



RhinoGuard™ Counter Terror & Security Solutions

www.marshalls.co.uk/pas68







Marshall's

Creating Better Landscapes

Marshall's is the UK's leading hard landscaping manufacturer and we have been supplying some of the most prestigious landmarks in the UK with hard landscaping solutions since the 1890s.

From our Fair Trade stone and products that alleviate flood risks, to our innovative RhinoGuard security solutions; we strive to create a better environment for everyone, using our expertise to create high quality, safe and attractive spaces that promote well-being.

The requirement for security in the public realm is nothing new, however due to the evolving threat of international terrorism over the past decade, a lot has changed in the design and construction of our built environment. One challenge that remains constant, however, is the balance we must strike to deliver good design that creates a sense of security without sacrificing design quality.

At Marshall's, we are acutely aware of the need to meet security and counter-terrorism requirements in an imaginative, sustainable and proportionate way. We believe in continuous investment in the development of new technologies and products, which enables the discrete integration of physical protection into our landscapes, without compromising creativity, character and design.

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The Threats

The concept of terrorism is not new in the UK. However, following events in recent years, the threat of international terrorism has risen to unprecedented levels.

The attacks on the USA in 2001, and more recently on the London transport system and Glasgow Airport, have further highlighted the necessity to protect the UK's infrastructure from the threats posed by terrorist organisations.

Over the past few years, the terror threat level set by the UK government security services has fluctuated between 'substantial' and 'severe'. 'Substantial' means that there is a very real threat of an attack occurring without prior warning, with

'Severe' meaning that the possibility of an attack is highly likely.

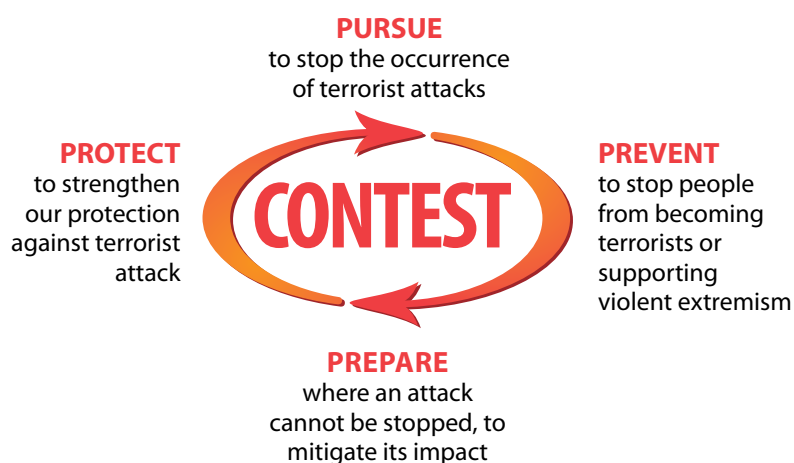
International terrorist groups have stated their intent to deliberately target innocent people, seeking mass casualty as their primary objective. These groups are prepared to use unconventional techniques and attack without giving any prior warning to achieve their aim of maximum damage and destruction.

The Response

In order to combat this threat, the UK government has devised an integrated counter-terrorism strategy. The government's 'CONTEST' strategy aims to reduce the risk to the United Kingdom and its interests overseas from international terrorism, so that people go about their lives freely and with confidence.

In order to achieve this, CONTEST incorporates four key strands, which are designed to complement and reinforce each other to help reduce the overall vulnerability of the UK to international terrorism:

The 'Pursue' and 'Prevent' strands of the strategy are designed to reduce the overall threat from terrorism, whereas the 'Prepare' and 'Protect' strands are designed to help safeguard the UK and reduce our vulnerability to an attack.



Protect
is the tactical element of the strategy which focuses on adequately safeguarding the places at most risk from the threat of terrorism.

Implementing CONTEST

Protect

The Protect strand of the counter-terrorism strategy is driven by a number of government agencies, tasked with ensuring that the UK's defences against terrorist attacks are strengthened and our vulnerability is reduced.

The areas seen to be at greatest risk from terrorist attacks can be classified under two key headings; which are the **Critical National Infrastructure (CNI)** and **Crowded Places**.

Critical National Infrastructure

The Critical National Infrastructure is defined as any location with assets deemed essential for the functioning of our society and economy. Damage to this infrastructure can have a severe economic impact and could potentially cause large scale loss of life.

Areas which make up the Critical National Infrastructure include:

Transport Infrastructure

Rail network, aviation, maritime.

Key Utilities

Gas, water, electricity and nuclear power.

Emergency Services

Police, healthcare and the fire services.

Finance

Large commercial and economic centres.

Crowded Places

Crowded places are defined as 'any locations or environments to which members of the public have access and that may be considered potentially liable to terrorist attack by virtue of their crowd density'.

These areas will remain attractive targets for terrorist groups, who have demonstrated that they are more likely to target locations which are easily accessible, readily available and provide an impact beyond the loss of life.

The term 'Crowded Place' can apply to a wide range of areas throughout the public realm, including:

- City / Town Centres
- Shopping Centres
- Leisure Venues
- Visitor Attractions
- Sports Stadia



Crowded Places



Transport



Emergency Services



Key Utilities



Finance

Key Agencies

The effort to reduce the vulnerability of the UK to terrorist attacks is coordinated and driven by a number of government agencies.

The Home Office, Office for Security and Counter-Terrorism (OSCT) leads all work on delivering the government's counter-terrorism strategy, working closely with the UK Police force and the Centre for the Protection of National Infrastructure (CPNI).



The CPNI provides advice, training and awareness across a variety of disciplines, including physical, personnel and information security. The advice provided by the CPNI aims to reduce the vulnerability of the UK's Critical National Infrastructure and safeguard it against the threat of attack.



The National Counter Terrorism Security Office (NaCTSO) is a police unit co-located with the CPNI. NaCTSO coordinates the activities of local police force Counter Terrorism Security Advisers (CTSA's), who deliver guidance on protecting a wide range of assets within their regions, including any crowded places.

