FOOTBRIDGES

A Manual for Construction at Community and District Level

SUPPLEMENT B:

Manufacture of a Modular Steel Truss Footbridge

Prepared for the

DFID **Department for International Development, UK.**

by

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Consultants in Transport for Development

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SUPPLEMENT B

CONSTRUCTION OF MODULAR STEEL TRUSS FOOTBRIDGE

B1 INTRODUCTION

The Manual contains the design details of a steel truss footbridge for spans of 10 to 20m. Two standard widths are included, 1.4m and 2.1m. However, the design can readily be adapted to other widths by changing the width of the base panels.

The design is made up of modules formed by bolting together 2 side panels and a base panel. The construction of the panels is the same for all footbridge sizes but with changes in the lengths and widths (heights) of panels and some changes in section sizes.

This Appendix contains step-by-step instructions for construction of a footbridge with working drawings for manufacture of all the components

In order to cover the range of footbridge sizes the overall dimensions are given in terms of the – Modular Length (ML); Modular Height (H); and Modular Width (W). These dimensions are obtained from Tables B1 and B2.

Brackets are provided on the drawings for the construction supervisor to fill in the specific dimensions for the workshop technicians.

Panels and Modules have to be bolted together on site to assemble the footbridge. It is therefore **very important** that a systematic approach is used in construction to ensure that panels fit together without problems. The following instructions are important.

MANUFACTURING NOTES:

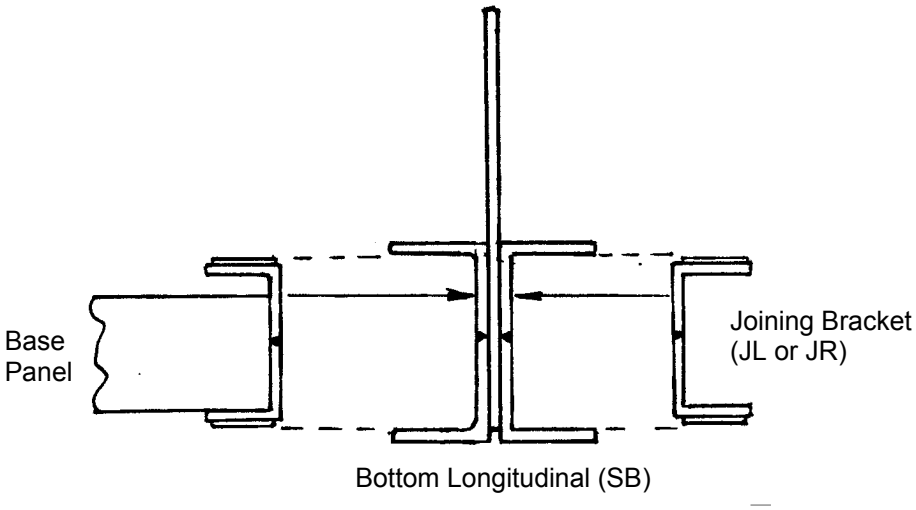
1. **In the manufacture of the panels described below, ALL bolt holes must be drilled BEFORE the panels are assembled and welded. Joining parts must be clamped together for drilling to ensure holes line up.**

2. **All members should be clearly marked using the panel index from Figure B1 and the assembly drawings. This should ensure that panels match up and bolt together without problems. Marking should be with weld deposit or punch as chalk or paint may rub off.**

3. **The Joining Brackets (JL and JR) and the Longitudinals of the Base Panels (BL) have to fit inside the Base Longitudinals of the End Panels (EB) and Side Panels (SB) as shown below. Check this is satisfactory before welding. Leave gaps of 1 or 2mm between the angles for EB and SB and weld in the gap**

1. **Welding of the panels MUST be carried out using an assembly jig and MUST be done in sequence starting from the Left or Right Hand end of the bridge. Joining members MUST be bolted together during the welding up of the panels to make sure holes line up when the footbridge is being assembled.**

2. The strength of the footbridge depends on the joints of the panels being <u>fully</u> and <u>properly</u> welded. Make sure all joints are fully welded all round with good penetration of the welds. Note in particular that angle sections (verticals and diagonals) must be welded both to the gussets at the joints <u>and also to the joining channels or angles</u>.



