



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

Via Antonio Zanussi, 300/302
33100 Udine - Italy
Cap. Soc. EURO 100.000 i.v.

P.Iva / C.F. 00477620306
Reg. Imp. UD 00477620306
R.E.A. UD-138461

ph. +39.0432.522970
fax +39.0432.522253
info@mmgrigliati.it



FRP STAIRWAYS
MM07
23.12.2015 Rev. 4

FRP STAIRWAYS

COMPOSITE SOLUTION



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

Via Antonio Zanussi, 300/302
33100 Udine - Italy
Cap. Soc. EURO 100.000 i.v.

P.Iva / C.F. 00477620306
Reg. Imp. UD 00477620306
R.E.A. UD-138461

ph. +39.0432.522970
fax +39.0432.522253
info@mmgrigliati.it



TABLE OF CONTENTS

1. USE AND CHARACTERISTICS	3
2. EMPLOYMENT FIELD	4
3. MATERIALS	5
3.1 STAIRWAYS.....	5
3.2 STRUCTURE PROFILES SHEET.....	6
3.3 HANDRAIL SYSTEM PROFILES SHEET	7
4. INSTRUCTIONS FOR DESIGN ENGINEER	8
4.1 STAIRWAY DESIGN	9
4.2 STANDARD STEPS TABLE	10
5. ASSEMBLING INSTRUCTIONS	11
5.1 STAIRWAY FIXING	11
5.2 STEPS ASSEMBLING	11
5.3 HANDRAIL SYSTEM ASSEMBLING	12
5.4 FASTENING STRINGERS TO CONCRETE	12
5.5 STAIRWAY INTERMEDIATE SUPPORTS.....	13

1. USE AND CHARACTERISTICS



The FRP stairways are built by assembling the fiberglass and polyester resin profiles and gratings, 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. Heat resistant
- d. Long-lasting
- e. Lightness
- f. Dimensional stability
- g. High dielectric properties
- h. No maintenance

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

2. EMPLOYMENT FIELD

MM's stairways can be installed in any plant, but they are mainly used in **corrosive environments** where their characteristics are emphasized, in those plants where conventional materials are not long-lasting or need continuous varnishing or protection with high maintenance costs and in any case safety in the working environment is not guaranteed.

The industries that use MM's STAIRWAYS 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 and others**



3. MATERIALS

3.1 STAIRWAY

Main structure

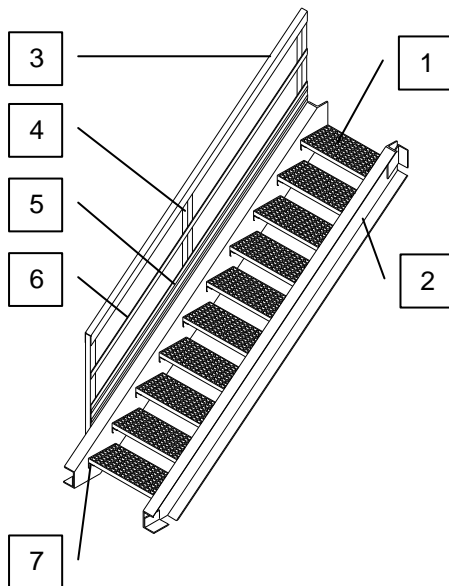
Made by two stringers, connected to the landing and the ground floor with steel plates.

Handrail system

The handrail system is made of the profiles described in table 3.2 connected to each other by cupronickel rivets. The distance between stanchions is of approximately 120cm and they are fixed to the stringers with two S.S. bolts.

Steps

Made of at least 38 mm height FRP antiskid surface grating. Steps are supported by FRP "L" angle profiles directly connected to the stringers by S.S. bolts.



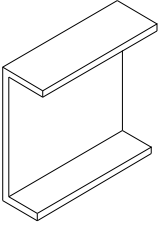
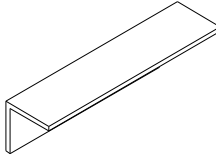
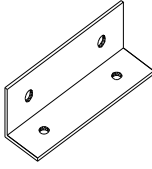
1. Steps
 - Minimum 38mm thickness grating
2. Stringers
 - FRP C profile mm 300x100 thickness 15 mm
 - FRP C profile mm 200x60 thickness 10 mm
 - FRP C profile mm 150x45 thickness 8 mm
3. Handrail
 - FRP C profile mm 60x50 thickness 5 mm
 - FRP C ergonomic profile mm 60x60 thickness 5 mm
4. Stanchion
 - FRP square profile mm 50x50 thickness 5 mm
5. Toe-plate
 - FRP flat shaped profile mm 150 thickness 5 mm
6. Kneerail
 - FRP flat shaped profile mm 55 thickness 5 mm
 - FRP tubular profile Ø 26 mm thickness 5 mm
7. Step support
 - FRP angle 50x50 mm thickness 5 mm

Accessories

Stainless steel bolt & nuts and clamps.
Cu-Ni alloy rivets.

