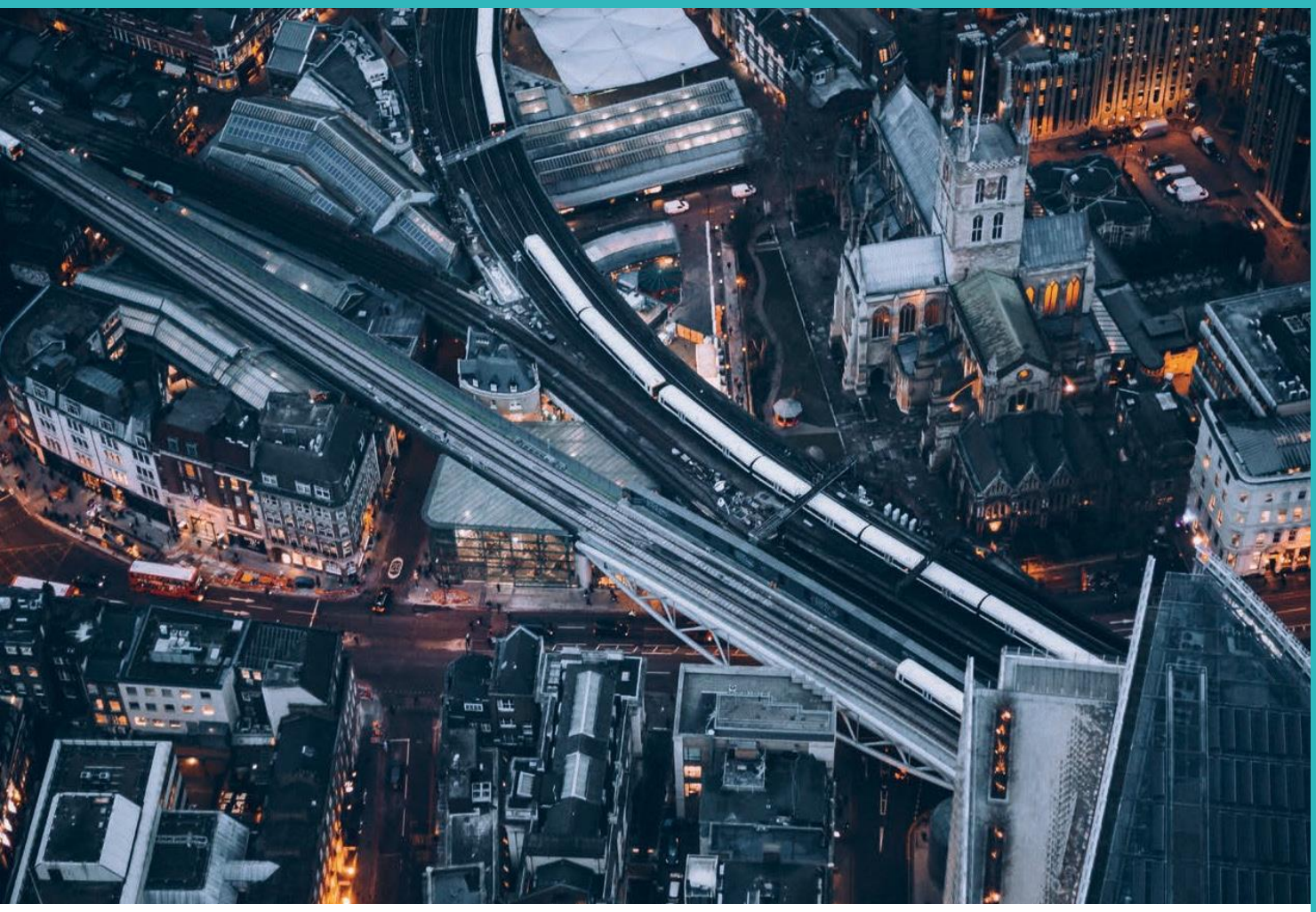

REPORT

Testing and Certification of Naylor C3 50mm Cable Ducts to ENATS 12/24 Issue 2021

