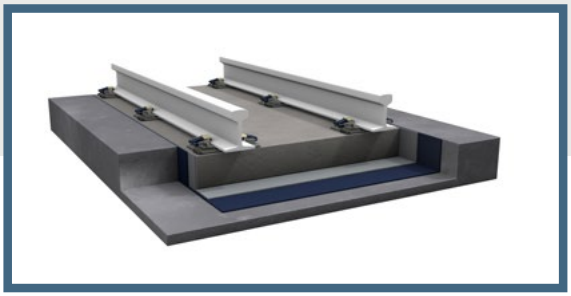
# Pandrol Floating Slab Mat

## EPD Summary Report

Pandrol is proud to be the first manufacturer in the field to be assessed and certified to EPD criteria in recognition of the impressively low carbon footprint of our sustainable resilient systems. Like all our products, these reflect Pandrol's commitment to reducing the environmental impact of railway infrastructure.

Pandrol Floating Slab Mat (FSM) is a high-performing vibration attenuation floating slab system that combines best-in-class technical performance with an extremely low carbon footprint.



**High performance**

Noise and vibration attenuation are achieved while reducing the $CO_2$ impact of railway infrastructure construction.

**Easy to install**

Fast and easy to install, the Pandrol FSM is a maintenance-free system designed to last the lifetime of the concrete slab.

**Eco-friendly**

All Pandrol sustainable resilient systems are made from recycled material and are 100% recyclable.

## What is an Environmental Product Declaration?

Internationally accepted, an Environmental Product Declaration (EPD) is a transparent, third-party audited comparison tool that uses scientific parameters to measure a business' or product's environmental impact. Independently verified and used across all sectors, the EPD process supports increased understanding of environmental impact throughout the supply chain and provides businesses with a benchmark for continuous improvement.

## The EPD Process

**Lifecycle analysis**

All elements are considered for a detailed lifecycle analysis, from the collection of raw materials, through production, to transport to the customer.

**Third-party specialised audit**

Auditors work with Pandrol to collect data relating to all stages of the product lifecycle. Real-life 2019 examples of manufacturing and shipping to customers were used.

**Real data of product lifecycle**

The data is used to measure the impact of each stage of the product's lifecycle on the environment.

**Carbon footprint score**

Environmental impact and carbon usage at each stage is used to populate an impact report and give each product a comparable carbon footprint score.

**Public report available**

The EPD report is available for everyone to download from the EPD library. The report details the full process for collecting the data and the findings for each stage.

# Pandrol Floating Slab Mat EPD results

Example below is for FSM-L13. Pandrol can provide specific value for each system and project needs.

## Acid Rain mitigation

Gases such as sulphur dioxide ($SO_2$) react with water in the atmosphere to form acid deposition in a process known as 'acid rain'. Acidification Potential (AP) measures a product's impact on acid rain.

Pandrol FSM results show there is only 0.2% $SO_2$ eq per kg of product. This means by choosing Pandrol FSM as a sustainable alternative, less acid rain will fall.

**Pandrol FSM: 0.033 kg $SO_2$ eq / m²**

## Ozone depletion

Ozone-depleting gases cause damage to the ozone layer. CFCs, halons and HCFCs are the major causes of ozone depletion. Ozone Depletion Potential (ODP) measures how many of these harmful chemicals are emitted during a product's lifecycle.

Pandrol FSM results show nearly no ODP (less than 1 mg/m² to be accurate!). This means that choosing Pandrol FSM as a sustainable alternative has no impact on ozone layer depletion.

**Pandrol FSM: 0.0000008 kg CFC 11 eq / m²**

## Global warming reduction

Human activity releases greenhouse gases into the atmosphere, causing changes to the global temperature and resulting in changes to the Earth's climate. Measuring Global Warming Potential (GWP) quantifies a product's impact on climate change.

Pandrol FSM results show a minimal impact on global warming.

**Pandrol FSM: 16.4 kg $CO_2$ eq / m²**

## Water pollution

Water pollution can lead to the death of aquatic plants and animals and leaching of fertilisers into the water table leads to eutrophication. Eutrophication Potential (EP) measures the impact a product has on water quality and animal populations.

Pandrol FSM results show limited impact on water quality. By choosing Pandrol FSM as a sustainable alternative, quality of aquatic life improves.