Terrorist Methodology

Whilst the terrorist threat is constantly evolving and terrorist groups are continually seeking new methods of attack, it is expected that attacks are most likely to fall within one of four key types:

- Chemical
- Biological
- Radiological
- **Improvised Explosive Devices (IEDs)**

The most likely form of attack is seen to be the use of Improvised Explosive Devices, and whilst IED attacks can take a number of different forms, one of the greatest threats is posed by the use of **Vehicle-borne Improvised Explosive Devices (VBIEDs)**.

VBIED attacks involve the use of a vehicle containing an explosive device, being either parked close to or driven into a target destination before being detonated.

They are regarded as one of the most effective and common weapons available to terrorist organisations, as the load carrying capacity and mobility of vehicles provides terrorists with an effective, readily available method of delivery, with the capacity to inflict large scale damage and loss of life.

For this reason, it is essential that effective counter-measures are considered to safeguard our critical infrastructure and crowded places from this type of threat.



Resilient Design

Key Design Principles

A key element of the strategy to combat the threat of international terrorism is to promote the adoption of counter-terrorism design principles in the planning and design process, to help reduce the vulnerability of our infrastructure to all types of attack, including those that are vehicle-borne.

The three main objectives of counter-terrorism design are to:

- **Deter** would be terrorists
- **Detect** an intrusion
- **Delay** an intrusion for a sufficient time to allow a response force to attend

To achieve these key objectives, successful counter-terrorism should be based upon four key principles, which are :

- Better Blast Resistance
- Better Building Management Facilities and Practices
- Better Visual Oversight
- Better Traffic Management and Hostile Vehicle Mitigation Measures



Blast Resistance



Better Building Management



Better Oversight



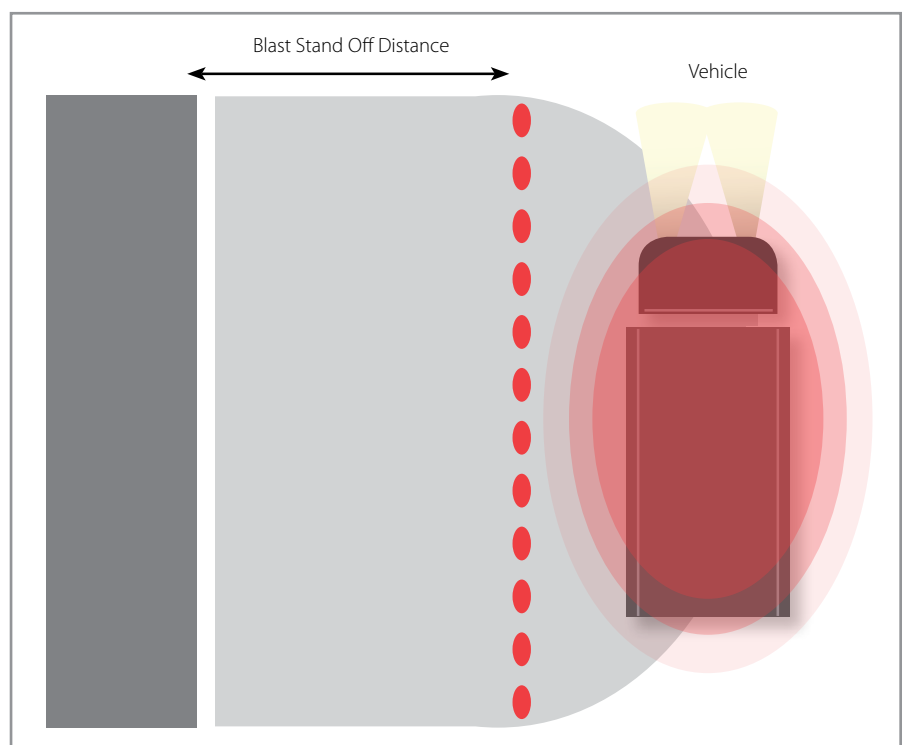
Hostile Vehicle Mitigation

Hostile Vehicle Mitigation

The primary objective of Hostile Vehicle Mitigation measures (HVM) is to keep hostile vehicles as far away from buildings and people as possible, through a variety of methods and techniques.

The concept of Hostile Vehicle Mitigation involves the careful consideration of a number of factors, including; the effects of blast loading, assessments of vehicle dynamics and potential vehicle approach routes, solutions for vehicle exclusion and traffic calming, but ultimately, it involves the implementation of physical security measures to help create safe 'stand off distances' between hostile vehicles and potential targets.

Incorporating appropriate physical security measures into landscape design is an essential part of protecting our infrastructure from the threat of vehicle-borne terrorism. However, it is equally important that any measures incorporated are proportionate to the threat, and consider the physical, functional and aesthetic impact on the surrounding environment.



Blast Stand-off Distance

PAS 68

At the heart of the concept of Hostile Vehicle Mitigation is the BSI PAS 68 standard. Devised and administered by the CPNI, PAS 68 specifies a performance classification for vehicle security barriers and their foundations when subjected to a horizontal impact.

PAS 68 involves the physical impact testing of perimeter security products at varying speeds with different vehicle types. This ranges from medium sized saloon cars to large trucks, measuring the penetration of the load carrying part of the vehicle beyond the barrier.

The existence of PAS 68 enables business and organisations to specify assured levels of protection against hostile vehicles, at a level that is in proportion with the risk of attack at their specific site.

Whilst it is only through specifying products successfully tested in accordance with PAS 68 that protective security can truly be assured, this does not necessarily mean that the highest specifications of PAS 68 protection are always required.

Depending on site specific conditions, such as the traversability of the surrounding landscape, it is not always physically possible for larger vehicles to reach the required speeds to carry out a successful attack. In these cases, lower, more cost effective levels of protection can be employed, meaning that tested security and peace of mind can be achieved in proportion with all levels of risk, vulnerability and project budget.



PAS 69

BSI PAS 68 is complemented by the PAS 69 document, which provides guidance on the selection, installation, foundations and use of PAS 68 tested security products, taking into account site specific conditions.

PAS 69 suggests a maximum gap of 1.2m between the installed, upright faces of successive security products, to ensure that vehicles are prevented from encroaching freely between the barriers.

