



M.M. S.R.L.
Fiberglass Reinforced Polymer
gratings and structures

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FRP HANDRAIL SYSTEMS

MM09

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COMPOSITE SOLUTION



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1. USE AND CHARACTERISTICS



The FRP handrail systems are built by assembling fiberglass and polyester resin profiles, they assure several advantages compared to the normal metal ones:

- a. High resistance to chemical and atmospheric aggressions
- b. High mechanical/weight ratio peso
- c. Long-lasting
- d. Lightness
- e. Dimensional stability
- f. High dielectric properties
- g. No maintenance
- h. Easy to install

Handrail systems are designed and built accordingly to the **UNI EN ISO 14122-3** norm.

2. EMPLOYMENT FIELDS

MM's HANDRAIL SYSTEMS can be installed in any plant, but they are mainly used in **corrosive environments** where their characteristics are emphasized, as in those plants where conventional materials are not long lasting or need continuous varnishing or protection with high maintenance costs and even so, the working environment may in any case not be completely safe.

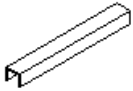


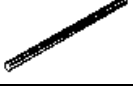






The industries that use MM's PARAPETS are:

- **Chemical industries**
- **Galvanic plants**
- **Mineral industries**
- **Textile industries**
- **Food industries**
- **Electric stations**
- **Electric distribution cabins**
- **Oil plants**
- **Tanneries**
- **Water treatment plants**
- **Marine field**
- **Paper factories**

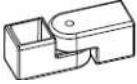




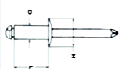







3. MATERIALS

3.1 PROFILES

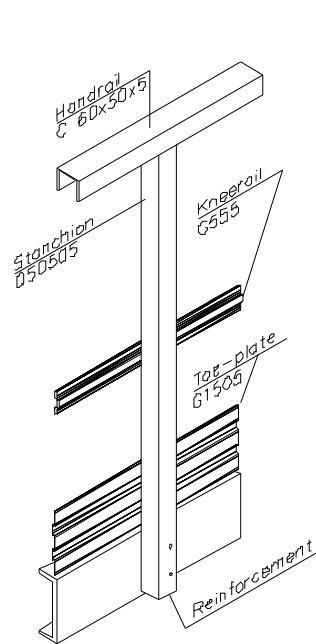
HORIZONTAL PROFILES						
PROFILE	CODE	DESCRIPTION	DIMENSIONS (mm)	BAR LENGTH (m)	WEIGHT (Kg/m)	COLOR
	53C60505I	Handrail	60x50x5	6	1.27	Yellow/Grey
	53C60605I	Ergonomic handrail	60x60x5	6	1.24	Yellow/Grey
	53G555I	Kneerail	shaped 55x5	6	0.5	Yellow/Grey
	5302619I	Tubular kneerail	Ø 26x19	6	0.5	Yellow/Grey
	53G1505I	Toe-plate	shaped 150x5	6	1.35	Yellow/Grey
VERTICAL PROFILES						
PROFILE	CODE	DESCRIPTION	DIMENSIONS (mm)	BAR LENGTH (m)	WEIGHT (Kg/m)	COLOR
	53Q50505I	Stanchion POST01	square 50x50x5	1.10	1.53	Yellow/Grey
	53Q50505I	Stanchion POERG01 with Ø 26 mm hole	square 50x50x5	1.10	1.53	Yellow/Grey
	53Q50505I	Stanchion PVST01	square 50x50x5	1.33	1.53	Yellow/Grey
	53Q50505I	Stanchion PVERG01 with Ø 26 mm hole	square 50x50x5	1.33	1.53	Yellow/Grey
	53Q50505I	STANDARD Stanchion	square 50x50x5	6.00	1.53	Yellow/Grey