**Pandrol FSM: 0.005 kg $PO_4^{3-}$ eq / m²**

## Pandrol Floating Slab Mat key facts

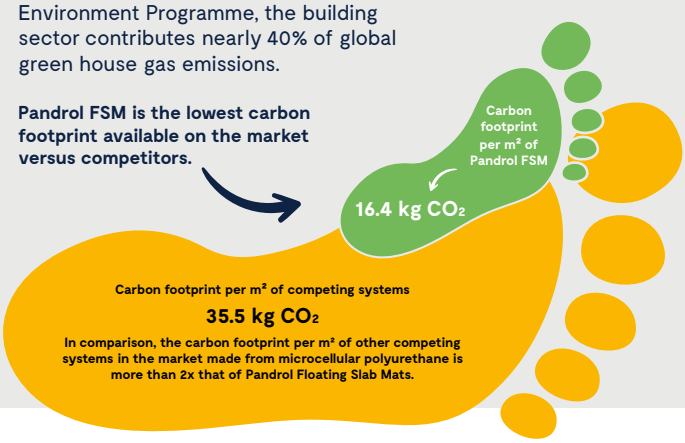
**Every kilometer of railway track installed with Pandrol FSM saves 24,000 tyres from landfill or burning.**

**Pandrol saves 150 tonnes of $CO_2$ per km of railway track installed compared to industry average microcellular polyurethane. To give an idea of how much $CO_2$ this is, it's the equivalent of an average passenger vehicle driving 1.3 million km or, 32 times around the globe!**

## Footprint comparison

According to the United Nations Environment Programme, the building sector contributes nearly 40% of global green house gas emissions.

**Pandrol FSM is the lowest carbon footprint available on the market versus competitors.**



# Pandrol Under Sleeper Pad

## EPD Summary Report

Pandrol is proud to be the first manufacturer in the field to be assessed and certified to EPD criteria in recognition of the impressively low carbon footprint of our sustainable resilient systems. Like all our products, these reflect Pandrol's commitment to reducing the environmental impact of railway infrastructure.

Pandrol Under Sleeper Pad (USP) solutions reduce maintenance requirements, increase track quality and provide vibration attenuation to Ballasted Track. The systems are easy to install, maintenance free and compatible with all types of track design; with their use also proven to reduce the life-cycle cost of the railway.

**High performance**

Increased track lifetime and reduced track maintenance while reducing the $CO_2$ impact of railway infrastructure.

**Easy to install**

Very easy to install without machinery, the Pandrol USP is a maintenance-free system designed to last the lifetime of the sleeper.

**Eco-friendly**

All Pandrol sustainable resilient systems are made from recycled material and are 100% recyclable.

## What is an Environmental Product Declaration?

Internationally accepted, an Environmental Product Declaration (EPD) is a transparent, third-party audited comparison tool that uses scientific parameters to measure a business' or product's environmental impact. Independently verified and used across all sectors, the EPD process supports increased understanding of environmental impact throughout the supply chain and provides businesses with a benchmark for continuous improvement.

## The EPD Process

**Lifecycle analysis**

All elements are considered for a detailed lifecycle analysis, from the collection of raw materials, through production, to transport to the customer.

**Third-party specialised audit**

Auditors work with Pandrol to collect data relating to all stages of the product lifecycle. Real-life examples of manufacturing and shipping to customers were used.

**Real data of product lifecycle**

The data is used to measure the impact of each stage of the product's lifecycle on the environment.

**Carbon footprint score**

Environmental impact and carbon usage at each stage is used to populate an impact report and give each product a comparable carbon footprint score.

**Public report available**

The EPD report is available for everyone to download from the EPD library. The report details the full process for collecting the data and the findings for each stage.

# Pandrol Under Sleeper Pad EPD results

Example below is for USP-I-07d-MFF. Pandrol can provide specific value for each system and project needs.

## Acid Rain mitigation

Gases such as sulphur dioxide ($SO_2$) react with water in the atmosphere to form acid deposition in a process known as 'acid rain'. Acidification Potential (AP) measures a product's impact on acid rain.

Pandrol USP results show there is only 0.2% $SO_2$ eq per kg of product. This means by choosing Pandrol USP as a sustainable alternative, less acid rain will fall.

**Pandrol USP: 0.010 kg $SO_2$ eq / USP**

## Ozone depletion

Ozone-depleting gases cause damage to the ozone layer. CFCs, halons and HCFCs are the major causes of ozone depletion. Ozone Depletion Potential (ODP) measures how many of these harmful chemicals are emitted during a product's lifecycle.