CEN Workshop Agreement 16221

CWA 16221: 2010 is a European workshop agreement, which identifies impact test methods, test vehicle types and performance criteria for vehicle security barriers.

It also provides guidance on the selection, installation and use of vehicle security barriers, to ensure that they are selected and placed as effectively as possible.

The testing methods and criteria outlined in the workshop agreement are identical to those outlined in the BSI PAS 68 standard. As such, any products that have been successfully tested to the requirements of PAS 68 are also approved to the requirements of CWA 16221.

Vehicle Speed km/h (mph)	Vehicle Mass (kg)				
	1500	2500	3500	7500	30000
16 (10)	15kJ	25kJ	35kJ	74kJ	296kJ
32 (20)	59kJ	99kJ	138kJ	296kJ	1185kJ
48 (30)	133kJ	222kJ	311kJ	667kJ	2667kJ
64 (40)	237kJ	395kJ	553kJ	1185kJ	4741kJ
80 (50)	370kJ	617kJ	864kJ	1852kJ	7407kJ
96 (60)	533kJ	889kJ	1244kJ		
112 (70)	726kJ	1210kJ			

The table above provides the kinetic energy values (in kJ) created on impact, for each of the vehicle types and speeds used in BSI PAS 68 and CWA 16221 impact testing.

RhinoGuard™ - Counter Terror & Security Solutions

In order to meet the ever evolving security threats faced by modern day society, Marshalls places an emphasis on the development of physical security products, designed to protect our landscapes from the threat of vehicle-borne terrorism.

Marshalls' RhinoGuard™ products have been successfully crash tested in accordance with the BSI PAS 68 standard for vehicle security barriers, and are designed to provide effective hostile vehicle mitigation in proportion with all levels of risk, site vulnerability and project budget.



Our Philosophy

Whilst the main objective of counter-terrorism security measures is to ensure that they provide the required levels of protection to sites at potential risk, Marshalls believes that it is also vital that landscapes remain functional, attractive and appreciated by the communities that use them.

Incorporating some of the more traditional methods of hostile vehicle mitigation into landscape design, such as large diameter bollards, can sometimes have a negative visual impact on an environment. For this reason, the concept of counter-terrorism design has received resistance from some involved in built environment design, as they feel it restricts architects to designing bland, standardised places without any real sense of character or individual identity.

To address this, Marshalls has assembled a highly specialised team of design engineers to develop innovative, design-led hostile vehicle mitigation solutions. In keeping with our 'better landscapes' philosophy, development places an emphasis on the importance of security measures being seamlessly integrated into the public realm, without compromising the aesthetics, character and accessibility of the surrounding landscape.



Outer Beauty



Inner Strength

Our Portfolio

To fulfill the security needs of locations which require very different levels of perimeter protection, the RhinoGuard™ range includes bollards designed to provide assured impact performance at distinct levels of protection and budget.

Design-led Solutions

In addition to our extensive range of bollards, our portfolio also enables architects to integrate security seamlessly into the public realm in the form of attractive street furniture products, such as planters, seating, litter bins and cycle parking; designed to mitigate the threat of vehicle-borne terrorism in a creative, proportionate and well-designed manner.

Successfully crash tested in accordance with PAS 68, our innovative range of anti-terrorist street furniture is strengthened by our unique RhinoGuard™ technology, providing architects with an ideal alternative to the traditional methods of protection, enabling the creation of safer and better landscapes.

PSSA

Marshalls is a member of the Perimeter Security Suppliers Association, a trade association for companies involved in the supply of equipment and services designed to provide the highest levels of physical protection from terrorist or criminal attack.





RhinoGuard™ 25/40 bollards, Ravenscraig Sports Centre

Proportionate Security

RhinoGuard™ bollards have been successfully crash tested in accordance with the BSI PAS 68 standard, providing proven impact performance at distinct levels of protection and budget.

Crash tested using various vehicle types travelling at differing speeds, the bollards are designed to fulfill the security needs of locations requiring very different levels of perimeter protection.

The range enables clients to design effective hostile vehicle mitigation measures into their schemes, in proportion with the level risk of an attack, the traversability of the surrounding landscape, the stand-off distance available at their site and the overall project budget.

For sites with little available excavation depth, our highly engineered shallow mount foundation system is also available.

Design

Our crash tested bollard cores can be sleeved in a variety of cosmetic designs in steel and stainless steel, to meet individual project requirements. Marshalls offer a full design and manufacture service for RhinoGuard™ PAS 68 bollards, which can also be sleeved with Ferrocast polyurethane in bespoke styles, to complement any surrounding environment.

For more information on our design options, see page 19.



PAS 68 Bollards

RhinoGuard 15/30

Test

Performance

Vehicle: 1.5 tonne saloon car

Vehicle Speed: 30mph (48km/h)

PAS 68 Classification Code: Fixed Bollard V/1500/48/90:1.3/0.0

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.

Designed for:

- Areas at lower risk of a high-energy vehicular attack
- Locations with tighter vehicle access, making it impossible for larger vehicles to reach significant speed
- Locations which require protection against criminal ram raiding.

The bollard provides the ideal security solution for a wide range of applications which previously would have required a generic 'anti ram' bollard specification, including:

- Retail parks
- Garage forecourts
- Supermarkets
- Protected parking
- Cash machine protection
- Public Realm.

These locations can now achieve a guaranteed level of protection, which was previously unquantifiable and left somewhat to chance.



Product Specification

Core:

- RhinoGuard™ 114mm core

Sleeve Dimensions:

- Steel – **168mm**
- Stainless Steel – **129mm**
- Ferrocast Polyurethane – **designed to order**
- Height Above Ground – **1000mm**



RhinoGuard 25/40

Test

Performance

Vehicle: 2.5 tonne 4x4 utility vehicle

Vehicle Speed: 40mph (64km/h)

PAS 68 Classification Code: Fixed Bollard V/2500/64/90:0.0/0.0

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.

Designed for:

The bollard is ideal for applications requiring a higher level of protection and that are more vulnerable to a vehicular attack.

