



**Guardrail T40 4MS2 BP
for
Bridge Parapet**

Containment level H2

Installation Manual & Specifications



Patented

CE
EN 1317

SUMMARY

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GUARDRAIL WOOD & STEEL MODEL « T40 4MS2 BP »

A. GENERAL DESCRIPTION :

The guardrail T 40 4MS2 BP containment level H2 includes :

- HEA 100 steel posts on steel base, height 1080 mm with wood cladding both sides
- steel spacer blocks T40
- 2 meters long steel-backed wooden rails , model T 40 built with 2 superimposed diameter 22 cm half round logs
- main connecting steel fishplates TL 600 joining guardrails at post locations.
- 4 butt straps TL 20 reinforcing TL 600 fishplates
- steel intermediate fishplates TI 600.
- fastener hardware with bolts TRCC (round head) 16-110 et 16-120 connecting wooden rails with embedded U channels
- steel spacer block for handrail
- handrail main connecting fishplate
- handrail intermediate fishplate
- diameter 12 cm half round hand rail 4m long , reinforced with 120x200x3mm, U channel



B. CRASH TESTING & CE CERTIFICATE :

The guardrail **T40 4MS2 BP** has been successfully tested at LIER Laboratory facility (France) according to EN 1317 -1 & 2 , meeting the requirements of containment level H2 (tests TB 51 & TB 11) and is CE marked according to EN 1317-5 :



Association pour la Qualification des Equipements de la Route
165 avenue Aristide Briand 94234 CACHAN - FRANCE
Tel : +33 (0)1 49 08 51 90 www.asquer.fr
Organisme Notifié/Notify Body N° 1826

**Annexe au Certificat de Conformité CE / EC Certificate of Conformity Annex
1826-CPD-09-02-06 du 21 Décembre 2009**

1826-CPD-09-02-06 -DR2 admis le 18 Décembre 2009 T40 4MS2 Bord de Pont

Barrière de pont mixte bois-métal (Support tous les 2 mètres) à utiliser dans les zones de circulation

Mixed wood-steel bridge parapet (posts every 2 metres) to be used in circulation areas

Performances au choc/ performance under impact

- | | |
|--|--------------------|
| a) Niveau de retenue
<i>Containment level</i> | H2 |
| b) Sévérité de choc :
<i>Impact severity level</i> | B |
| c) Largeur de fonctionnement
<i>Working width level</i> | W=1,5m (W5) |
| d) Déflexion dynamique maximale
<i>Maximum Dynamic deflection</i> | Dm=1,3m |

