HANDRAIL STANDARDS
HANDRAILS
AXESS LADDER SYSTEM
KICK FLAT SYSTEM
OPEN FLOORING

Member of PF Group

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Guardrail Engineering Limited.

Guardrail is a member of the PF group of Companies. It first traded in 1983 and was incorporated as a Limited Company in 1985.

Our Industrial Hand-railing (including “ball” type handrail posts), Vertical Access Ladder system “AXESS”, Open Flooring & Kick Flat System is supplied to Structural & Coastal Engineers, Architects & Consultants, Fabricators and General Industry alike. We can manufacture in Aluminium and Mild or Stainless Steel with a range of protective finishes that suit various applications.

We fully understand the need to meet Health & Safety requirements and our products conform to the latest British Standards where applicable.

Guardrail is **NQA approved (Certificate No. 1613)** to BS EN ISO 9001 and our Technical and Production team ensure that customer needs are met to the full.
Tubular & Solid Handrail Standards
**Load Table:**
The table below shows the spacing of various type of 1100 mm high handrail standards to achieve required loadings for various codes of practice.

<table>
<thead>
<tr>
<th>Handrail Standard</th>
<th>Handrail</th>
<th>Horizontal Design Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.22 kN/m</td>
</tr>
<tr>
<td>Tubular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.7 mm o.d. x 3.0 mm</td>
<td>33.7 mm o.d.</td>
<td>1650 mm</td>
</tr>
<tr>
<td>42.4 mm o.d. x 3.0 mm</td>
<td>33.7 mm o.d.</td>
<td>2000 mm</td>
</tr>
<tr>
<td>42.4 mm o.d. x 3.0 mm</td>
<td>42.4 mm o.d.</td>
<td>2000 mm</td>
</tr>
<tr>
<td>48.3 mm o.d. x 3.0 mm</td>
<td>42.4 mm o.d.</td>
<td>2000 mm</td>
</tr>
<tr>
<td>48.3 mm o.d. x 4.0 mm</td>
<td>42.4 mm o.d.</td>
<td>2000 mm</td>
</tr>
<tr>
<td>60.3 mm o.d. x 4.0 mm</td>
<td>48.3 mm o.d.</td>
<td>2000 mm</td>
</tr>
<tr>
<td>Solid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 mm o.d.</td>
<td>33.7 mm o.d.</td>
<td>2000 mm</td>
</tr>
<tr>
<td>38 mm o.d.</td>
<td>42.4 mm o.d.</td>
<td>2000 mm</td>
</tr>
<tr>
<td>40 mm o.d.</td>
<td>42.4 mm o.d.</td>
<td>2000 mm</td>
</tr>
</tbody>
</table>

Loads are unfactored - please contact our technical department should safety factored loading be required.

**Types of standard:**

**Handrail Standards**
Guardrail Handrail standards can be manufactured in tubular or solid materials with varying outside diameters, tube wall thickness, ball sizes, ball types in a multiple of material grades in Mild Steel, Stainless Steel and Aluminium.

Many different heights, ball centres and tail lengths can be accommodated but to meet current regulations we would recommend a ball centre of 500mm.
Base details:
Alternative base thickness 10 mm, 15 mm and 20 mm. All dimensions are in millimetres.

Type: GS1

Type: GS2

Type: GS3

Type: GS5

Type: GS4

Type: GS6

Type: GS7

Type: GS8

Hole Diameter in bases as requested (standard 18 mm). Other types available on request along with steel to steel or steel to concrete fixing bolts.
Standard industrial handrail components:

**Tubular sticks:**
Finish: Self colour (vented)
Special and raked sticks on request
Usually available ex-stock

<table>
<thead>
<tr>
<th>Ball size</th>
<th>Rail size Outside diameter</th>
<th>Shank Outside Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>63</td>
<td>34</td>
<td>42</td>
</tr>
<tr>
<td>82</td>
<td>42</td>
<td>42</td>
</tr>
<tr>
<td>82</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>95</td>
<td>48</td>
<td>48</td>
</tr>
</tbody>
</table>

**Solid fabricated sticks:**
i.e. solid forged balls welded to solid bar shank
Finish: Self colour
Special and raked sticks on request
Usually available ex-stock