Pandrol USP results show nearly no ODP (less than 0.001 mg/USP to be accurate!). This means that choosing Pandrol USP as a sustainable alternative has no impact on ozone layer depletion.

**Pandrol USP: 0.0000000005 kg CFC 11 eq / USP**

## Global warming reduction

Human activity releases greenhouse gases into the atmosphere, causing changes to the global temperature and resulting in changes to the Earth's climate. Measuring Global Warming Potential (GWP) quantifies a product's impact on climate change.

Pandrol USP results show a minimal impact on global warming.

**Pandrol USP: 8.3 kg $CO_2$ eq / USP**

## Water pollution

Water pollution can lead to the death of aquatic plants and animals and leaching of fertilisers into the water table leads to eutrophication. Eutrophication Potential (EP) measures the impact a product has on water quality and animal populations.

Pandrol USP results show limited impact on water quality. By choosing Pandrol USP as a sustainable alternative, quality of aquatic life improves.

**Pandrol USP: 0.002 kg $PO_4^{3-}$ eq / USP**

## Pandrol Under Sleeper Pad key facts

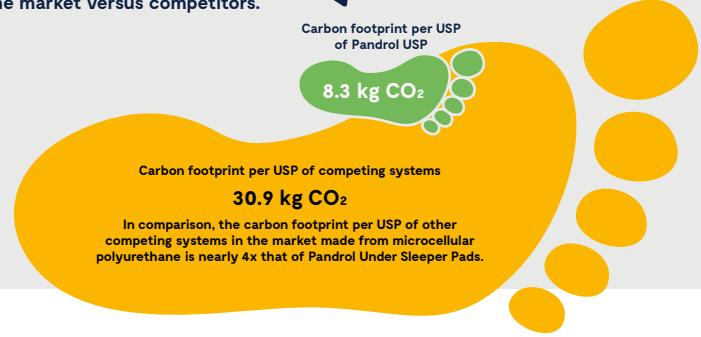
**Every kilometer of railway track installed with Pandrol USP saves 3,000 tyres from landfill or burning.**

**Pandrol saves nearly 80 tonnes of $CO_2$ per km of railway track installed compared to industry average microcellular polyurethane. To give an idea of how much $CO_2$ this is, it's the equivalent of an average passenger vehicle driving 630,000 km or, 16 times around the globe!**

## Footprint comparison

According to the United Nations Environment Programme, the building sector contributes nearly 40% of global green house gas emissions.

**Pandrol USP is the lowest carbon footprint available on the market versus competitors.**

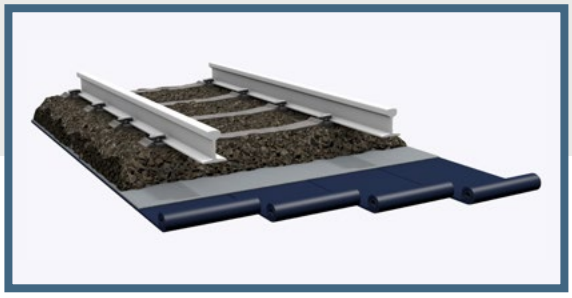


# Pandrol Under Ballast Mat

## EPD Summary Report

Pandrol is proud to be the first manufacturer in the field to be assessed and certified to EPD criteria in recognition of the impressively low carbon footprint of our sustainable resilient systems. Like all our products, these reflect Pandrol's commitment to reducing the environmental impact of railway infrastructure.

Pandrol Under Ballast Mats (UBMs) can reduce life cycle cost of the railway and/or vibration attenuation for ballasted track. Easy to install, maintenance free and compatible with all types of track design, they aim to reduce the lifecycle costs of the railway.



**High performance**

Noise and vibration attenuation are achieved while reducing the $CO_2$ impact of railway infrastructure construction.

**Easy to install**

Fast and easy to install, the Pandrol UBM is a maintenance-free system designed to last the lifetime of the ballast.

**Eco-friendly**

All Pandrol sustainable resilient systems are made from recycled material and are 100% recyclable.

## What is an Environmental Product Declaration?

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## The EPD Process

**Lifecycle analysis**

All elements are considered for a detailed lifecycle analysis, from the collection of raw materials, through production, to transport to the customer.

**Third-party specialised audit**

Auditors work with Pandrol to collect data relating to all stages of the product lifecycle. Real-life 2019 examples of manufacturing and shipping to customers were used.

