Varley and Gulliver Ltd.

Managing Safety Around The World…

Bridge Parapets
Pedestrian Systems
Passive Sign Supports

THIS IS

Varley and Gulliver Ltd.

Inside

Introduction

Raising Safety Standards

VARLEY AND GULLIVER are continually pushing the boundaries to improve road safety.
Many of the company's products not only meet the requirements of their respective standards, they actually exceed them, thus providing products that have been proven to work in the locations they were designed for.
In addition to ensuring that their products are at the forefront of the industry, Varley and Gulliver are active in talking to engineers and roads authorities around the world to understand their needs as well as providing up to date information on continually changing standards and safety requirements in working installations.
Specifying Varley and Gulliver on your project will ensure maximum safety for today's road users.

Quality

Varley and Gulliver are dedicated to quality and continuous process improvement and aim to exceed the expectations of every customer. This approach has ensured the highest standards within the industry. A stringent monitor and measure programme enables the team to achieve their ultimate goal of 'total customer satisfaction'. The company is ISO 9001 approved which encompasses UK National Highways Sector Schemes for Vehicle Restraint Systems.

CE certification

All of our EN 1317 and EN 12899 products are CE marked, which demonstrates compliance with Europe's most stringent controls. The CE mark certifies that a product has met EU consumer safety, health or environmental requirements.

Products

Varley and Gulliver provide a range of street furniture, including vehicular and pedestrian restraint systems, passively safe sign supports and general fabrications to BS EN 1090.

Vehicle Restraint Systems (Parapets) - Erected on the edge of bridge structures and elevated roads to prevent errant vehicles from leaving the highway. Systems available have been approved to EN 1317, NCHRP 350, MASH and BS 6779

Pedestrian Restraint Systems - The pedestrian guardrail is used to separate pedestrians from vehicles, whilst the pedestrian parapet is for applications where there is a likelihood of a fall from height.

Passive Sign Supports - Frangible sign support systems are designed to break under impact from an errant vehicle, thus reducing the likelihood of serious injuries to its occupants. Tested and approved to EN 12767 and EN 12899.






What we do

Vehicle Restraint Systems

Service - Varley and Gulliver manufacture all of their vehicle restraint systems to ensure the highest quality standards. The company supply and install the majority of their vehicle restraint systems throughout the UK and Eire with supply only for export projects where they are installed by the main contractor. We offer supervision and can provide on site training for the installation of our products. Training is provided by qualified personnel in accordance with UK's National Highways Sector Scheme for Vehicle Restraint Systems.

Inspection - In the UK Varley and Gulliver own the intellectual property rights for most of the vehicle restraint systems installed on the network. This enables them to go beyond what can be actually seen as we have the knowledge of a systems full pedigree. Systems may appear to be acceptable from the outside but what is happening internally, what process was used to produce the product, was the system ever tested, were there known defects etc. Don't compromise on safety, get a thorough inspection by Varley and Gulliver.

Refurbishment - Where there is ailing infrastructure Varley and Gulliver offer a complete refurbishment service. We will conduct a survey of the parapet, provide edge protection to the structure, remove the existing parapet, carry out pull tests on site to determine the suitability of existing anchorages, drill and install new resin fixed anchorage sockets as necessary and manufacture, supply and install the replacement parapet.

Repair - Following accident damage to bridge parapets Varley and Gulliver offer two methods to action a repair. We can either attend site to carry out a full survey of the damage and identify the system or provide an inspection data sheet to the requesting company that will show the information that is necessary for us to identify the extent of damage and will generally be sufficient to determine the system. The latter option is more cost effective and provides a quicker response time.

Passive Sign Supports

Service - Varley and Gulliver manufacture all of their passive sign supports to ensure the highest quality standards. Passive sign supports are provided on a supply only basis and are installed by others. Typically passive sign supports are supplied to sign installers who have the expertise for casting foundations.

Repair - Following an accident passive sign supports are simply replaced by unbolting the existing baseplate to foundation anchorage connection and replacing with a new support.