Private and Confidential

Prepared for: Naylor Specialist Plastics Ltd

Report No: A3143_3
Document Version: Issue 3
Date: 10 September 2024

Version History

Date	Version	Author(s)	Notes
31/07/2024	Issue 1	Sara Griffiths	First Issue
06/09/2024	Issue 2	Sara Griffiths	Correction to 1. Cable duct description on Certificate, to headers on subsequent pages.
10/09/2024	Issue 3	Sara Griffiths	Correction to 'Naylor Specialist Plastics Ltd, cover page and certificate.

Final Approval

Approval Type	Date	Version	EA Technology Issue Authority
Final	02/08/2024	Issue 1	Jeff Robertson
Final	06/09/2024	Issue 2	Jeff Robertson
Final	10/09/2024	Issue 3	Jeff Robertson 

EA Technology Limited, Capenhurst Technology Park, Capenhurst, Chester, CH1 6ES;
Tel: 0151 339 4181 Fax: 0151 347 2404

http://www.eatechnology.com

Registered in England number 2566313

EA Technology Limited
Capenhurst Technology Park
Capenhurst, Chester CH1 6ES

t +44 (0) 151 339 4181
e sales@eatechnology.com
www.eatechnology.com

Certificate No: **A3143_3**

Project: **Cable Ducts User Spec ENATS 12/24 Issue 2021**

Client: **Naylor Specialist Plastics Ltd.**

Date: **10th September 2024**

This certificate is issued to NAYLOR SPECIALIST PLASTICS LTD to certify that the undersigned testing facility did, at their request complete the performance tests stipulated below on the following products:

1. Cable duct description:

   Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable

2. Standard Reference:

   Technical Specification for plastic ducts for buried electric cables, Cable Duct User Spec ENATS 12/24 Issue 2021.

3. The following tests were completed:

Routine Test	Sample Test	Type Test
1. Construction	1. Dimensions	1. Marking and documentation
	1.1 - Inside diameter	2. Duct Assembly, by other means than threads
	1.2 - Ovality	3. Vicat softening test
	1.3 - Length	4. Static friction coefficient test
	2. Compression test: Resistance to deformation at 23˚C	
	3. Impact test at -5˚C	
	4. Heat Reversion	

4. All results of tests stated in paragraph 3 are included in the client test schedule. The annexes mentioned in the test schedule are supporting documentation.

5. The results of the mentioned tests were found to be within the requirements of the Technical Specification for plastic ducts for buried electric cables, Cable Duct User Spec ENATS 12/24 Issue 2021.

Sara Griffiths

Materials Lab Technician

EA Technology Ltd

ROUTINE TEST: Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable

Test period: May 2024 to June 2024

Standard Reference: Cable Duct User Spec ENATS 12/24 Issue 2021

No	Description	Standard Reference Clause	Requirement	Test Method	Results	Remarks
1	Construction	9				
		9.1a	The cross section of the ducts shall be circular, and the internal bore shall be smooth and substantially concentric with the external surfaces	Inspection	Passed	Annex A
		9.1b	Both ends of the duct shall be cleanly cut perpendicular to the central axis of the duct	Inspection	Passed	Annex A
		9.1c	All spigot ends or plain ends of the duct shall be radiused, or slightly bull-nosed in profile, to prevent the risk of damage to the cable during cable installation, and to ensure that the ends fit smoothly into the coupling or socket	Inspection	N/A	N/A
		9.1d	The material shall be free from cracks, inclusions, delamination, or other defects	Inspection	Passed	Annex A
		9.1e	Any profiled surface of a cellular wall structure shall be complete, with no break in the cell walls	Inspection	N/A	N/A

