CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

CORPORATE SERVICES AND COMPLIANCE
EXECUTIVE SUPPORT

Suzanne Abel
Executive Committee Services

T: 021 400 3664 F: 021 418 9009
E: Suzanne.Abel@capetown.gov.za

DATE 17 August 2016
TO **The Executive Mayor**
P de Lille

ITEM 01/17/08/16

Dear Madam Mayor,

The **attached** undermentioned Feedback Trip Report is submitted to you for consideration and noting:

FEEDBACK ON THE INTERNATIONAL TRIP UNDERTAKEN FROM 27 JUNE 2016 TO 1 JULY 2016 TO ATTEND A FACTORY INSPECTION AND WITNESS THE QUALITY CONTROL AND ASSURANCE TESTING OF THE PIPES FOR THE NEW BULK WATER PROVISION TO BELHAR CBD UNDER CONTRACT NO 1796-00-20/ID04 - DELFT CBD BULK WATER SERVICES, IN SPAIN

pp Mrs Rehana Razack
Manager: Executive Committee Services
Office of the Executive Director: Corporate Services and Compliance

1284

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

49197

×4075×

ACM 11/7910

CML1704

REPORT TO THE EXECUTIVE MAYOR

1. ITEM NUMBER

2. SUBJECT

FEEDBACK ON THE INTERNATIONAL TRIP UNDERTAKEN FROM 27 JUNE 2016 TO 1 JULY 2016 TO ATTEND A FACTORY INSPECTION AND WITNESS THE QUALITY CONTROL AND ASSURANCE TESTING OF THE PIPES FOR THE NEW BULK WATER PROVISION TO BELHAR CBD UNDER CONTRACT NO 1796-00-20/ID04 – DELFT CBD BULK WATER SERVICES, IN SPAIN.

ONDERWERP

TERUGVOERING OOR DIE INTERNASIONALE REIS VAN 27 JUNIE 2016 TOT 1 JULIE 2016 IN SPANJE OM 'N FABRIEKINSPEKSIE BY TE WOON EN WAAR TE NEEM HOE DIE PYPE VIR DIE NUWE GROOTMAATWATER-VOORSIENING AAN DIE BELHAR-SSB VIR GEHALTEBEHEER EN -VERSEKERING GETOETS WORD VOLGENS KONTRAK NO. 1796-00-20/ID04 – GROOTMAATWATERDIENSTE VIR DIE DELFT-SSB-DIENSTE

ISIHLOKO

INGXELO EMALUNGA NOHAMBO OLUYA PHESHEYA ESPAIN, OLUTHATYATHWE UKUSUSELA NGOWAMA-27 JUNI 2016 UKUYA KOWO-1 JULAYI LOKUZIMASA UHLOLO LOMZI-MVELISO NOKUBEK'ILISO KULAWULO LOMGANGATHO NOVAVANYO LWENGQINISEKISO KWIMIBHOBHO EMIKHULU NEMITSHA ENIKEZELA NGAMANZI KUMMANDLA I-BELHAR CBD PHANTSI KWEKHONTRAKTHI ENGUNOMBOLO 1796-00-20/ID04 –IINKONZO ZOKUNIKEZELA NGAMANZI E-DELFT CBD.

City Manager's Office
19 JUL 2016
Name: Zizipho
Signature: 09:21

3. EVENT SUMMARY

EVENT DETAILS	
CONFERENCE/SEMINAR	
OTHER	Witness, quality control and compliance testing including dimensional, stiffness, ovality and tensile tests were performed on the new Polyvinyl Chloride Orientated (PVC-O) pipes to confirm compliance to SANS 16422: 2007.
DATE	27 June 2016 tot 1 July 2016
VENUE	Molecor Technology and Pipe Production
CITY	Madrid
COUNTRY	SPAIN

ATTENDEE DETAILS	
NAME AND SURNAME	DESIGNATION
Anic Smit	**HEAD: PLANNING, DESIGN&PROJECTS**

PROVIDE SUMMARY OF HOST ORGANISATION / CITY

Molecor Canalizaciones is a Spanish manufacturing company of PVC-O pipes since 2013 and market the pipes across Europe. They have invested in South Africa by starting with the commissioning of a PVC-O pipe manufacturing facility in Richards Bay. This new factory should be up and running by the end of 2016.

They together with their South African Agent, Sizabanthu Piping Systems, have invited an official from the City of Cape Town to visit their factory in Madrid ensuring the quality control and standards of the manufactured pipes are in conformance to the South African National Standard and for acceptance by the City of Cape Town.

4. OBJECTIVE

Alternative pipe materials were investigated and the latest technology in molecular orientation of PVC material is the most cost effective material satisfying the design requirements of the new Reticulation bulk water supply to the Belhar CBD.