3.2 ACCESSORIES FOR FIXING AND JOINTS

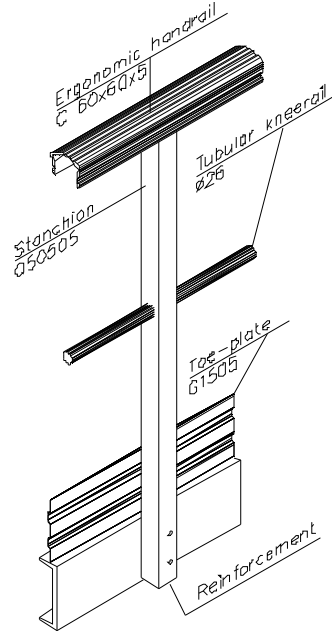
ACCESSORY	CODE	DESCRIPTION	COLOR
	58PA66SCE17035	Adjustable handrail junction in recycled plastic Specific for angle junctions different from 90°	Yellow/Grey
	58PA66STI17035	Adjustable tubular kneerail junction in recycled plastic Specific for angle junctions different from 90°	Yellow/Grey
	58PA66FPQ50505	Reinforcement for vertical fixing stanchion	Black
	58PA66TCE17035	Ergonomic handrail cap	Yellow/Grey
	58PA66TTI17035	Tubular kneerail 26x19mm cap	Yellow/Grey
	57RIVCUNI416	Cu-Ni 4x12 mm rivets	-
	56ASTAFFA8	Stainless Steel AISI 304 stanchion base plate	-
	56A40404012	90° handrail junction Stainless Steel angle type L40x40x40 mm thickness 1.2 mm	-
	56P501512	Linear junction for toe-plate Stainless Steel plate 50x15mm, thickness 1.2 mm	-
	56A40401512	90° toe-plate junction Stainless Steel angle type L40x40x15 mm thickness 1.2 mm	-
	53Q505051	Linear junction for ergonomic handrail 100mm long square Q50x50x5mm	Yellow/Grey

4. TYPES

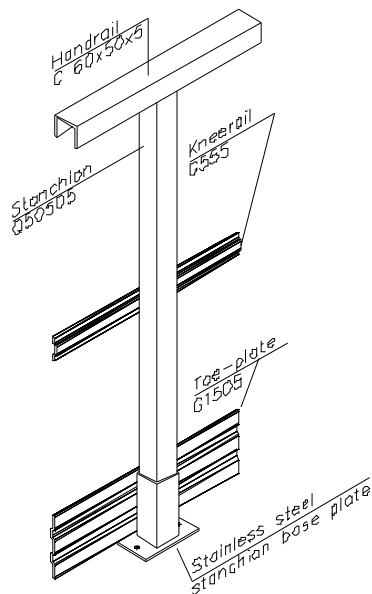
MM's standard parapets have been studied and built according to the **UNI EN ISO 14122-3** norm.



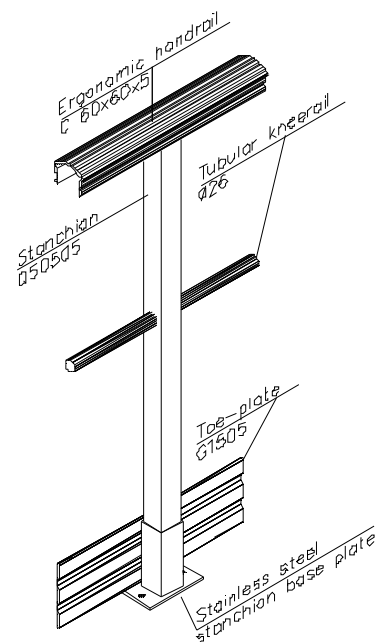
PVST01
Handrail system with lateral
fixing STANDARD type



PVERG01
Handrail system with lateral
fixing ERGONOMIC type



POST01
Handrail system with horizontal
fixing STANDARD type



POERG01
Handrail system with horizontal
fixing ERGONOMIC type

5. INSTRUCTIONS FOR DESIGN ENGINEER

1. When the height of the possible fall exceeds 500 mm, a handrail system shall be installed (ref. UNI EN ISO 14122-3 norm)
2. Minimum height of the handrail system shall be 1100 mm (ref. UNI EN ISO 14122-3 norm).
3. The handrail system shall include at least one intermediate kneerail. The clear space between the handrail and the kneerail, as well as between the kneerail and the toe-plate, shall not exceed 500 mm.
4. A toe-plate with a minimum upstand of 100 mm shall be placed at 10 mm maximum from the walking level and the edge of the platform.
5. The distance between the axes of the stanchions shall be:
 - limited to **1300 mm** for handrail system type **POST01** (horizontally fixed)
 - limited to **1300 mm** for handrail system type **POERG01** (horizontally fixed)
 - limited to **1300 mm** for handrail system type **PVST01** (vertically fixed)
 - limited to **1300 mm** for handrail system type **PVERG01** (vertically fixed)

All handrail systems have been tested according to UNI EN ISO 14122-3 norm.
Ask for Bureau Veritas tests made on MM handrail systems at info@mmgrigliati.it .