All M.M. S.r.l. stairways are made by FRP gratings, FRP pultruded profiles, and Stainless Steel accessories according to **UNI EN ISO 14122-2-3** norms. Stairways can be manufactured in different slopes, pre-assembled and complete of handrail systems.

3. STRUCTURAL PROFILES SHEET

PROFILES	DESCRIPTION	DIMENSIONS (mm)	BAR LENGTH (m)	WEIGHT (Kg/m)	COLOR
	Stringer	300x100x15 200x60x10 150x45x8	6	12,5 5,3 3,2	Yellow/grey
	FRP angle profile	50x50x5	6	0,79	Yellow/grey
	S.S. angle	45x45x160x3 45x45x170x3			

Accessories







For FRP angle profiles

- M6 screws
- M6 self-blocking nuts
- M6 washers

For S.S. angles

- M8 screws
- M8 self-blocking nuts
- M8 washers

3.3 HANDRAIL SYSTEM PROFILES SHEET

PROFILES	DESCRIPTION	DIMENSIONS (mm)	BAR LENGTH (m)	WEIGHT (Kg/m)	COLOR
HORIZONTAL PROFILES					
	Handrail	60x50x5	6	1.27	Yellow/grey
	Ergonomic handrail	60x60x5	6	1.24	Yellow/grey
	Kneerail	shaped 55x5	6	0.50	Yellow/grey
	Tubular kneerail	Ø 26x19	6	0.50	Yellow/grey
	Toe-plate	shaped 155x5	6	1.35	Yellow/grey
VERTICAL PROFILES					
	Stanchion	square 50x50x5	1,00 – 1,33 or 6	1.53	Yellow/grey

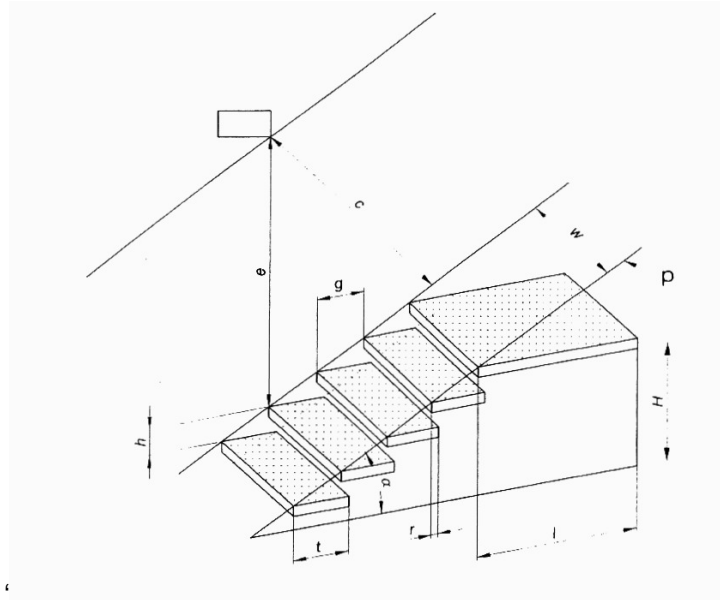
Accessories

- M8 screws
- M8 nuts and washers
- Rivets
- PA reinforcement
- Adjustable junction for handrail
- S.S. plate 50x15 mm
- Adjustable junction for tubular kneerail