PVC-O was never used before in the City of Cape Town and only a handful of projects were completed in South Africa in the last year, but in different diameters and pressure classes.

The experience and knowledge acquired is not only shared with colleagues, but provide confidence in selecting this material for the Belhar bulk water supply.

This pipe material is cost effective and complies with the standards which will ensure a reliable service to the City for many years.

5. OUTCOMES

City of Cape Town is the second Municipality in South Africa that will install 800mm diameter class 16 PVC-O pipes. The visit and this first project with this pipe material will form a basis for future pipe material selection in new projects.

- ☐ - Partnership Agreement
- ☐ - Membership Agreement
- ☐ - Grants Agreement
- ☐ - Memorandum of Understanding
- ☐ - Statement of Intent
- ☒ - Other

6. ACTIONS REQUIRED

No direct action is required other than to monitor compliance by the manufacturer to SANS 16422: 2007.

As part of the project for the installation of the bulk water supply to Belhar CBD, the services of SGS, an international quality control company is employed to verify every load of pipe shipped to South Africa and provide their report to the engineer.

7. IMPLICATIONS

7.1	**Constitutional and Policy Implications**	No ☒	Yes ☐
7.2	**Environmental implications**	No ☒	Yes ☐
7.3	**Financial Implications**	No ☐	Yes ☒
7.4	**Legal Implications**	No ☒	Yes ☐

7.5	**Staff Implications**	No ☒	Yes ☐
7.6	**Risk Implications**	No ☐	Yes ☒

8. OTHER SERVICES CONSULTED

None

9. RECOMMENDATIONS

RECOMMENDED that:

a) IT BE NOTED

AANBEVEEL dat:

a) DAARVAN KENNIS GENEEM WORD

KUNDULULWE ukuba:

a) MAKUQATSHELWE

10. GENERAL DISCUSSION

The conformance testing of the pipes were conducted in collaboration with the laboratory at the Molecor factory in Madrid.

The testing and inspection was conducted on a 500mm and 800mm diameter class 16 PVC-O pipes randomly selected from the manufactured stock pile.

- Recorded the batch numbers and details of the print on the pipe.
- The pipes were cut at about 1 m from face of socket.
- Check that the seal seats properly.
- Removed seal.
- Based on measure pipe wall thicknesses, cut the socket pipe piece longitudinally at eight different locations, and measure the wall thickness variance along different sections of the socket.
- Inspect each cut section to confirm that the pipe material is homogeneous and there is no presence of any impurities.
- Take measurements of the following:
  - Pipe outside diameter on the spigot end at eight different positions circumferentially.
  - Confirm percentage ovality based on the measurements.
  - Pipe inside diameter on the spigot end at eight different positions circumferentially.

- Pipe wall thickness on the spigot end at eight different positions circumferentially.
- Chamfer length and height on the spigot end.
- The depth of entry mark on the spigot end.
- Pipe outside diameter on the socket end at eight different positions circumferentially.
- Pipe inside diameter on the socket end at eight different positions circumferentially.
- Pipe wall thickness on the spigot end at eight different positions circumferentially.
- Socket lip length (i.e. the dimension from the face of the socket to the tip of the seal).
- Socket depth (i.e. the dimension form the tip of the seal to the end of the socket where it starts to taper down to the pipe barrel).

Based on the above measurements and tests, including allowance for the effect of poisson contraction, temperature expansion/contraction and angular deflection, the depth of engagement is sufficient for the application.

The selected pipes were then subjected to hydrostatic testing, which was also the most important verification of the pipe quality.

- A short section was prepared with socketed joints in the middle of the test section. It was then placed in the testing bench in order to carry out the hydrostatic pressure test as per Clause 11.1.2 and Annex A of ISO 16422.
- Carry out a 10 hour hydrostatic pressure test at a constant pressure of 28.86 bar and 22 bar respectively for 800mm and 500mm diameter pipes (based on the Barlow Formula) using a pipe wall thickness of 21.1mm and 13.6mm respectively as per the Molecor catalogue and using a stress of 48MPa based on the regression curve of the assembled jointed pipe using water at a temperature of 20°C.

The tests for both diameters passed and it was not necessary to be repeated.

Sections of of the selected pipes were then subject to the following 3 tests, which in all cases passed.

- Witness ring stiffness testing of a sample of both diameters.
- Witness tensile strength testing of a sample of both diameters.
- Witness impact resistance testing of a sample of both diameters.

PVC-O satisfies the requirements for use in the water network of the City of Cape Town.

Sample test results are attached as Annexures A to D.