6. ASSEMBLING INSTRUCTIONS

6.1 VERTICAL FIXING

The stanchions could be fixed to the load bearing structure in two ways.

i. Completely adherent stanchion fixing

When the support beam of the structure is a C or tubular profile or a concrete beam the fixing is very simple. On the bottom part of the stanchion, a plastic reinforcement is inserted in order to ease screws or anchor bolts fixing (Figg. 1-2).

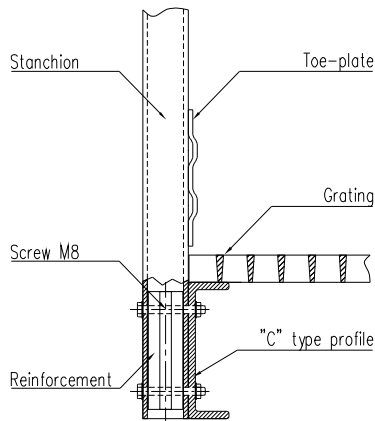


Fig. 1: fixing on profile

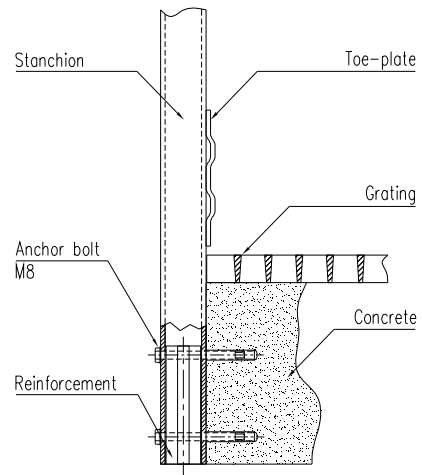


Fig. 2: fixing on concrete structure

ii. Incompletely adherent stanchion fixing

This is the case when fixing has to be made on an I or H type beam or whichever beam with wings. A steel plate has to be welded (if the beam is made of steel) or a spacer shall fit into the recess (for FRP beams) in order to produce a flat surface (Figg. 3 e 4); then fixing has to follow as the above point i.

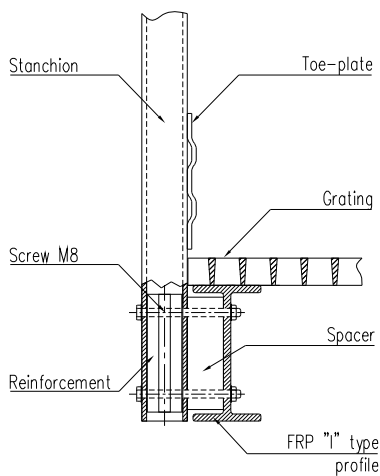


Fig. 3: fixing on an FRP beam

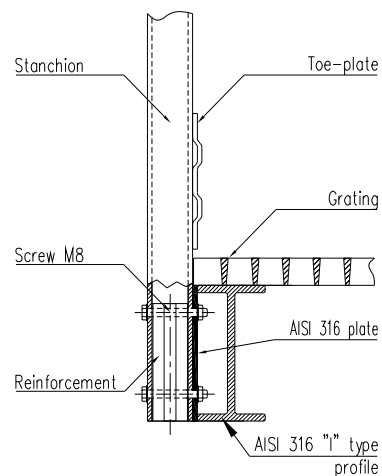


Fig. 4: fixing on a steel beam

6.2 HORIZONTAL FIXING

i. Base-plate permanent fixing

Stainless steel base-plate has to be fixed on a flat surface by using four M8/75-165 expansion anchor bolts. Then the stanchion is fit into the slot and fixed to the base-plate (Fig. 5) by an M6x70mm screw.

