White Paper

Composite Access Covers and EN 124:2015

Raising the Standard

How the publication of EN 124:2015 reinforces the importance of best-in-class composite access products and gives peace-of-mind to buyers and end users.

Vincent Cooper, BE PhD

EJ

Product Manager - Composites & Plastics

Vincent is a Mechanical Engineering graduate from University College Dublin and holds a Material Science PhD. He is a BSI committee member (b/505/4/2), a member of CEN/TC 165/WG4 technical committee for waste water engineering, the Irish Composite Research Centre (IComp) technical committee and the Composites UK trade body.

Overview

In recent years, the arrival of composite access covers to the market has delivered new advantages and a new level of choice for project managers of utilities and municipalities, engineers, specifiers and owners. A substantial revision of the performance standard from the EU in the shape of EN 124:2015 has provided a clear framework for composite producers to adhere to and confirms that composites are here to stay.

In this paper, we take a closer look at these new standards and the implications for both suppliers and buyers. As a member of the CEN European Standards working group (WG4), EJ, along with other manufacturers are responsible for the drafting and publication of EN product standards related to covers, gully gratings, and frames. In further examining the new framework, research and testing was also commissioned on the new EJ range demonstrating how we meet the new requirements.

What is a composite?

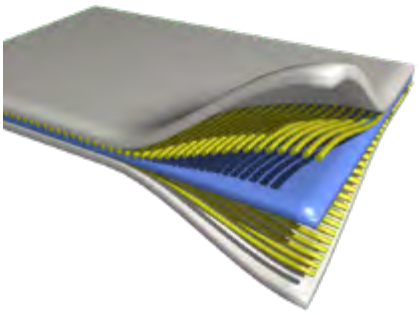
A composite is anything that is made from two or more materials with different physical or chemical properties that, when combined, are stronger than those individual materials by themselves.

Composite is also commonly known as Fibre-Reinforced Polymer (FRP) and is made from a polymer matrix that is reinforced with an engineered fibre. The matrix protects the fibres from environmental and external damage and transfers the load between the fibres.

These fibres, in turn, provide strength and stiffness to reinforce the matrix and help it resist cracks and fractures.

For composite manhole covers, the reinforcing fibre is normally glass fibre and the matrix can vary from polyester to vinylester to polyurethane to many other materials. Many combinations of resins and reinforcements can be used in composite manufacturing - and each material contributes to the unique properties of the finished product.

The fibre provides strength and stiffness, while more flexible resin provides shape and protects the fibre. Composites may also contain fillers, additives, core materials or surface finishes designed to improve the manufacturing process, appearance, and performance of the final product.



Composites are formed by combining materials together to form an overall structure with properties that differ from the sum of the individual components

The advantages of using composite access covers

Composite materials are used today for a wide range of applications from construction to the aerospace industry. When it comes to manhole covers and access solutions, high quality composite products now offer many benefits.

Composite access covers...

- **Are easy to handle and install,** due to their low weight.
- **Have no resale value** to the scrap market, therefore eliminating theft.
- **Are corrosion-resistant** by nature. Composite products will remain unchanged, even in the most aggressive environments. This can apply to areas with exposure to sewers, petrochemicals, diesel, de-icing solutions, and salt water
- **Exhibit no signal interference** with wireless communication devices which makes them particularly suitable for applications associated with water metering automation or electrical switching for smart grid technology.
- **Do not conduct stray voltage** nor heat and can shield pedestrians from the underground environment
- **Can be colour-customised** to display a personalised logo or service identification.

While composite products offer many advantages, how composite products are made and what standards they are produced to, can vary widely - and this is the primary reason why the European standard was expanded.

Ease of handling

Varying standards in production

In this overall context, varying standards in production do occur, resulting in low quality products entering the market. Less experienced manufacturers sometimes focus on low grade materials and manufacturing technologies to save on cost.
What this means for our industry is that there are many ways to construct a product and call it a 'composite'. Given the potential for such a variety of products, it is important that stringent standards are in place. On the next page, we'll consider EN 124:2015 in a little more detail.

