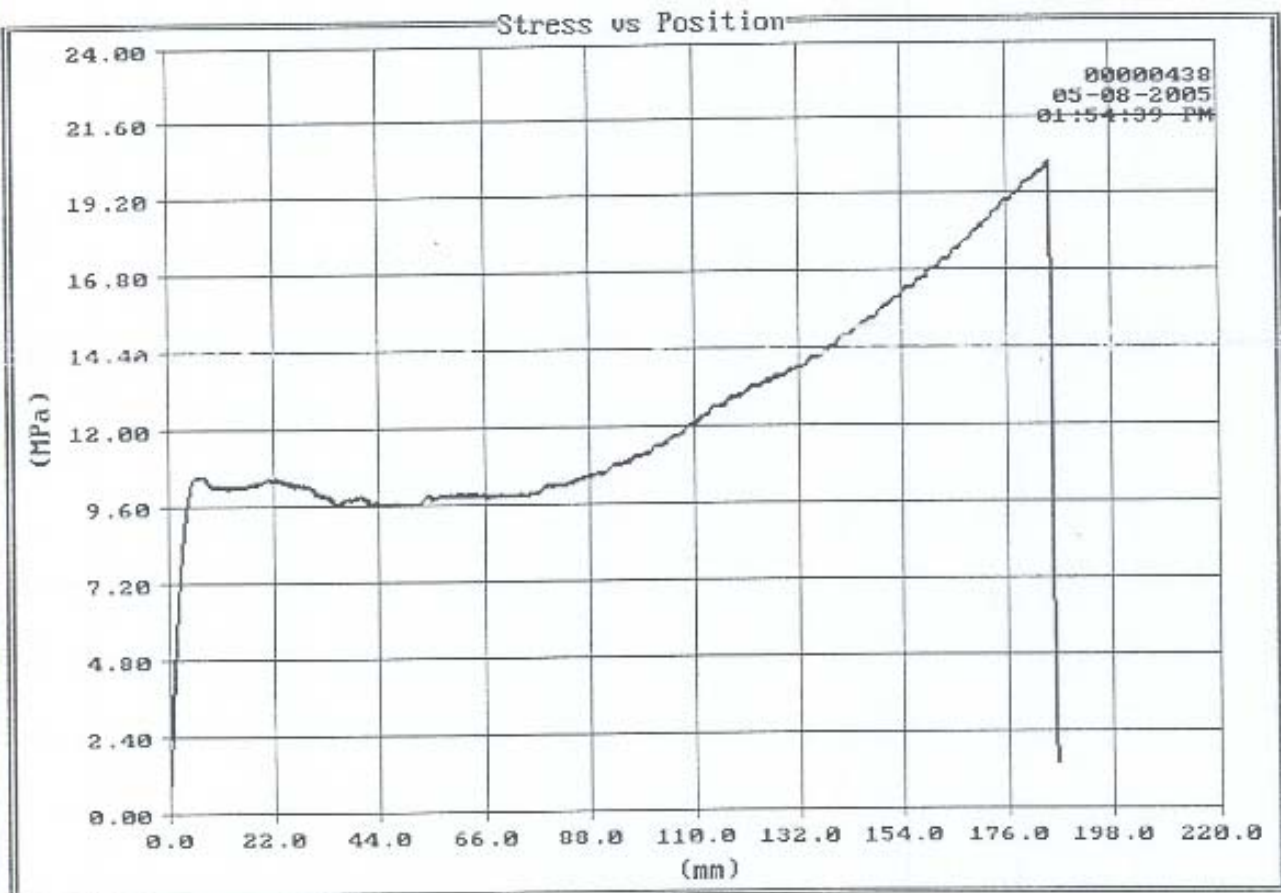
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Procedure Tensile test

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Tested By E.H.V.R.C
Test Counter 00000438
Area 4.7280 mm²

Tensile Strgth 20.1550 MPa
Total Elong 525.00 %

Peak Load 95 N
Init Punch Len 20.000 mm



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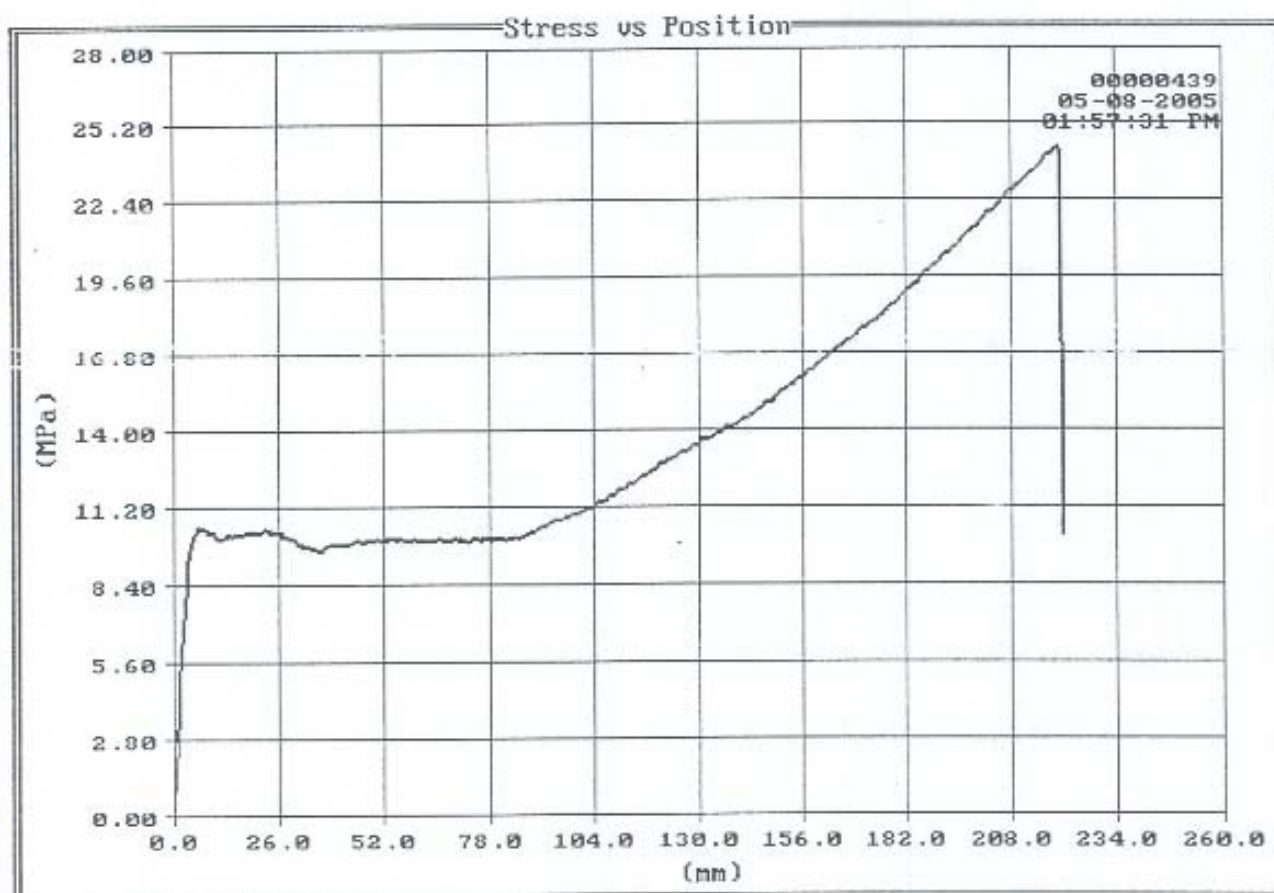
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Procedure Tensile test

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Test Time 01:57:31 PM
Elapsed Time 00:00:53

Tested By E.H.V.R.C
Test Counter 00000439
Area 6.3000 mm²

Tensile Strgth 24.5080 MPa
Total Elong 600.00 %

Peak Load 154 N
Init Punch Len 20.000 mm



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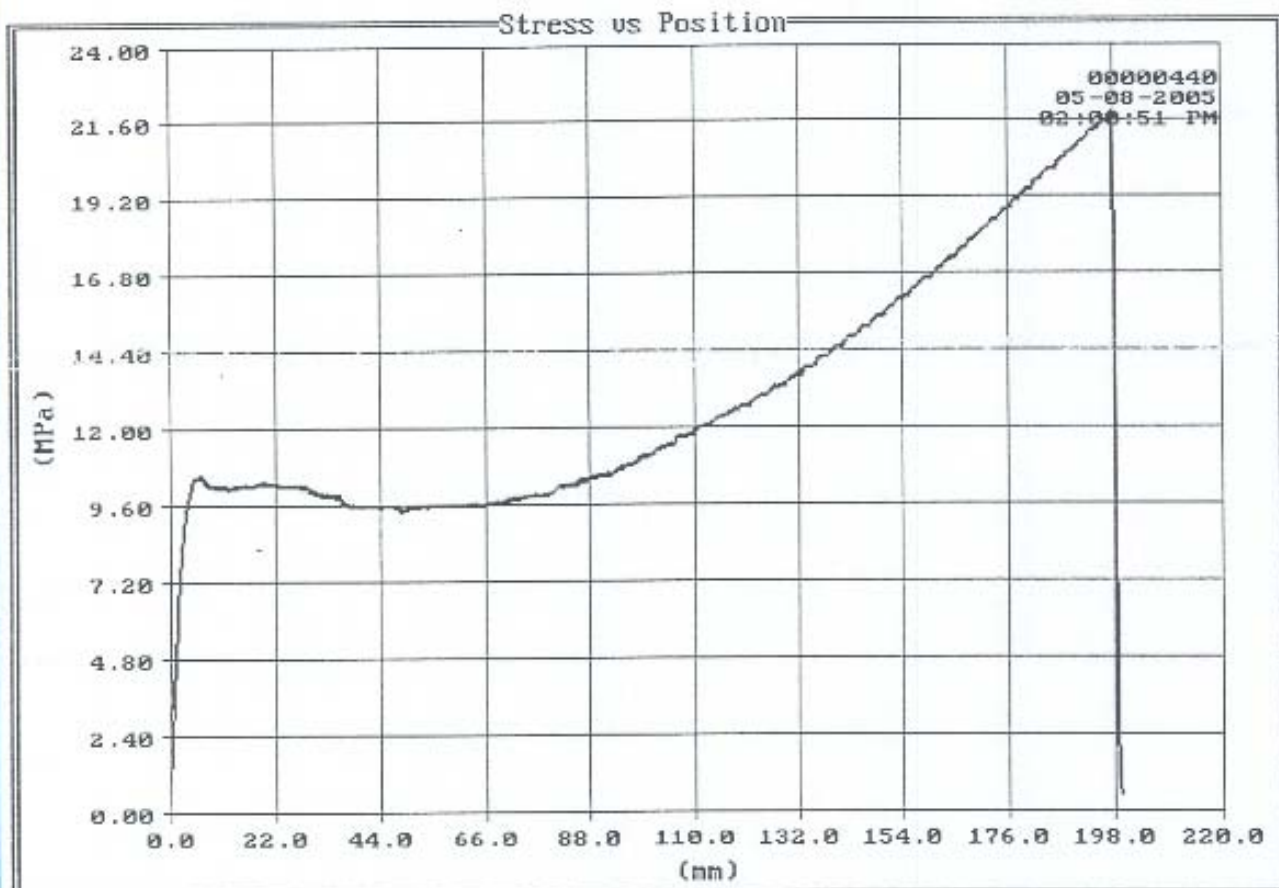
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Procedure Tensile test

Test Date 05-08-2005
Test Time 02:00:51 PM
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Tested By E.H.V.R.C
Test Counter 00000440
Area 4.6400 mm²