The bollard provides the perfect solution for sites where a medium-sized vehicle could reach considerable speed, but also where it would be physically impossible for a larger vehicle to gain access or achieve the required acceleration. These can include:

- Rail Stations
- Sports Stadia
- Leisure Venues and Arenas
- Bus Depots
- Ports
- Public Realm
- Large Shopping Centres.



Product Specification

Core:

- RhinoGuard™ 168mm core

Sleeve Dimensions:

- Steel – **194mm**
- Stainless Steel – **204mm**
- Ferrocast Polyurethane – **designed to order**
- Height Above Ground – **1000mm**



PAS 68 Bollards

RhinoGuard 75/40

Test

Performance

Vehicle: Fully-laden 7.5 tonne two axle rigid N2 lorry

Vehicle Speed: 40mph (64km/h)

PAS 68 Classification Code: Fixed Bollard V/7500(N2)/64/90:8.7/0.0

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.

Designed for:

The bollard is suitable for high risk applications and for sites with a sufficient stand-off distance between the bollard and the area it is protecting.

The bollard provides an ideal solution for locations where large vehicles capable of carrying out high-energy attacks are able to reach considerable speed. This includes:

- Rail Stations
- Sports Stadia
- Leisure Venues and Arenas
- Large Shopping Centres
- Critical Infrastructure
- Public Realm.



Product Specification

Core:

- RhinoGuard™ 168mm core

Sleeve Dimensions:

- Steel – 194mm
- Stainless Steel – 204mm
- Ferrocast Polyurethane – **designed to order**
- Height Above Ground – 1200mm



MIRA
Post Test J0002



MIRA
Post Test J0002



MIRA
Post Test J0002



MIRA
Post Test J0002

RhinoGuard 75/50

Test

Performance

Vehicle: Un-laden 18 tonne two axle rigid N3 lorry (weighing 7.5 tonnes)

Vehicle Speed: 50mph (80km/h)

PAS 68 Classification Code: Fixed Bollard V/7500(N3)/80/90:12.5/21.8

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.

Designed for:

The 75/50 bollard is designed for high risk applications requiring the ultimate in protection.

The bollard offers an ideal solution for locations where large vehicles capable of carrying out high energy attacks are able to reach high speeds. These areas can include:

- Airports
- Rail Stations
- Sports Stadia
- Leisure Venues and Arenas
- Large Shopping Centres
- Critical Infrastructure
- Public Realm.



Product Specification

Core:

- RhinoGuard™ 194mm core

Sleeve Dimensions:

- Steel – **204mm**
- Stainless Steel – **204mm**
- Ferrocast Polyurethane – **designed to order**
- Height Above Ground – **1000mm**



PAS 68 Shallow Mount Bollards

Shallow Mount



Typical PAS 68 bollard foundations consist of a combination of concrete and steel reinforcement, with some product available requiring up to 1000mm of depth below ground.

However, for many sites requiring counter-terrorism protection, the existence of underground utilities and cramped building foundations can prohibit this level of excavation without serious disruption.

To overcome this issue, Marshalls has developed an innovative Shallow Mount foundation system, designed to withstand hostile vehicle impact with around 75% less excavation than some standard PAS 68 bollard systems.

The RhinoGuard™ Shallow Mount system requires a foundation depth of just **152mm**, providing the perfect solution for sites with even the smallest available depths.

In addition to the benefits of its shallow depth, the system is also designed to minimise the disruption and time required on site, facilitating cost effective, quick and easy installation.

Benefits of Shallow Mount:

- Up to 75% less excavation required (only 152mm)
- Cost effective installation
- Less time required on site.



Cramped Underground Services

RhinoGuard 25/40 Shallow Mount

Test

Performance

Vehicle: 2.5 tonne 4x4 utility vehicle

Vehicle Speed: 40mph (64km/h)

PAS 68 Classification Code: Fixed Bollard V/2500/64/90:2.3/0.0

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.

Designed for:

The 25/40 Shallow Mount bollard provides the perfect solution for sites with limited excavation depth, where a medium sized vehicle could reach considerable speed.

- Rail Stations
- Sports Stadia
- Leisure Venues and Arenas
- Large Shopping Centres
- Critical Infrastructure
- Public Realm.



Product Specification

Core:

- RhinoGuard™ 168mm core

Sleeve Dimensions:

- Steel – 194mm
- Stainless Steel – 204mm
- Ferrocast Polyurethane – **designed to order**
- Height Above Ground – 1000mm



PAS 68 Shallow Mount Bollards

RhinoGuard 75/30 Shallow Mount

Test

Performance

Vehicle: Fully laden 7.5 tonne two axle rigid N2 lorry

Vehicle Speed: 30mph (48km/h)

PAS 68 Classification Code: Fixed Bollard V/7500(N2)/48/90:1.5/0.0

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.

Designed for:

The bollard is suitable for high risk applications, with little available excavation depth.

The bollard provides an ideal solution for locations where large vehicles capable of carrying out high energy attacks, are able to reach considerable speed. These areas include:

- Rail Stations
- Sports Stadia
- Leisure Venues and Arenas
- Large Shopping Centres
- Critical Infrastructure
- Public Realm.



Product Specification

Core:

- RhinoGuard™ 194mm core

Sleeve Dimensions:

- Steel – **204mm**
- Stainless Steel – **204mm**
- Ferrocast Polyurethane – **designed to order**
- Height Above Ground – **1000mm**



Introducing protective security into an environment does not mean that the aesthetics of the surrounding area must be compromised.

RhinoGuard™ bollard cores have been developed and tested so that they can be specified with cosmetic sleeves in various materials, to complement any surrounding area.

Sleeve Options

Standard sleeves designs are available in steel and stainless steel and can be specified with reflective banding for increased visibility and safety. Bespoke design commissions for other styles and finishes can also be accommodated on request.

Steel

Steel sleeves are treated with the Akzo Nobel, Interpon PZ 770 system, being first treated with a zinc primer for enhanced corrosion protection and finished with a polyester powder topcoat. Bollards are supplied in Black RAL 9005 as standard; however a full range of RAL colours is also available.

Steel sleeves are available in three standard flat top designs; Plain, and with single or double grooved reflective bands.