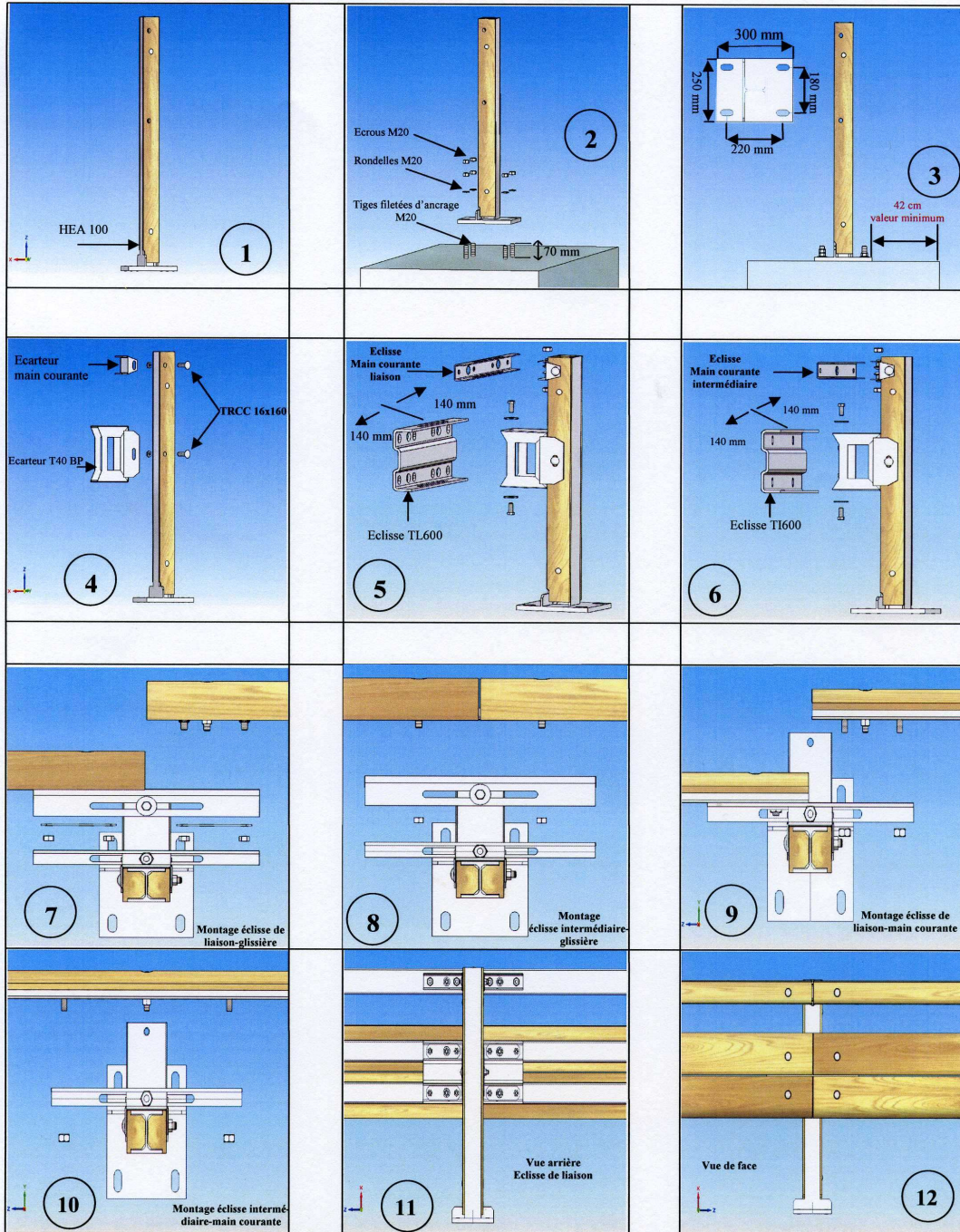
Le Délégué Général de l'ASQUER

Gérard DECHAUMET

C. Working

During impact , the steel posts bend and the rails are detached from the posts thanks to the bolts who break out TL 600 and TI 600 oblong holes .The system breakaway feature allows the rail to form a pocket which captures , guides and directs the vehicle back toward the highway .

D. T 40 4MS2 BP INSTALLATION METHOD



1 – Post installation (figures 1 et 2)

The HEA 100 post on steel base height 1080mm is factory decorated with two timber pieces and shall be installed every 2m on a concrete base with anchor studs according to the following method :

1.1 Post erection (schemes 2 & 3)

1.1.1 Trace and mark M20X220 class 8.8 (ref.12 et 13) anchor bolts position considering a compulsory 42 cm distance between the back side of the steel base and the edge of the concrete base .

1.1.2 Perforate the concrete base with an adapted tooling :

- holes diameter : 24 mm
- holes depth : 155 mm

1.1.3. Use chemical anchors . In all cases , the tangential tension adherence shall be superior at 12,5 N/mm² .

For standard applications , we recommend the following product :

► HOLES DIAMETER 24 mm

HILTI HIT RE 500 ml 1400(2.1 kg) every 40 holes (for 10 posts)

REMARKS :