Tensile Strgth 21.8760 MPa
Total Elong 550.00 %

Peak Load 102 N
Init Punch Len 20.000 mm



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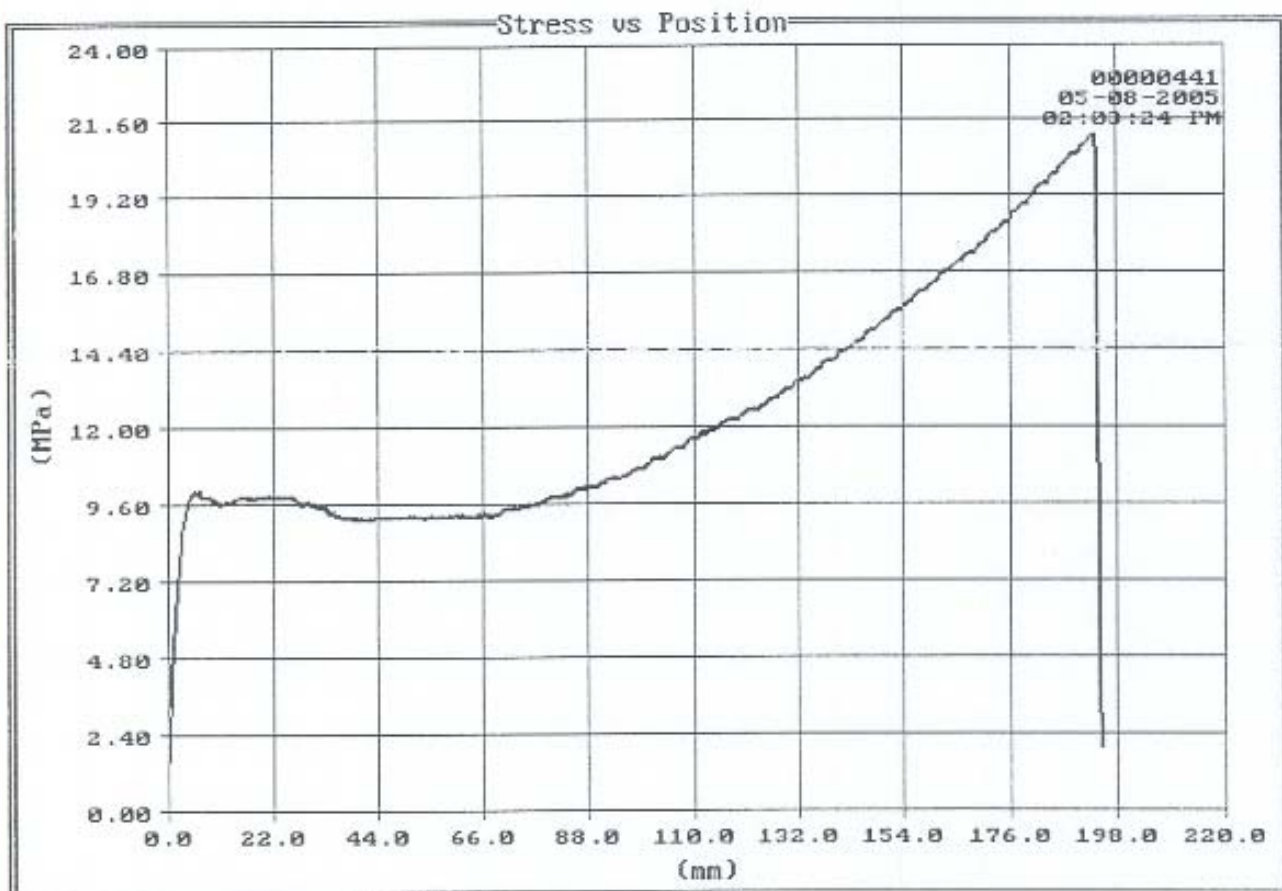
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Procedure Tensile test

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Elapsed Time 00:00:47

Tested By E.H.V.R.C
Test Counter 00000441
Area 4.6800 mm²

Tensile Strgth 21.3830 MPa
Total Elong 540.00 %

Peak Load 100 N
Init Punch Len 20.000 mm



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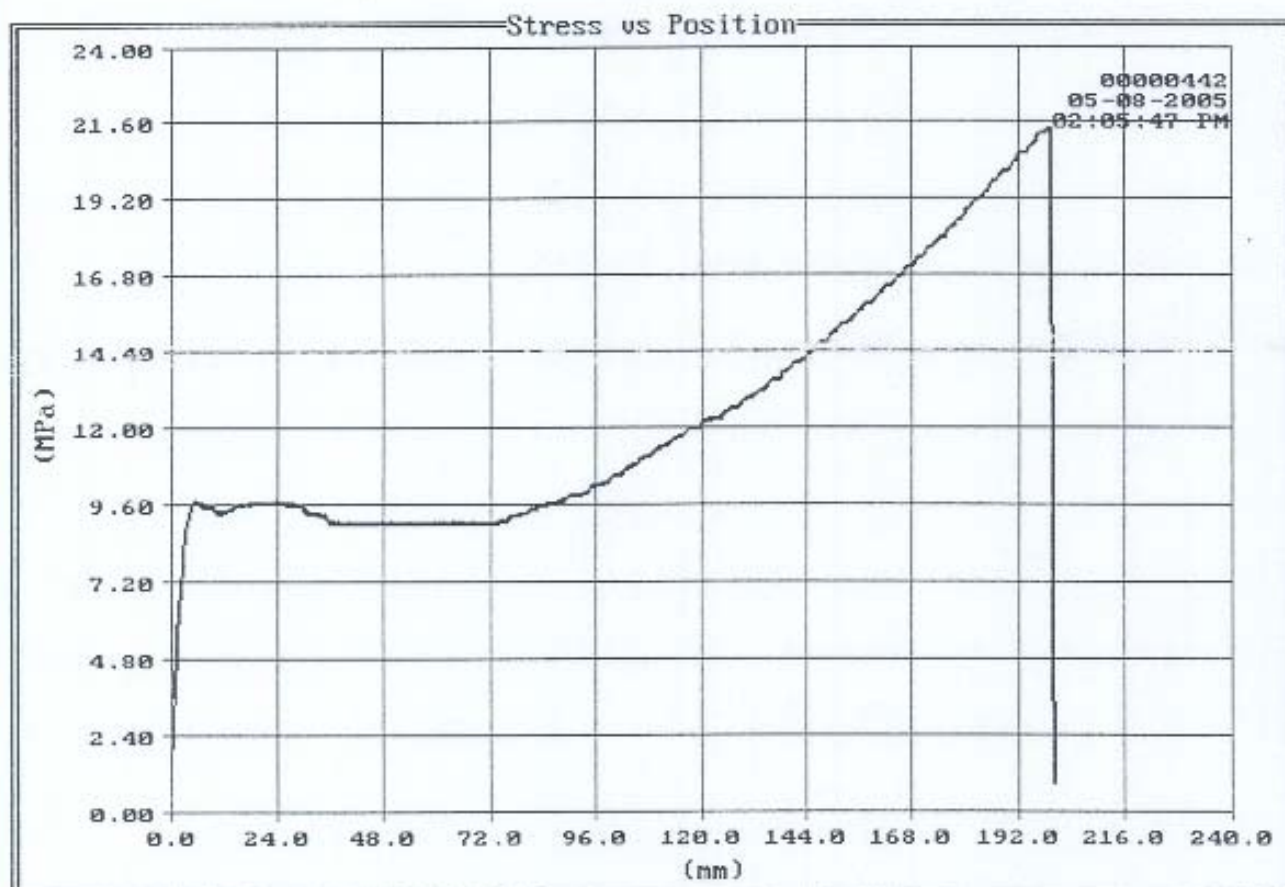
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Elapsed Time 00:00:48

Tested By E.H.V.R.C
Test Counter 00000442
Area 4.7800 mm²

Tensile Strgth 21.5350 MPa
Total Elong 550.00 %

Peak Load 103 N
Init Punch Len 20.000 mm



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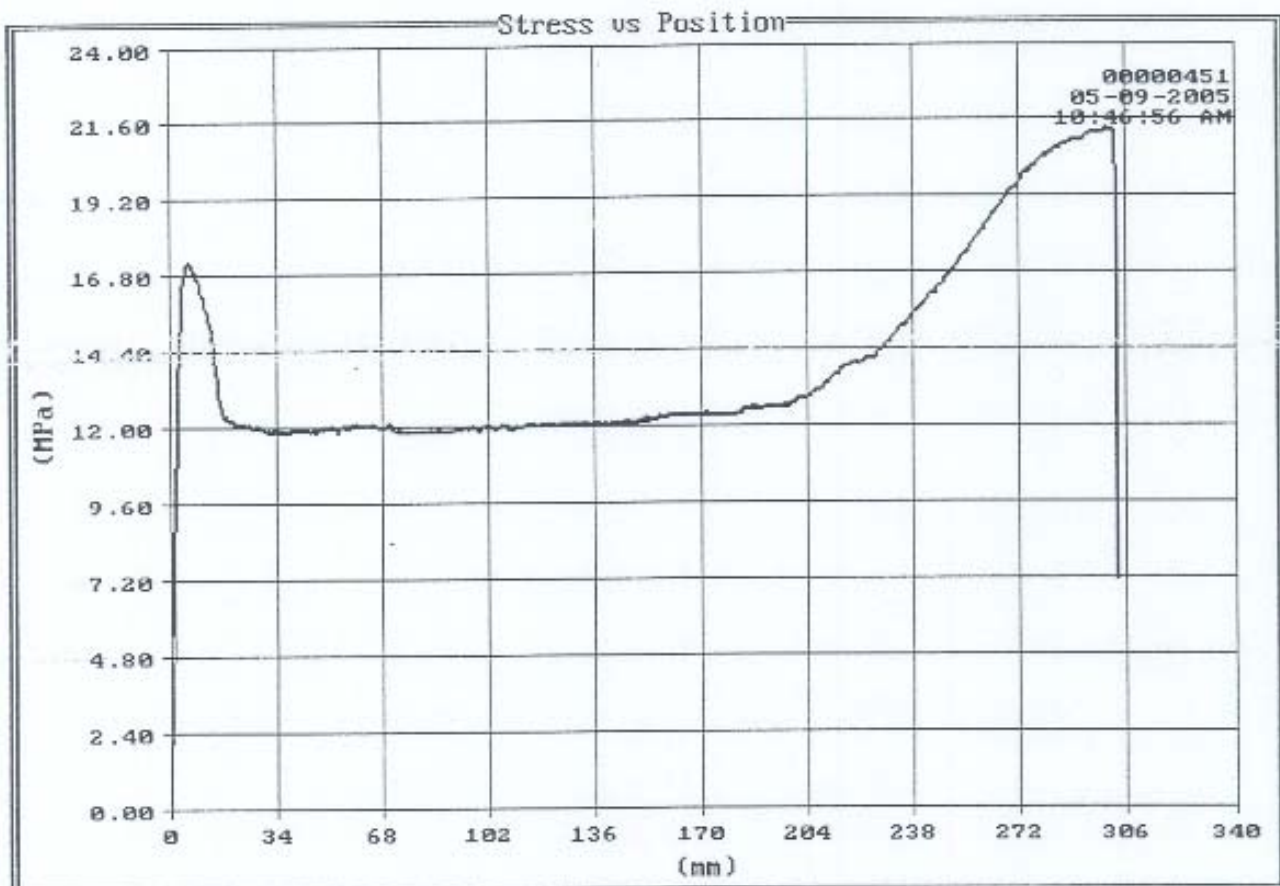
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Elapsed Time 00:01:13