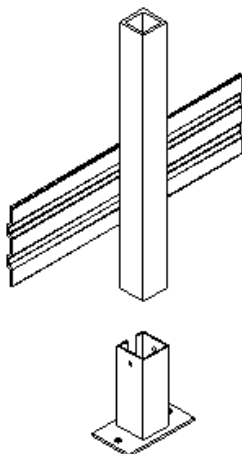


Fig. 5: Assembling illustration

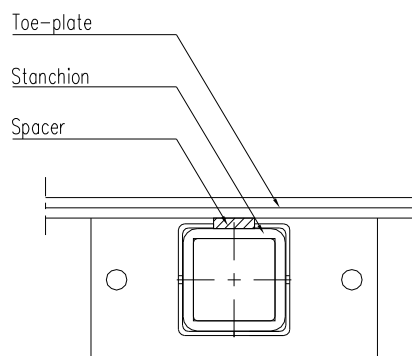


Fig. 6: 5mm spacer stanchion/toe-plate fixing for handrail system removal

ii. Base-plate removable fixing

It may be possible that the handrail system must be partially or totally removed: in this case the toe-plate, stanchion and a 5mm spacer, placed in a ... of the base-plate, shall have to be fixed by rivets. The gap created by the spacer between the outer face of the base plate and the toe-plate eases the removal of the handrail system (Fig. 6).

6.3 HADRIL APPLICATION

After the fixing of the stanchions, the installation of the handrail can follow-up. The C profile 60x50x5 mm or the Ergonomic C60x60x5 mm are placed on the top of the stanchion and pressed at level and until leaning on it. All stanchions must be perfectly straight before fixing the handrails. Fixing is made with alloy rivets suitable for the specific environment but generally are in cupronickel. Two rivets are fit diagonally in the inside part of the handrail system and one on the outside part (Fig. 7).

6.4 KNEERAIL APPLICATION

The handrail system shall have at least one kneerail. The shaped kneerail profile of 55x5 mm or the tubular kneerail, supplied in 6 m long bars, shall be placed in the middle of the clear span. The shaped profile must touch the inside surface of the handrail system and be blocked by clamps. When they are perfectly horizontal, they could be definitively fixed with two rivets on each stanchion. The tubular profile will pass through a 26mm drilled hole in the middle of the stanchion and needs no fixing (Fig. 7).

6.5 TOE-PLATE APPLICATION

The shaped toe-plate profile 150x5 mm is placed on the bottom part of the structure at 1 cm from the walking level. When it is in the required position it is fixed to the stanchion with clamp blocking systems and when it is perfectly horizontal it could be definitively fixed with three rivets for each stanchion (Fig. 7).