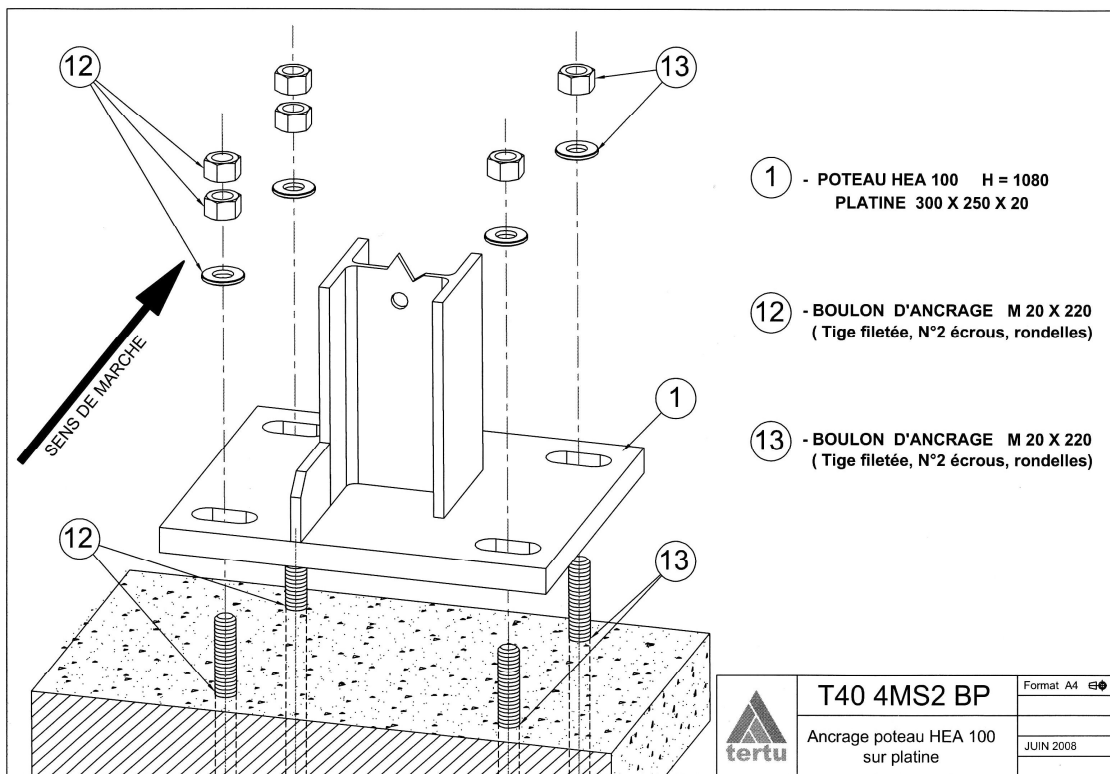
- Others resins types for chemical anchors are admitted as long as a tangential tension adherence shall be superior at 12,5 N/mm² as mentioned above is guaranteed.
- If the temperature is inferior at -5 °C , it is strongly recommend to use adhesive HILTI HVU .

1.1.4. The holes must be filled up with resin .

- Prepare the resin according to provider instructions and safety recommendations as using resin may be dangerous .
- Clean the holes with a compressed air blast and pour the resin . The appropriate functioning of the anchor will be guaranteed by the stud holes complete filling .
- Insert the four anchor studs with a minimum 150 mm depth and check the complete filling of the holes . If not , just dispense more adhesive . As soon as the resin starts to set , washers and M 20 nuts can be installed .
- During installation , it is recommended to carefully maintain studs orthogonal position (see SCHEME below) .

1.1.5. HEA 100 (ref. 1) post must be placed as follows :

- post lowest end is formed by the 300 x 250 x 20 mm steel base with 24 X 50 mm oval holes for introducing anchor bolts . It must be placed as shown in scheme below (« *sens de la marche* » = traffic flow) .
- tolerances : post spacing is 2.00 m + 0 or – 0,05 m .



- anchor nuts M 20 X 220 torque : 150 Nm

2 – Spacers (figure 4)

Steel spacer T40 and handrail spacer are connected to the HEA 100 post with a 16-160 TRCC (round head) and a M16-32 nut .

3– Fishplates (figures 5 & 6)

- 1- Main fishplate TL 600 and intermediate TI 600 are alternatively installed on the spacer with 2 16-40 HEX bolts and 2 XL washers . These fishplates are equipped with oblong openings allowing a very flexible 300 mm adjustment on both post sides .
- 2- Handrail connecting plates (main & intermediate) are alternatively installed on the handrail spacer with 2 TRCO 16-30 bolts + M16 nuts . Head bolts are placed inside the plates who are equipped with oblong openings allowing a very flexible 300 mm adjustment on both post sides .

4 – Installing the rails (figures 7 & 8)

a) Start placing lower rail (flat edge orientated to the top) on main fishplate TL 600 and embed the 2 threaded diameter 16 mm heads in the corresponding lower openings holes of the TL 600 , then place butt strap TL 20 with 2 M16 bolts not tightened

b) To install the rail on intermediate plate TI 600, remove the 2 M16 nuts from the 2 TRCC 16-120 bolts then place those bolts in front of the corresponding lower openings of the TI 600 and put back in place M16 bolts .

c) Same process for superior rail (flat edge orientated to the bottom).

To optimize setting , vertical openings of plates TL 600 and TI 600 allow rails lining up .