Stainless Steel

Stainless steel sleeves are manufactured from a carefully selected Grade 316L (1.4401). Exceptionally strong and requiring very low maintenance, the material provides higher resistance to corrosion, pitting and staining compared to other grades. Stainless steel sleeves are provided with a brushed satin finish as standard. A bright polished finish is also available on request.

Stainless steel cosmetic sleeves are available in six standard styles, which include plain, single and double-banded designs, with a choice of either a flat or mitred top.



168mm Steel



129mm Stainless Steel Flat Top



129mm Stainless Steel Mitre Top



194mm Steel



204mm Stainless Steel Flat Top



204mm Stainless Steel Mitre Top

Bollard	Diameter (mm)			Height above ground* (mm)
	Core	Steel Sleeves	Stainless Steel Sleeves	
15/30	114	168	129	1000
25/40	168	194	204	1000
75/40*	168	194	204	1100
75/50	194	204	204	1000
25/40 SM	168	194	204	1000
75/30 SM	194	204	204	1000

* The 75/40 is available in flat top sleeve designs only.

Bespoke Design

Ferrocast is an engineering grade polyurethane, which can be cast into any shape around a steel core.

With Ferrocast, it is possible to cast pieces of street furniture which have an appearance and finish identical to cast iron but which have all of the benefits of polyurethane.

Ferrocast is a low-maintenance solution that provides an exceptionally strong, non-ferrous exterior which is completely resistant to the effects of rust and corrosion. The material contains coloured

pigments throughout to match the ultimate paint colour, meaning that in the event of any exterior damage, the appearance of scratches and abrasions are minimised.

RhinoGuard™ Ferrocast bollards can be designed in almost any style to complement any landscape and meet individual project requirements. Bollards can be designed to recreate an existing traditional theme ideal for heritage sites, or to create a more unique contemporary styling.



Manchester, Westminster and Waterside styles shown



Integrated Counter Terrorism Design

The introduction of appropriate physical security measures into crowded places and the critical national infrastructure is essential in ensuring that the UK is protected from vehicle-borne threats.

The Objective

Whilst the main objective of counter terrorism security measures is to ensure that they provide the required levels of protection to sites at potential risk, it is vital that landscapes remain functional, attractive and appreciated by the communities that use them.

The Challenge

The most common methods of hostile vehicle mitigation include the use of products such as PAS 68 tested bollards, gates, barriers and blockers.

However, whilst these products can provide excellent levels of protection against hostile attacks, some believe that they can be detrimental to the overall look and feel of landscapes, if over used.

For this reason, the concept of counter-terrorism design has received resistance from some involved in the design of the built environment, as they feel it restricts architects to designing bland, standardised places, without a sense of character or individual identity.

Some also argue that schemes which include security measures will look cluttered and may raise awareness of the potential threats to those who use the area.

The Solution

The inclusion of hostile vehicle mitigation measures in landscape design does not mean that the overall look and feel of a scheme should be diminished.

Whilst counter-terrorism design poses significant challenges to architects and planners, Marshalls believes that the threat of vehicle-borne terrorism can be mitigated in a proportionate, creative and well designed manner.

Through integrating our unique RhinoGuard™ technology seamlessly into the natural street scene in the form of planters, seating, litter bins and cycle parking, Marshalls can now provide architects with design-led, functional alternatives to traditional methods of hostile vehicle mitigation, creating safer and attractive spaces.



Giove Planters, Cardiff

RhinoGuard 75/50 Planter Frame

Introducing trees and planting into urban landscapes provides numerous benefits, with research showing positive effects on social and environmental well-being, evoking a sense of pride of place within communities.

To facilitate the integration of attractive planting into our public spaces whilst also mitigating the threat of vehicle-borne attacks, Marshalls has developed and impact tested a high strength steel frame, designed to fit inside range of planters.

The RhinoGuard™ 75/50 Planter Frame provides architects and designers with an ideal alternative to the more traditional methods of hostile vehicle mitigation, offering exceptional levels of security along with the benefits of introducing planting to urban spaces.

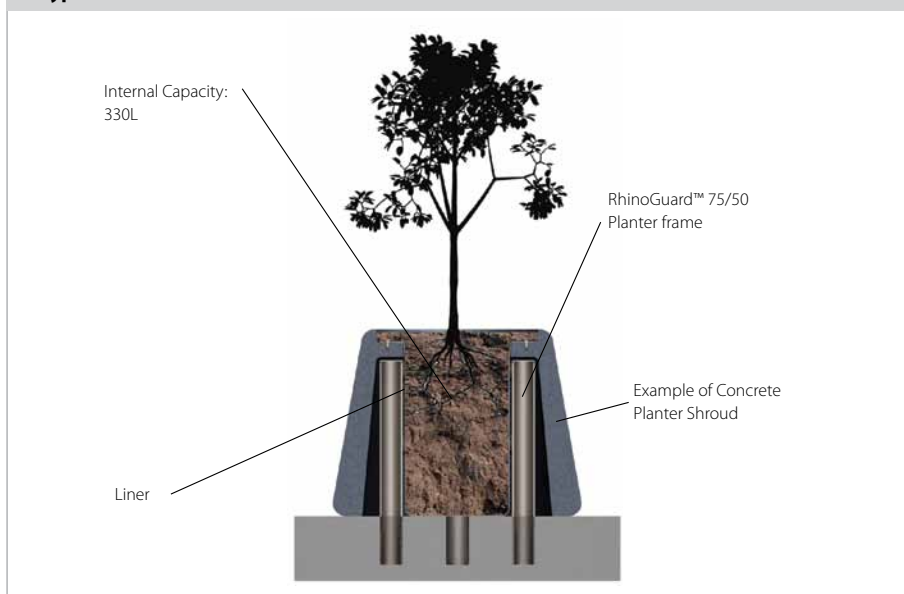
The design of the RhinoGuard™ frame allows for the root ball of a medium sized tree to be contained inside the planter, providing landscape architects with the freedom they require to introduce creative planting solutions into the built environment.

The high strength frame is designed to fit seamlessly inside a range of cosmetic planter styles in various materials, providing a design-led, high performance security solution that can both enhance and protect any scheme.