SAMPLE TEST: Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable

Test period: May 2024 to June 2024

Standard Reference: Cable Duct User Spec ENATS 12/24 Issue 2021

No	Description	Standard Reference Clause	Requirement	Test Method	Results	Remarks
1	Dimensions	8				
1.1	Inside diameter	8.2.3a	Inside diameter of the duct shall be determined by the average of four measurements taken at regular intervals around the cross section. The Measurements shall be taken at the end of the duct. Nominal inside diameter 50mm	User Spec 8.2.3a	Measured	Annex B
1.2	Ovality	8.2.3b	The ovality shall be determined as the difference between the measured maximum internal diameter and the measured minimum internal diameter expressed as a percentage of the nominal internal diameter. The measurement shall be taken from the end of the duct. Maximum Ovality 2.8mm	User Spec 8.2.3b	Passed	Annex B
1.3	Length	8.2.3c	The minimum length shall be the length ordered	User Spec 8.2.3c	Passed	Annex B
2	Compression test: Resistance to deformation at 23˚C	10.2	When reaching the deflection of 5%, the applied force shall be at least 450 N or equivalent at 23˚C. After test samples shall show no cracks visible to normal or corrected vision without additional magnification.	User Spec 10.2	Passed	Annex C
3	Impact test at -5˚C	10.3	Using a 5kg weight with a fall distance of 300 mm, it shall be possible to pass a 47.5mm ball through the conduit. There shall be no signs of disintegration, nor shall there be any crack allowing the ingress of light or water between the inside and outside.	User Spec 10.3	Passed	Annex D
4	Heat Reversion	16.5	Maximum percentage change 1%, samples shall be free from blistering	User Spec 16.5.3b	Passed	Annex E

TYPE TEST:	Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable
Test period:	May 2024 to June 2024
Standard Reference:	Cable Duct User Spec ENATS 12/24 Issue 2021

No	Description	Standard Reference Clause	Requirement	Test Method	Results	Remarks
1	Marking and documentation	7.1	Ducts, couplings and bends shall be coloured black or red, throughout length	Inspection	Passed	Annex F
		7.2	The duct shall be marked "ELECTRIC CABLE DUCT C_MFR"	Inspection	Passed	Annex F
		7.2a	Class number shall be inserted after "C"	Inspection	Passed	Annex F
		7.2b	"MFR" shall be replaced by manufacturer's reference	Inspection	Passed	Annex F
		7.2d	Minimum print size of 6mm	Inspection	Passed	Annex F
		7.2e	The full print message shall be repeated along the length of the duct. The gap between the end of one print message and start of the next print shall not be more than 200 mm	Inspection	Passed	Annex F
		7.2f	The markings shall be on two print lines, 180˚ apart	Inspection	Passed	Annex F
		7.4	Cable duct shall also have marked on it at 1m intervals its classification code	Inspection	Passed	Annex F
		7.5	The marking shall be durable and easily legible	Inspection	Passed	Annex F
2	Duct Assembly, by other means than threads	9.6	Not designed to be disassembled	N/A	N/A	N/A
3	Vicat softening test	16.2	The vicat softening temperature shall not be less than 75˚C	User Spec 16.2	Passed	Annex G
4	Static friction coefficient test	16.3	The static friction coefficient shall not exceed 0.27	User Spec 16.3	Passed	Annex H

ANNEX A:

SAMPLE TEST:	Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable
Sample identification:	1m Test Samples - Batch from Client
Test period:	May 2024 to June 2024
Standard Reference:	Cable Duct User Spec ENATS 12/24 Issue 2021

CONSTRUCTION

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 clause 9.1c

The cross section of the ducts shall be circular, and the internal bore shall be smooth and substantially concentric with the external surface. The material shall be free from cracks, inclusions, delamination or other defects. Both ends of the duct shall be cleanly cut perpendicular to the central axis of the duct.

Test results: All tests passed.