After having installing several rails , it is already possible to improve vertical settings while dropping higher points thanks to the spacer oblong hole .

The whole system can be then definitely tightened .

5 – Installing handrail (figures 9 & 10)

a) The handrail is embedded on the handrail main connecting plate with 4 premounted 16-30 TRCO bolts .

b) To install the handrail on intermediate handrail plate , remove the 2 M16 nuts from the 2 TRCO 16-30 bolts then place those bolts in front of the corresponding openings of the intermediate plate and put back in place M16 bolts .

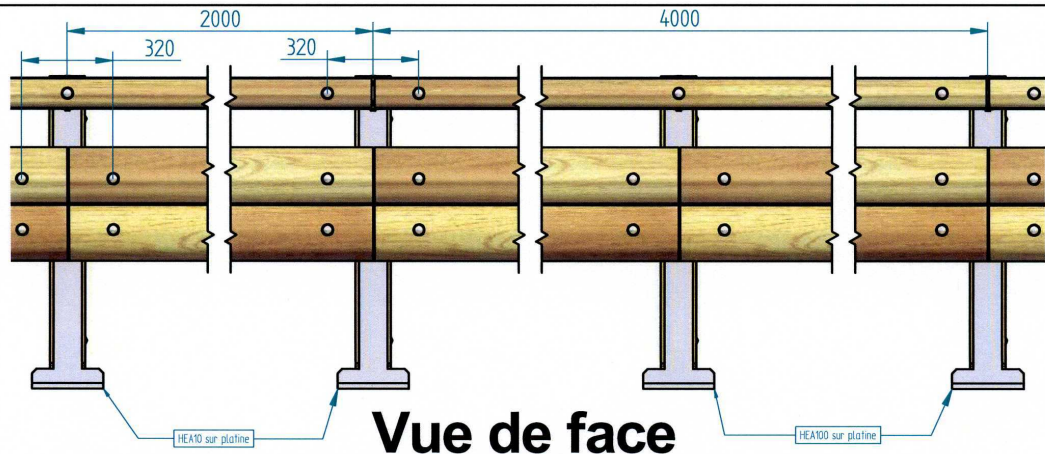
6 – Guardrail height (figures 11 & 12)

a) Values & tolerances for lower rails

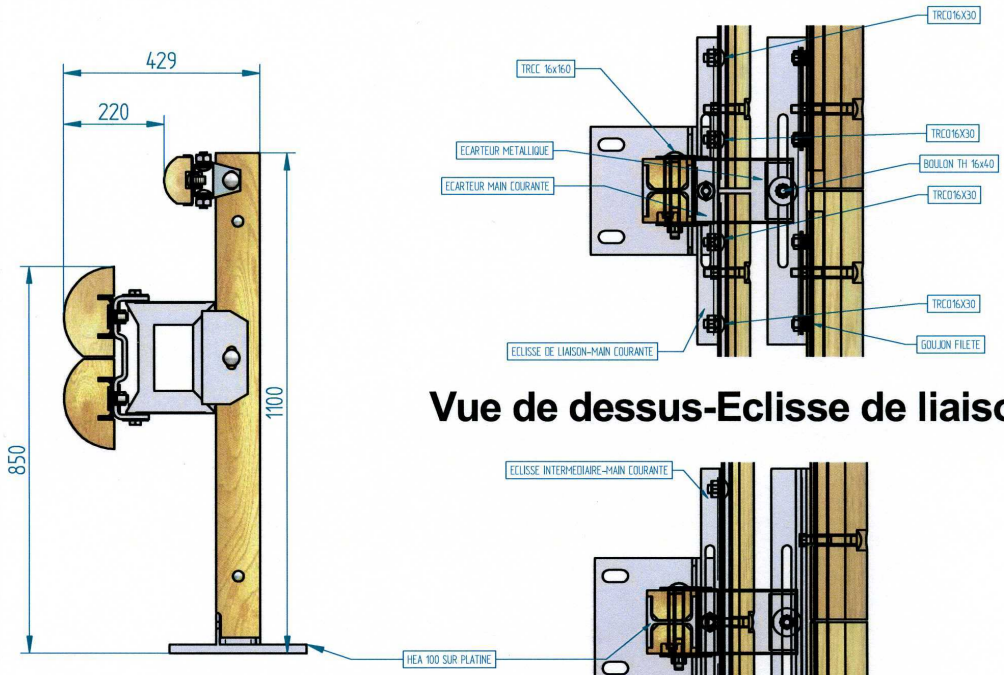
Top edge of the rail shall be 85 cm (+0, -5) high from ground average level measured on a 50 cm stripe ahead the rail .

b) Value & tolerances for the handrail

Top edge of the handrail shall be 110 cm (+0, -5) high from ground average level measured on a 50 cm stripe ahead the rail .