**Real data of product lifecycle**

The data is used to measure the impact of each stage of the product's lifecycle on the environment.

**Carbon footprint score**

Environmental impact and carbon usage at each stage is used to populate an impact report and give each product a comparable carbon footprint score.

**Public report available**

The EPD report is available for everyone to download from the EPD library. The report details the full process for collecting the data and the findings for each stage.

# Pandrol Under Ballast Mat EPD results

Example below is for UBM-H35-C. Pandrol can provide specific value for each system and project needs.

## Acid Rain mitigation

Gases such as sulphur dioxide ($SO_2$) react with water in the atmosphere to form acid deposition in a process known as 'acid rain'. Acidification Potential (AP) measures a product's impact on acid rain.

Pandrol UBM results show there is only 0.2% $SO_2$ eq per kg of product. This means by choosing Pandrol UBM as a sustainable alternative, less acid rain will fall.

**Pandrol UBM: 0.025 kg $SO_2$ eq / m²**

## Ozone depletion

Ozone-depleting gases cause damage to the ozone layer. CFCs, halons and HCFCs are the major causes of ozone depletion. Ozone Depletion Potential (ODP) measures how many of these harmful chemicals are emitted during a product's lifecycle.

Pandrol UBM results show nearly no ODP (less than 1 mg/m² to be accurate!). This means that choosing Pandrol UBM as a sustainable alternative has no impact on ozone layer depletion.

**Pandrol UBM: 0.0000007 kg CFC 11 eq / m²**

## Global warming reduction

Human activity releases greenhouse gases into the atmosphere, causing changes to the global temperature and resulting in changes to the Earth's climate. Measuring Global Warming Potential (GWP) quantifies a product's impact on climate change.

Pandrol UBM results show a minimal impact on global warming.

**Pandrol UBM: 12.0 kg $CO_2$ eq / m²**

## Water pollution

Water pollution can lead to the death of aquatic plants and animals and leaching of fertilisers into the water table leads to eutrophication. Eutrophication Potential (EP) measures the impact a product has on water quality and animal populations.

Pandrol UBM results show limited impact on water quality. By choosing Pandrol UBM as a sustainable alternative, quality of aquatic life improves.

**Pandrol UBM: 0.004 kg $PO_4^{3-}$ eq / m²**

## Pandrol Under Ballast Mat key facts

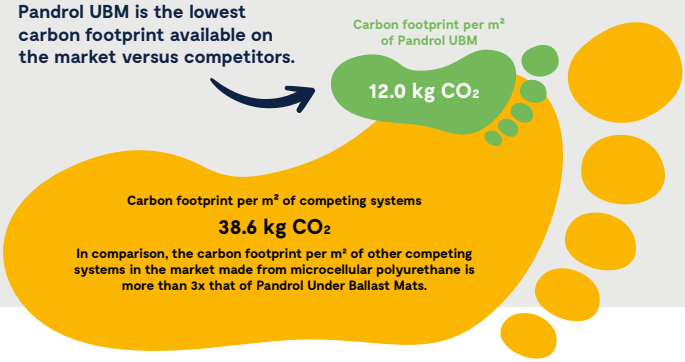
**Every kilometer of railway track installed with Pandrol UBM saves 15,000 tyres from landfill or burning.**

**Pandrol saves 190 tonnes of $CO_2$ per km of railway track installed compared to industry average microcellular polyurethane. To give an idea of how much $CO_2$ this is, it's the equivalent of an average passenger vehicle driving 1.6 million km or, 39 times around the globe!**

## Footprint comparison

According to the United Nations Environment Programme, the building sector contributes nearly 40% of global green house gas emissions.

**Pandrol UBM is the lowest carbon footprint available on the market versus competitors.**

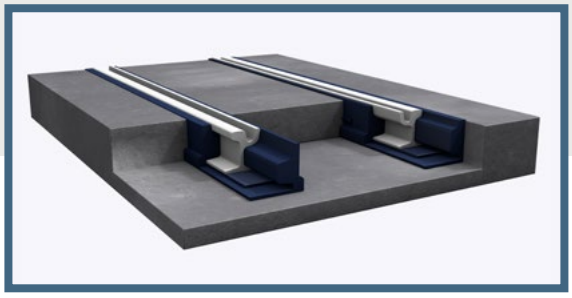


# Pandrol QTrack®

## EPD Summary Report

Pandrol is proud to be the first manufacturer in the field to be assessed and certified to EPD criteria in recognition of the impressively low carbon footprint of our sustainable resilient systems. Like all our products, these reflect Pandrol's commitment to reducing the environmental impact of railway infrastructure.