4. INSTRUCTIONS FOR DESIGN ENGINEER

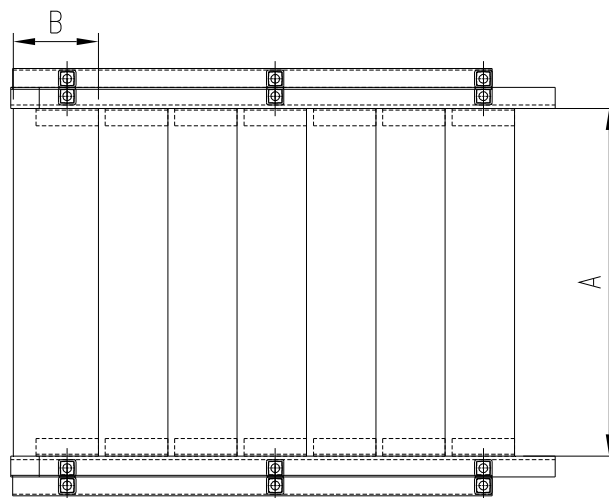
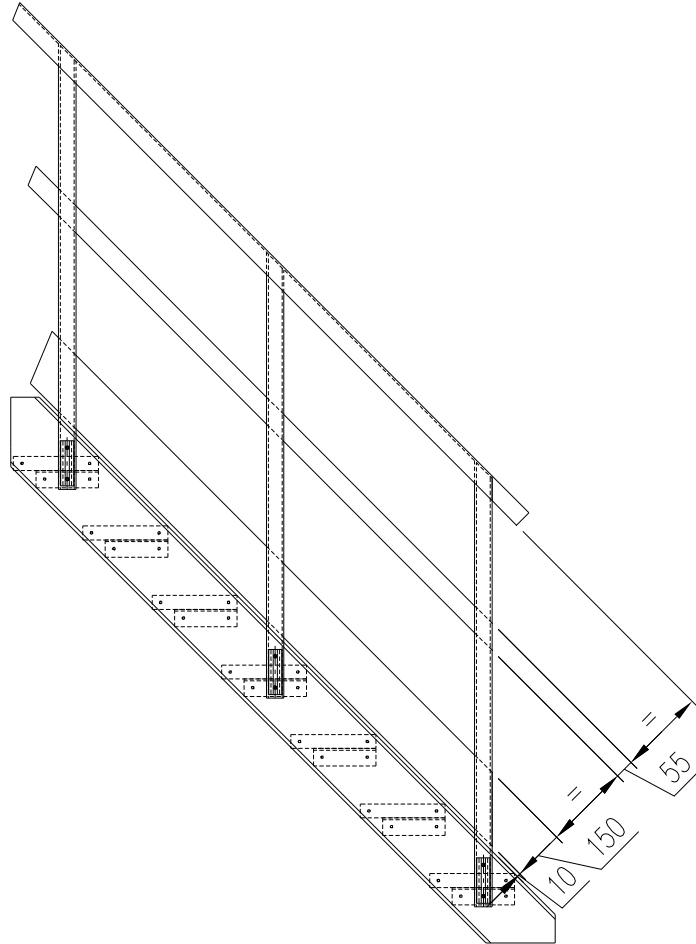
Stairways are designed and built accordingly to the **UNI EN ISO 14122-2-3** norm.

The essential criteria that a design engineer must consider for their construction are listed here below:



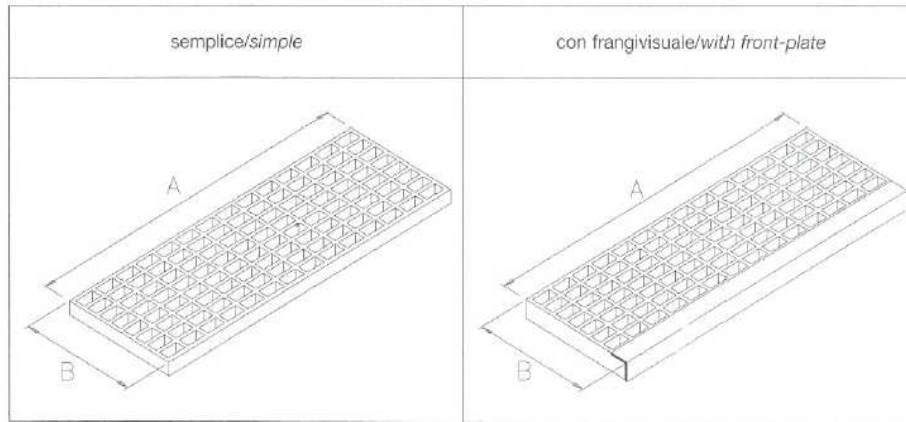
1. slope shall be included between 20° e 45° (30°-40° suggested)
2. going, g , and rise, h , shall meet the formula: $600 \leq g+2h \leq 660$
3. the overlap, r , of the step shall be ≥ 10 mm
4. the clear width of the stair, w , shall be a minimum of 600 mm but preferably 800 mm
5. the vertical height of the handrail shall be at least 900 mm above the walking level
6. the handrail system is not required whenever the height to climb is less than 500 mm
7. if the stair width is greater or equal to 1200 mm, there shall be two handrails