Tested By E.H.V.R.C
Test Counter 00000451
Area 5.6600 mm²

Tensile Strgth 21.4040 MPa
Total Elong 875.00 %

Peak Load 121 N
Init Punch Len 20.000 mm



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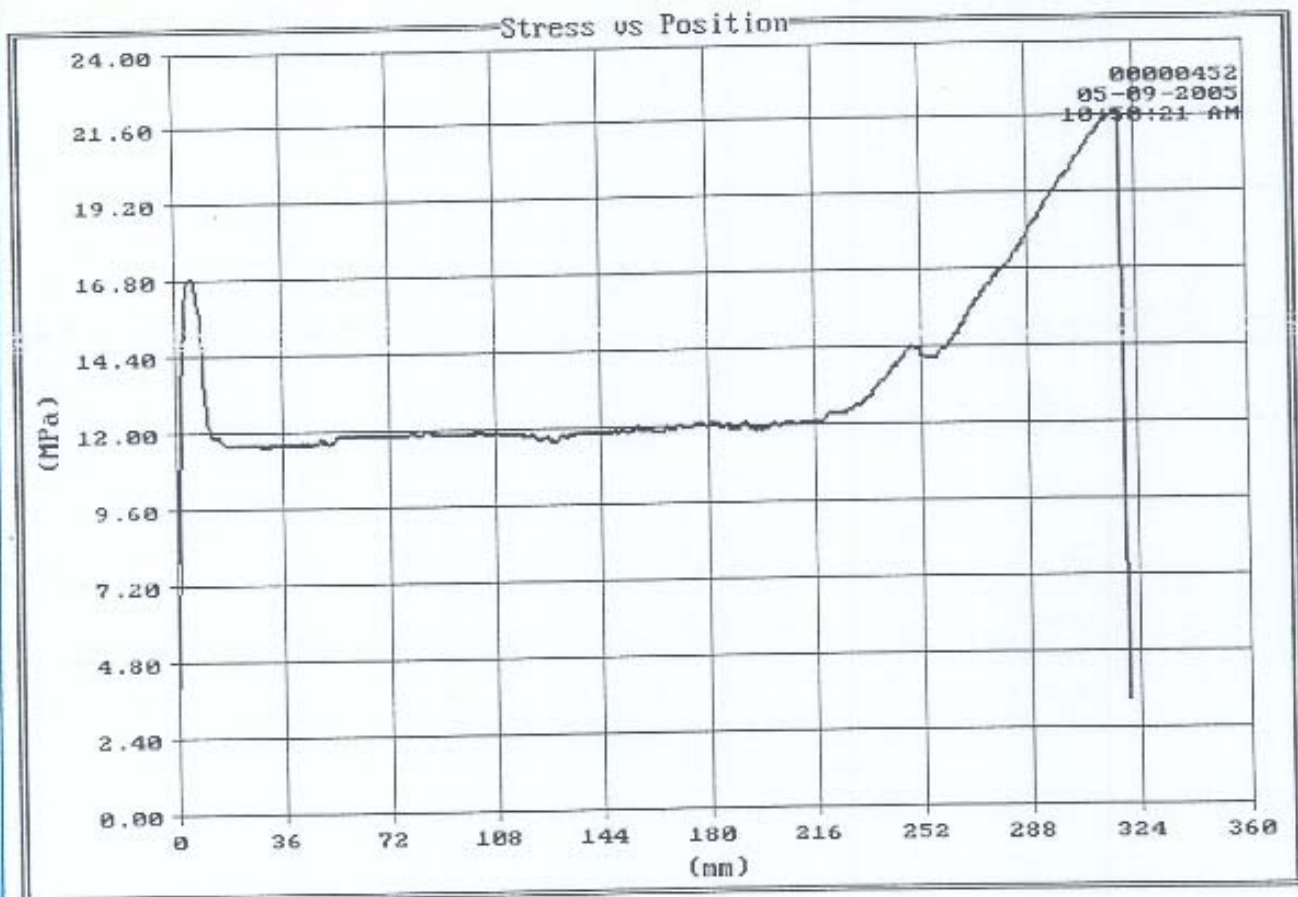
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 10:50:21 AM
Elapsed Time 00:01:17

Tested By E.H.V.R.C
Test Counter 00000452
Area 5.7400 mm²

Tensile Strgth 21.7790 MPa
Total Elong 875.00 %

Peak Load 125 N
Init Punch Len 20.000 mm



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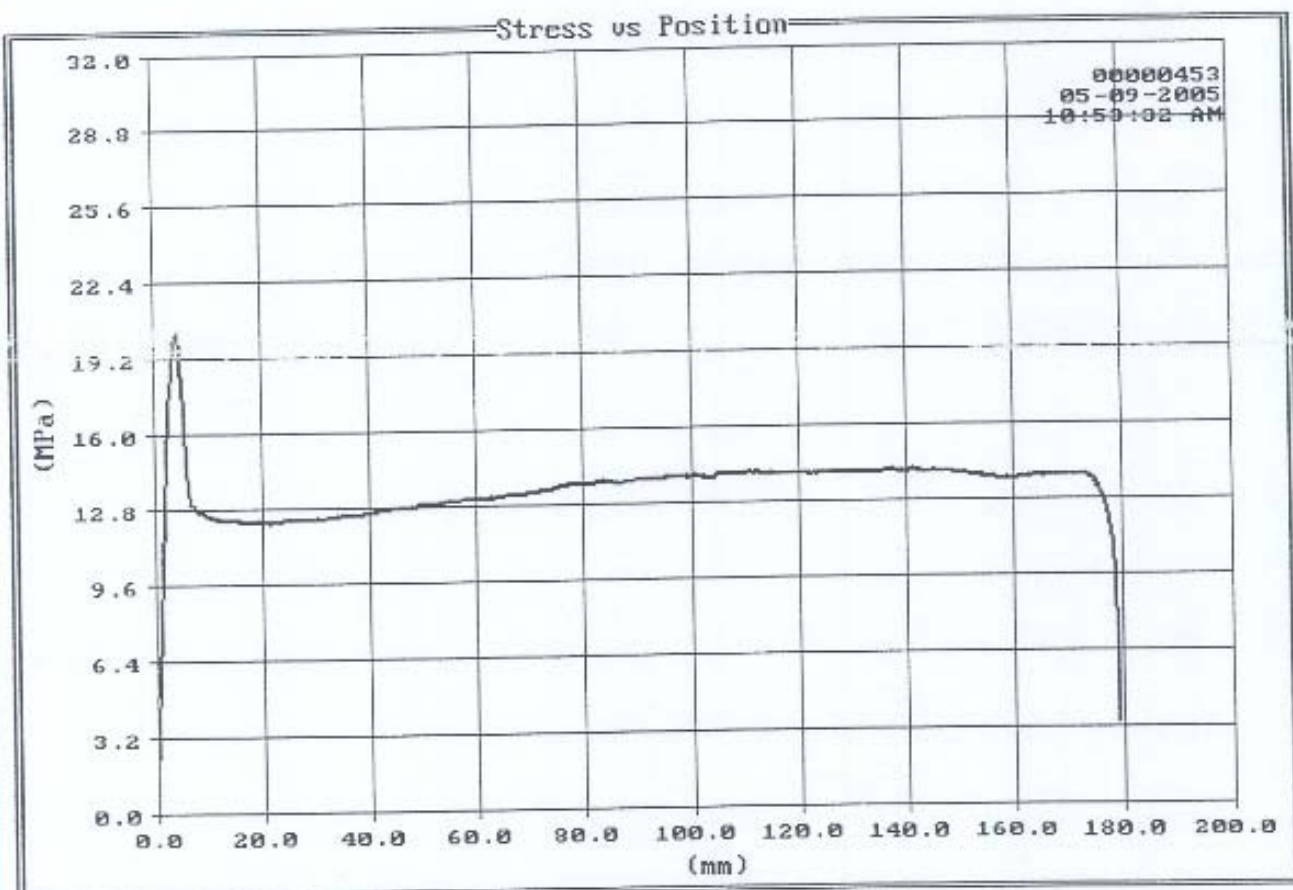
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Procedure Tensile test

Test Date 05-09-2005
Test Time 10:53:32 AM
Elapsed Time 00:00:43

Tested By
Test Counter 00000453
Area 7.6800 mm²

Tensile Strgth 20.3020 MPa
Total Elong 675.00 %

Peak Load 156 N
Init Punch Len 20.000 mm



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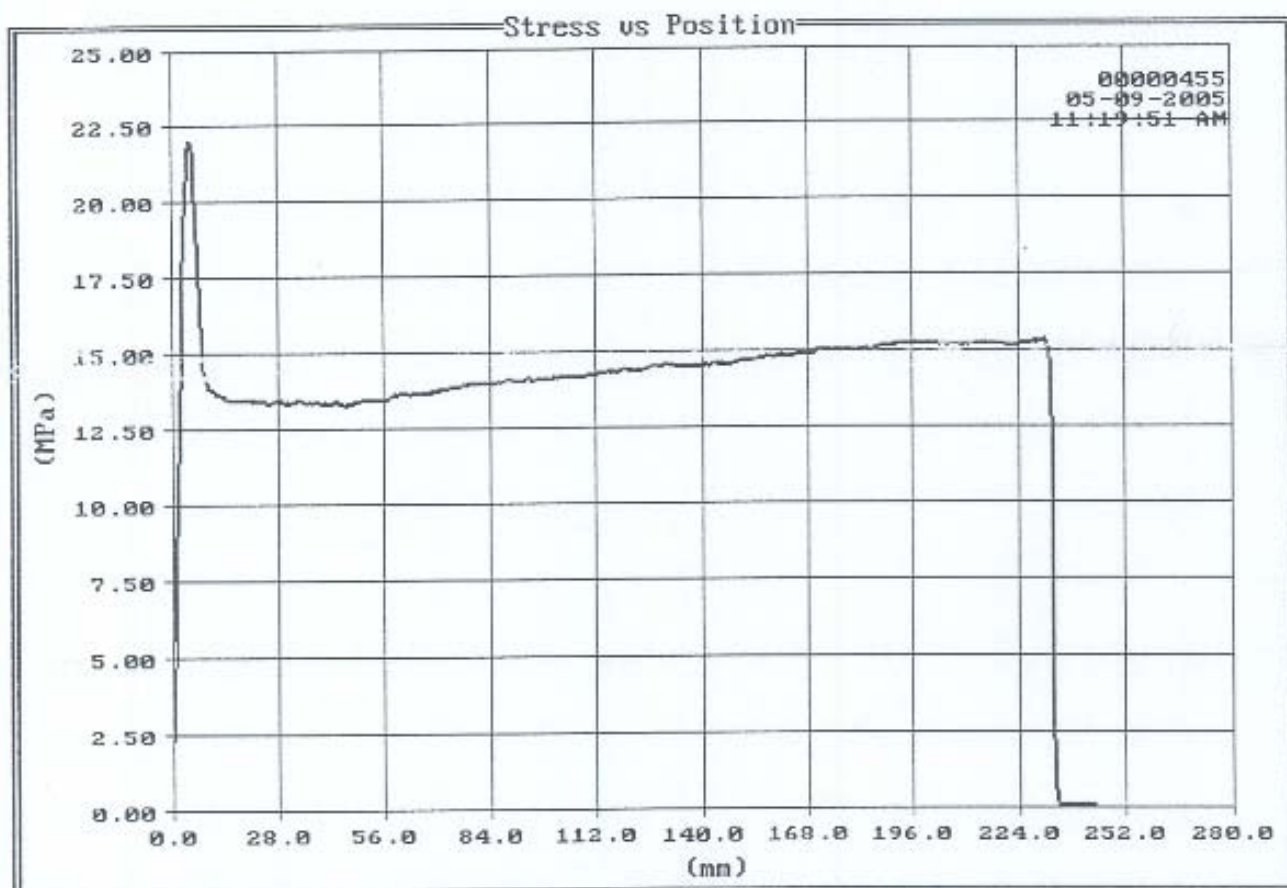
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
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Elapsed Time 00:00:58