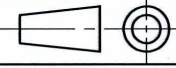
Vue de face

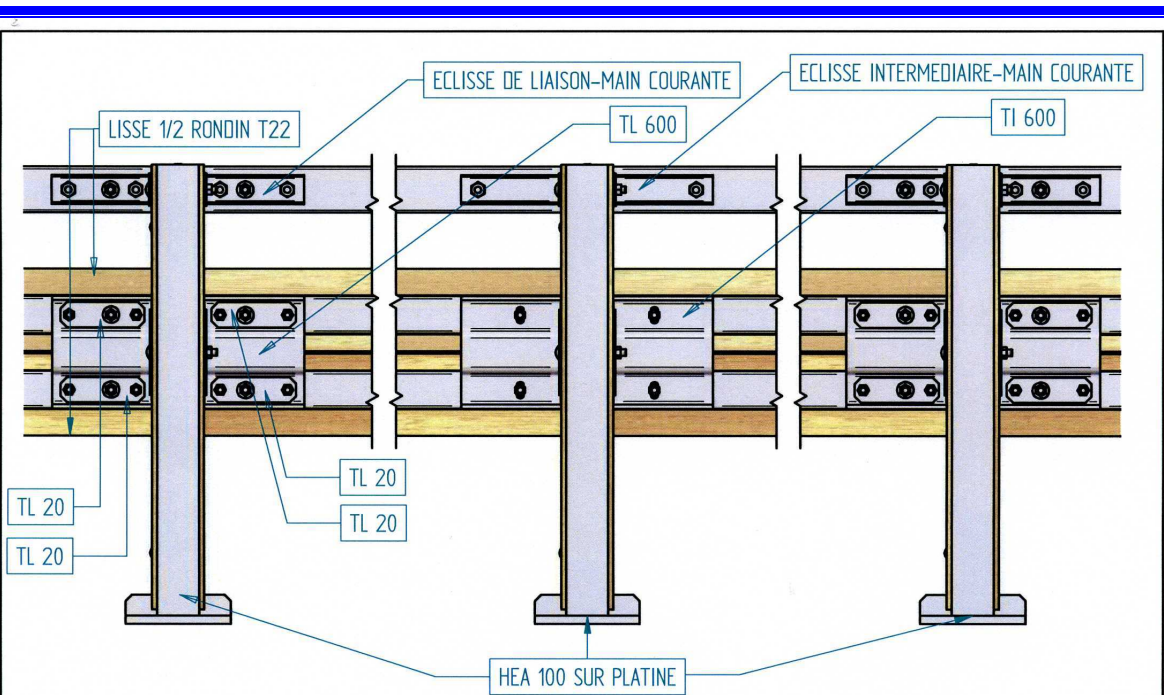


Vue de dessus-Eclisse de liaison

Vue de profil

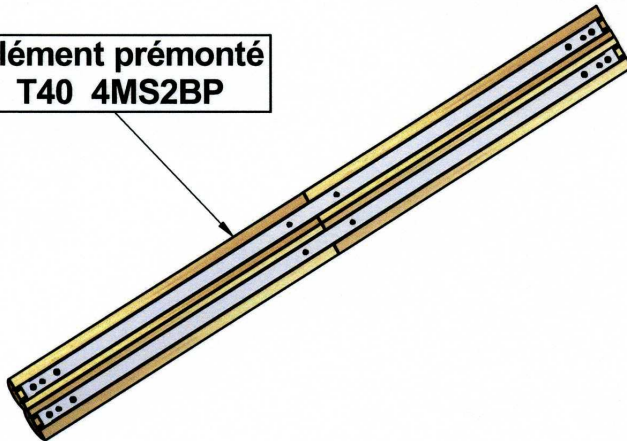
Vue de dessus-Eclisse intermédiaire

Matière :	Date : 26/06/2009	Dessiné par : R.J.
Réf:	Désignation:	
	TERTU	
Masse:	Volume:	
Validé par :	Rév. 1 :	Rév. 2 :
Rév. 3 :	Rév. 4 :	
Dimensions : mm		Feuille : 1