11. ANNEXURES

Annexure A: Summary page of measurements for 800mm and 500mm PVC-O class 16 pipes.
Annexure B: Hydrostatic pressure testing results over 10 hours.
Annexure C: Tensile strength testing results.
Annexure D: Ring stiffness testing results.

FOR FURTHER DETAILS CONTACT:

NAME	Anic Smit
CONTACT NUMBERS	021-444 2366
E-MAIL ADDRESS	Anic.smit@capetown.gov.za
DIRECTORATE	Water & Sanitation
FILE REF NO	
SIGNATURE	11/7/16

EXECUTIVE DIRECTOR

NAME L Rencontre (Acting)

DATE 18/7/2016

COMMENT:

MANAGER INTERNATIONAL RELATIONS
DR. DENVER VAN SCHALKWYK

COMMENT: NOTED

DATE 19/07/2016

C Whitehead

a/CITY MANAGER

~~ACHMAT EBRAHIM~~ Melissa Whitehead

☑ SUPPORTED FOR ONWARD SUBMISSION TO MAYOR ☑ / MAYCO ☐ / COUNCIL ☐

☐ NOT SUPPORTED

DATE 19/7/2016

☐ REFERRED BACK

COMMENT:

☐ REPORT COMPLIANT WITH THE PROVISIONS OF COUNCIL'S DELEGATIONS, POLICIES, BY-LAWS AND ALL LEGISLATION RELATING TO THE MATTER UNDER CONSIDERATION.

LEGAL COMPLIANCE

☐ NON-COMPLIANT

COMMENT:

NAME Joan-Mari Holt

TEL 021 400 2753

DATE 20/07/2016

For information only

COMMENT:

MAYORAL COMMITTEE MEMBER

NAME E. Sonnenberg

DATE 24/7/2016

EXECUTIVE MAYOR (ACTING)

~~PATRICIA DE LILLE~~ IAN NEILSON

☐ SUPPORTED FOR ONWARD SUBMISSION TO MAYCO ☐ / COUNCIL ☐:

- ☐ PC RECOMMENDATION
- ☐ RECOMMENDATION AS CONTAINED IN ORIGINAL REPORT
- ☐ ALTERNATIVE RECOMMENDATION TO BE REFLECTED BELOW

☐ APPROVED I.T.O. DELEGATED AUTHORITY

☑ NOTED

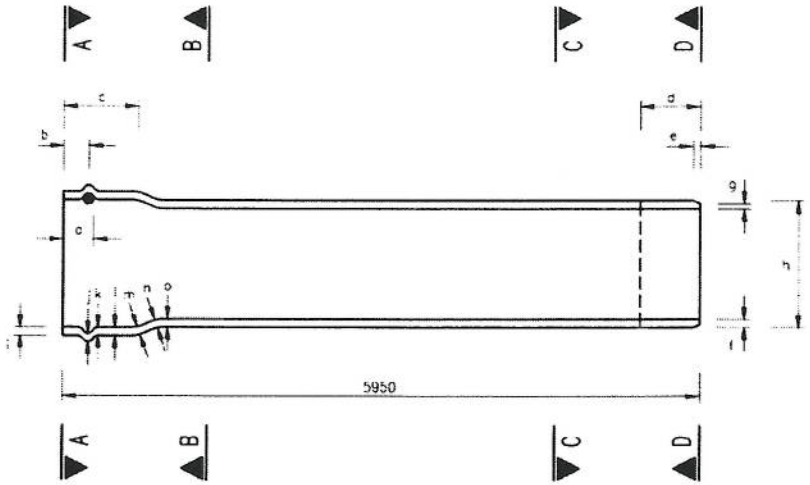
☐ REFUSED

☐ REFERRED BACK

DATE 18/8/2016

Contract 1796-00-20/ID04: Construction of Stellenbosch Arterial Bulk Water Pipeline

Witness Testing: 800mmø Molecor TOM500 CL16 Pipe - 28/06/2016 to 30/06/2016

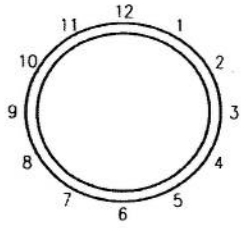


Measurements:

a = 180.200 mm
b = 163.850 mm
c = 373.820 mm
d = 402.780 mm
e = 40.670 mm
f = 21.100 mm
g = 12.406 mm
h = 800.000 mm
i = 19.844 mm
j = 17.335 mm
k = 15.591 mm
l = 19.358 mm
m = 19.530 mm
n = 19.379 mm
o = 21.436 mm

Based on the above measurements, including allowance for the effect of Poisson contraction, temperature expansion/contraction, and angular deflection, the depth of engagement is sufficient for the application.
➡ Pass

Note: the top of pipe (12 o'clock) was taken on the pipe marking.