Pedestrian Restraint Systems

Service - Varley and Gulliver manufacture all of their pedestrian restraint systems to ensure the highest quality standards. For the pedestrian guardrail Varley and Gulliver will provide these on a supply only basis as they are generally installed by the main contractor as part of their works. For the pedestrian parapet they will provide a supply and install service. Many pedestrian parapets are installed on ramps, stairs, curves etc. which should be surveyed prior to manufacture to ensure a perfect fit. This is a service that is offered by Varley and Gulliver.

As with Vehicle Restraint Systems we can also conduct inspections, carry out refurbishments and repairs.

Presentations - Varley and Gulliver offer two types of presentation. For purchasers, designers and engineers our presentation on Vehicle Restraint Systems and Passive Sign Supports focuses on the standards and specifications for each product group. We show examples of installations and actual crash testing videos to point out the pertinent points that need to be considered when determining the right product specification to ensure informed decisions can be made. With so many systems available with different performance characteristics and testing arrangements, it is possible to use an inappropriate product although approved. Compliance with the standards and CE Marking does not denote that a product will work as designed.

For maintenance teams our presentation focuses on the history and intellectual property ownership of bridge parapets and the details that we need following an accident to effect a repair. The presentation can actually incorporate site visits so a practical demonstration can be carried out. If this is done on a structure under review it will act as a free inspection providing the attendees with valuable information.

VGAN 300 - *TL3 & TL4*

The **VGAN 300** aluminium parapet is a modular design, consisting of 3 horizontal rail sections located to supporting posts. The system is 1070mm high and is made from special grade aluminium to meet the demands of the larger vehicle.

This remarkable system complies with 2 standards, AASHTO 17th Edition and AASHTO LRFD. The latter requires dynamic impact testing to NCHRP 350.

The VGAN 300 was tested on a 450mm edge beam to demonstrate that the system performs on actual bridge dimensions.

Constructed from aluminium the VGAN 300 offers a high resistance to corrosion. There is no maintenance required as with some other materials, offering a lower whole life cost, with an almost unlimited life expectancy

The design is more aesthetically appealing over conventional systems.

Highways Design
Loading = 10kips

Pedestrian Rail
Loading = 50lbs/ft

Anchorage Centres = 4 bolt 110mm longitudinally x 150mm transversely

VGAN 300

Standard	NCHRP 350
Containment Level	TL3 and TL4
System Height	1070mm
Post Centres	3m
Plinth Height	50mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
TL3	3-10	100	20	820	Car
	3-11	100	25	2000	Pickup Truck
Containment Level	**Test**	**Speed km/h**	**Angle**	**Mass kg**	**Vehicle**
TL4	4-10	100	20	820	Car
	4-11	100	25	2000	Pickup Truck
	4-12	80	15	8000	Single Unit Van Truck

The American standard has many similarities to the European standard EN 1317 but with the most notable difference being the impact angles and vehicle size. As an example EN1317 uses a 1500kg vehicle impacting at 110km/h at an impact angle of 20 degrees for the N2 containment level versus NCHRP 350 with a 2000kg vehicle impacting at 100km/h at an impact angle of 25 degrees for the TL3 containment level. The difference in energy is huge with the NCHRP 350 impact being over 50% higher than EN 1317. The American standard should be considered where the majority of the vehicular population is larger than in Europe.

VGAN 500 - N1 / W2 & VGAN 1000 - N2 / W2

The **VGAN 500** and **VGAN 1000** series of aluminium parapets are modular in design, they consist of 3, 4 or 5 horizontal rail sections located to supporting posts at heights ranging from 1m (standard) up to 1.8m. Being of aluminium construction the system is light, quick to install and versatile. Rails can be pulled to a radii of 50m on site without the need and cost of specialised curving and accommodate a vertical alignment of +/- 2 degrees without modifications.

The VGAN 500 and VGAN 1000 were tested on a 450mm edge beam to demonstrate that the system performs on actual bridge dimensions.