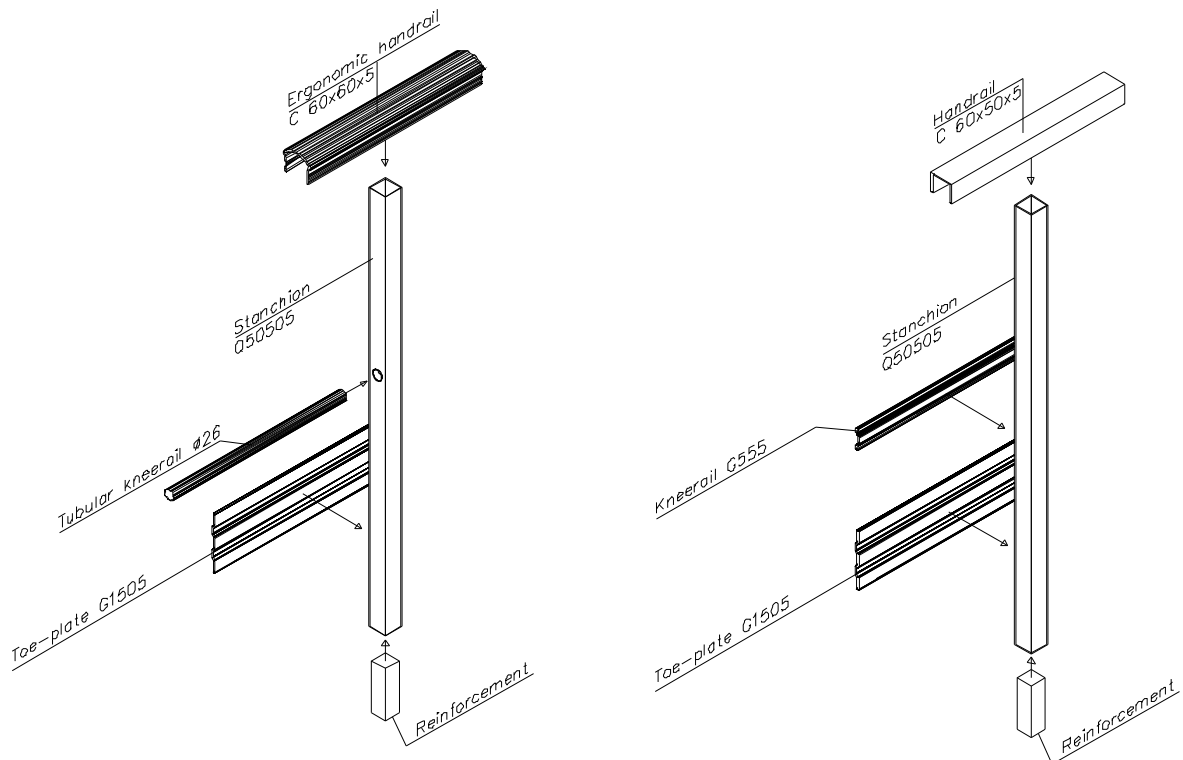


Fig. 7: fixing of handrail system components

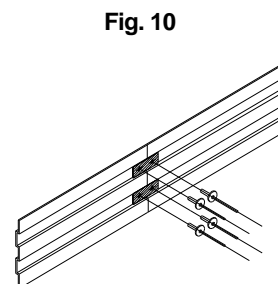
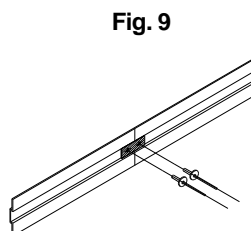
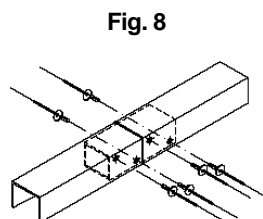
6.6 JUNCTIONS

Shall the handrail system be over 6 m long it will be necessary to connect all the profiles in order to have a continuous structure.

i. Linear junctions distant from stanchions

If the junction is not on the stanchion, profiles are connected as follows:

- N. 1 square profile of 50x50x5 mm piece (approx. 10 cm long) shall be used for handrail (Fig. 8)
- N. 1 Stainless Steel plate 40x15mm, thickness 1.2 mm shall be used for shaped kneerail type G55x5 (Fig. 9)
- N. 2 Stainless Steel plates 40x15mm, thickness 1.2 mm shall be used for shaped toe-plate type G150x5 (Fig. 10)



ii. 90° junctions

For 90° angle connections, it is necessary to use:

- n. 2 stainless steel angles 40x40x40 mm thickness 1.2mm to fit in the handrail and fixed with M6 flathead screws (Fig. 16)
- n. 1 stainless steel angle 40x40x15 thickness 1.2mm and two M4 rivets for the connection of the kneerail type G55x5 (Fig. 17)
- n. 2 stainless steel angles 40x40x15 thickness 1.2mm and four M4 rivets for the connection of the toe-plate type G150x5 (Fig. 18)

It is suggested to use two stanchions in a 90° corner at a distance of approximately 100 mm (Fig. 19-20).

Fig. 16

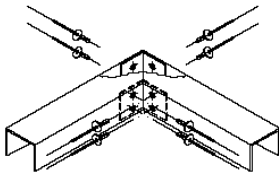


Fig. 17

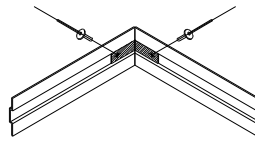


Fig. 18

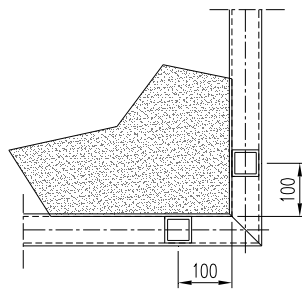
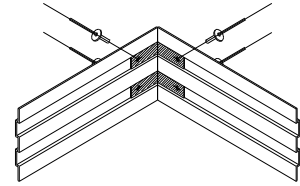


Fig. 19: Top view: stanchion's position for lateral fixing

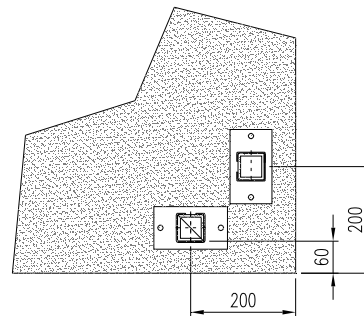


Fig. 20: Top view: stanchion's position for horizontal fixing