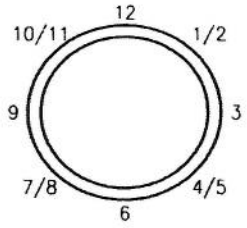


Point of Measurement	View B-B Wall Thickness Measurement (mm)	View C-C Wall Thickness Measurement (mm)
12	21.698	19.714
1	21.247	19.188
2	22.273	19.799
3	22.524	20.639
4	22.728	20.700
5	23.013	21.510
6	23.299	21.331
7	22.938	21.056
8	23.129	20.885
9	22.763	20.530
10	22.201	20.331
11	21.246	19.216

Minimum wall thickness as per ISO 16422 = 17.4mm
➡ Pass

Point of Measurement	View B-B Outside Diameter (mm)	View B-B Inside Diameter (mm)
12 - 6 o'clock	801.990	755.520
1 - 7 o'clock	800.890	755.880
2 - 8 o'clock	800.930	753.810
3 - 9 o'clock	800.140	755.240
4 - 10 o'clock	800.860	755.380
5 - 11 o'clock	801.700	756.120

Maximum OD = 801.990
Minimum OD = 800.140
% Ovality = 0.2%
➡ Pass



Point of Measurement	View A-A Wall Thickness Measurement (mm)
12	20.513
1/2	20.330
3	20.136
4/5	20.727
6	21.509
7/8	21.119
9	20.904
10/11	20.392

Minimum wall thickness as per ISO 16422 = 17.4mm
➡ Pass

Note: due to the orientation of the views, the 3 o'clock position for Views A-A and C-C will be the same side of the pipe as the 9 o'clock position for Views B-B and D-D.

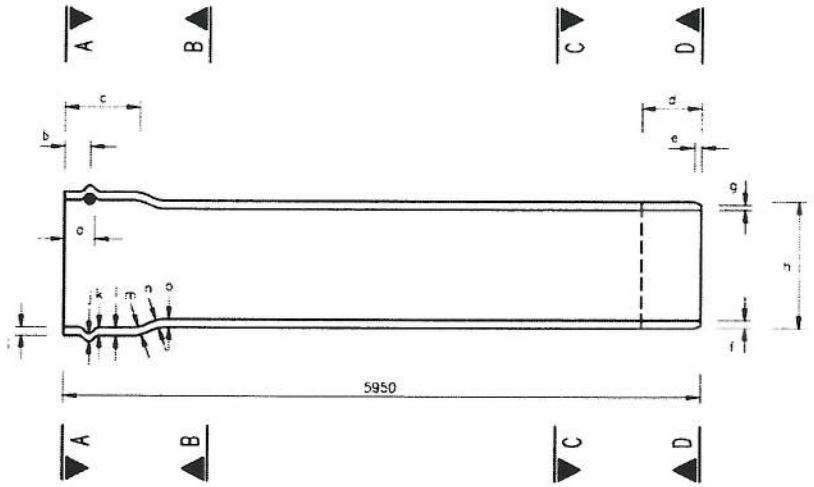
Other witness testing included:
- Tensile strength testing
- Ring stifness testing
- Impact resistance testing
- 10-hour pressure testing

The governing test to confirm the pipes can be approved (as this test confirms overall performance of the pipe based on the individual pipe charactenstics and testing), was the 10-hour pressure testing
This test has passed, and the supporting test results records, including the test results records for the other tests mentioned above, are available as a separate record

Annexure: A

Contract 1796-00-20/ID04: Construction of Stellenbosch Arterial Bulk Water Pipeline

Witness Testing: 500mmø Molecor TOM500 CL16 Pipe - 28/06/2016 to 30/06/2016

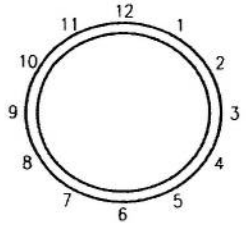


Measurements:

a = 134.490 mm
b = 118.500 mm
c = 329.660 mm
d = 277.430 mm
e = 31.470 mm
f = 13.600 mm
g = 5.442 mm
h = 500.000 mm
i = 12.911 mm
j = 10.297 mm
k = 9.975 mm
l = 11.247 mm
m = 11.071 mm
n = 11.106 mm
o = 12.423 mm

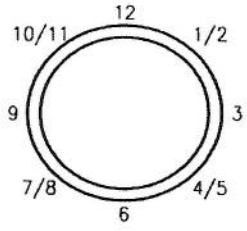
Based on the above measurements, including allowance for the effect of Poisson contraction, temperature expansion/contraction, and angular deflection, the depth of engagement is sufficient for the application.
➡ Pass

Note: the top of pipe (12 o'clock) was taken on the pipe marking.