Tested By
Test Counter 00000455
Area 8.0000 mm²

Tensile Strgth 21.99200 MPa
Total Elong 900.00 %

Peak Load 176 N
Init Punch Len 20.000 mm



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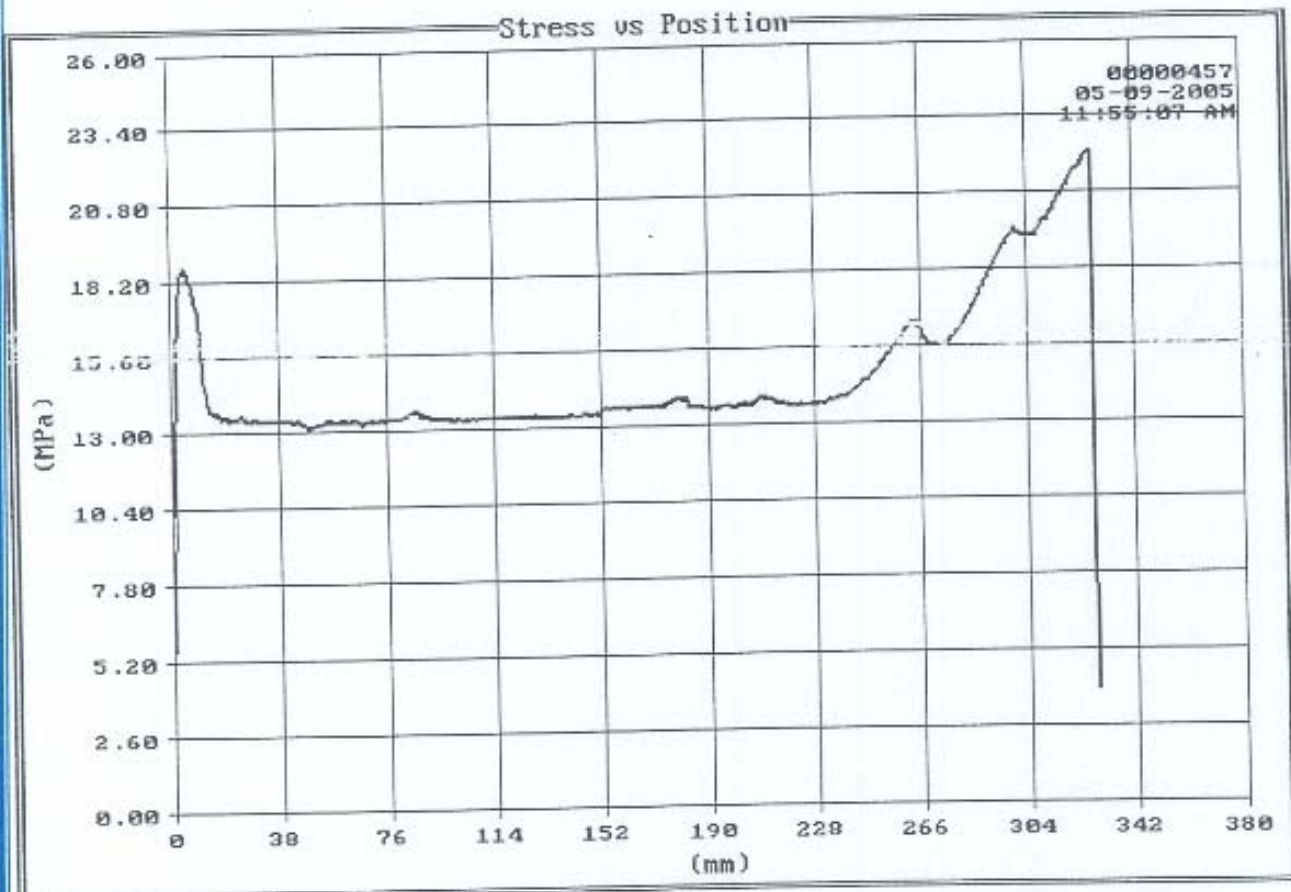
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 11:55:07 AM
Elapsed Time 00:01:19

Tested By E.H.V.R.C
Test Counter 00000457
Area 5.0400 mm²

Tensile Strgth 22.1250 MPa
Total Elong 950.00 %

Peak Load 112 N
Init Punch Len 20.000 mm



E. Faraj M. A. Abd Elgany

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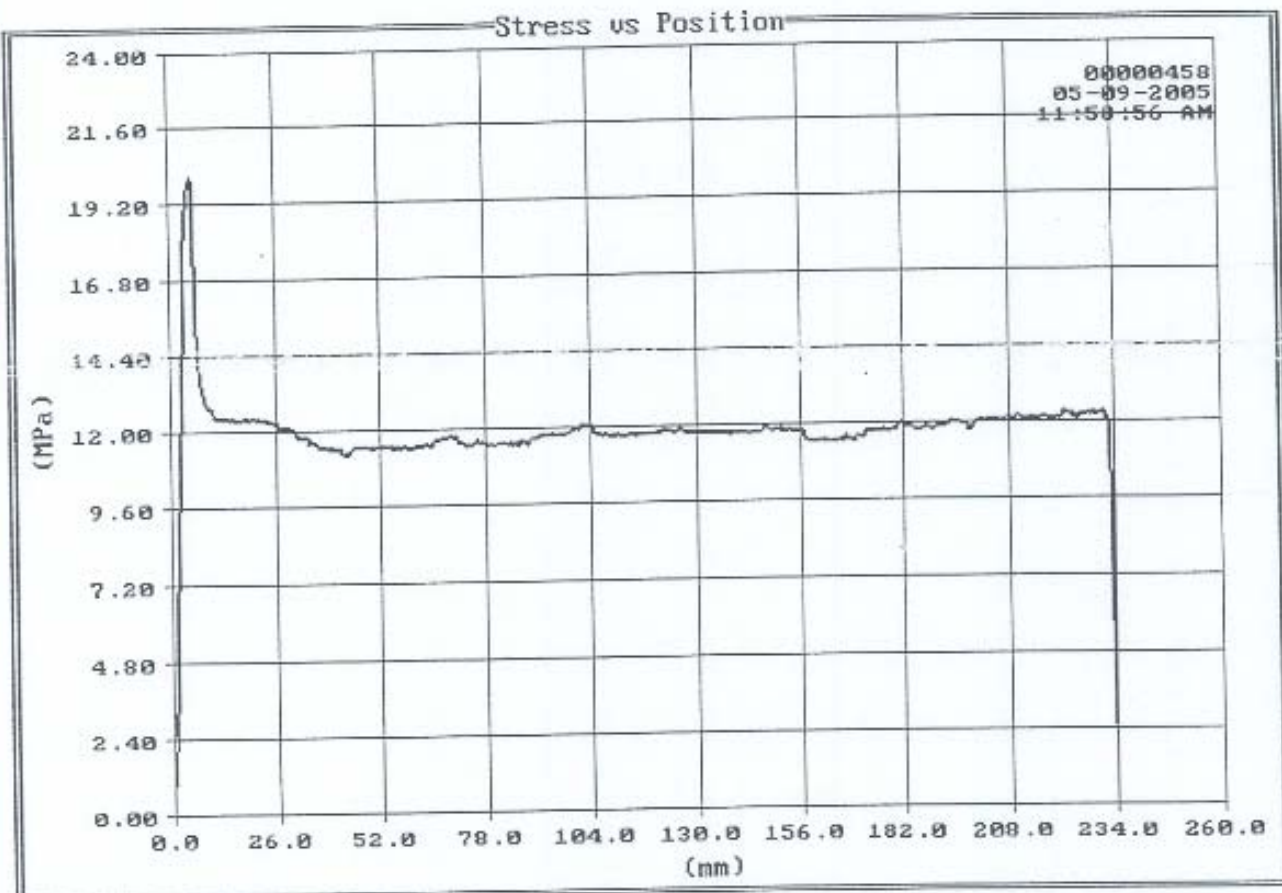
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 11:58:56 AM
Elapsed Time 00:00:56

Tested By E.H.V.R.C
Test Counter 00000458
Area 4.5400 mm²

Tensile Strgth 20.2340 MPa
Total Elong 1000.00 %

Peak Load 92 N
Init Punch Len 20.000 mm



E.Fanzy

M.A. Abd Elgany

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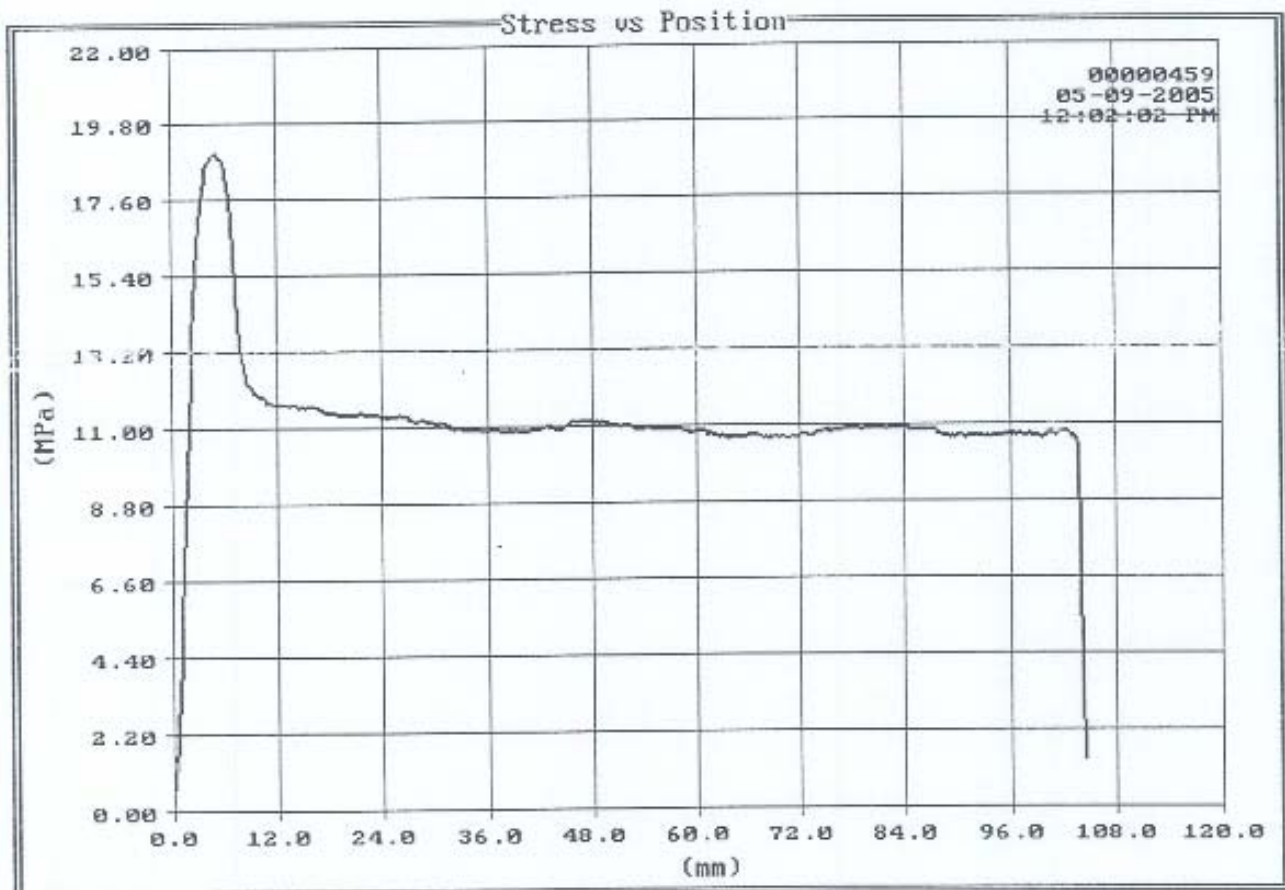
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 12:02:02 PM
Elapsed Time 00:00:25

Tested By E.H.V.R.C
Test Counter 00000459
Area 5.6600 mm²

Tensile Strgth 18.9440 MPa
Total Elong 500.00 %

Peak Load 107 N
Init Punch Len 20.000 mm



E. Farag M. Abdel Elg.
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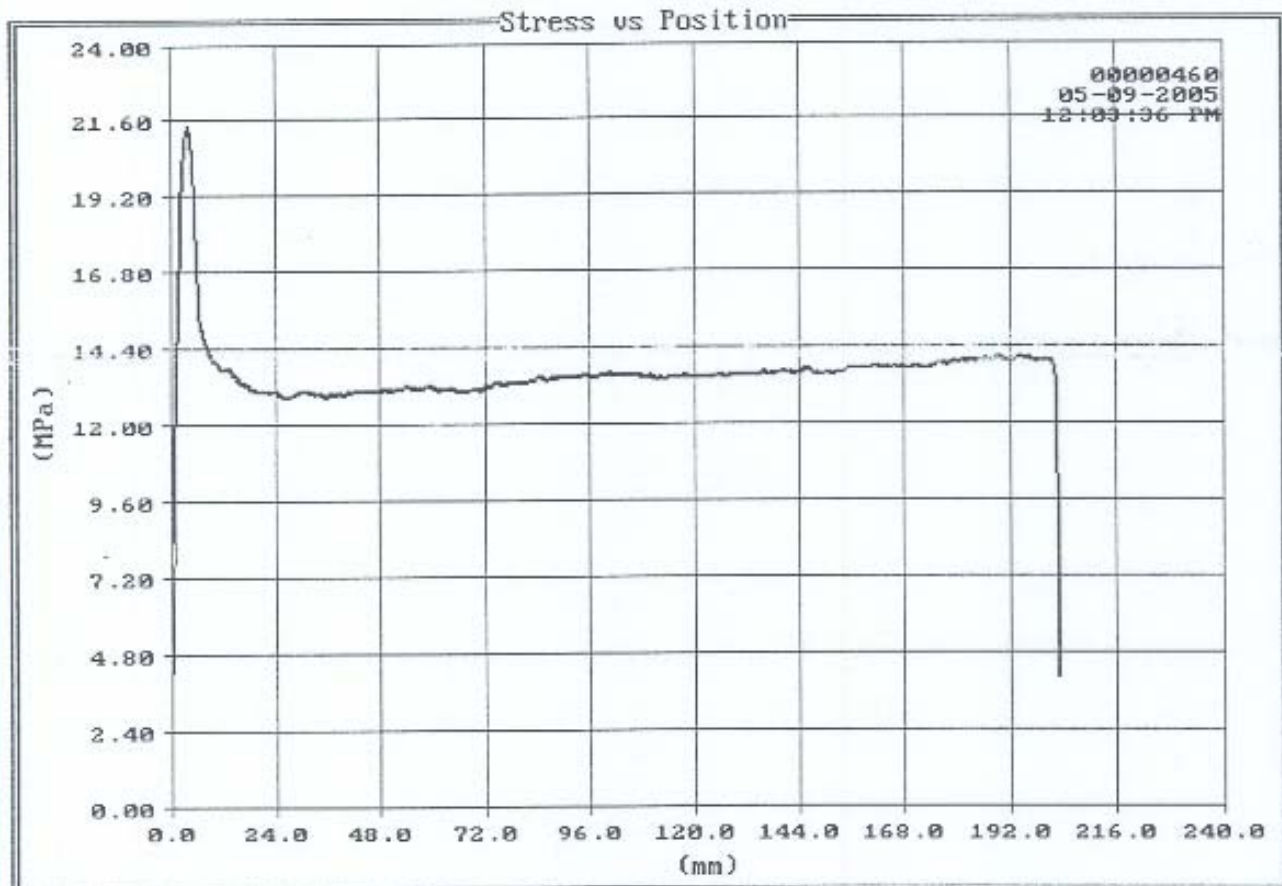
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 12:03:36 PM
Elapsed Time 00:00:49