Planters are available in both traditional and contemporary designs, with a variety of material options, including concrete, timber and steel. Our long term partnerships with leading European street furniture manufacturers Bellitalia and Sineu Graff enable us to supply elegant, stylish pieces to fit around the tested RhinoGuard™ frame.

For larger schemes, the frame also provides an ideal opportunity for completely bespoke solutions. Marshalls offers unique street furniture design capabilities with expertise in various materials, including concrete, timber, steel, stainless steel and Ferrocass polyurethane, enabling us to tailor designs to exact project requirements.

A Typical Cross Section



RhinoGuard 75/50 Planter Frame

Test 1

Performance

Vehicle: Fully laden 7.5 tonne two axle rigid N2 lorry

Vehicle Speed: 40mph (64km/h)

PAS 68 Classification Code:

V/7500(N2)/64/90:0.0/0.0

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.

Test 2

As the frame stopped the N2 vehicle with ease at 40mph, it was later retested using the larger N3 vehicle at a greater speed.

Performance

Vehicle: Un-laden 7.5 tonne two axle rigid N3 lorry (empty 18 tonner)

Vehicle Speed: 50mph (80km/h)

PAS 68 Classification Code:

V/7500(N3)/80/90:1.7/0.0

Test results: The frame successfully brought the vehicle to rest, immobilising it completely.



Test 1 - N2 vehicle at 40mph.

Product Specification

Frame Dimensions:

Height Above Ground: **955mm**

Width: **952mm**



Test 2 - N3 vehicle at 50mph.

RhinoGuard 75/50 Planter Frame with Giove Planter

The RhinoGuard™ 75/50 Planter Frame has also been tested inside the Bellitalia Giove concrete planter.

The significant size and wall thickness of the Giove are deemed to be structural, meaning that an additional crash test was required.

Test 3

Performance

Vehicle: Un-laden 7.5 tonne two axle rigid N3 lorry (empty 18 tonner)

Vehicle Speed: 50mph (80km/h)

PAS 68 Classification Code:

V/7500(N3)/80/90:3.8/35.5

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.



Product Specification

Giove Planter Dimensions:

Height Above Ground: **1090mm**

Width: **2000mm**



Giove Planter

The Bellitalia Giove large planter provides an elegant solution for introducing planting to the public realm.

Fitted with our innovative RhinoGuard™ technology, the Giove features a large 1,224 litre capacity and is designed to accommodate the root ball of a tree.

The planter is cast from a mix of concrete and fine Italian marble aggregates sourced from specific regions of Italy. The use of high quality natural marble ensures long term colour consistency, meaning that the colour of the planter will not fade over time.

Each planter is polished during manufacture to leave a smooth surface, then treated with a protective varnish and polished further to provide a sleek, glossy finish.

Colour Options:

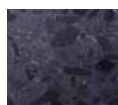
Available in seven beautiful colourways to coordinate with any environment, the Giove makes a bold architectural statement which can complement any contemporary or traditional landscape.



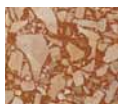
Bianco.



Giallo



Nero



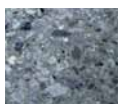
Porfido



Rosso



Veneziano



Verde



Giove, Nero Planters



Timber

Our RhinoGuard™ planter technology can also be incorporated into a range of styles from our European partner Sineu Graff.

Sineu Graff timber planters provide attractive planting solutions for urban landscapes. Styles range from the traditional to the contemporary, with designs available to enhance any scheme.

Sineu Graff timber planters are manufactured using wood from sustainably managed forests, holding a PEFC certification for timber of European origin and FSC certification for exotic hardwoods.

The **Rendezvous** planter features a sleek, geometric design using vertical slatted timber panels with powder coated steel uprights.

The **Optima** planter offers an elegant, contemporary solution, featuring wider horizontal wooden slats and streamlined steel uprights.

Roseaie planters combine polyester powder coated steel with hardwood timber, mixing natural and contemporary styling.

The **Marquise** features a natural, understated design, suitable for more traditional landscapes.

Sineu Graff timber planters are available with a choice of either a light coloured Ash or exotic Garapa timber.



Roseaie



Optima



Rendezvous



Marquise

Steel

Our RhinoGuard™ planter technology is also available inside a range of steel planter designs from Sineu Graff.

Sineu Graff steel planters add a unique, contemporary aesthetic to any environment, enabling the creation of attractive, green urban spaces.

Roots and **Domino** feature side panels with a double layer of sheet steel, which are profiled and mounted onto hardwood supporting legs with a choice of either Ash or Garapa timber.

Polyester powder coated steel outer panels feature laser cut patterns, which are highlighted by contrasting steel sheets beneath them.

Steel planters can also be commissioned with bespoke designs. Patterns and motifs can be designed to meet specific requirements, to provide truly unique styling.

The **Urban Daisy Vase** provides a bold, yet elegant solution to greening urban spaces, and is ideal for tall vertical planting.

Available in three standard colour combinations as standard: Annapuro White with a Copper rim, Cannon Blue with an Annapuro White rim and Brown Copper with an Annapuro White rim.



Bespoke Design



Roots



Domino



Urban Daisy Vase

* Standard planters shown PAS 68 versions may differ slightly in design



Example of Bespoke PAS 68 Concrete Planters

The RhinoGuard™ planter frame provides architects and designers with an ideal opportunity to introduce optimal security into their schemes, whilst making a strong, unique design statement.

Fully bespoke planters designs can be manufactured to fit around the RhinoGuard™ frame, enabling clients to specify the exact style, material and detailing they require to coordinate with and enhance their scheme.

Marshalls is able to provide the technical support and design expertise required to take planters from initial concept stage, through to final production.

Our experienced design team can work with you throughout the development process, providing advice on design, creating prototypes and recommending methods of installation, ensuring that exact client requirements are effectively fulfilled.