ANNEX B:

SAMPLE TEST:	Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable
Sample identification:	1m Test Samples - Batch from Client
Test period:	May 2024 to June 2024
Standard Reference:	Cable Duct User Spec ENATS 12/24 Issue 2021

DIMENSIONS- DIAMETER

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 Clause 8.2.3a
Test Requirements: Nominal inside diameter 50mm

Test results:

	Duct Diameter (mm)			
Measurement 1	Measurement 2	Measurement 3	Measurement 4	Average
50.18	49.83	50.25	49.89	**50.04**
49.96	49.95	50.19	49.96	**50.02**
49.93	50.36	49.91	49.98	**50.05**
49.98	50.20	49.83	50.04	**50.01**
50.17	49.98	49.92	49.93	**50.00**
49.96	49.99	50.25	49.90	**50.03**

DIMENSIONS- OVALITY

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 Clause 8.2.3b
Test Requirements: Maximum Ovality 2.8mm

Test results:

Measurement	Maximum Measured Ovality (mm)
1	0.84
2	0.50

DIMENSIONS- LENGTH

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2007/08 Clause 8.2.3c
Test Requirements: The minimum length shall be the length ordered.
Test results: All duct samples were provided as 1 metre lengths.

ANNEX C:

SAMPLE TEST:	Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable
Sample identification:	1m Test Samples - Batch from Client
Test period:	May 2024 to June 2024
Standard Reference:	Cable Duct User Spec ENATS 12/24 Issue 2021

COMPRESSION TEST

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 Clause 10.2

Test Requirements: Sample length 200±5 mm, temperature 23˚C, nine test samples. When reaching the deflection of 5%, the applied force shall be at least 450 N or equivalent at 23˚C. After test samples shall show no cracks visible to normal or corrected vision without additional magnification.

Test Equipment Instron 3367, 15mm +/-0.5 per minute crosshead speed (Figure 1).

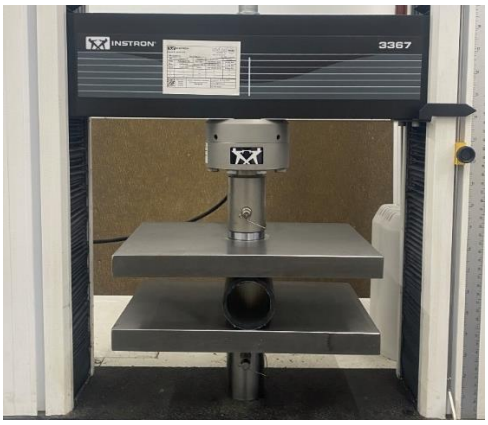

Figure 1Resistance to deformation test rig

Test Results:

Test Sample	Load at 5% Deformation (N)
1	1697.133
2	1654.495
3	1659.293
4	1594.267
5	1595.712
6	1660.485
7	1577.164
8	1665.133
9	1649.353
Average	1639.226
Median	1654.495
Standard Deviation	40.28218
Range	119.9691

ANNEX D:

SAMPLE TEST:	Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable
Sample identification:	1m Test Samples - Batch from Client
Test period:	May 2024 to June 2024
Standard Reference:	Cable Duct User Spec ENATS 12/24 Issue 2021

IMPACT TEST at -5˚C

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 Clause 10.3

Test Requirements: Sample length 200±5 mm, temperature -5˚C conditioned for 2 hours, fourteen test samples, hammer weight 5kg, fall distance 300mm, 47.5mm diameter ball used for compliance test.

Test Equipment Temperature controlled environmental chamber, as shown in Figure 2

Figure 2 Impact test rig

Test Results: 47.5mm ball passed through all test pieces freely, no signs of disintegration or any crack that allowed the ingress of light or water between the inside and outside were present.

ANNEX E:

SAMPLE TEST:	Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable
Sample identification:	1m Test Samples - Batch from Client
Test period:	May 2024 to June 2024
Standard Reference:	Cable Duct User Spec ENATS 12/24 Issue 2021

HEAT REVERSION

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 Clause 16.5

Test Requirements: Sample length 300±5 mm, temperature 150˚C conditioned for 1 hour, one test sample.
Maximum percentage change 5%, samples shall be free from blistering.