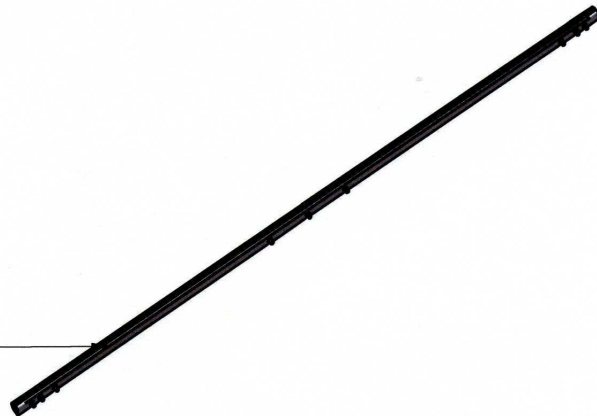


Vue arrière


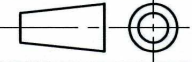
Élément pré-monté
T40 4MS2BP



Élément pré-monté
main courante



T40 4MS2 BP

Matière :	Date : 26/06/2009	Dessiné par : R.J.
Réf:	Désignation:	
	Echelle: Document n°:	
Masse:	Volume:	
Validé par :	Rév. 1 :	Rév. 2 :
	Rév. 3 :	Rév. 4 :
Dimensions : mm		Feuille : 2

E. MINIMAL LENGTH

To insure correct anchoring , it is strongly recommended to install a 60 meters minimum length .

F. COMPONENTS

Components listing & description

- STEEL POSTS – HEA 100 on steel base , height 1080 mm with bolted wooden cladding both sides .
- STEEL SPACERS - TE 40
- RAILS MODEL- T40/4MS2,
- Built with 2 half round logs diameter 22 cm ,backed with a steel U channel factory bolted into place with 2 bolts set at each rail section (see view above “ élément prémonté” T40 4MS2 BP)
- CONNECTING FISHPLATE - TL 600, is a press-broke steel 270 x 10 in 600 mm length with 12 vertical and 2 horizontal oblong holes , allowing easy settings during installation .
- FISHPLATE - TL 20 (butt straps) , structural steel 60 x 4 in 200 mm length .
- INTERMEDIATE FISHPLATE - TI 600, is a press-broke steel 270 x 10 in 600 mm length with 4 vertical and 2 oblong holes , allowing easy settings during installation
- HANDRAIL CONNECTING PLATE TL600 MC : steel U channel 600x70x4mm with 8 oblong holes
- HANDRAIL INTERMEDIATE PLATE TI 600 MC : steel U channel 600x70x40x4mm with 5 oblong holes
- HARDWARE for INSTALLATION : 16 x 160 HEX bolts + washers -16 x 40 HEX bolts + plates 45 x 45 mm – Nuts M16.

Nom de la pièce	Echelle: 1:20 - 1:10 - 1:5 - 1:2	
Fer en U 30x30x5 en 3920mm		
Demi-rondin en 1,99 M droit		
Demi-rondin en 1,99M gauche		
HEA 100		
Bois poteau T40 BP droit		
Bois poteau T40 BP gauche		
Lisse main courante en 3990 mm		
Eclisse TL600 et TI600		
Eclisse TL20		
Ecarteur T40 et Ecarteur main courante		
TRCC (M10 et M16) TH M16x40 +Ecroû		
Rondelles		
Goujon et TRCO (16x30)		

Matière :	Date :	Dessiné par : R.J.
Ref :	Designation :	
	TERTU	
Echelle :	Document n° :	
Masse :	Volume :	
Validé par :	Rév 1 :	Rév 2 :
Rév 3 :	Rév 4 :	
Dimensions : mm		Feuille : 4

G. MATERIALS

a) WOOD

Species for the rails and posts cladding shall be Scots pine (pinus sylvestris) , Douglas pine , Spruce and Larch .

Technical qualities :

The minimum qualities required are the following :

- growth ring shall be 10 mm wide, measured on five sequential rings at one end of wood component,
- maximum diameter of knots measured perpendicularly to the generating line should not exceed 7 cm in the running parts, 3 cm in the last 35 cm to the end of the wood component,
- wood components shall not have evidence of fungi or insect decay,
- moisture content after treatment and drying shall not exceed 20%.