Marshalls offers unrivalled street furniture design and manufacturing capabilities in a wide variety of materials, enabling the creation of truly unique planter styles. Materials include:

- Concrete
- Natural stone
- Steel
- Stainless Steel
- Timber
- Ferrocast polyurethane

Concrete Concepts

As the UK's leading manufacturer of hard landscaping materials, Marshalls offers unique capabilities in high quality precast concrete.

Attractive concrete planters can be designed in almost any shape and style to fit seamlessly around the RhinoGuard™ frame, providing stylish security and planting solutions.

Colours and Finishing

Cast in fibre reinforced concrete, planters can be supplied in a variety of colours, including mixes designed specifically to coordinate with Marshalls concrete paving.

Bespoke detailing can be incorporated into planter designs in materials such as steel, stainless steel and Ferrocast polyurethane, to create uniquely styled schemes.

Logos, patterns and motifs can also be sandblasted or water cut into the surface finish for truly bespoke finishing.

Contact our Sales Office from more details on bespoke solutions on 0870 600 2425.



RhinoGuard 75/30 Seat Frame



Introducing adequate seating facilities is an essential aspect of public realm design. Seating provides people with areas to rest and enjoy public areas, and can contribute towards the overall character and identity of an outdoor space.

Marshall's has developed and impact tested an innovative frame structure, designed to fit seamlessly inside an array of seating styles, providing the ultimate in integrated security solutions.

This highly engineered RhinoGuard™ technology signals a remarkable breakthrough in the security industry, enabling exceptional levels of protection to be incorporated into the natural street scene, whilst enhancing both the functionality and design of our public spaces.

The structure has been developed to enable seating styles in various materials to be designed around it to coordinate with any environment, and is supplied shrouded with the elegant 'Eos' design as standard.

The seat ends are manufactured using our durable Ferrocast polyurethane material, and can be supplied in a wide selection of RAL colours to coordinate with the surrounding environment. Seating slats are manufactured from FSC sourced Iroko hardwood timber, whilst a perforated steel front panel adds to the contemporary design.

Utilising the experience and knowledge of our team of design engineers, we can develop bespoke seating styles in many materials, to disguise the crash tested structure and meet the requirements of any project.

Standard Design - Eos Seat



Bespoke Concepts



RhinoGuard 75/30 Seat Frame

A number of crash tests have been conducted for the 75/30 Seat Frame in order to measure impact performance from a number of angles and directions.

Test

Performance

Vehicle: Fully laden 7.5 tonne two axle rigid N2 lorry

Vehicle Speed: 30mph (48km/h)

PAS 68 Classification Code:

Test 1: Front Facing (Centre): V/7500(N2)/48/90:0.0/0.0

Test 2: Back facing (Centre): V/7500(N2)/48/90:3.1/0.0

Test 3: Back facing (Off Centre): V/7500(N2)/48/90:2.7/0.0

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.



Product Specification

Span: **1800mm**

Height Above Ground: **875mm**

* Please note, the installed spacing between the 75/30 Seat Frame and the outer face of the next successive security measure should be a maximum of 900mm



Igneo Seat



Igneo is a modular seating system that offers unique contemporary styling, combined with functionality and exceptional impact performance.

Igneo seating can be specified to any length, using any number of modules, dependant on location and the amount of seating places required.

Manufactured from Marshalls' fibre reinforced precast concrete, the seating system is further strengthened by our unique RhinoGuard™ technology, which is cast into the individual seating modules during the manufacturing process.

In addition to its impressive impact resistance, Igneo also provides an extremely durable seating solution. Extremely hard wearing, the seating is designed to withstand the rigours of the toughest modern urban environments.

Due to the natural weathering properties of concrete, the pieces will require minimal maintenance and upkeep. The seating is also almost vandal resistant, and is supplied with an anti-graffiti coating as standard.

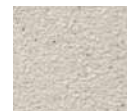
Arm rests can be installed between the seating sections. Manufactured in our Ferrocast polyurethane material, they too provide an extremely long life span, requiring very little maintenance. Arm rests can be ordered in any standard RAL colour to match individual requirements.

Colours and Finishing

As standard, the seating is supplied with a smooth etched finished across the seating and backrest areas, and a more textured, exposed finish on the underside.

The products are available in four colourways as standard designed to coordinate with Marshalls leading range of concrete paving:

- Cream
- Boulevard Black
- Conservation Silver Grey
- Conservation Charcoal



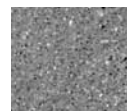
Cream



Boulevard Black



Conservation Silver Grey



Conservation Charcoal

Igneo Seat

Test

Performance

Vehicle: Fully laden 7.5 tonne two axle rigid N2 lorry

Vehicle Speed: 40mph (64km/h)

PAS 68 Classification Code:

Test 1: Centre: V/7500(N2)/64/90:3.7/0.0

Test 2: Off Centre: V/7500(N2)/64/90:3.5/0.0

Test results: The vehicle was completely immobilised, eliminating the chance of a second attack.



Product Specification

Span:

Modular End Section: 1037mm

Modular Centre Section: 1102mm

Height Above Ground:

Seat Section: 474mm

* Please note, the installed spacing between Igneo seating and the outer face of the next successive security measure should be a maximum of 900mm





GEO bollards, The Sage, Gateshead

Woodhouse is a Marshalls specialist business, offering unique capabilities in the design and manufacture of street furniture and exterior lighting products to the highest international standards.

Selected products from the Woodhouse GEO range can now be supplied incorporating Marshalls' unique RhinoGuard™ technology.

Woodhouse systems have been used on many of the most prestigious public and private sector projects throughout the UK and around the world, ranging from the award-winning reconstruction of Kensington High Street, to the stunning Formula One race track at Yas Island, Abu Dhabi.

Woodhouse enjoys a reputation for high quality, contemporary design, with coordinated product families of lighting, signage, seating, bollards and other street furniture, sharing common design themes and materials.

The Woodhouse philosophy is to help reduce street clutter and create visual links between public spaces. With extensive experience of project specific design, Woodhouse have both the engineering skills and the manufacturing resources needed to turn clients' concepts into functioning and practical reality.

GEO

GEO is a fully co-ordinated lighting and street furniture system from Woodhouse. Whilst its styling is contemporary, its simple unobtrusive outlines are equally suited to both historical and modern environments. The high quality materials used in its construction are chosen to minimise routine maintenance and to maximise whole life cost benefits.

