

REPORT

# Testing and Certification of Naylor C3 32mm Cable Ducts to ENATS 12/24 Issue 2021

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Prepared for: Naylor Industries  
PLC

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**ROUTINE TEST:**

**Polyethylene, nominal outside diameter 32mm, Class 3, rigid and non-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 outside diameter 32mm, Class 3, rigid and non-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 32mm.	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 4mm	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	<b>Failed</b>	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 30.4mm 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 outside diameter 32mm, Class 3, rigid and non-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:**

<b>SAMPLE TEST:</b>	Polyethylene, nominal outside diameter 32mm, Class 3, rigid and non-coilable
<b>Sample identification:</b>	1m Test Samples - Batch from Client
<b>Test period:</b>	May 2024 to June 2024
<b>Standard Reference:</b>	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:**

<b>SAMPLE TEST:</b>	Polyethylene, nominal outside diameter 32mm, Class 3, rigid and non-coilable
<b>Sample identification:</b>	1m Test Samples - Batch from Client
<b>Test period:</b>	May 2024 to June 2024
<b>Standard Reference:</b>	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 32mm

Test results:

Measurement 1	Duct Diameter (mm)			
	Measurement 2	Measurement 3	Measurement 4	Average
32.38	32.83	32.45	32.49	32.54
32.50	32.71	33.13	32.57	32.73
31.57	32.47	31.26	31.63	31.73
31.87	32.69	32.04	32.17	32.19
32.54	33.30	32.85	32.78	32.87
32.43	33.08	32.60	33.23	32.84

**DIMENSIONS- OVALITY**

Test Procedure: Cable Duct User Spec ENATS 12/24 Issue 2021 Clause 8.2.3b  
 Test Requirements: Maximum Ovality 4mm

Test results:

Measurement	Maximum Measured Ovality (mm)
1	1.41
2	1.63

**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-meter lengths.

ANNEX C:

SAMPLE TEST:	Polyethylene, nominal outside diameter 32mm, Class 3, rigid and non-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 1 Resistance to deformation test rig

Test Results:

Test Sample	Load at 5% Deformation (N)
1	405.5128
2	427.169
3	407.6673
4	400.0775
5	377.3923
6	375.0429
7	402.2057
8	443.9031
9	413.4429
Average	<b>405.8237</b>
Median	405.5128
Standard Deviation	21.70576
Range	68.86014

ANNEX D:

SAMPLE TEST:	Polyethylene, nominal outside diameter 32mm, Class 3, rigid and non-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, 30.4mm diameter ball used for compliance test.

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



Figure 2 Impact test rig

Test Results: 30.4mm ball passed through 11 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:**

<b>SAMPLE TEST:</b>	Polyethylene, nominal outside diameter 32mm, Class 3, rigid and non-coilable
<b>Sample identification:</b>	1m Test Samples - Batch from Client
<b>Test period:</b>	May 2024 to June 2024
<b>Standard Reference:</b>	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:**

<b>SAMPLE TEST:</b>	Polyethylene, nominal outside diameter 32mm, Class 3, rigid and non-coilable
<b>Sample identification:</b>	1m Test Samples - Batch from Client
<b>Test period:</b>	May 2024 to June 2024
<b>Standard Reference:</b>	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 meter  
The marking shall be durable and easily legible

Test Equipment Visual Inspection

Test Results: Coloured Black  
Duct marked 'ELECTRIC CABLE DUCT C3NAYLOR"  
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 outside diameter 32mm, Class 3, rigid and non-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<sup>2</sup>.  
Sample thickness 3mm.  
Heat transfer medium Transformer oil.

Test Results: Vicat softening temperature 121.0°C.  
No alterations in appearance

ANNEX H:

TYPE TEST:	Polyethylene, nominal outside diameter 32mm, Class 3, rigid and non-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 meter, 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						Average
		1	2	3	4	5	6	
1	1	0.09	0.09	0.09	0.09	0.10	0.09	<b>0.09</b>
	2	0.10	0.10	0.09	0.10	0.10	0.09	<b>0.10</b>
2	1	0.10	0.10	0.09	0.09	0.10	0.10	<b>0.10</b>
	2	0.10	0.10	0.09	0.10	0.10	0.09	<b>0.10</b>
3	1	0.10	0.11	0.09	0.10	0.10	0.11	<b>0.10</b>
	2	0.10	0.10	0.11	0.10	0.10	0.10	<b>0.10</b>
							Overall Average	<b>0.10</b>



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