4.1 STAIRWAY DIMENSIONS

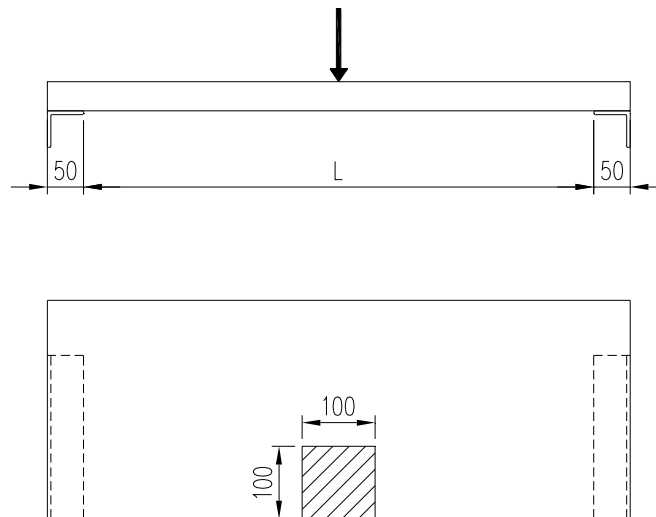


4.2 STANDARD STEPS TABLE

Steps are provided with closed borders on all sides and with our without front-plate.



Every step is supported by a 50 mm wide FRP profile on both sides. The maximum value of the step's clear span L corresponding to an admissible deflection of $1/200 L$ under a punctual load of 150 Kg are shown in the following table. The load is concentrated on a 100×100 mm area in the middle of the step close to the front border, in accordance to the UNI EN 14122-3 norm.



GRATING		MINIMUM DIMENSION GOING B^* (mm)	MAX CLEAR SPAN L (mm)	MAX CONCENTRATED LOAD CORRESPONDING TO A $L/200$ DEFLECTION (Kg)	COLOUR
Type 1	SCH38/38	PLAIN	245	650	Grey
		WITH FRONT-PLATE	245	830	RAL 7004
Type 2	SCH52/40	PLAIN	270	685	Grey
		WITH FRONT-PLATE	270	850	RAL 7004
Type 3	SCH52/52	PLAIN	270	970	Grey
		WITH FRONT-PLATE	270	1200	RAL 7004

* The tolerance of the dimension shown in table is of ± 2 mm.

Shall the steps' dimensions exceed the values shown in the table, M.M.'s Technical Department is available for customized solutions.

All steps are antislip, and reach level R13 V10 in accordance to the DIN 51130 norm.

5. ASSEMBLING INSTRUCTIONS

5.1 STAIRWAY FIXING

S.S. angles, screws, bolts & nuts are used to fix the stairway on the top and the ground (Fig. 1 and 2).

The fixing of the structure to the concrete is made by using standard angles and anchor bolts (Fig.3).

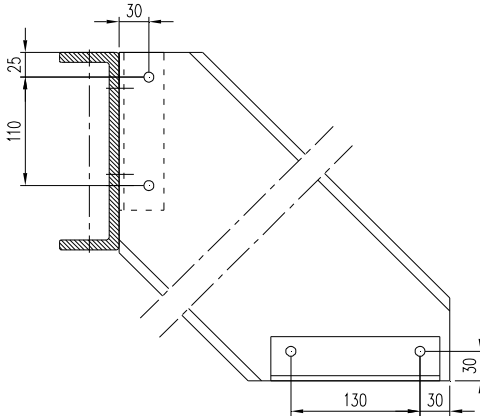


Fig. 1 Stringer fixing to FRP structure

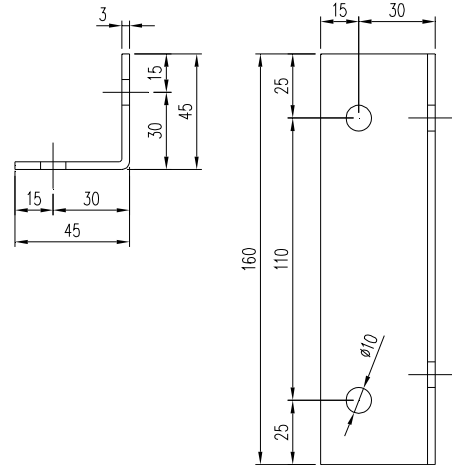


Fig. 2 S.S. angle

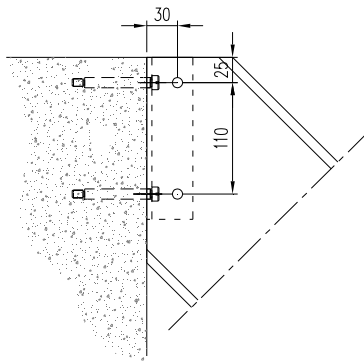


Fig. 3 Stringer fixing to concrete

5.2 STEPS ASSEMBLING

The steps are fastened to the stringers by using S.S. M6 screws and supported by FRP angles, which are fastened as well to the stringers with S.S. M6 screws (Fig.4).