Tested By E.H.V.R.C
Test Counter 00000460
Area 6.2800 mm²

Tensile Strgth 21.4560 MPa
Total Elong 850.00 %

Peak Load 135 N
Init Punch Len 20.000 mm



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Test Tensile Test
Procedure Tensile test

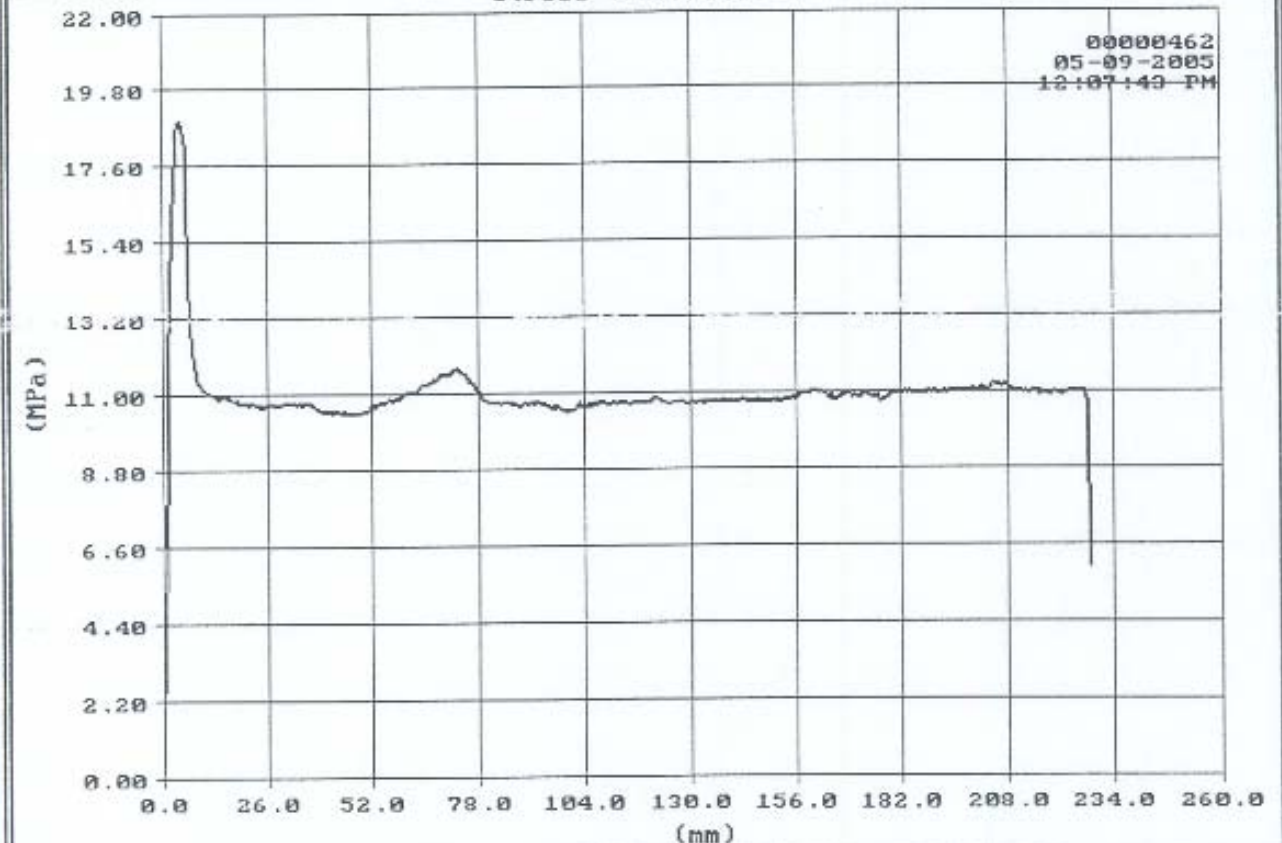
Test Date 05-09-2005
Test Time 12:07:43 PM
Elapsed Time 00:00:55

Tested By E.H.V.R.C
Test Counter 00000462
Area 5.2400 mm²

Tensile Strgth 18.8960 MPa
Total Elong 925.00 %

Peak Load 99 N
Init Punch Len 20.000 mm

Stress vs Position



E. Fawzy

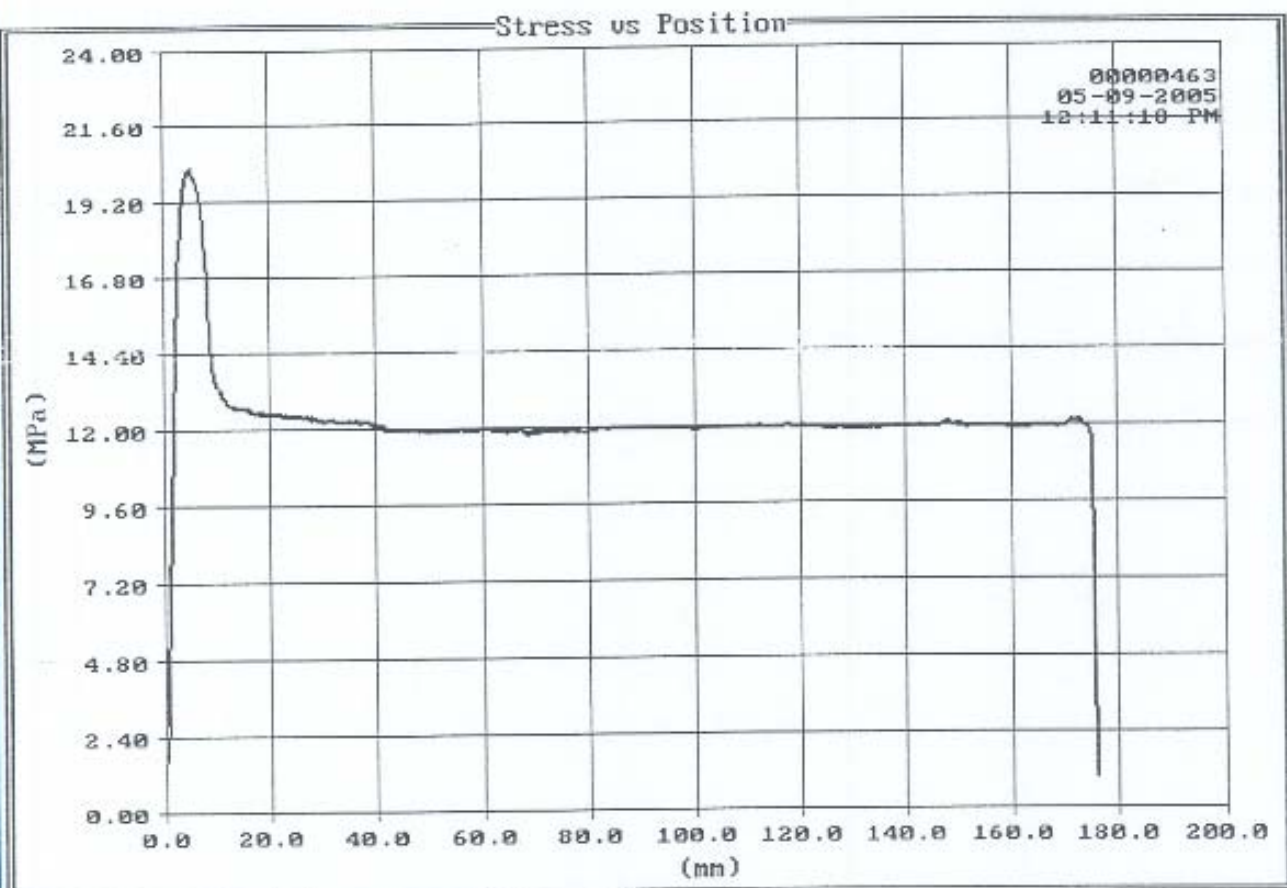
M. Abdelley

Fatma



Test Tensile Test
Procedure Tensile test

Test Date	05-09-2005	Tested By	E.H.V.R.C
Test Time	12:11:18 PM	Test Counter	00000463
Elapsed Time	00:00:42	Area	5.6400 mm ²
Tensile Strgth	20.2780 MPa	Peak Load	114 N
Total Elong	850.00 %	Init Punch Len	20.000 mm



E. Farag

M. A. El Ely

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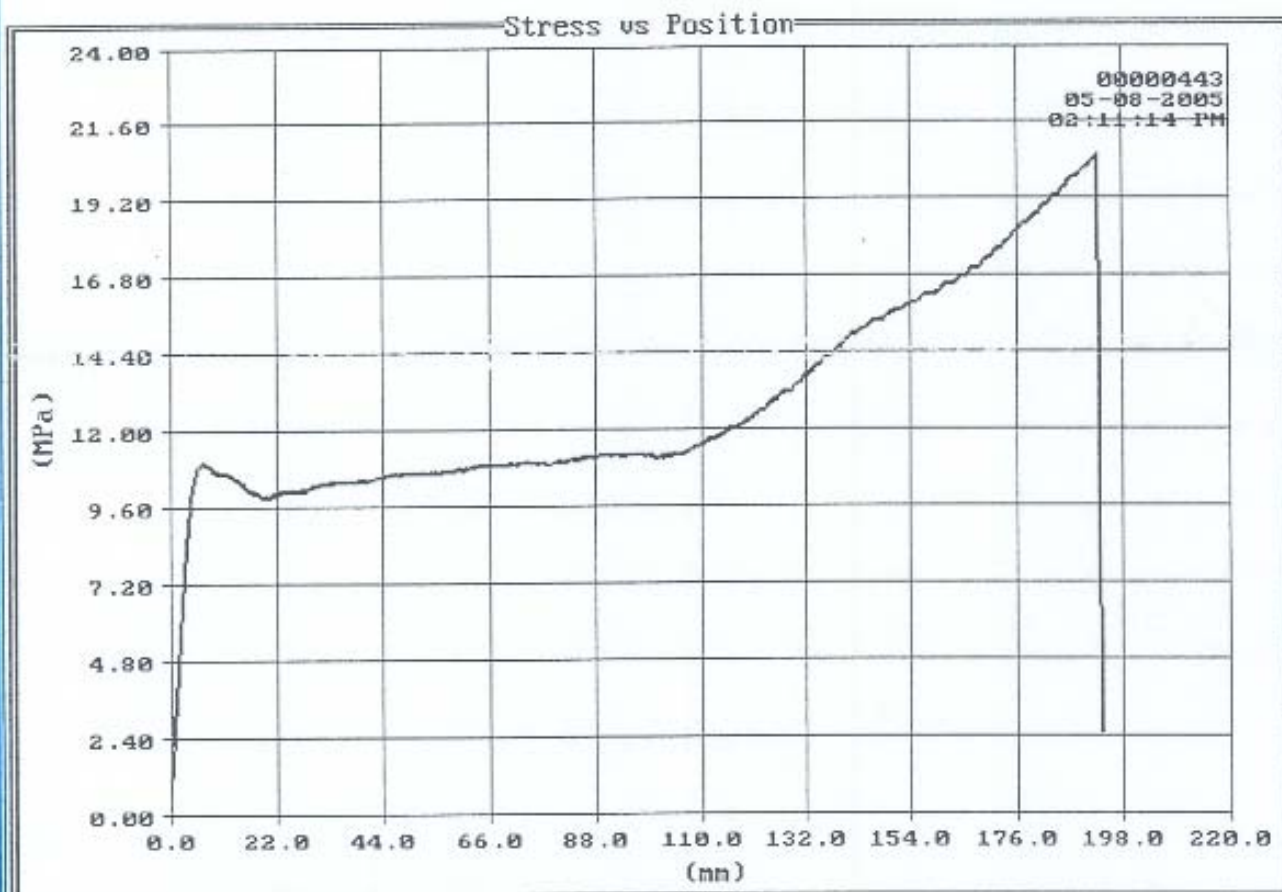
Test Tensile Test
Procedure Tensile test