Testing the load bearing capacity at the Birr composite facility

A closer look at EN 124:2015 - Part 5

The new standard is split into 6 parts, where Part 1 contains general design and performance requirements and Parts 2-6 addresses performance requirements for manhole tops and gully tops made of specific materials (see below);

- Part 2: Gully tops and manhole tops made of cast iron;
- Part 3: Gully tops and manhole tops made of steel or aluminium alloys;
- Part 4: Gully tops and manhole tops made of steel reinforced concrete;
- **Part 5: Gully tops and manhole tops made of composite materials;**
- Part 6: Gully tops and manhole tops made of polypropylene (PP), polyethylene (PE) or un-plasticised poly(vinyl chloride) (PVC-U).

For the first time, Part 5 of the revised European product standard EN 124:2015 for gully tops and manhole tops for vehicular and pedestrian areas now sets down specific requirements for access products made from composite material.

Figure 1 NSAI Certification mark

As well as performance requirements, there is also a requirement for the following markings to be a permanent and integral part of the cover and frame:

a) name of the European Standard, i.e. EN 124-5
b) appropriate class (e.g. B 125)
c) name and/or identification mark of the manufacturer
d) factory of manufacturer which may be in code
e) date or week and year of manufacture (coded or not coded)

In addition to the above, EJ composite products are independently tested and accredited by the NSAI (National Standards Authority of Ireland) and carry this certification mark, as shown in Figure 1.

As industry leaders, we commissioned our own research and testing to demonstrate our commitment to the standard and to ensure all requirements are met.

Badging on the EJ IDS range of covers

Meeting the new standards - the EJ approach

In 2013, EJ began the process of researching the manufacture of best-in-class composite access covers to meet the pending requirements of EN 124:2015.

By applying a two-phase approach to meeting this overall goal, we would ensure the new standards were met by EJ composites and be assured of producing the best possible products for our customers worldwide.

Project team: (L to R) Dr. Ioannis Manolakis, Dr. Walter Stanley, Dr. Vincent Cooper and Dr. Ananda Roy

Phase 1 - Developing and perfecting our level of expertise

Outstanding commercial products often have their roots in academic research and we took the step of partnering with the Irish Composites Research Centre (IComp) based at the University of Limerick in southwest Ireland.

As an industry group whose aim is to facilitate innovation that leads to the commercialisation of products to meet market demands, they could provide help on all aspects of composite development from manufacturing trials to technical support.
This gave us access to a pool of knowledge and expertise in the area which helped us establish our new production facility in Birr.

2018 Impact Award

Our commitment to the composite sector was acknowledged in April 2018, when the University of Limerick President presented the prestigious Impact Award to EJ and IComp to acknowledge outstanding impact through successful knowledge transfer to industry.

Additionally, the EJ composites project was also short-listed in the top 3 projects for a national Knowledge Transfer of Ireland (KTI) innovation award.

Phase 2 - Specific testing and completion of independent research

As we developed our internal expertise we undertook a research and testing programme with the EN standard in mind.

In-house testing on materials was followed by load tests on product prototypes, before moving on to a formal independent third-party testing programme.

From product strength and skid resistance properties to how materials behave in weather extremes, our comprehensive independent testing programme assessed various composite materials across a range of criteria.