Point of Measurement	View B-B Wall Thickness Measurement (mm)	View C-C Wall Thickness Measurement (mm)
12	13.417	16.105
1	12.965	15.047
2	12.804	15.198
3	13.013	14.414
4	13.204	14.027
5	13.679	13.947
6	12.717	14.718
7	11.821	15.559
8	11.829	15.097
9	12.390	14.642
10	12.916	14.723
11	13.216	15.387
	Minimum wall thickness as per ISO 16422 = 11.0mm ➡ Pass	

Point of Measurement	View B-B Outside Diameter (mm)	View B-B Inside Diameter (mm)
12 - 6 o'clock	501.320	475.260
1 - 7 o'clock	499.510	473.940
2 - 8 o'clock	498.900	474.470
3 - 9 o'clock	500.580	475.400
4 - 10 o'clock	502.600	476.930
5 - 11 o'clock	503.790	477.310
Maximum OD =	503.790	
Minimum OD =	498.900	
% Ovality =	1.0%	
➡ Pass		



Point of Measurement	View A-A Wall Thickness Measurement (mm)
12	13.828
1/2	13.478
3	12.952
4/5	12.630
6	13.194
7/8	13.609
9	13.230
10/11	13.352
Minimum wall thickness as per ISO 16422 = 11.0mm ➡ Pass	

Note: due to the orientation of the views, the 3 o'clock position for Views A-A and C-C will be the same side of the pipe as the 9 o'clock position for Views B-B and D-D.

Other witness testing included:
- Tensile strength testing
- Ring stifness testing
- Impact resistance testing
- 10-hour pressure testing

The governing test to confirm the pipes can be approved (as this test confirms overall performance of the pipe based on the individual pipe characteristics and testing), was the 10-hour pressure testing
This test has passed, and the supporting test results records, including the test results records for the other tests mentioned above, are available as a separate record

Annexure A

IT-C-LAB-05 **Informe Ensayo Resistencia a Presión Interna** ISO 1168 INTERNAL PRESSURE TEST REPORT

MOLECOR

Annexure: B

LOTE	Día nº	Fecha	Línea	Hora
56022	1	21/06/2016	5	2:02

Diámetro	800
Presión	16
Referencia	B

CÓD. PRODUCTO **TOM 800-16B**

Tipo de Ensayo **COPA** (Type of Test: Socket)

Temperatura **20 °C**

ESTACIÓN 1

☑ NF T 54-948

Wall thickness

Espesores TOTALES TUBO

MAX	MIN	MED
23,28	19,13	21,04

Valores a tener en cuenta para espesor de pared

- ☐ Labio A
- ☑ Cabo D
- ☐ Cabo E
- ☑ Cabo F

Espesor "e" de

- ○ e Mín Medido
- ◉ e Mín norma
- ○ e Med nominal

	Característica	Criterio	Especificac. min	Especificac. max	unidades	Observaciones (Remarks)									Resultado
	Ø ext. COPA (labio A)	Molecor	****	****	mm	845,5	Ver referencia en Diámetro interior de copa más abajo								
	Ø ext. Tubo (Cabo D)	ISO 16422 NF T 54-948	800,0	802,0	mm	800,9									OK
PROBETA COPA	Espesor de pared de copa (labio A)	Molecor (min)	17,4	****	mm	19,95	20,39	20,73	21,30				Min	18,68	OK
		Molecor (med)	20,5	****		20,80	20,93	20,96	18,68				Med	20,50	OK
	Espesor de pared de Tubo (cabo D)	ISO 16422	17,4	****	mm	21,51	21,67	22,31	22,55	22,87	23,24		Min	21,51	OK
		****	****	****		23,28	22,58	22,10	22,02	21,95	22,01		Med	22,30	
	Longitud COPA (lc)	Molecor	460,0	490,0	mm	468,8									OK
	Ø int. COPA (labio A) (1)	Molecor NF T 54-948	802,1	807,0	mm	804,5									OK
	Longitud Probeta				mm	910									
PROBETA CABO (ENSAYO COPA)	Ø ext. TUBO (cabo E)	ISO 16422 NF T 54-948	800	802	mm	800,6									OK
	Espesor pared TUBO (cabo E "e")	ISO 16422	17,4	****	mm	21,73	22,93	21,47	22,06	22,09	22,65		Min	21,47	OK
		****	****	****	mm	23,20	23,22	22,48	22,48	22,16	21,80		Med	22,40	
	Longitud Probeta				mm	990									
PROBETA ENSAYO TUBO	Øext TUBO (cabo F)	ISO 16422 NF T 54-948	800	802	mm	801,4									OK
	Espesor pared TUBO (cabo F "f") Bisel	ISO 16422	17,4	****	mm	20,96	20,84	20,96	21,30	21,25	21,81		Min	20,82	OK
		Molecor (Med)	21,2	22,2	mm	21,80	21,73	21,06	20,90	20,82	20,97		Med	21,20	OK
	Espesor pared TUBO (cabo F "f") Extremo No biselado	ISO 16422	17,4	****	mm	19,50	19,13	19,36	19,52	19,60	19,97		Min	19,13	OK
		****	****	****	mm	20,13	20,15	19,65	19,90	19,72	19,29		Med	19,70	
	Longitud Probeta				mm	1505									