Constructed from aluminium the VGAN range offers a high resistance to corrosion. There is no maintenance required as with some other materials, offering a lower whole life cost, with an almost unlimited life expectancy

Unfactored moment resistance of post at underside of baseplate = 32.51kNm.

Ultimate shear force resistance of post = 116.4kN.

Size of holding down bolts = M20

Anchorage Centres = 4 bolt 127mm longitudinally X 203mm transversely

VGAN 500

Standard	EN 1317
Containment Level	N1
Working Width	W2
Impact Severity	A
System Height	1000mm - 1800mm
Post Centres	4m
Plinth Height	50mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
N1	TB 31	80	20	1500	Car

VGAN 1000

Standard	EN 1317
Containment Level	N2
Working Width	W2
Impact Severity	B
System Height	1000mm - 1800mm
Post Centres	3m
Plinth Height	50mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
N2	TB 11 TB 32	100 110	20	900 1500	Car

VGSN 500 - N1 / W1 & VGSN 1000 - N2 / W2

CE

The **VGSN 500** and **VGSN 1000** series of steel parapets are modular in design, they consist of 3, 4 or 5 horizontal rail sections located to supporting posts at heights ranging from 1m (standard) up to 1.8m. Rails can be pulled to a radii of 75m on site without the need and cost of specialised curving and accommodate a vertical alignment of +/- 6 degrees without modifications.

The VGSN 500 and VGSN 1000 were tested on a 450mm edge beam to demonstrate that the system performs on actual bridge dimensions.

Constructed from high grade steel the VGSN range is galvanised to ISO 1461 to provide a corrosion resistant system.

Unfactored moment resistance of post at underside of baseplate = 14.135kNm and 26.235kNm respectively.

Ultimate shear force resistance of post = 142.89 kN and 190.52 kN respectively.

Size of holding down bolts = M20

Anchorage Centres = 4 bolt 180mm longitudinally x 180mm transversely

VGSN 500

Standard	EN 1317
Containment Level	N1
Working Width	W1
Impact Severity	B
System Height	1000mm - 1800mm
Post Centres	3.75m
Plinth Height	50mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
N1	TB 31	80	20	1500	Car

VGSN 1000

Standard	EN 1317
Containment Level	N2
Working Width	W2
Impact Severity	B
System Height	1000mm - 1800mm
Post Centres	3.66m
Plinth Height	50mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
N2	TB 11 TB 32	100 110	20	900 1500	Car

VGSN 800 - N1 / W2 Vehicular / Pedestrian

The **VGSN 800** series of steel parapets offer vehicular containment as well as pedestrian protection. The standard parapet consists of vertical infill bars between two horizontal members to form a panel. There are variants that incorporate a third rail with a visible gap or decorative infilling.

The VGSN 800 was tested on a 450mm edge beam to demonstrate that the system performs on actual bridge dimensions.

Constructed from high grade steel the VGSN range is galvanised to ISO 1461 to provide a corrosion resistant system.

Unfactored moment resistance of post at underside of baseplate =14.09kNm.

Ultimate shear force resistance of post = 132kN.

Size of holding down bolts = M16.

Anchorage Centres = 4 bolt 160mm longitudinally x 160mm transversely

VGSN 800

Standard	EN 1317
Containment Level	N1
Working Width	W2
Impact Severity	B
System Height	1150mm - 1500mm
Post Centres	3.75m
Plinth Height	50mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
N1	TB 31	80	20	1500	Car

VGAH 2000 - H2 / W3

The **VGAH 2000** aluminium parapet is a modular design, consisting of 4 horizontal rail sections located to supporting posts. The system is 1250mm high and is made from special grade aluminium to meet the demands of the larger vehicle.

The VGAH 2000 was tested on a 450mm edge beam to demonstrate that the system performs on actual bridge dimensions.