Test Date 05-08-2005
Test Time 02:11:14 PM
Elapsed Time 00:00:46

Tested By E.H.V.R.C
Test Counter 00000443
Area 5.1200 mm²

Tensile Strgth 20.6630 MPa
Total Elong 525.00 %

Peak Load 106 N
Init Punch Len 20.000 mm



E. Farag

M. Abdel Vagis

S. Attia



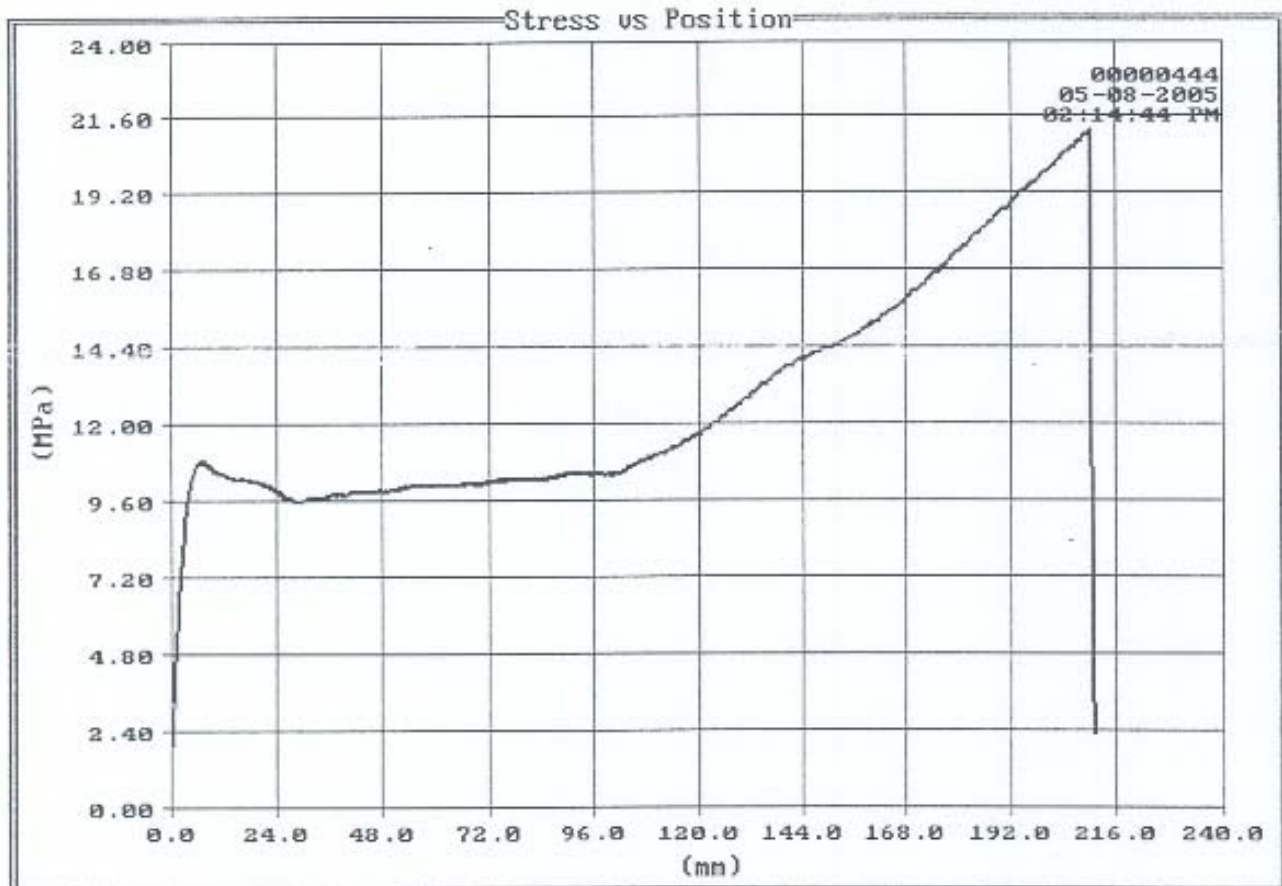
Test Tensile Test
Procedure Tensile test

Test Date 05-08-2005
Test Time 02:14:44 PM
Elapsed Time 00:00:51

Tested By E.H.V.R.C
Test Counter 00000444
Area 7.3000 mm²

Tensile Strgth 21.2080 MPa
Total Elong 550.00 %

Peak Load 155 N
Init Punch Len 20.000 mm



E. Faraj

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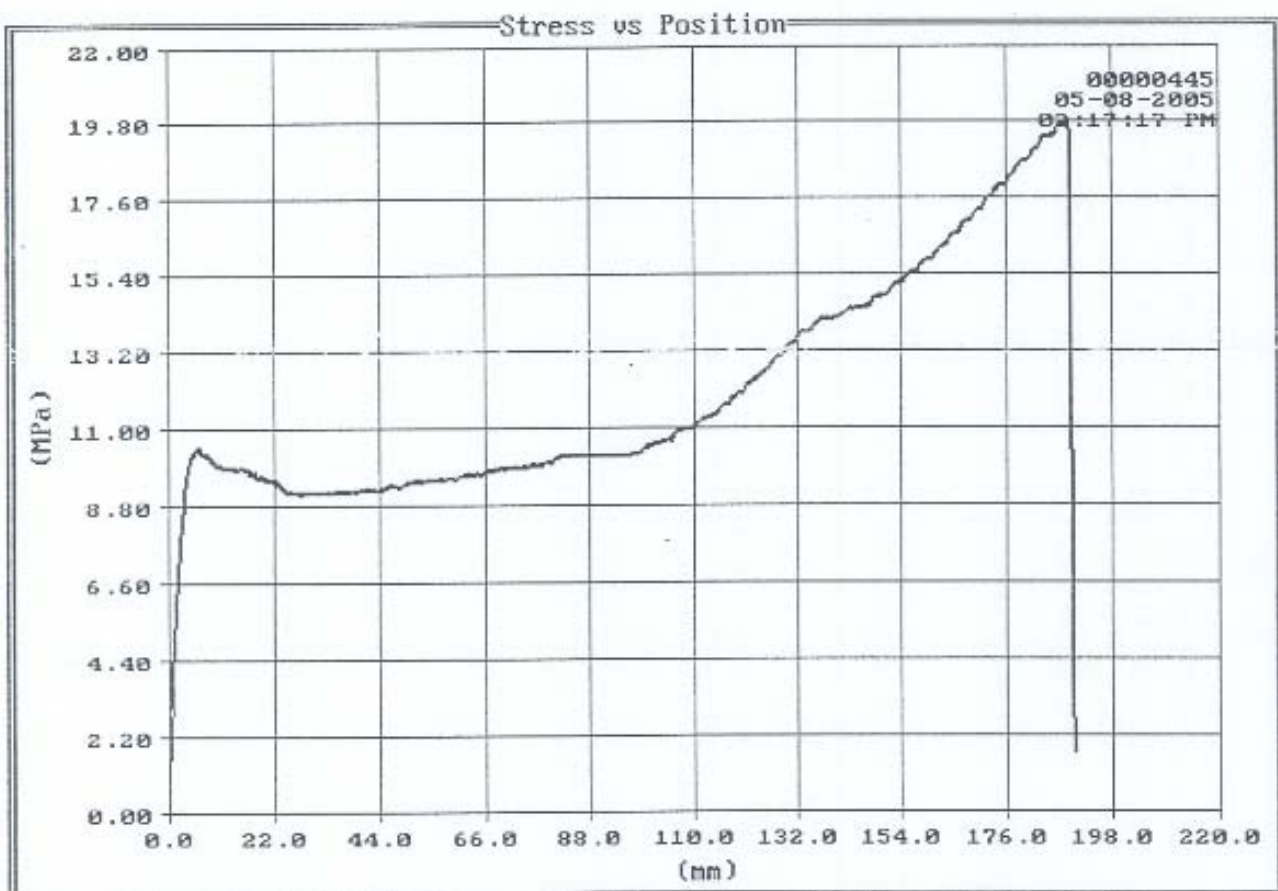
Test Tensile Test
Procedure Tensile test

Test Date 05-08-2005
Test Time 02:17:17 PM
Elapsed Time 00:00:45

Tested By E.H.V.R.C
Test Counter 00000445
Area 4.0600 mm²

Tensile Strgth 20.0710 MPa
Total Elong 525.00 %

Peak Load 81 N
Init Punch Len 20.000 mm



E. Fawzy

M. Abdelaziz

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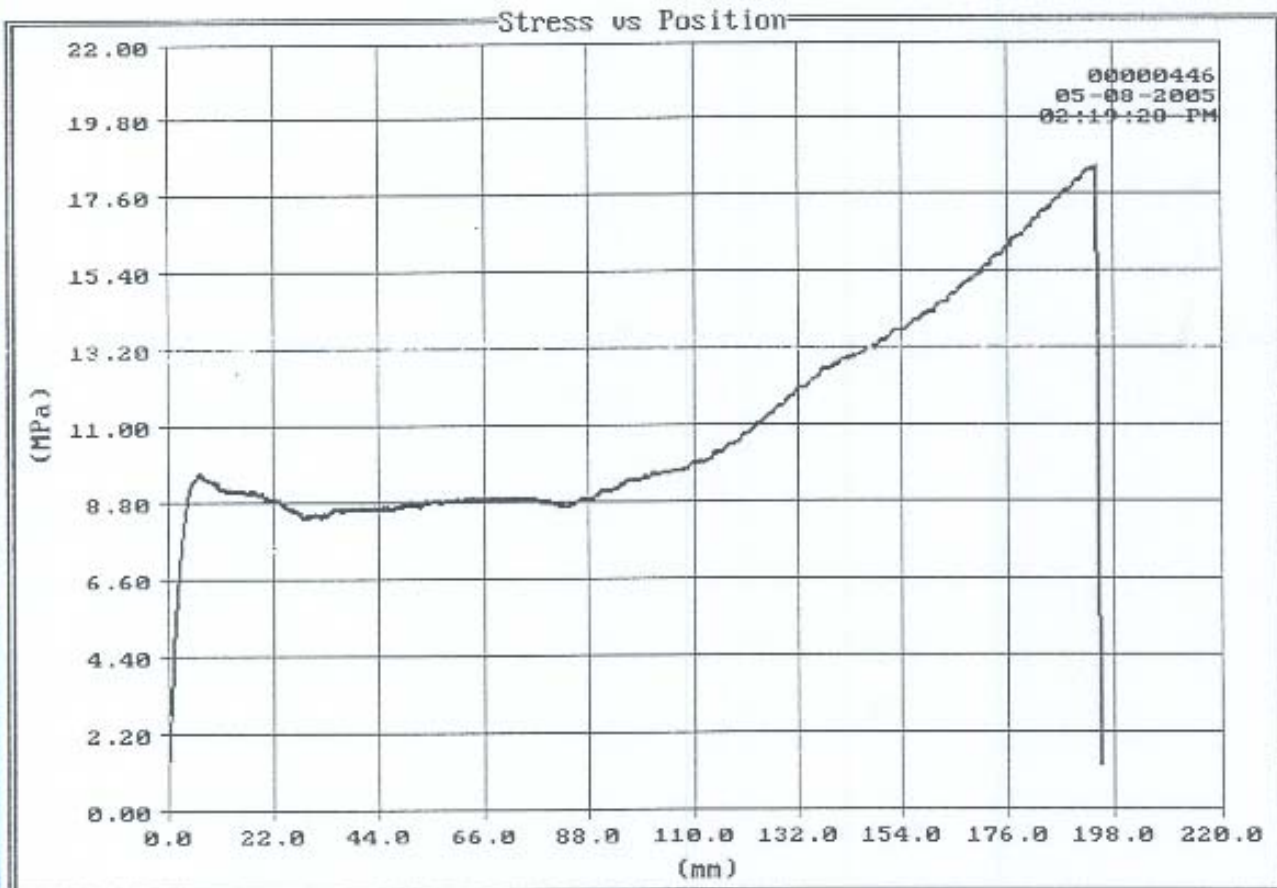
Test Tensile Test
Procedure Tensile test