Specimen setup. End cap Type

Orientac probeta	Vertical
Tipo de cierre	B (con varilla)

Pipe Length. Longitud Libre	mm	≥2dn
Lugar de ensayo	****	Both. Baño
Temperatura ambiente (Amb. Temperat.)	°C	20
Acondicionamiento (Conditioning)		
Temperatura baño/aire	°C	20
Time. Tiempo	horas	≥16 h
Temperatura ensayo (Test Temperat.)	°C	20
Tiempo teórico (Test Time)	horas	10
Esfuerzo a aplicar (Hoop Stress)	MPa	65
Espesor de pared de cálculo ($e_{y,min}$) (Wall thickness for calculation)	mm	17,40
d_{em} (Ø) OD	mm	801,15
Presión teórica de ensayo (Test Pressure.)	bar	28,86
Presión configurada	bar	28,86

Pressure set.

RESULTADOS

Initial Test Date. Fecha inicio ensayo	****	23-06-16
Fecha fin ensayo (Final T.D.)	****	24-06-16
Tiempo TOTAL de ensayo	h/min	13:20
Tiempo ensayo OK	h/min	10:00
Tiempo tolerancia Negativa	h/min	3:20
tiempo en alcanzar la presión	h/min	0:05
Resultado	****	OK
Tipo de Fallo (Type of failure.)	****	OK

Observaciones (Remarks).

Ø ext Tras Ensayo mm

$$P = 10\sigma \cdot \frac{2e_{y,min}}{d_{em} - e_{y,min}}$$

Total Time.
Total Time ok (inside Tolerances)
Time outside Tolerances
Time to reach set pressure.
Result.

Fecha	24/06/2016
Realizado:	Rafael Palacios

Annexure: B

MOLECOR

Detalles del producto

Nº del Ensayo	**56022002** (Batch.)
Descripción	**56022 PI COPA 20ºC 16-06-21 80O**
Nº de producción	**56022 02:02**
Tipo Ensayo	**COPA** (SOCKET.)
Cliente	

Datos del test de presión

Operador	**RAFA**
Estación	**1**
Presión Deseada (Target Pressure.)	**28,86** [bar]
Tolerancia	**0,29** [bar]
Límite de alarma	**0,58** [bar]
Presión Máx. (Max Press.)	**29,60** [bar]
Velocidad de fuga	**5**

Resultados del test de presión

Tempo Deseado	**10:00** horas
Tiempo O.K.	**10:00** horas
Tiempo de test actual	**13:20** horas
Tiempo Fuera Tolerancia	**3:20** horas
Tiempo Fallo Energia	**0:00** horas