The Joining Brackets and Base Panels must fit inside the channels of the Bottom Longitudinals so that the faces bolt together without gaps

Construction Details of Footbridge

The guidelines for construction of a footbridge are presented as follows:

Figure B1: Details of Footbridge Modules
Figure B2: Assembly of Panels
Table B1: Numbers and Lengths of Modules needed for Range of Spans

STAGE 1: ***Construction of Side Panel Members***
Figure B3: Details of Side Panel Members
Table B2: Parts List for Side Panel
Figure B4: Manufacture of Side Panel Members (Sheets 1, 2 and 3)

STAGE 2: ***Construction of End Panel Members***
Figure B5: Details of End Panel Members
Table B3: Parts List for End Panel
Figure B6: Manufacture of End Panel Members (Sheets 1 and 2)

STAGE 3: ***Construction of Base Panel Members***
Figure B7: Details of Base Panel Members
Table B4: Parts List for Base Panel
Figure B8: Manufacture of Base Panel Members

STAGE 4: ***Drilling of joining members***

Figure B9: Manufacture of Joining Bracket and Drilling Template
Figure B10: Drilling Template for Verticals and Base Panel Cross-Members
Figure B11: Drilling Procedure

STAGE 5: ***Assembly and Welding Procedure***
Figure B12: Construction of Assembly Jig
Figure B13: Assembly and Welding Procedure (Sheets 1, 2 and 3)

STAGE 6: ***Assembly and Testing of Footbridge***

STAGE 7: ***Fitting the Decking***

B2: DETAILS OF FOOTBRIDGE MODULES

Figure B1: Shows the arrangement of modules

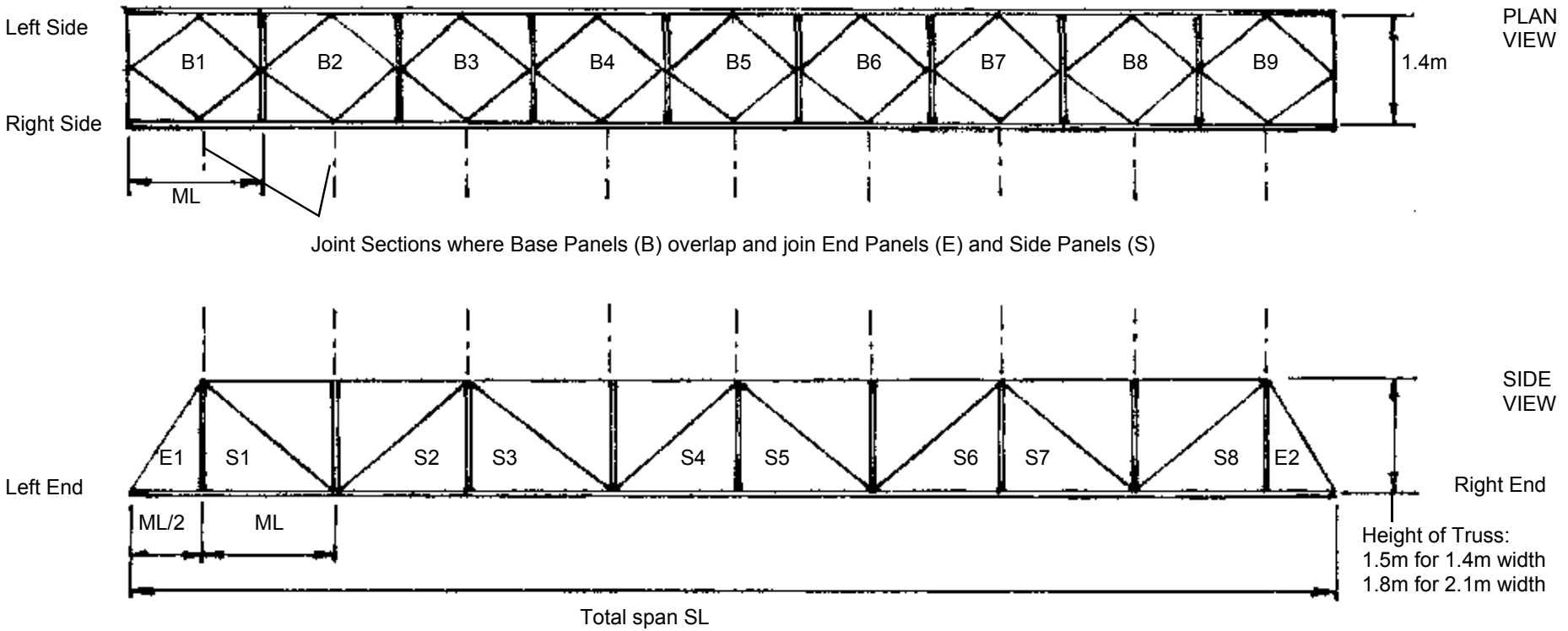
Figure B2: Shows how the panels are bolted together to form and join the modules