Test Date 05-08-2005
Test Time 02:19:28 PM
Elapsed Time 00:00:47

Tested By E.H.V.R.C
Test Counter 00000446
Area 5.3200 mm²

Tensile Strgth 18.5090 MPa
Total Elong 535.00 %

Peak Load 98 N
Init Punch Len 20.000 mm



E. Fawzy

M. Abdel Elguy

Fatma



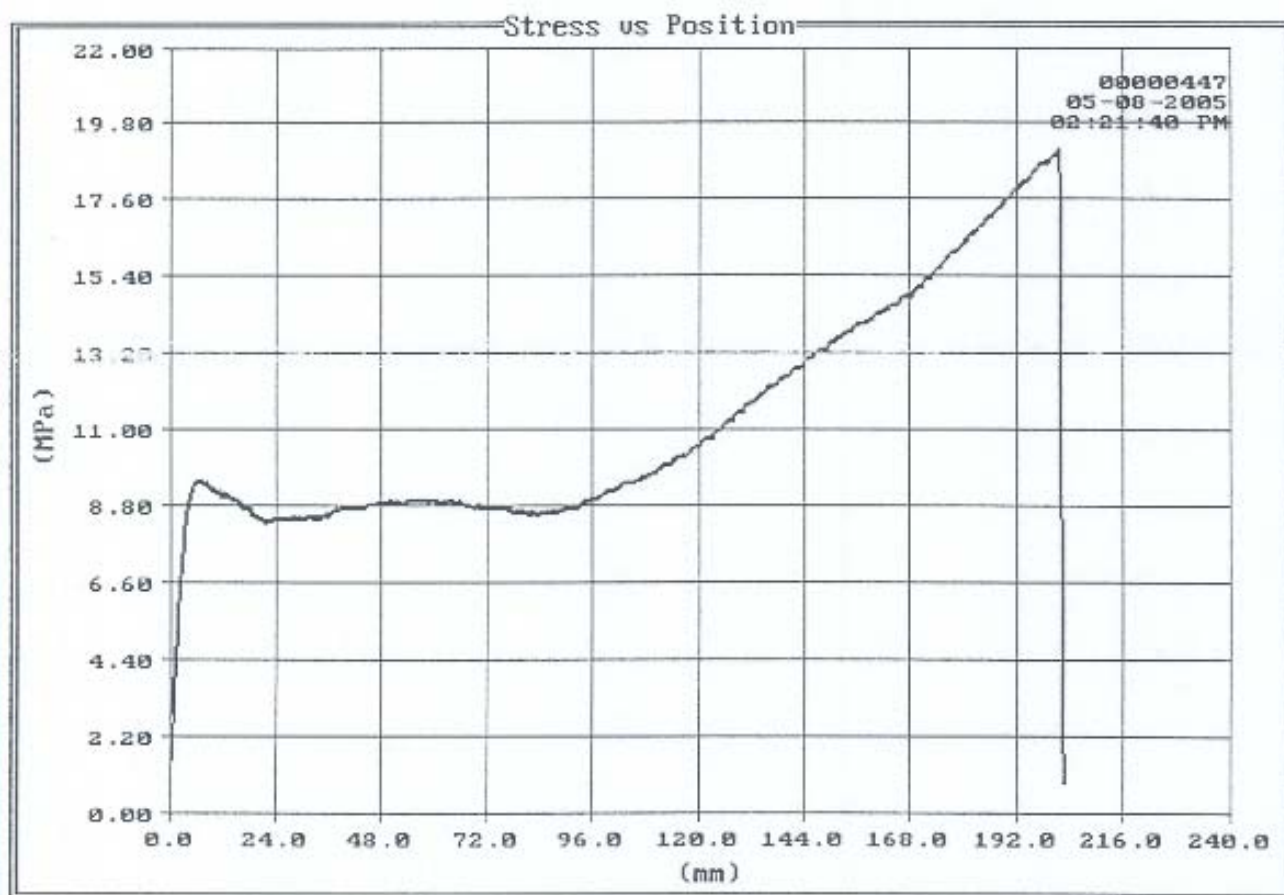
Test Tensile Test
Procedure Tensile test

Test Date 05-08-2005
Test Time 02:21:40 PM
Elapsed Time 00:00:49

Tested By E.H.V.R.C
Test Counter 00000447
Area 5.6000 mm²

Tensile Strgth 19.1350 MPa
Total Elong 540.00 %

Peak Load 107 N
Init Punch Len 20.000 mm



E. Farag

M. Abd Elgany

Fatma



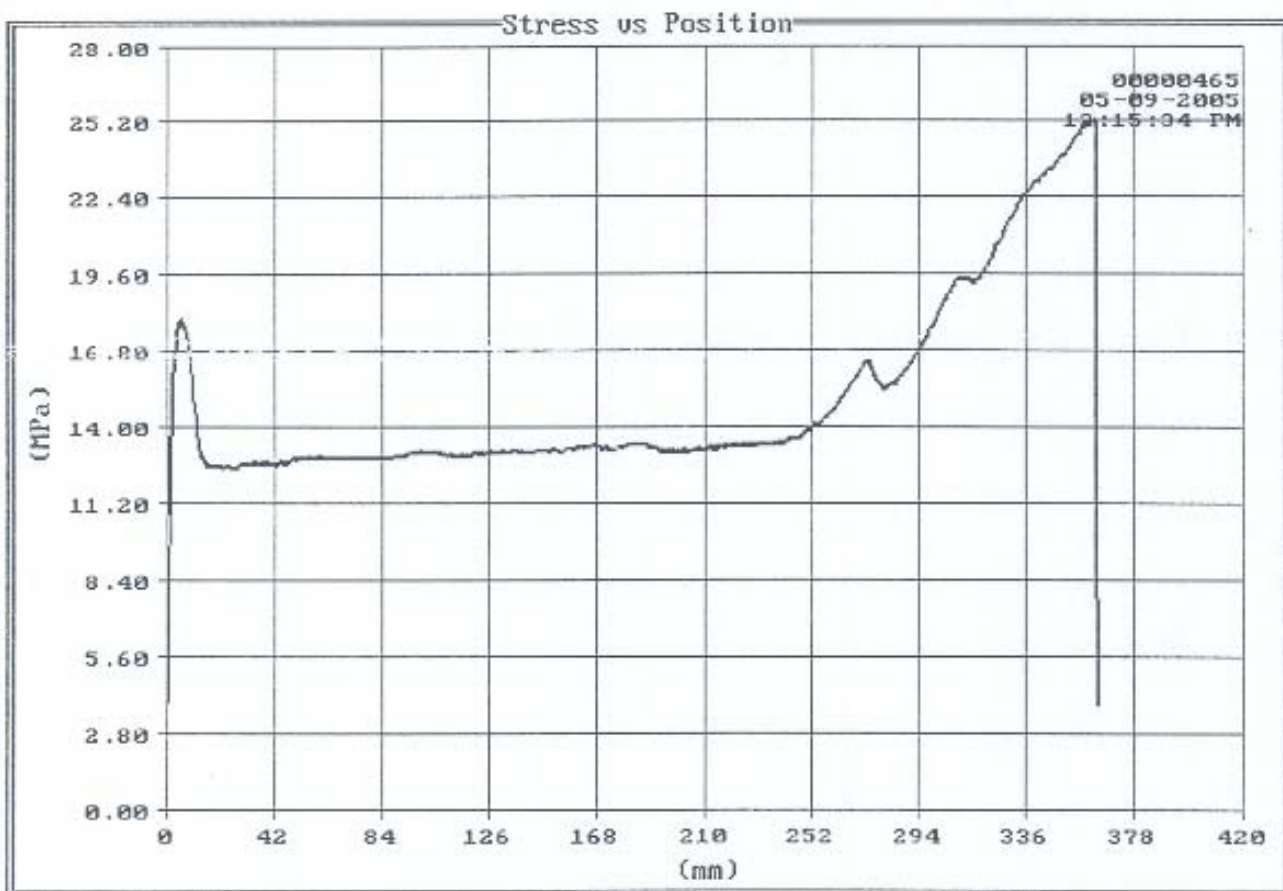
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 12:15:34 PM
Elapsed Time 00:01:27

Tested By E.H.V.R.C
Test Counter 00000465
Area 5.6600 mm²

Tensile Strgth 25.1880 MPa
Total Elong 1000.00 %

Peak Load 143 N
Init Punch Len 20.000 mm



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M. Abdelaziz

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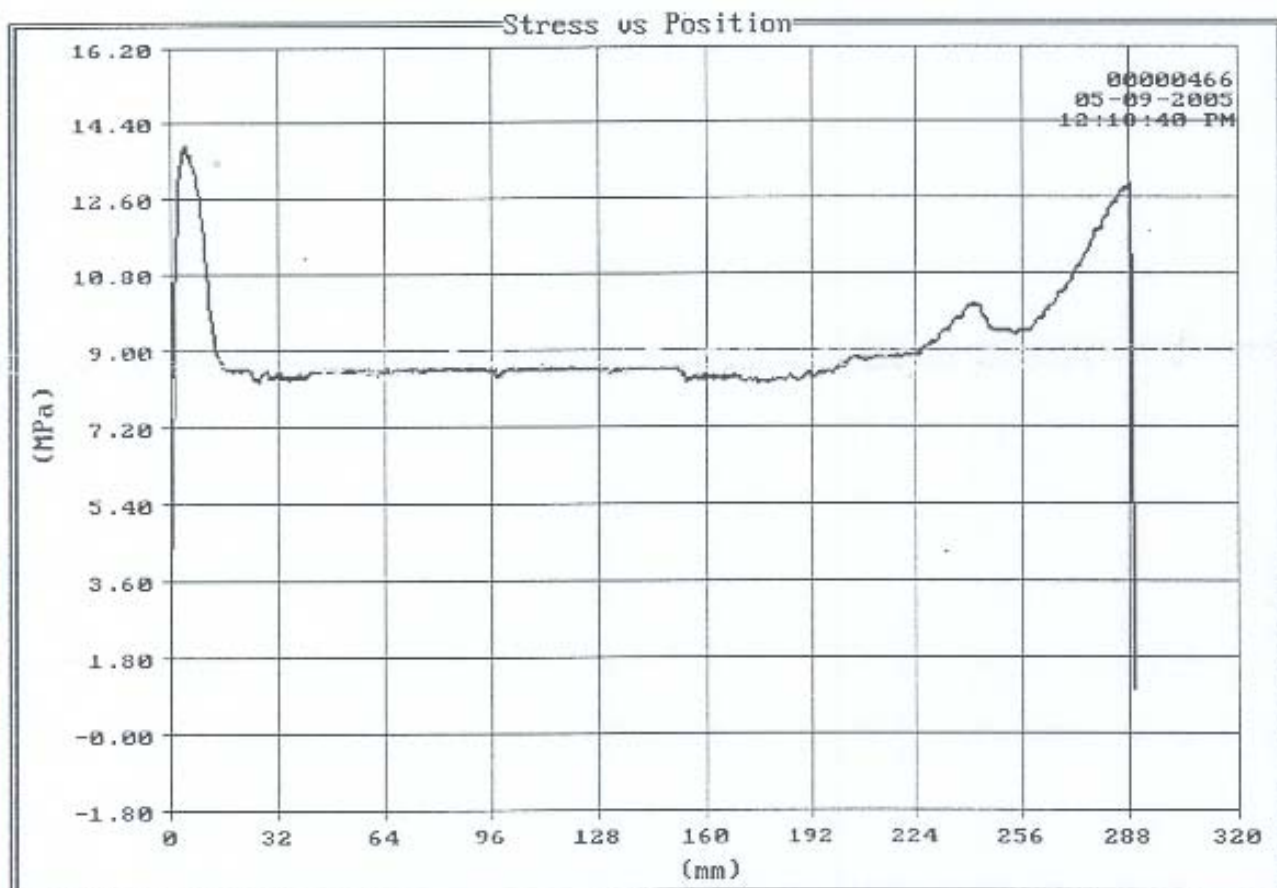
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 12:18:40 PM
Elapsed Time 00:01:09