Constructed from aluminium the VGAH 2000 offers a high resistance to corrosion. There is no maintenance required as with some other materials, offering a lower whole life cost, with an almost unlimited life expectancy.

The design is more aesthetically appealing over conventional Systems.

Unfactored moment resistance of post at underside of baseplate = 87.15kNm.

Ultimate shear force resistance of post = 140.35kN.

Size of holding down bolts = M24

Anchorage Centres = 4 bolt 315mm x 240 longitudinally X 215mm transversely

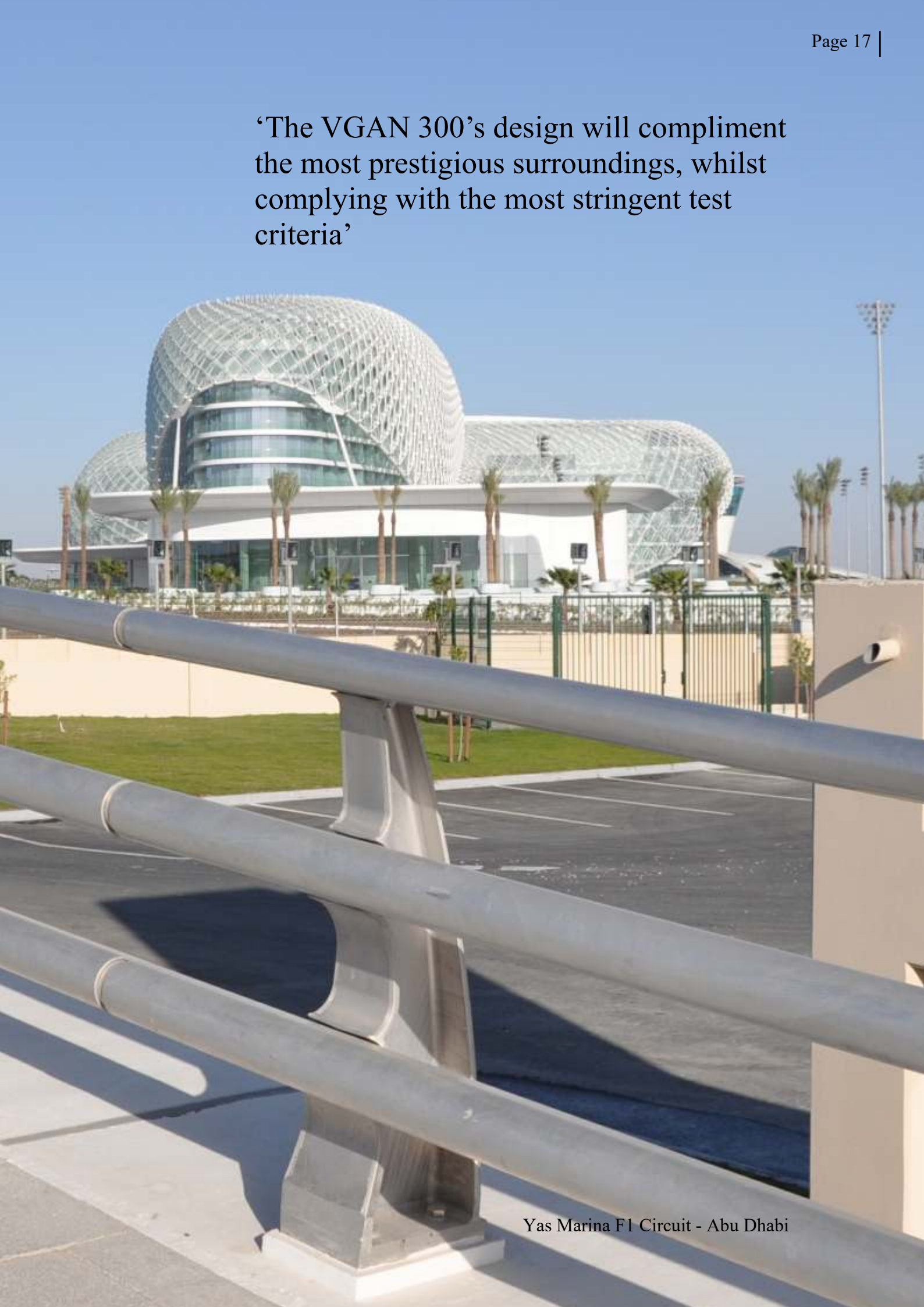
VGAH 2000

Standard	EN 1317
Containment Level	H2
Working Width	W3
Impact Severity	C
System Height	1.380m
Post Centres	2.5m
Plinth Height	50mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
H2	TB 11	100	20	900	Car
	TB 51	70	20	13000	Bus

Varley and Gulliver Ltd.

‘The VGAN 300’s design will compliment the most prestigious surroundings, whilst complying with the most stringent test criteria’



Yas Marina F1 Circuit - Abu Dhabi

VarleyGuard - H2 / W1

The **VarleyGuard** steel parapet is a modular design consisting of 3 horizontal rail sections located to supporting posts. Post spacing's are at 2m centres. The centre rail utilises a 'W' beam so that it can seamlessly connect to the most common form of safety barrier. The system can be surface mounted onto cast in anchorages or driven into the soil.

Constructed from high grade steel the VarleyGuard is galvanised to ISO 1461 to provide a corrosion resistant system.

Unfactored moment resistance of post at underside of baseplate = 29.5kNm

Ultimate shear force resistance of post = 98.4kN

Size of holding down bolts = M20

Anchorage Centres = 4 bolt 180mm longitudinally x 180mm transversely

VarleyGuard

Standard	EN 1317
Containment Level	H2
Working Width	W1
Impact Severity	B
System Height	1.250m
Post Centres	2m
Plinth Height	150mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
H2	TB 11	100	20	900	Car
	TB 51	70	20	13000	Bus


50

VGSH 2000 - H2 / W3