Mechanical properties :

- for the rail components , minimum Modulus of Elasticity E shall be 7580 Mpa and minimum Allowable Bending Stress Fb shall be 4.65 Mpa,
- for spacers, minimum Modulus of Elasticity shall be 6985 Mpa and Modulus of Rupture MOR shall be 48,925 or greater.

Preserving treatment :

Wood components rails and wooden cladding shall have a preserving treatment corresponding to classes 3B for Douglas fir or 4 for Scots pine of European norm EN 335 for biological contamination with preservation products defined by the European norm EN 599.

Wooden components recycling

Pressure treatment in autoclave with Wolmanit CX-10 (preservation product defined in European norm EN 599) is Chromium and Arsenic free . T 40 BP wooden components are naturally RECYCLABLE .

b) STEEL

- **All the metal parts, except the fasteners**, are steel. All steel components shall be fit for hot -dip galvanizing (EN ISO 1461) and its mechanical characteristics are at least equal to the steel quality S 235 JR, as defined in the European norm EN 10025.

- **Steel posts** : HEA 100 on steel base

- **The metal for fasteners** is defined as follows :

- the screw bolts shall be of quality 5.6,

- the screw nuts shall be of quality 5,

The quality class is defined by French norm NF E 27 005.

- **Protection against the corrosion**

All steel components (included fasteners) should be protected against corrosion by hot ---dip galvanization according as per standard specification EN ISO 1461.

H - DIMENSIONS AND TOLERANCES

All the sizes and tolerances of the drawings are in millimetres, even when not specified.

a) For wood components (measured at 20% of humidity)

- diameter 22 cm (-0, +0.5 cm)
 - length of the wood 399 cm (+or -0.5 cm)
 - rectitude : admitted tolerance is of 1% of the maximum length
 - gap or space between rail sections at the joints shall be 1cm
- The quality class is defined by French norm NF EN 27 005.

b) For steel components

- holes (+ or -0.5 mm)
- center to center distances (+ or -2 mm)
- length of steel reinforcing components (+ or -5 mm)

I. MANUFACTURER IDENTIFICATION MARKING

Every steel component shall be marked by the manufacturer stamp , the Certificate of Conformity and batch numbers as well as CE and Tertu logos .

J. BILL OF MATERIALS

Item	Code	Description (all dimensions mm)
Steel Post	HEA 100 BP	Post HEA 100 on steel base height 1080 Steel base 300x250x20 + reinforcement 75x50 in 8 mm Pre bolted wooden cladding with 2 TRCC 10X120 + washer 4 anchor bolts M20x220
Steel spacer block	TE 40	Spacer 245 x 125 x 267 – 1 TRCC 16x160 + M16 washer
2 Lisses modèle T	T22/ 4MS2	Diam 220 length 4000 including : - 1 U channel 90 x 30 x 5, length 3920 - 4 factory mounted bolts on U channel - 2 half round logs , length 1998 drilled with two holes -2 TRCC 16x120 + 2 TRCC 16x110
1 Handrail T	T12 4m	Diameter 120 , length 4000 - 1 U channel 110 x 20x 3, length 3990 - 6 factory mounted HEX bolts 16-40 on U channel 1 half round log diameter 120 , length 3990 drilled with 3 holes and bolted to U Channel with 3 TRCC 16x80 bolts
Connecting main fishplate	TL600	Press breaked steel 270 x 10, length 600 with 14 oblong holes
Butt strap	TL20	Structural steel 60 x 4, length 200
Intermediate fishplate	TI600	Press break steel 270 x 10, length 600 with 6 oblong holes
Handrail connecting fishplate	TL600 MC	U channel 600 x 70x40x4 with 8 oblong holes
Handrail intermediate fishplate	TI 600MC	U channel 600x70x40x4mm with 5 oblong holes
Handrail spacer	TE 40 MC	
Bolts		
TRCC (round head) →	M16x 160 M16x120 M16x110 M16 x 80 M10 x 120	Class 5.8 Class 5.8 Class 5.8 Classe 4.6 Classe 4.6
TRCO (round head) →	M 16x 30	Classe 5.8
TH (hexagonal head) →	M16x40	Classe 5.8
ANCHOR BOLTS →	M20X200	Classe 8.8
Nut	M16	



APRIL 2010