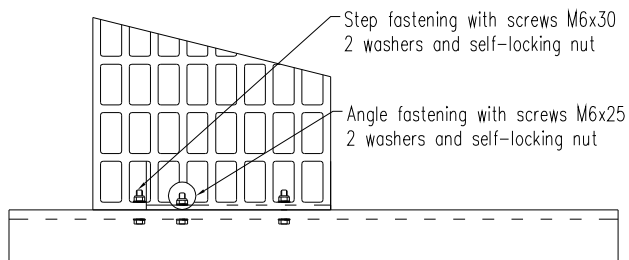


Fig. 4 Step fastening

5.3 HANDRAIL SYSTEM ASSEMBLING

The handrail system, cut accordingly to the stair slope, is fastened to the stringers by fitting a square profile 50x50x5 into the C stringer and screwing them together (Fig. 5 shows a C200 stringer case). Connections are made by S.S. M8 screws. The handrail system can be installed on one or both sides of the stairway.

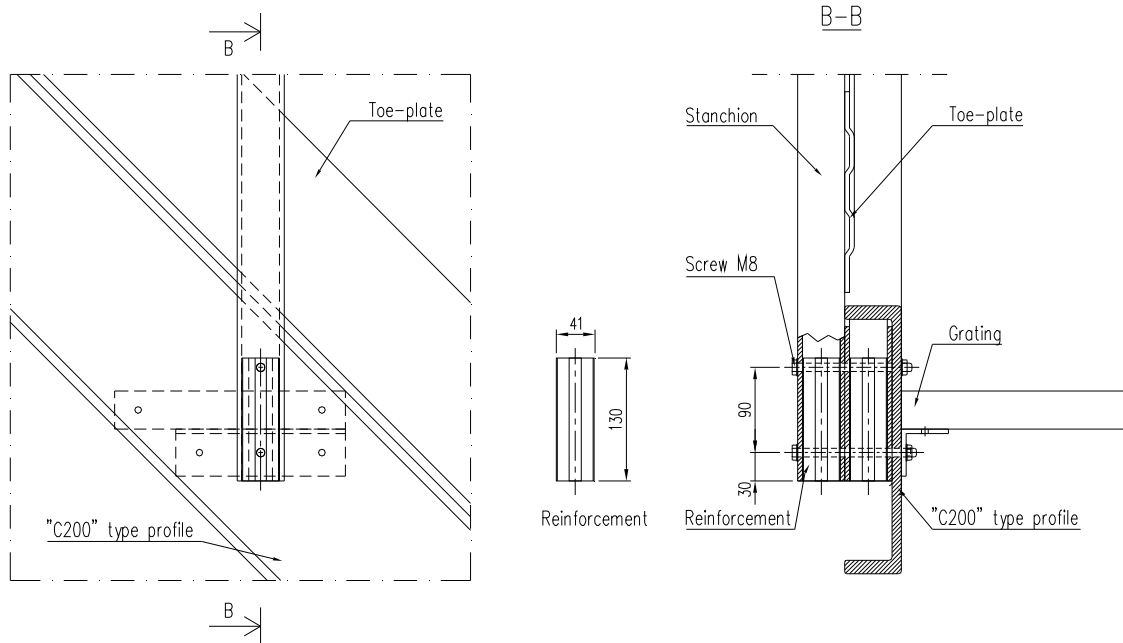


Fig. 5

5.4 FASTENING STRINGERS TO CONCRETE

Whit an alongside wall stairway, the stringer can be fastened to the concrete by using S.S. angles 45x45x170 mm and M8 anchor bolts. (Fig. 6)

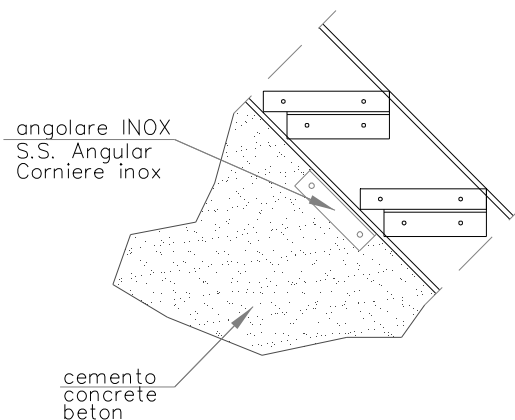


Fig. 6

5.5 STAIRWAY INTERMEDIATE SUPPORTS

If a stairway has an over 4 m span, an intermediate support is required (Fig.7).