The **VGSH 2000** steel parapet is a modular design and consists of 4 or 5 horizontal rail sections located to supporting posts at a heights of 1.250m and 1.8m. Rails can be pulled to a radii of 75m on site without the need and cost of specialised curving and accommodate a vertical alignment of +/- 6 degrees without modifications.

The VGSH 2000 is tested on a 450mm edge beam to demonstrate that the system performs on actual bridge dimensions.

Constructed from high grade steel the VGSH range is galvanised to ISO 1461 to provide a corrosion resistant system.

Unfactored moment resistance of post at underside of baseplate = 42.245kNm

Ultimate shear force resistance of post = 307.44 kN

Size of holding down bolts = M20

Anchorage Centres = 180mm longitudinally x 180mm transversely

VGSH 2000

Standard	EN 1317
Containment Level	H2
Working Width	W3
Impact Severity	B
System Height	1.250m -1.80m
Post Centres	2m
Plinth Height	50mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
H2	TB 11	100	20	900	Car
	TB 51	70	20	13000	Bus

V6Guard - H4a / W3

The **V6Guard** steel Parapet is a modular design consisting of 3m, 4.5m and 6m long top and bottom units attached together to form a 1.5m high system. Ideally suited to provide the ultimate in protection such as on a rail overbridge.

The V6Guard is tested on a 600mm edge beam to demonstrate that the system performs on actual bridge dimensions.

Constructed from high grade steel the V6Guard is galvanised to ISO 1461 to provide a corrosion resistant system.

Unfactored moment resistance of post at underside of baseplate = 30kNm

Ultimate shear force resistance of post = 140.3kN

Size of holding down bolts = M16 & M20

Anchorage Centres = 2 bolt 250mm transversely

V6Guard

Standard	EN 1317
Containment Level	H4a
Working Width	W3
Impact Severity	C
System Height	1.5m
Post Centres	1.5m
Plinth Height	50mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
H4a	TB 11 TB 71	100 65	20 20	900 30000	Car HGV

H4a Parapet system with an integrated Noise Barrier. Eliminates the need for the noise barrier to be placed outside of the parapet systems Working Width.