Fitting seamlessly over the tested RhinoGuard™ bollard cores, GEO bollards can now be used to provide assured levels of protection to public spaces without compromising design.

In addition to the bollards, both the GEO litter bin and cycle stand can also be fitted with the RhinoGuard™ technology, providing a fully coordinated, design-led and functional security solution.

Available in the same PAS 68 specifications as the RhinoGuard™ bollards, the GEO bollard, litter bins and cycle stand can offer proportionate protection in line with individual site requirements.

GEO Bollard

The GEO bollard features a bead blasted grade 316 stainless steel body, and is finished with a contemporary machine finished stainless steel cap.

The products are supplied with either a 140mm or 204mm diameter post design, dependent on the level of security required.

GEO Litter Bin

The GEO Litter Bin consists of a grade 316 stainless steel cylindrical body, housing a 70 litre capacity polyethylene liner. The bin section pivots forward once unlocked, cushioned by gas struts to allow the liner to be easily removed during emptying.

The body is attached to an upright stainless steel post, which incorporates the PAS 68 RhinoGuard™ bollard cores. As with the bollard, this post is available with either a 140mm or 204mm diameter dependent on the required specification.

GEO Cycle Stand

The GEO cycle stand features an upright GEO bollard post design, which incorporates a stainless steel arm, allowing bicycles to be securely locked into place. The bollard section is available with a 140mm or 204mm diameter dependent on the level of security required.



GEO bollards and litter bin



RhinoGuard™ PAS 68 Core	Post Diameter (mm)		
	GEO Bollard	GEO Litter Bin	GEO Cycle Stand
15/30	140	140	140
25/40	204	204	204
75/40	204	204	204
75/50	204	204	204



Sharing Expertise in Landscaping

The success of the Marshalls Group has been built upon understanding specifiers' aspirations and objectives. With over 100 years experience in enhancing the landscape environment it has generated a wealth of knowledge and become an authoritative voice within the industry.

It is a business committed to working in partnership with designers, creating sustainable partnerships and relationships that exist to deliver a single minded goal – the creation of better landscapes!

These partnerships require an ongoing knowledge transfer. This is why Marshalls has invested considerable effort in its CPD (Continual Professional Development) programme which facilitates a structured sharing of knowledge. CPD is both a professional and personal matter, enhancing individual skills and knowledge to maintain competence in continuously developing professions.

The Marshalls Group offers an extensive programme of CPD seminars, covering wide ranging subjects from permeable paving solutions to alleviate flood risk, to developments in hard landscaping, external lighting and sustainability.

Counter-terrorism Design: An Introduction to BSI PAS 68 & Hostile Vehicle Mitigation

Marshalls also provides a fully RIBA accredited CPD Seminar on counter-terrorism design. The Seminar introduces the threats and potential solutions, focusing on hostile vehicle mitigation and the BSI PAS 68 standard for vehicle barriers.

The Seminar highlights the key considerations in counter-terrorism design and how protective measures can be incorporated into landscapes without sacrificing design quality.





Booking your CPD Seminar

Marshalls CPDs are designed to offer flexibility specific to your individual or company development needs. As well as booking individual CPD seminars, there are other ways to maximise your learning needs:

1. Booking a coordinated CPD Package

Working with your local Project Consultant, Marshalls can coordinate a structured annual CPD programme to help address the specific learning needs of your practice.

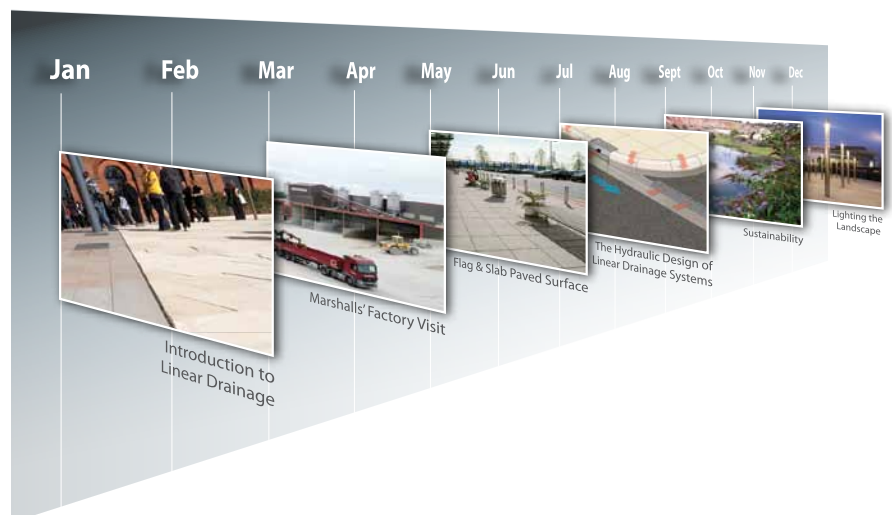
The advantage of this is that it is not only a bespoke CPD programme but one that you and your colleagues can build upon throughout the year. A proactive approach that helps to maximise learning outcomes whilst minimising disruption.

2. Combining CPD Seminars

If required we can combine CPD seminars to work in tandem with one another. For example if you are dealing with a project which has linear drainage and natural stone elements within it and want to maximise your learning needs in one hit, then we would recommend that you combine both topics in one CPD session. It will give you access to best practice in two disciplines and the knowledge bank of two product specialists in one go.

3. Project Specific CPD Seminars

Through our own experience we recognise that there are a number of projects whose needs fall outside of the scope of Marshalls' current CPD offer. In consultation with your local Project Consultant, we can construct a bespoke CPD seminar. This CPD would combine landscape knowledge covering several disciplines to fulfil your project-specific needs.



Counter-terrorism Design



An overview of Natural Stone

How to book your CPD seminar:
www.marshalls.co.uk/cpd

or through the hotline number
0845 302 3131



Landscape House, Premier Way, Lowfields Business Park, Elland HX5 9HT
Telephone: 0870 600 2425
www.marshall's.co.uk/pas68