Tested By E.H.V.R.C
Test Counter 00000466
Area 4.7400 mm²

Tensile Strgth 13.9490 MPa
Total Elong 950.00 %

Peak Load 66 N
Init Punch Len 20.000 mm



E. Fany M. Abdelgany

Fatma



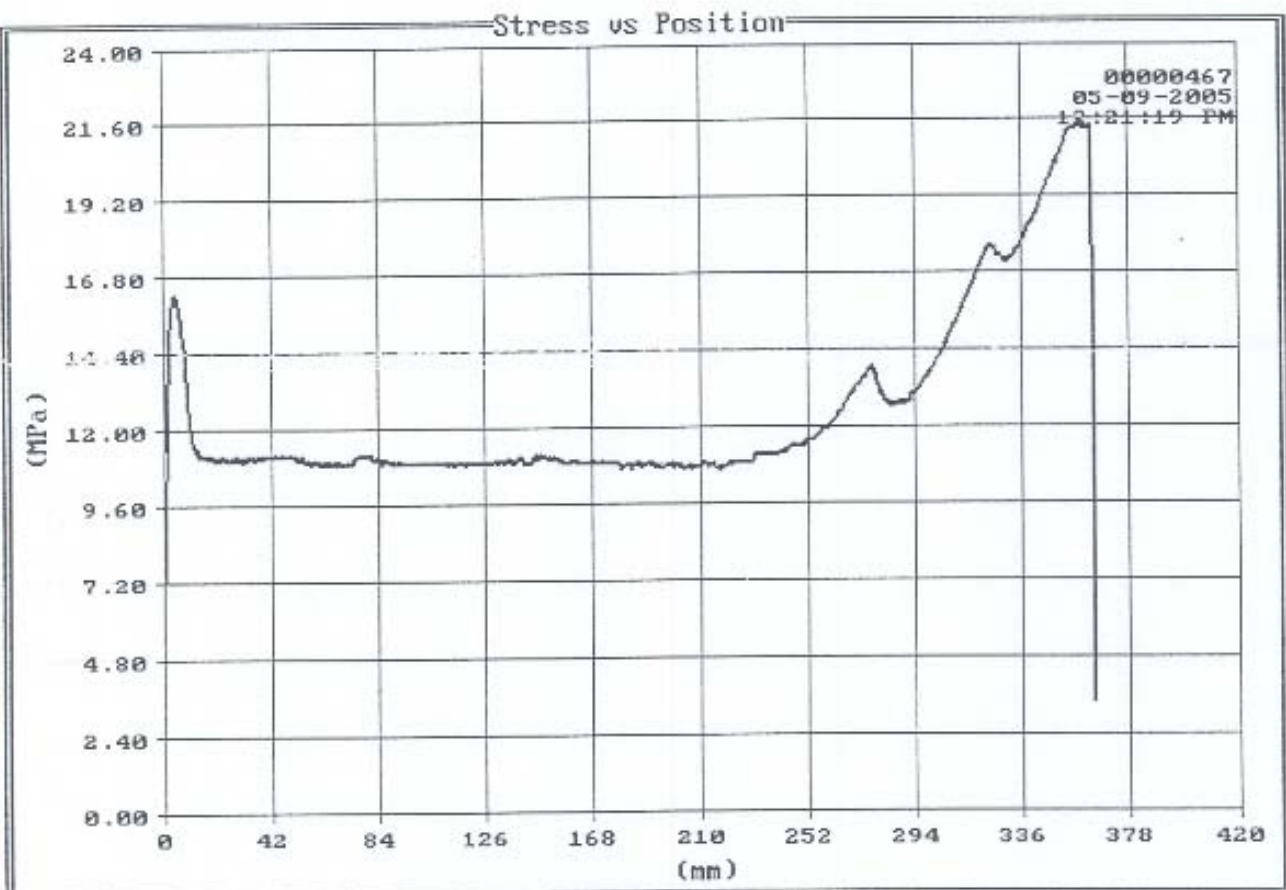
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 12:21:19 PM
Elapsed Time 00:01:27

Tested By E.H.V.R.C
Test Counter 00000467
Area 5.3400 mm²

Tensile Strgth 21.5760 MPa
Total Elong 1025.00 %

Peak Load 115 N
Init Punch Len 20.000 mm



E. Fawzy M. A. AbdelEziz

Fatma



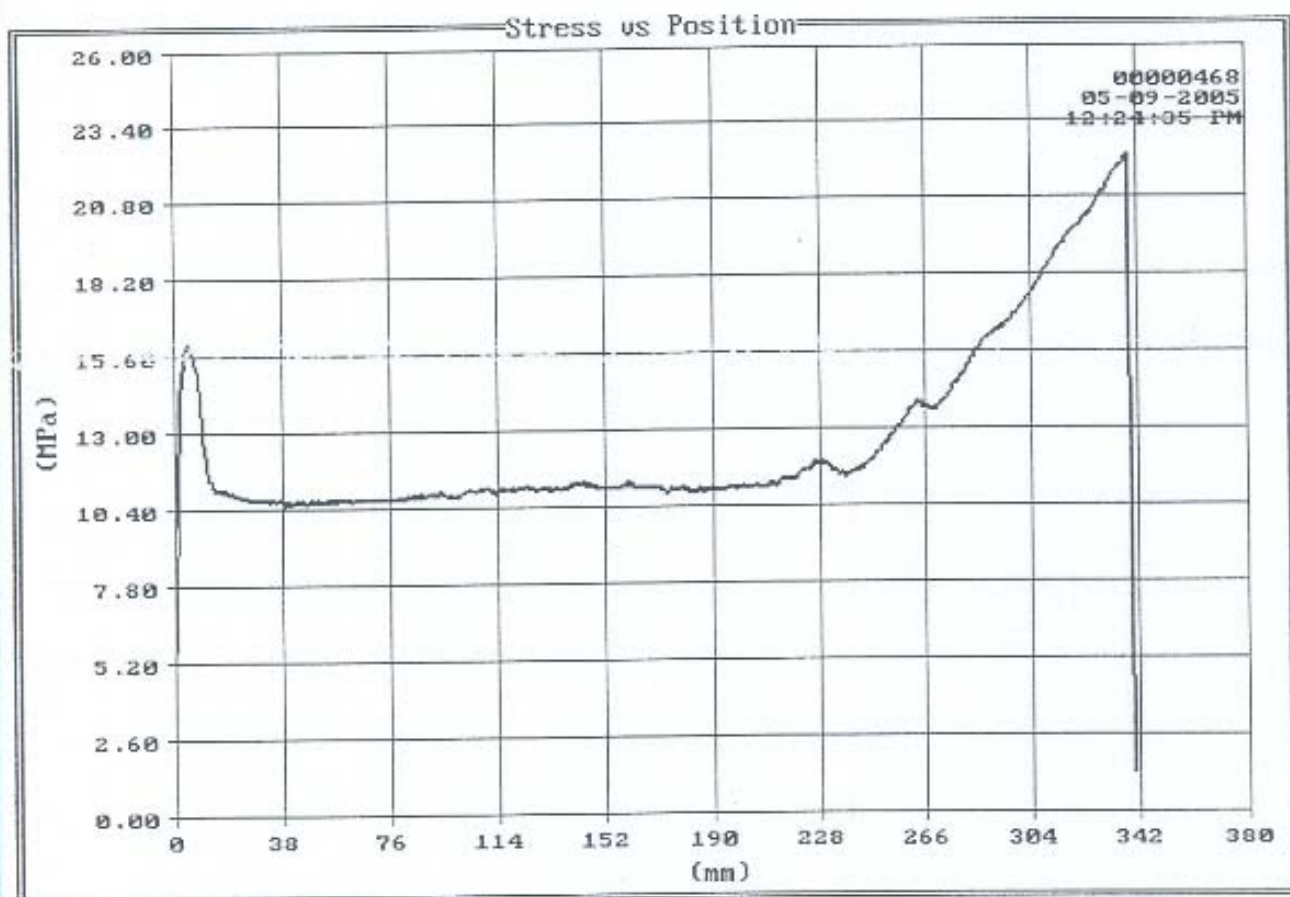
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 12:24:35 PM
Elapsed Time 00:01:21

Tested By E.H.V.R.C
Test Counter 00000468
Area 4.8600 mm²

Tensile Strgth 22.4610 MPa
Total Elong 975.00 %

Peak Load 109 N
Init Punch Len 20.000 mm



E. Fawzy

M. Abdel Elgys

Fatma



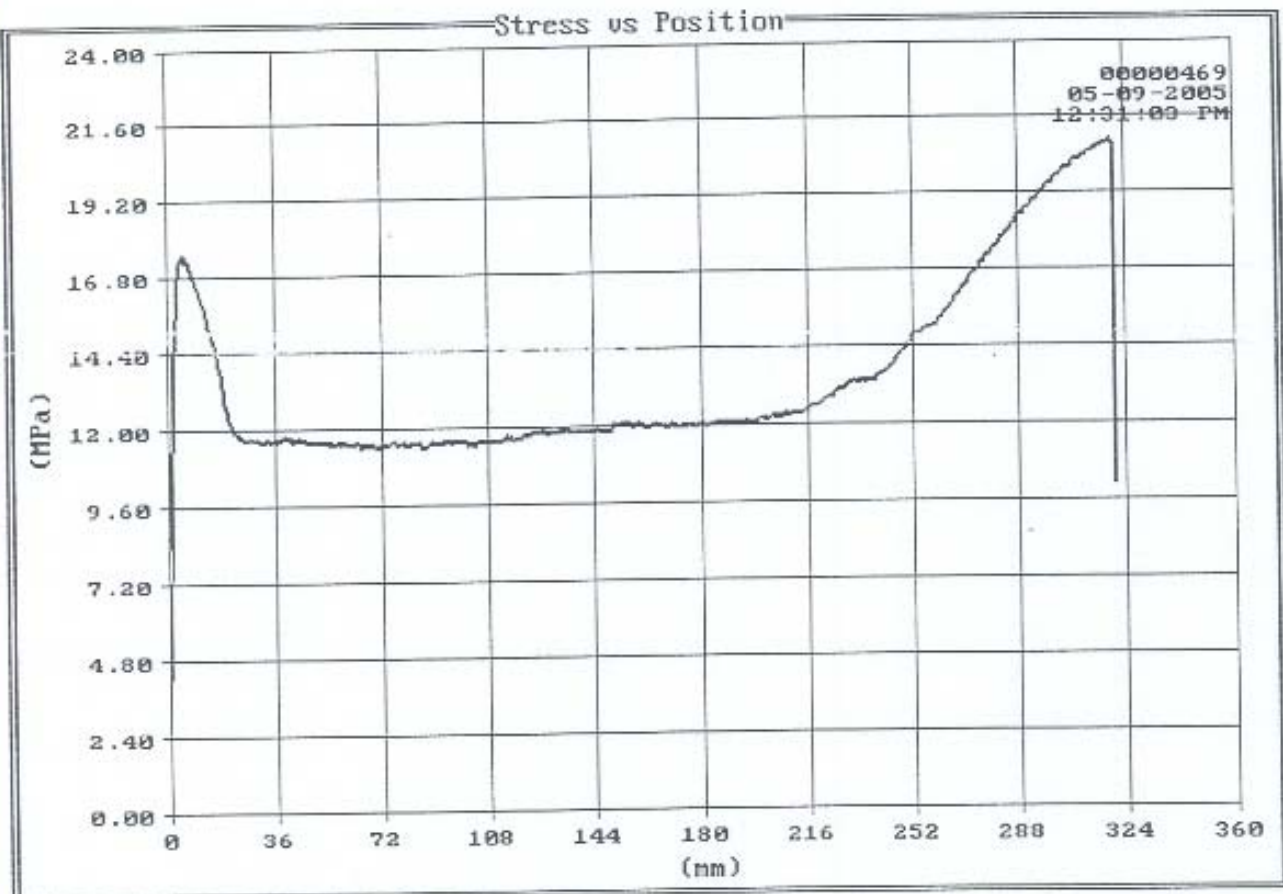
Test Tensile Test
Procedure Tensile test

Test Date 05-09-2005
Test Time 12:31:03 PM
Elapsed Time 00:01:17

Tested By E.H.V.R.C
Test Counter 00000469
Area 5.7800 mm²

Tensile Strgth 20.9670 MPa
Total Elong 925.00 %

Peak Load 121 N
Init Punch Len 20.000 mm



E. Fawzy M. A. Hady

Fatigue