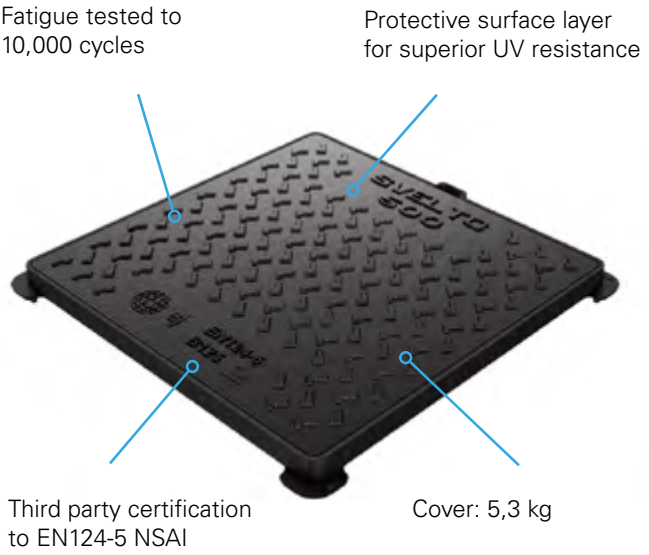
The research itself was completed in independent labs and with the help of academic researchers from prominent universities worldwide.

The advantages were twofold. Using the outputs of the research, we could design and finalise several production elements of our new plant and we could also disclose the research results and demonstrate our capacity to produce first-class products that were fully compliant with EN 124:2015.

What the research tells us - EJ product compliance

At EJ, our primary manufacturing technology is closed mould **resin transfer moulding (RTM)** which incorporates continuous E-glass fibres as the reinforcement.

EN 124:2015 specifies a comprehensive series of tests which must be passed to comply with the standard and the performance of EJ products in these tests is reported below.



- EJ composite products meet the permanent set requirements and exceed the required ultimate load rating of EN 124.
- The mean hardness of the EJ material far exceeds the specified Barcol hardness level, thus confirming a strong and durable surface.
- Independent testing shows the water absorption of EJ products to perform well within the limit of 0.3% mass change, so performance is not affected by moisture.
- When conditioned in diesel for 168 hours according to EN ISO 175 (resistance to fuels test), our EJ product scored significantly less than the 0.5% limit which demonstrates a good resistance to vehicle fuels.
- Samples were tested in accordance with EN ISO 4892-3 (QUV weathering test) and passed the EN 124:2015 requirement. Reduction in strength and discoloration is not an issue for EJ products.
- EJ products do not show visible cracking or delamination after impact testing.
- Following the effect of heating test, there were no visible defects, blistering, cracks or delamination of the test sample.
- EJ composite products have a suitably coarse skid resistant upper surface featuring our trademarked 4L non-slip tread pattern, and have a high USRV value, making them safe to use in pedestrian areas.

A complete set of test results is available on request.

Leading the way forward with EJ

We understand that since the arrival of composite access solutions, supplier knowledge and expertise has never been more important.

As a traditional cast iron specialist, our market knowledge and expertise is already in place and now we also design, produce, and deliver high quality composite products.

As one of the world's leading manufacturers of access covers and drainage solutions, EJ is a 5th generation family-owned company that spans five continents, promoting innovation, quality and a commitment to customer service. With manufacturing facilities, distribution hubs, sales offices, and multiple research and development centres worldwide, we have a complete understanding of the global market.

Our composite plants are in located Birr, Ireland serving the European market and Muskegon, Michigan serving the United States.

As a specialist manufacturer working to very specific standards in a highly regulated industry, we have built up years of experience when it comes to producing composite products to industry standards.

Our 13,500 sq ft European composite facility is also certified to ISO9001 and ISO14001.

By regularly investing in our plant and equipment, and adopting a continuous investment strategy, we confirm our commitment to be the world leader in infrastructure access solutions.

Preparing the fabric reinforcement on the automated cutting machine

Demoulding at the European composite facility, Birr, Ireland

Ireland
Roscrea Road
Birr
Co. Offaly R42 X009
tel 00353 57 91 23100
ireland.sales@ejco.com

France
1 Rue Edouard Prenat
69700 Givors
tel +33 (0)4 72 49 27 27
france.commercial@ejco.com

UK
Liberty House
LIberty Way
Nuneaton
CV11 6RZ
Tel: +44 (0) 24 7664 1777
uk.sales@ejco.com