<table>
<thead>
<tr>
<th>Ball size</th>
<th>Rail size Outside diameter</th>
<th>Shank Outside Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>34</td>
<td>32</td>
</tr>
<tr>
<td>70</td>
<td>34</td>
<td>38</td>
</tr>
<tr>
<td>77</td>
<td>42</td>
<td>38</td>
</tr>
</tbody>
</table>

**Tubular Ball fittings (Mild steel):**
Also available in Gr 316 stainless steel and aluminium

<table>
<thead>
<tr>
<th>Theoretical Size Outside Diameter</th>
<th>Actual size Outside diameter</th>
<th>Rail Size Outside Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>63</td>
<td>34</td>
</tr>
<tr>
<td>75</td>
<td>82</td>
<td>42</td>
</tr>
<tr>
<td>75/90</td>
<td>82</td>
<td>48</td>
</tr>
<tr>
<td>90</td>
<td>95</td>
<td>48</td>
</tr>
</tbody>
</table>

**Solid forged balls (Mild steel):**

<table>
<thead>
<tr>
<th>Size Outside Diameter</th>
<th>Rail Size Outside Diameter</th>
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</thead>
<tbody>
<tr>
<td>64</td>
<td>34</td>
</tr>
<tr>
<td>70</td>
<td>34</td>
</tr>
<tr>
<td>77</td>
<td>42</td>
</tr>
</tbody>
</table>

**Loose Base plates:**
65 x 12 Flat, 2 x 18 dia. holes.
Others on request
Industrial Handrail System:
Guardrail’s industrial handrail system consists of “Ball” type handrail posts and individually fabricated handrails which once passed through the ball in the post are locked into position by way of a grub-screw to form a complete handrail.

Different post diameters, wall thickness and spacing coupled with a variety of base types mean that the majority of loading requirements are met whilst it’s aesthetic qualities are usually preferred to clamp and other types of handrail systems.

The system is easily erected/dismantled in small sections and can be “tailored” to suit many applications.

All products are available in mild, stainless steel and aluminium.
WORK SHOP FABRICATED BENDS
USUALLY SUPPLIED PLAIN ENDS
(SOME AVAILABLE EX-STOCK)

HANDRAIL TUBE SIZES AVAILABLE:
- 25 N.B TUBE (33.7 O/D)
- 32 N.B TUBE (42.4 O/D)
- 40 N.B TUBE (48.3 O/D)

12

TO SUIT BALL CENTRES

RETURN ('D') BEND

1000
500

TO SUIT BALL CENTRES

90 deg BEND

TO SUIT BALL CENTRES

STAIRCASE RETURN BEND

1000
1000

TO SUIT

ANGLE TO SUIT +/- 1 deg

RAMP BEND

TO SUIT

ANGLE TO SUIT +/- 1 deg

WREATH TYPE STAIRCASE BEND

NOTE:
In some instances weld elbows are used to achieve required sizes if machine bends are not possible.

NOTE:
Joints to be positioned 150 max from centre of a standard or preferably on centre of standard. ie: within the ball. There should be no joints between two corner standards.

INTERNAL GRUB SCREW TYPE JOINT

JUMBO HARDWARE

MARK x 8 grub screws

SHOP FABRICATED HANDRAILING
HANDRAIL LAYOUT

NOTES:
P = The pitch of standards to suit the design load
A or B should not be greater than 300mm
A + B should not exceed max pitch P.
RB = return bend
J = joint in handrail

ALLOW FOR FINGER CLEARANCE OF 75mm

MESH INFILL PANELS WHERE REQUIRED CLIPPED TO THE POSTS AND HANDRAILS

SELF CLOSING SPRING ASSEMBLIES (CAN BE SOLD SEPARATELY)

THROUGH HOLE

10
10

INTERNAL CLAMP (EXPANDING) TYPE JOINT

DETAILS

GATE HINGE DETAILS

LOWER HINGE
UPPER HINGE

FULL HEIGHT GATE

LOWER HINGE

FULL HEIGHT GATE

HALF HEIGHT GATE

ADVISE POST CENTRES

FIT PLASTIC CAPS IN RAIL ENDS

SIZE SIMILAR TO KICK FLAT

TUBE TO MATCH OD OF HANDRAIL

GUARDRAIL ENGINEERING LTD. · TEL. 01902 871208 · FAX 01902 453330
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AXESS Vertical Ladder System Self Assembly:

Guardrail’s “AXESS” vertical permanent ladder system is of a safe, simple modular design offering individual parts which bolt together to form a complete ladder. Parts are usually kept in stock for quick delivery or can be supplied as a complete ladder once the floor to floor dimension is given. This system tries to eliminate the need for expensive site surveys and the preparation of detail drawings which adds to delivery time.