Pandrol QTrack® is an embedded, ballastless track system that maximises the availability, safety and lifetime value of the track. The system itself provides vertical and lateral support to the rail, while reducing vibration transmission from the rolling stock to the surrounding structures and granting control of the electrical currents flowing out of the rails (known as stray currents).



**High performance**

Noise and vibration attenuation are achieved while reducing the $CO_2$ impact of railway infrastructure construction.

**Easy to install**

Fast and easy to install, the Pandrol QTrack® is a maintenance-free system designed to last the lifetime of the rail.

**Eco-friendly**

All Pandrol sustainable resilient systems are made from recycled material and are 100% recyclable.

## What is an Environmental Product Declaration?

Internationally accepted, an Environmental Product Declaration (EPD) is a transparent, third-party audited comparison tool that uses scientific parameters to measure a business' or product's environmental impact. Independently verified and used across all sectors, the EPD process supports increased understanding of environmental impact throughout the supply chain and provides businesses with a benchmark for continuous improvement.

## The EPD Process

**Lifecycle analysis**

All elements are considered for a detailed lifecycle analysis, from the collection of raw materials, through production, to transport to the customer.

**Third-party specialised audit**

Auditors work with Pandrol to collect data relating to all stages of the product lifecycle. Real-life examples of manufacturing and shipping to customers were used.

**Real data of product lifecycle**

The data is used to measure the impact of each stage of the product's lifecycle on the environment.

**Carbon footprint score**

Environmental impact and carbon usage at each stage is used to populate an impact report and give each product a comparable carbon footprint score.

**Public report available**

The EPD report is available for everyone to download from the EPD library. The report details the full process for collecting the data and the findings for each stage.

# Pandrol QTrack® EPD results

Example below is for QT-55G2-HP-R-Strip-32 with ELEC-L. Pandrol can provide specific value for each system and project needs.

## Acid Rain mitigation

Gases such as sulphur dioxide ($SO_2$) react with water in the atmosphere to form acid deposition in a process known as 'acid rain'. Acidification Potential (AP) measures a product's impact on acid rain.

Pandrol QTrack® results show there is only 0.1% $SO_2$ eq per kg of product. This means by choosing Pandrol QTrack® as a sustainable alternative, less acid rain will fall.

**Pandrol QTrack®: 0.036 kg $SO_2$ eq / lmr**

## Ozone depletion

Ozone-depleting gases cause damage to the ozone layer. CFCs, halons and HCFCs are the major causes of ozone depletion. Ozone Depletion Potential (ODP) measures how many of these harmful chemicals are emitted during a product's lifecycle.

Pandrol QTrack® results show nearly no ODP (0.003 mg per linear meter of rail to be accurate!). This means that choosing Pandrol QTrack® as a sustainable alternative has no impact on ozone layer depletion.

**Pandrol QTrack®: 0.000000003 kg CFC 11 eq / lmr**

## Global warming reduction

Human activity releases greenhouse gases into the atmosphere, causing changes to the global temperature and resulting in changes to the Earth's climate. Measuring Global Warming Potential (GWP) quantifies a product's impact on climate change.

Pandrol QTrack® results show a minimal impact on global warming.

**Pandrol QTrack®: 26.5 kg $CO_2$ eq / lmr**

## Water pollution

Water pollution can lead to the death of aquatic plants and animals and leaching of fertilisers into the water table leads to eutrophication. Eutrophication Potential (EP) measures the impact a product has on water quality and animal populations.

Pandrol QTrack® results show limited impact on water quality. By choosing Pandrol QTrack® as a sustainable alternative, quality of aquatic life improves.

**Pandrol QTrack®: 0.006 kg $PO_4^{3-}$ eq / lmr**

## Pandrol QTrack® key facts

**Every kilometer of railway track installed with Pandrol QTrack® saves 20,000 tyres from landfill or burning.**

**Pandrol saves 730 tonnes of $CO_2$ per km of railway track installed compared to industry average polyurethane solution. To give an idea of how much $CO_2$ this is, it's the equivalent of an average passenger vehicle driving 6.1 million km or, 153 times around the globe!**

## Footprint comparison

According to the United Nations Environment Programme, the building sector contributes nearly 40% of global green house gas emissions.

**Pandrol QTrack® is the lowest carbon footprint available on the market versus competitors.**