Temperatura del test de presión

Nota: Temperatura Introducida Manualmente

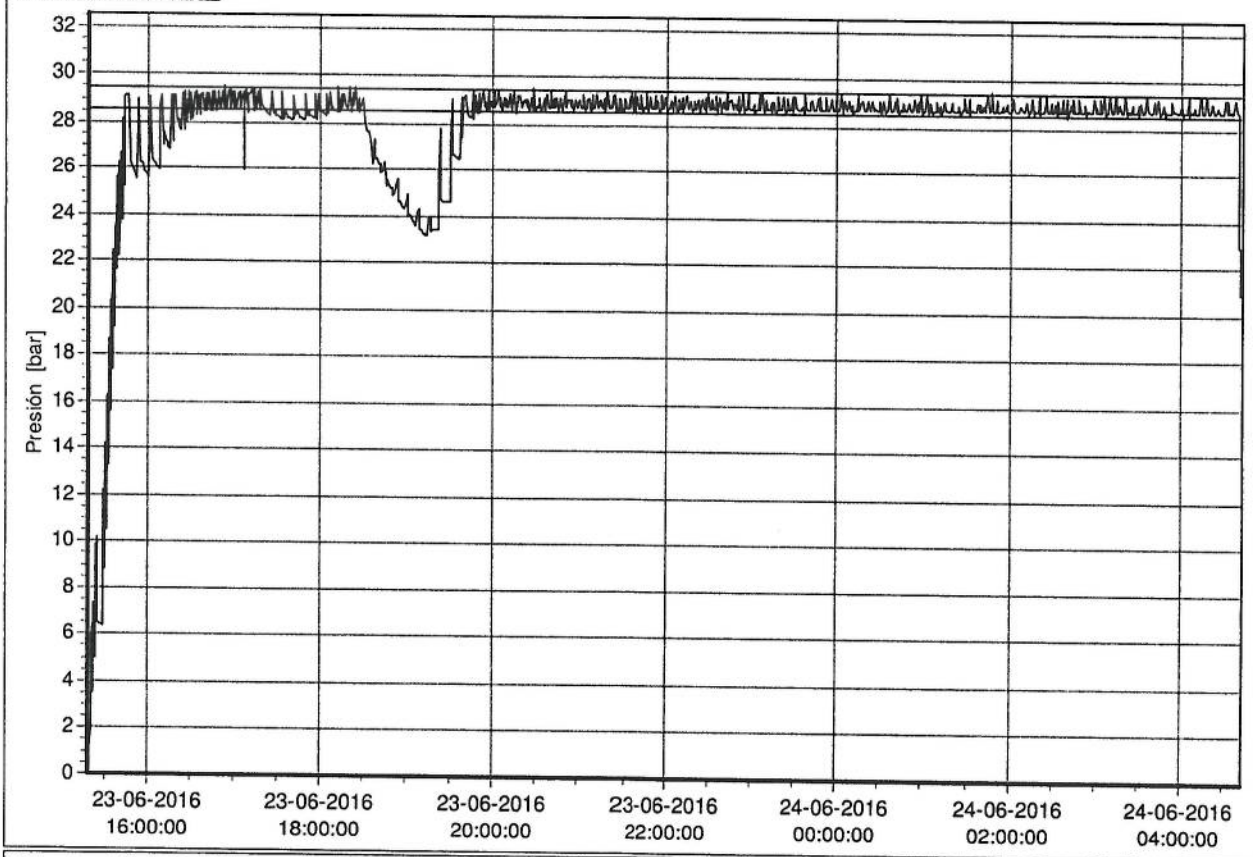
TempDeseadaBañera	**19,30** [°C]

Comentarios

Fechas

Fecha Inicio ensayo	**23-06-2016 15:20**
Fecha fin del ensayo	**24-06-2016 04:40**
Fecha de impresión	**24-06-2016 08:43:29**

Ensayo completo



Pc versión =02 03 2016 9.12
0 version = 21-05-2015

Ensayo aprovado por : Fecha . . / . . / . . . .

Annexure: C

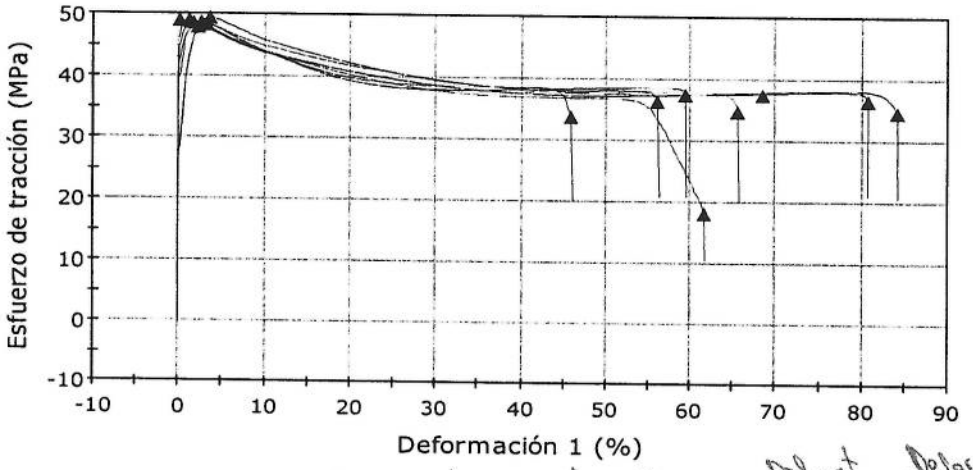
TRACCIÓN LONGITUDINAL ISO 6259-1

** Tº ambiente.- 24.3 °C.**
** Velocidad de cruceta.- 5 mm/min. **

PVC-O

DN:	800
PN:	16B/BS
BATCH Nº de lote:	56022
Fecha de fabricación:	21/06/16 04:02h

Probeta 1 a 8



Thickness. Width. First Peak Load at Break Max Load Def. at First Peak Deformation at Break Tensile strength at Break.