Health & Safety:
The unique design and production of AXESS components are generally BS compatible for the health and safety conscious.

Flexible
AXESS is usually available “off the shelf” and is so flexible it will solve virtually any access problem.

Easy to install
AXESS is straightforward to install.

Supplied in “flat-pack” form for ease of transportation thus lending itself to export projects
System Components:

- **ITEM AX3** Ladder Extension
- **ITEM AX4** Extension to Floor
- **ITEM AX5** Top Step
- **ITEM AX6** Ladder Stay
- **ITEM AX7** Ladder Foot
- **ITEM AX8** Top Hoop
- **ITEM AX9** Lower Hoop
- **ITEM AX10** Splice Plates
- **ITEM AX11** Top Cage Strap
- **ITEM AX12** Lower Cage Strap
- **ITEM AX13 & 14** Cage Splices
- **ITEM AX15** Long Ladder Section 2500mm
- **ITEM AX16** Short Ladder Section 1250mm

REQUIRED FOR BS EN 14122
Ladder Assembly Detail:

**NOTE**
CUP HEAD BOLTS TO EXTENSIONS PIECES ABOVE FLOOR LEVEL TO BE FITTED TO THE INSIDE OF THE LADDER

**NOTE**
CUP HEAD BOLTS TO LADDER SECTIONS TO BE FITTED TO THE OUTSIDE OF THE LADDER

**NOTE**
The longer cup head bolts are to be used when connecting 3 or more thicknesses of material together.
Cage Assembly Detail:

NOTE
FOR AX8 HOOPS THE CUP HEAD BOLTS ARE ALWAYS FITTED TO INSIDE OF LADDER

Gates are a mandatory requirement for BS EN ISO 14122

NOTE
FOR AX9 HOOPS THE CUP HEAD BOLTS ARE ALWAYS FITTED TO OUTSIDE OF LADDER

AX11

AX11 TOP STRAPS

AX9

AX12 STRAPS

AX12

AX14

AX13

CAGE SPLICE ASSEMBLY

NOTE
THE LONGER CUP HEAD BOLTS ARE TO BE USED WHEN CONNECTING 3 NO THICKNESSES OF MATERIAL TOGETHER

CLIMB RESTRICTION PLATES ARE AVAILABLE
Typical examples - for approx 2000, 2500 or 3500 mm rises:

**TYPICAL EXAMPLE FOR APPROX 2000mm RISE**
(2000 TO 2300 mm)

**TYPICAL EXAMPLE FOR APPROX 2500mm RISE**
(2400 TO 2700 mm)

**TYPICAL EXAMPLE FOR APPROX 3500mm RISE**
(3300 TO 3800 mm)
Typical examples - for approx 3000 & 4000 mm rises:

TYPICAL EXAMPLE FOR APPROX 3000mm RISE (2800 TO 3200 mm)

TYPICAL EXAMPLE FOR APPROX 4000mm RISE (3900 TO 4300 mm)
Typical examples - for approx 4500 & 5500 mm rises:

For rises above 6000 mm rest platforms are recommended, please contact our Sales Department for details.
Guardrail Engineering Ltd. · Tel. 01902 871208 · Fax 01902 453330
www.guardrailgroup.com · Email: enquiries@guardrailgroup.com
Kick Flat System

KICK FLAT ‘C’ SECTION
150mm high giving high strength to weight ratio

POST CONNECTIONS
Guardrail "C" Section Kick Flat System is usually available ex-stock in approximately 3000mm or 6000mm random lengths that can either be cut on site or shop fabricated to suit customer requirements.

These coupled with ‘U’ type post connections give a flexible and easy to fit product that can be part of a new installation or retro fitted to bring existing areas up to the requirements of the latest regulations.

The Standard recommended method of connection does not show any fixings on the pedestrian side of walkways and as such gives platforms a tidy, clean and linear "look". As this product lends itself to being easy to line / level / fix installation times are short.
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Guardrail open steel flooring consists of flat bars on edge restrained by twisted square or indented round bars forge welded at right angles to give a grating mesh that offers high strength to weight ratio.

Panels can be finished: Self Colour, Galvanised or others on request.