These supports can be made of the following profiles:

- C profile mm 300x100 thickness 15 mm
- C profile mm 200x60 thickness 10 mm
- C profile mm 150x45 thickness 8 mm

Support columns can be braced by FRP angles and C profiles:

- L 45x45 mm thickness 5 mm
- L 50x50 mm thickness 5 mm
- L 75x45 mm thickness 8 mm
- C profile mm 90x35 thickness 8 mm

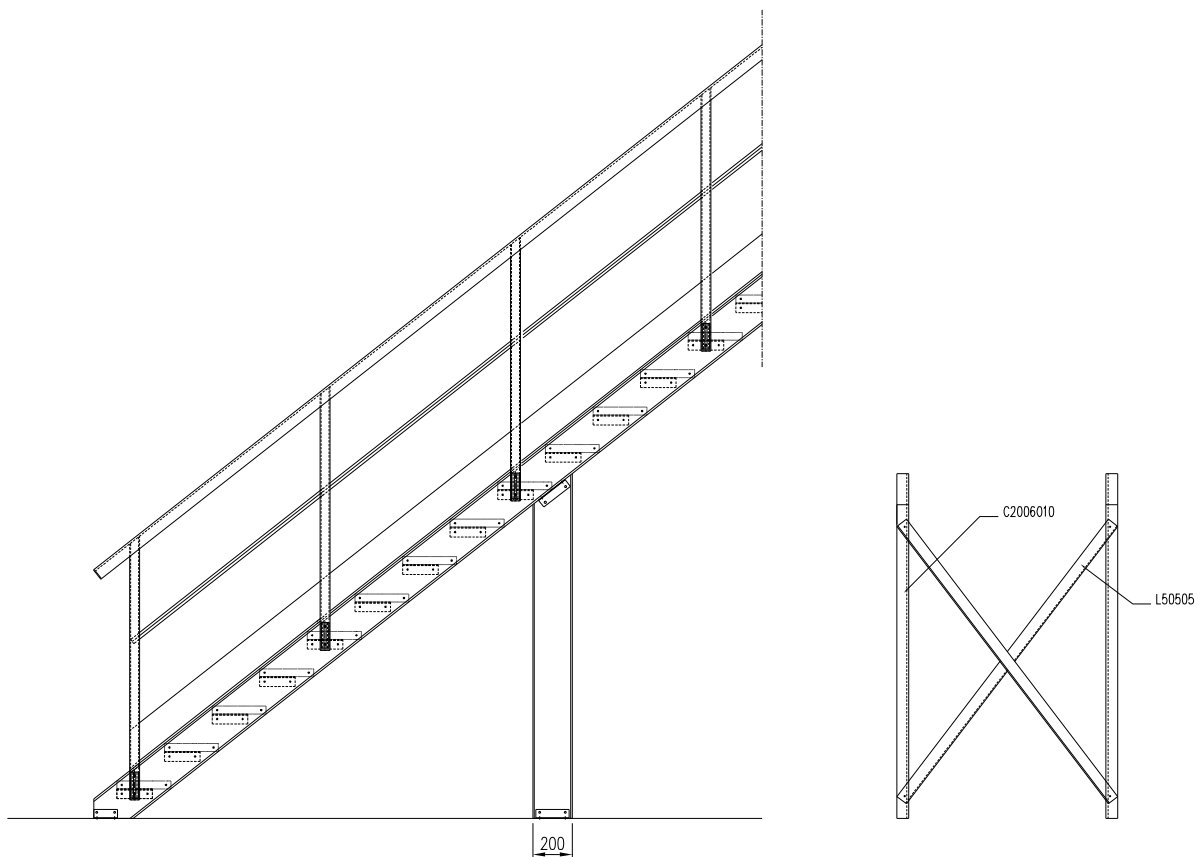


Fig. 7