VGSH 4000 - H4a / W4

The **VGSH 4000** steel Parapet is a modular design consisting of 3 horizontal rail sections located to supporting posts. At 4.5m post spacings the VGSH 4000 provides a very high containment system that is quick to install with a low cost. The system can be sheeted to eliminate debris from falling through the system.

The VGSH 4000 is tested on a 600mm edge beam to demonstrate that the system performs on actual bridge dimensions.

Constructed from high grade steel the VGSH 4000 is galvanised to ISO 1461 to provide a corrosion resistant system.

Unfactored moment resistance of post at underside of baseplate = 99.8kNm

Ultimate shear force resistance of post = 465kN.

Size of holding down bolts = M27

Anchorage Centres = 4 bolt 350mm longitudinally x 300mm transversely

Decorative finishes such as the GRP brick work shown in the picture can be attached to some of our designs

VGSH 4000

Standard	EN 1317
Containment Level	H4a
Working Width	W4
Impact Severity	B
System Height	1.5m
Post Centres	4.5m
Plinth Height	0-100mm minimum
Grout	10-30mm

Containment Level	Test	Speed km/h	Angle	Mass kg	Vehicle
H4a	TB 11	100	20	900	Car
	TB 71	65	20	30000	HGV

BACO 250 - P1

The **BACO 250** Aluminium Parapet is a modular design consisting of 2 horizontal rail sections located to supporting posts. Being of aluminium construction the system is light, quick to install and versatile. Rails can be pulled to a radii of 50m on site without the need and cost of specialised curving and can accommodate a vertical alignment of +/- 2 degrees without modifications. Post to rail fixings are hidden at the rear behind a cover strip to provide a smooth finish.

The BACO 250 was tested on 400mm high wall with a width at the top of 450mm

Constructed from aluminium the BACO 250 offers a high resistance to corrosion. There is no maintenance required as with some other materials, offering a lower whole life cost, with an almost unlimited life expectancy

Unfactored moment resistance of post at underside of baseplate = 13.20kNm.

Ultimate shear force resistance of Post = 74.4kN.

Size of holding down bolts = M16

Anchorage Centres = 4 bolt 155mm longitudinally X 145mm transversely

Baco 250

Standard	BS 6779
Containment Level	P1
System Height	600mm
Post Centres	3m
Wall Height	400mm
Grout	10-30mm

Containment Level	Speed km/h	Angle	Mass kg	Vehicle
P1	113	20	1500	Car

Pedestrian Restraint Systems

Varley and Gulliver produce a range of standard pedestrian restraint systems in aluminium and steel in accordance with BS 7818 and PD CEN/TR 16949, ranging from a standard height of 1m up to 1.8m with 1m - 2m standard panel lengths. All steel systems are galvanised to ISO 1461.The aluminium option provides a whole life cost benefit as no protective coatings are required.

Pedestrian Restraint Systems *are provided to separate people from vehicular traffic. It must be borne in mind that they are not a vehicle restraint system; i.e. they are not designed to resist the penetration of an errant vehicle.*

Pedestrian Guardrails *are used to prevent pedestrians walking into the road and are generally situated at potentially hazardous locations, such as Pedestrian Crossings, Schools, Shopping areas etc. Both systems are of modular design and come in standard panel lengths*

Pedestrian Parapets
The P4 system differs from standard guardrails in so much as they are designed for applications where there is a likelihood of a fall from height.

As well as standard panels, bespoke designs are available to satisfy the vision of designers. Probably the most iconic is the Sheikh Zayed Bridge in Abu Dhabi (pictured right), where Varley and Gulliver supplied an aluminium design where the rails resembled the shape of an airplane wing.

A special tubular design for the Erskine bridge in Scotland (pictured left) provides a high level of protection. The system was provided with enhanced galvanising to increase its corrosion protection. Each standard panel was 2.4m high by 4m long.