Test Equipment Genlab industrial air circulation oven.

Test Results:

Initial length	99.42mm
Final length	99.16mm
Percentage Change	0.26%

ANNEX F:

SAMPLE TEST:	Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable
Sample identification:	1m Test Samples - Batch from Client
Test period:	May 2024 to June 2024
Standard Reference:	Cable Duct User Spec ENATS 12/24 Issue 2021

MARKING

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 Clause 7.1, 7.2, 7.4 and 7.5

Test Requirements: Ducts, couplings and bends shall be coloured black or red, throughout their length
The duct shall be marked "ELECTRIC CABLE DUCT C_MFR" Class number shall be inserted after "C"

"MFR" shall be replaced by manufacturer's reference Minimum print size of 6mm

The gap between the end of one print message and start of the next print shall not be more than 200 mm

The markings shall be on two print lines, 180˚ apart
Classification code marked every 1 metre
The marking shall be durable and easily legible

Test Equipment Visual Inspection

Test Results: Coloured Black
Duct marked 'ELECTRIC CABLE DUCT C3 NAYLOR"
Text area more than 6mm
Gap between repeated print message less than 200mm
The markings printed on two lines, 180˚ apart
Classification code marked every 1 metre
The markings were legible following rubbing by hand for 15 seconds with a piece of cloth soaked in water and again for 15 seconds with a piece of cloth soaked with petroleum spirits
Care should be taken in handling the samples to ensure excessive abrasion does not remove the lettering. The consistency and clarity of marking should be continuously reviewed during manufacture.

ANNEX G:

TYPE TEST:	Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable
Sample identification:	1m Test Samples - Batch from Client
Test period:	May 2024 to June 2024
Standard Reference:	Cable Duct User Spec ENATS 12/24 Issue 2021

VICAT SOFTENING TEMPERATURE

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 Clause 16.2
Test Requirements: The vicat softening temperature not be less than 75˚C.
Two measurements shall be taken, and the difference shall not exceed 2˚C.

Test Equipment
Load of 9.81N
Indent size $1mm^{2.}$
Sample thickness 3mm.
Heat transfer medium Transformer oil.

Test Results:
Vicat softening temperature 122.4˚C.
No alterations in appearance

ANNEX H:

TYPE TEST:	Polyethylene, nominal inside diameter 50mm, Class 3, rigid and coilable
Sample identification:	1m Test Samples - Batch from Client
Test period:	May 2024 to June 2024
Standard Reference:	Cable Duct User Spec ENATS 12/24 Issue 2021

STATIC FRICTION COEFFICIENT TEST

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 Clause 16.3
Test Requirements: Sample length 1 metre, three test samples.
The static friction coefficient shall not exceed 0.27.

Test Equipment See Figure 3

Figure 3 Static friction coefficient test rig

Test Results:

Test Sample	Test No	Static Friction Coefficient						
		1	2	3	4	5	6	Average
1	1	0.17	0.11	0.13	0.14	0.14	0.15	**0.14**
	2	0.13	0.13	0.14	0.15	0.15	0.16	**0.14**
2	1	0.12	0.13	0.15	0.14	0.13	0.14	**0.14**
	2	0.13	0.12	0.13	0.15	0.14	0.15	**0.14**
3	1	0.10	0.12	0.14	0.15	0.14	0.16	**0.14**
	2	0.12	0.12	0.15	0.14	0.15	0.16	**0.15**
							Overall Average	0.15

Safer, Stronger, Smarter Networks

EA Technology Limited
Capenhurst Technology Park
Capenhurst, Chester CH1 6ES

t +44 (0) 151 339 4181
e sales@eatechnology.com
www.eatechnology.com