	Fecha ensayo	Espesor (mm)	Anchura (mm)	Primer pico (N)	Carga a Rotura (N)	Máximo Carga (N)	Def al Primer pico (%)	Def a Rotura (%)	Esf tracción a Rotura (MPa)
1	22/06/2016 11:06	18,86	6,12	5566,80	4322,10	5566,80	3,29	59,3	37,45
2	22/06/2016 11:13	19,16	6,02	5617,82	4208,00	5617,82	2,63	80,7	36,48
3	22/06/2016 11:29	19,94	6,05	5782,77	2193,65	5782,77	2,22	61,6	18,18
4	22/06/2016 11:42	19,93	5,96	5828,49	3996,05	5828,49	1,26	45,9	33,64
5	22/06/2016 11:50	20,00	6,01	5944,62	4365,49	5944,62	3,61	56,1	36,32
6	22/06/2016 11:59	19,78	6,00	5787,29	4116,00	5787,29	1,38	65,5	34,68
7	22/06/2016 12:05	18,90	6,06	5608,14	4287,30	5608,14	0,18	68,4	37,43
8	22/06/2016 12:15	19,23	5,98	5595,89	3978,16	5595,89	1,78	84,1	34,59
Máximo		20,00	6,12	5944,62	4365,49	5944,62	3,61	84,1	37,45
Mínimo		18,86	5,96	5566,80	2193,65	5566,80	0,18	45,9	18,18
Media		19,47	6,02	5716,48	3933,34	5716,48	2,04	65,2	33,60

	Esf tracción Primer pico (MPa)
1	48,23

— Tensile Strength at First Peak.

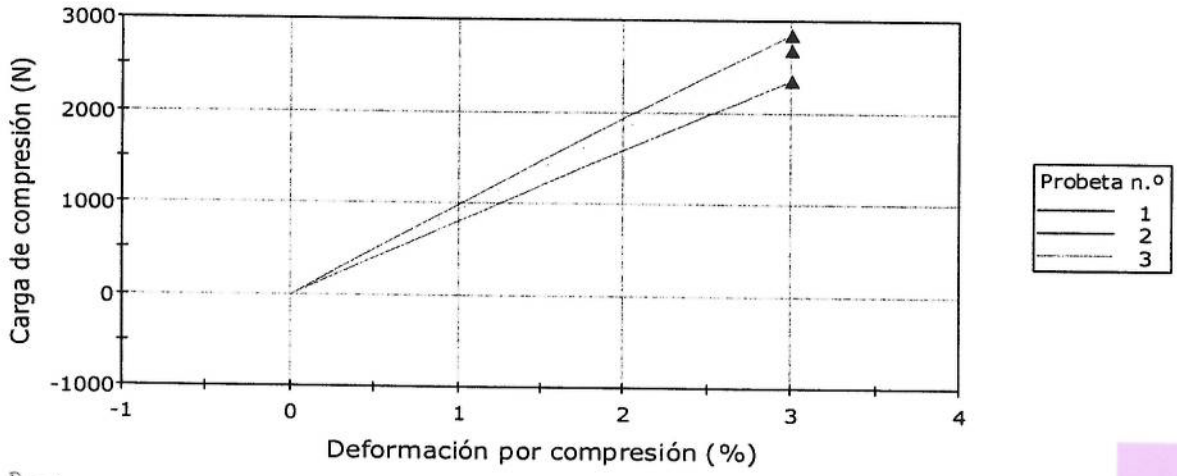
Annexure : D

RIGIDEZ ANULAR DN630. RING STIFNESS.

** Tº Ambiente.- 22.4ºC**
** Velocidad de deformación.- 20mm/min **

Fecha ensayo.- 28/06/16
Fecha fabricación.- 22/06/16 01:48
BATCH Nº de lote.- 56022
PN.- 16B

Probeta 1 a 3



Ring Stiffness. Length. I.D.

	Rigidez anular	Extensión al 3 % (mm)	Deformación al 3 % (N)	Longitud de tubo	Diametro int. medio	Diametro int.1	Diametro int.2	Diametro int.3
1	8,04	18,86	2352,33	298,30	755,52	759,10	756,20	753,20
2	7,75	23,92	2850,32	298,20	755,30	759,60	754,70	751,00
3	7,30	23,71	2686,37	300,70	755,53	759,20	754,20	751,40
Media	7,70	22,16	2629,67	299,07	755,45	759,30	755,03	751,87

	Diametro int.4	Espesor de la pared (mm)
1	753,60	22,18
2	755,90	22,21
3	757,30	22,17
Media	755,60	22,19

- Wall thickness.