Pedestrian Restraint Systems

In addition to standard systems we offer bespoke solutions to meet the vision of architects. These offerings are generally one-offs that have never been done before. We can fabricate in steel, stainless steel and aluminium.

Pedestrian Restraint Systems *are provided to separate people from vehicular traffic. It must be borne in mind that they are not a vehicle restraint system; i.e. they are not designed to resist the penetration of an errant vehicle.*

Pedestrian Guardrails *are used to prevent pedestrians walking into the road and are generally situated at potentially hazardous locations, such as Pedestrian Crossings, Schools, Shopping areas etc. Both systems are of modular design and come in standard panel lengths*

Pedestrian Parapets
The P4 system differs from standard guardrails in so much as they are designed for applications where there is a likelihood of a fall from height.

1.4m high pedestrian parapet for the protection of cyclists. The visible gap is a pedestrian aid to enable oncoming traffic to be easily seen.

Pedestrian systems often have to fit in with other structures and be designed to compliment their surroundings.

A pedestrian parapet on a ramp providing access between levels.

'Eliminates the need for safety barrier'

HiMast™

HiMast™ provides an alternative to the traditional structural steel poles that are protected by safety barrier. HiMast™ is designed to breakaway following a vehicle impact to minimise the harm to the vehicles occupants. HiMast™ doesn't require protection by safety barrier thus offering a significant cost saving.

Following more than two years in development Varley and Gulliver successfully completed the approval of single and multi-legged designs to EN 12767 at MIRA test facility in the UK.

HiMast™ is made from aluminium providing excellent corrosion resistance making it maintenance free and environmentally friendly.

The HiMast™ shape crates an omni directional mast that can be impacted from any angle and still provide the same performance.

The anti climb structure means that it can be placed in urban areas without fear of it being easily traversed.

With a 100 NE 2 rating HiMast™ can be placed on all speeds of road and the NE rating ensures minimal deceleration of the impacting vehicle occurs.

H500

Section Size	125mm x 125mm
Unfactored Bending Capacity	12.7 kNm
Unfactored Torsional Capacity	13.3 kNm
Anchorage Centres	4 bolt 140mm X 140mm

H1000

Section Size	159mm x 159mm
Unfactored Bending Capacity	17 kNm
Unfactored Torsional Capacity	10.7 kNm
Anchorage Centres	4 bolt 180mm X 180mm

H2000

Section Size	212mm x 212mm
Unfactored Bending Capacity	35.3 kNm
Unfactored Torsional Capacity	17.2 kNm
Anchorage Centres	4 bolt 235mm X 235mm

H3000

Section Size	252mm x 252mm
Unfactored Bending Capacity	58.1 **k**Nm
Unfactored Torsional Capacity	26.4 kNm
Anchorage Centres	4 bolt 290mm X 290mm

H4000

Section Size	290mm x 290mm
Unfactored Bending Capacity	102.3 kNm
Unfactored Torsional Capacity	46.2 kNm
Anchorage Centres	4 bolt 330mm X 330mm

Direct export provides a significant contribution to the current revenue and profit of Varley and Gulliver. The company has a thriving export business and is heavily involved in civil engineering projects around the world.

Varley and Gulliver has established itself overseas and has exported its products from as far east as Hong Kong to the British Virgin Islands in the west.

The company has provided solutions for over forty years and continues to be at the forefront of the vehicle restraint systems industry, developing products for tomorrow's markets, today.

The company offer a range of products that have satisfied the exacting requirements of European and American standards whilst still providing one off designs.
In 2010 Varley and Gulliver supplied an awe inspiring pedestrian system designed for probably the most iconic of bridge structures in the Middle East - The Sheikh Zayed Bridge in Abu Dhabi.

Hill & Smith Holdings PLC

Varley and Gulliver are part of the Hill and Smith group of companies. Hill & Smith Holdings PLC is an international group with leading positions in the design, manufacture and supply of infrastructure products and galvanizing services to global markets.