<table>
<thead>
<tr>
<th>Load-Bearing Bar</th>
<th>Deep Binding Bar</th>
<th>Cut-out</th>
</tr>
</thead>
<tbody>
<tr>
<td>A load-bearing member spanning between supports.</td>
<td>A bar or section fixed to the edge of a flooring panel flush and projecting below the underside.</td>
<td>An area of flooring removed to permit pipes, columns, etc., to pass through or to clear obstructions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transverse Bar</th>
<th>Front Edging Bar</th>
<th>Straight Shaping</th>
</tr>
</thead>
<tbody>
<tr>
<td>A member fixed at right angles to the load-bearing bars to provide lateral restraint.</td>
<td>A member attached to the front of a stair tread or to a flooring panel.</td>
<td>The part of a cut-out which is straight.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pitch</th>
<th>End Plate</th>
<th>Curved Shaping</th>
</tr>
</thead>
<tbody>
<tr>
<td>The distance centre-to-centre of load-bearing bars or centres between points of lateral support to load-bearing bars.</td>
<td>A plate fixed to a stair or ladder tread for attaching to the stringer.</td>
<td>The part of a cut-out which is curved.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length (Direction of Span)</th>
<th>Curb Angle</th>
<th>Segmental or Polygonal</th>
</tr>
</thead>
<tbody>
<tr>
<td>The overall dimension of a flooring panel parallel with the load-bearing bars.</td>
<td>A member fixed to concrete or supporting steelwork at the perimeter of a flooring area.</td>
<td>Types of flooring panels used for platform construction.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Width</th>
<th>Kicking Plate (Toe Plate)</th>
<th>Tangential or Radial</th>
</tr>
</thead>
<tbody>
<tr>
<td>The overall dimension of a flooring panel measured at right angles to the load-bearing bars.</td>
<td>A flat bar around the edge of a flooring panel and projecting above the top of the load-bearing bars.</td>
<td>The direction of span in segmental or polygonal flooring panels.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Binding Bar</th>
<th>Net Area</th>
<th>Gross Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>A bar or section fixed to the edge of a flooring panel flush with the top of the load-bearing bar.</td>
<td>The actual area of flooring excluding cut-out areas.</td>
<td>The total area of flooring including cut-out areas.</td>
</tr>
</tbody>
</table>

Flooring, Treads & Handrails for Industrial use

Aperture requirements BS 4592 “Flooring, Treads & Handrails for Industrial use”.

The opening should prevent the passage of a 35mm diameter sphere except where the grating is above a place where people are working as opposed to occasionally passing, then the openings should prevent a 20mm diameter sphere.

Aperture requirements BS EN ISO 14122 “Safety of machinery” - “Permanent means of access to machinery”

Openings should prevent a 35mm sphere for occasional passage underneath and a 20mm diameter sphere for spaces more regularly worked, please contact our sales department for specialist advice should any Guardrail product be required for this standard.

Please contact our Technical Department for information on Open Flooring load capabilities.

Mesh Types

<table>
<thead>
<tr>
<th>Mesh Type</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>a x b</td>
<td>41 x 100</td>
</tr>
<tr>
<td>30 x 100</td>
<td></td>
</tr>
<tr>
<td>34 x 100</td>
<td></td>
</tr>
</tbody>
</table>

N.B. 41 x 100 type does not conform to the requirements of BS 4592

Other mesh types available on request.
Open Flooring
STAIR TREADS

OPEN TYPE

Fixing dimensions for bolted end plates

Dimensions are in millimetres.

<table>
<thead>
<tr>
<th>Width of tread in mm</th>
<th>Dimension x in mm</th>
<th>Dimension y in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100</td>
<td>32</td>
<td>16</td>
</tr>
<tr>
<td>101 to 149</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>150 to 175</td>
<td>75</td>
<td>16</td>
</tr>
<tr>
<td>176 to 249</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>250 to 290</td>
<td>125</td>
<td>175</td>
</tr>
<tr>
<td>291 &amp; over</td>
<td>175</td>
<td></td>
</tr>
</tbody>
</table>

Chequerplate stairtread with Flat Nosing.

Back of Tread may be flanged up thus to comply with regulations where max. 100mm gap is required.
AXESS Vertical Ladder System
Please contact our Sales Department for specialist advise should any ‘Guardrail’ product be required to conform to BS EN ISO 14122, BS 4592, BS 13374, BS 6180 and The Work at Height Regulations.