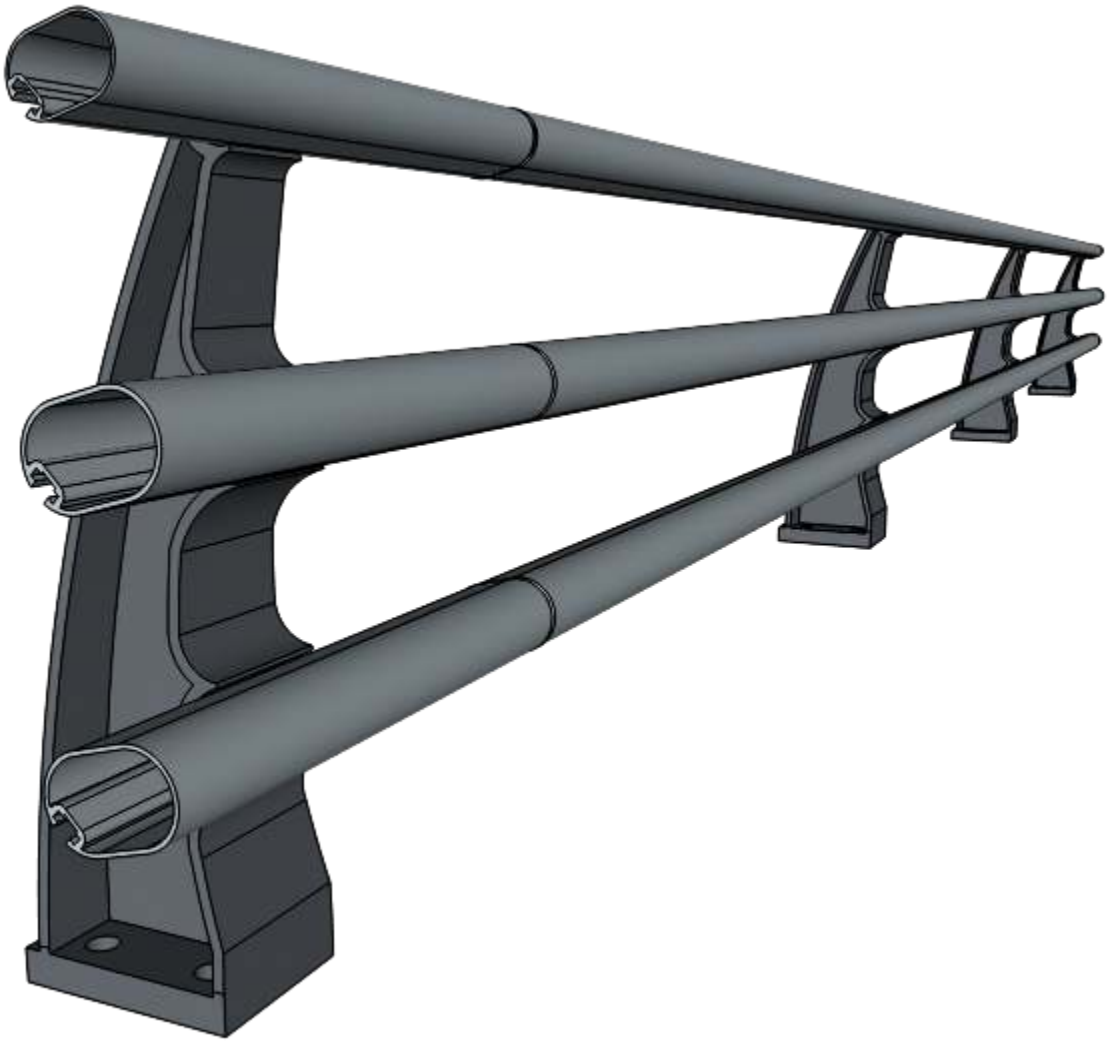
The Group's operations are organised into three main business segments:

Infrastructure Products – Roads

Infrastructure Products – Utilities

Galvanizing Services

Driving Safety…around the world



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