Table B1: Gives the number and lengths of the modules for the range of bridge spans in approximately 1m intervals. Note that the number of Side Panels always has to be EVEN for symmetry. The length of the End Panels is half that of the Side Panels.

Therefore Module Length ML =Bridge Length/(Number of Side Panels +1)

Table B1: Numbers and Lengths of Modules for the Range of Spans

Span (m)	Number of Side Panels/Side	Number of Base Panels	Length of Module (ML) m	Length of End Modules m
10	4	5	2.0	1.0
11	6	7	1.6	0.8
12	6	7	1.7	0.85
13	6	7	1.9	0.95
14	6	7	2.0	1.0
15	6	9	1.7	0.85
16	8	9	1.8	0.9
17	8	9	1.9	0.95
18	8	9	2.0	1.0
19	10	11	1.7	0.85
20	10	11	1.8	0.9



Panels Needed: End Panels (E) - 2 Left Side, 2 Right Side

Side Panels (S) - Even number; Note half have diagonal Top Left to Bottom Right
And half have diagonal Bottom Left to Top Right

Base Panels (B) - Number of side panels + 1

Note: The drawing shows 8 Side Panels. The actual number needed depends on the span, see Table B1.

Figure B1: Details of Modular Design

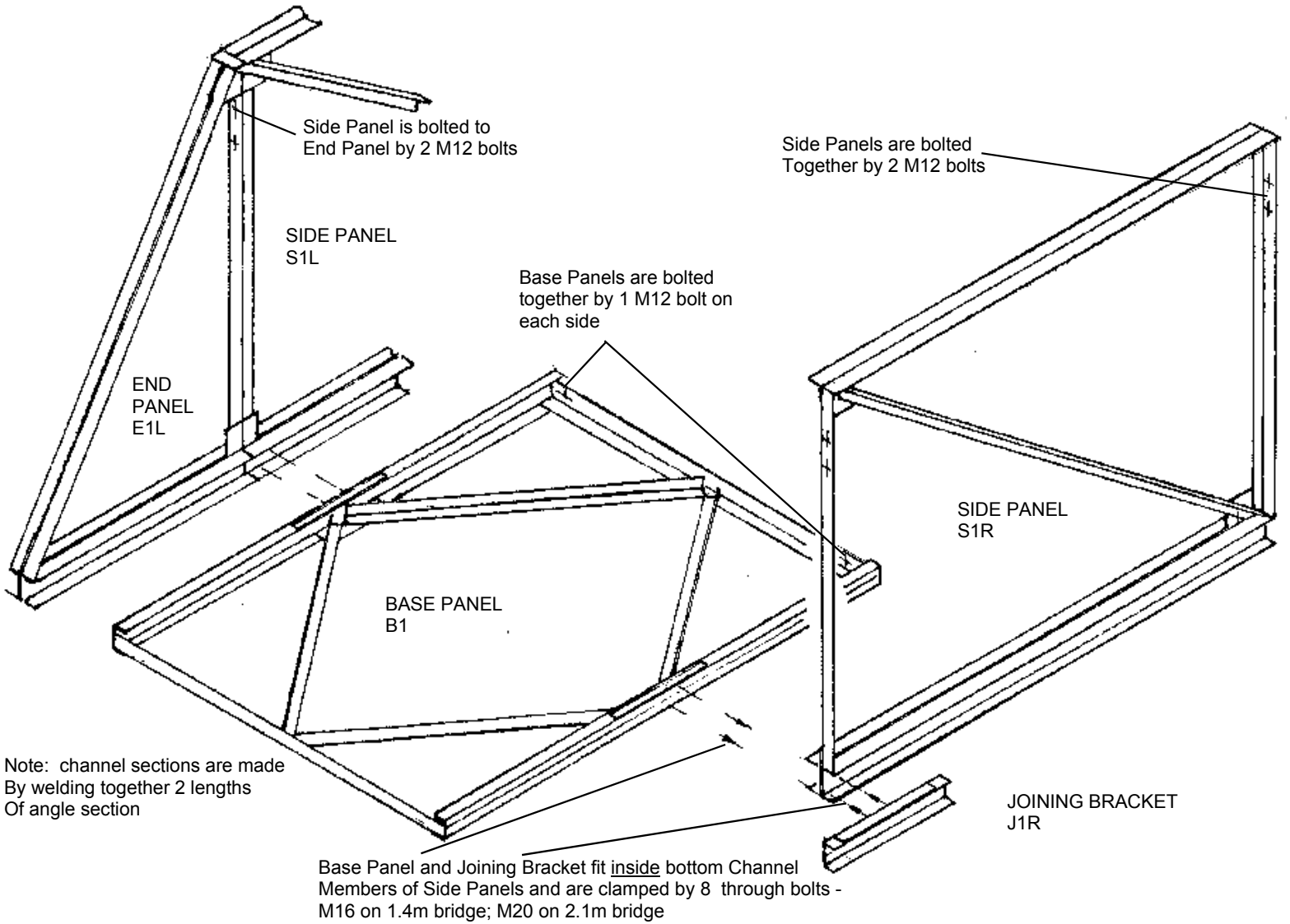


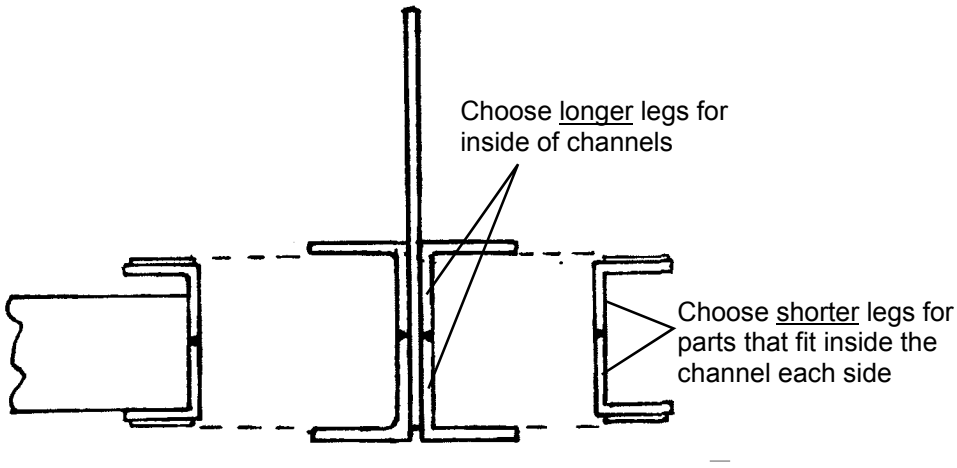
Figure B2: Details of Geometry and Assembly of Panels

B3: CONSTRUCTION DETAILS OF FOOTBRIDGE

Note:

Remember the Joining Brackets (JL and JR) and the Base Panel longitudinals (BL) have to fit inside the Side Panel longitudinals (SB) and End Panel longitudinals (EB). All these members are channel sections formed by welding 2 pieces of angle section together. Note that Joining Brackets and Base Panel longitudinals also have 3mm thick reinforcing strips welded on top and bottom.

Since the dimensions of angle section may vary slightly and may not be equal it is important to orientate the angle as shown in the sketch below and to check that the members fit together as specified.



If legs of angle are unequal, position them so they help in fitting the channels together

STAGE 1: Construction of Side Panel

Figure B3: Shows details of the Side Panel assembly and members. Note that on each side of the bridge half the Side Panels will have diagonals sloping from Top Left to Bottom Right and half Bottom Left to Top Right.

Table B2: Gives the materials list for a Side panel.

Table B2: Materials List for Side Panels (*per panel*)

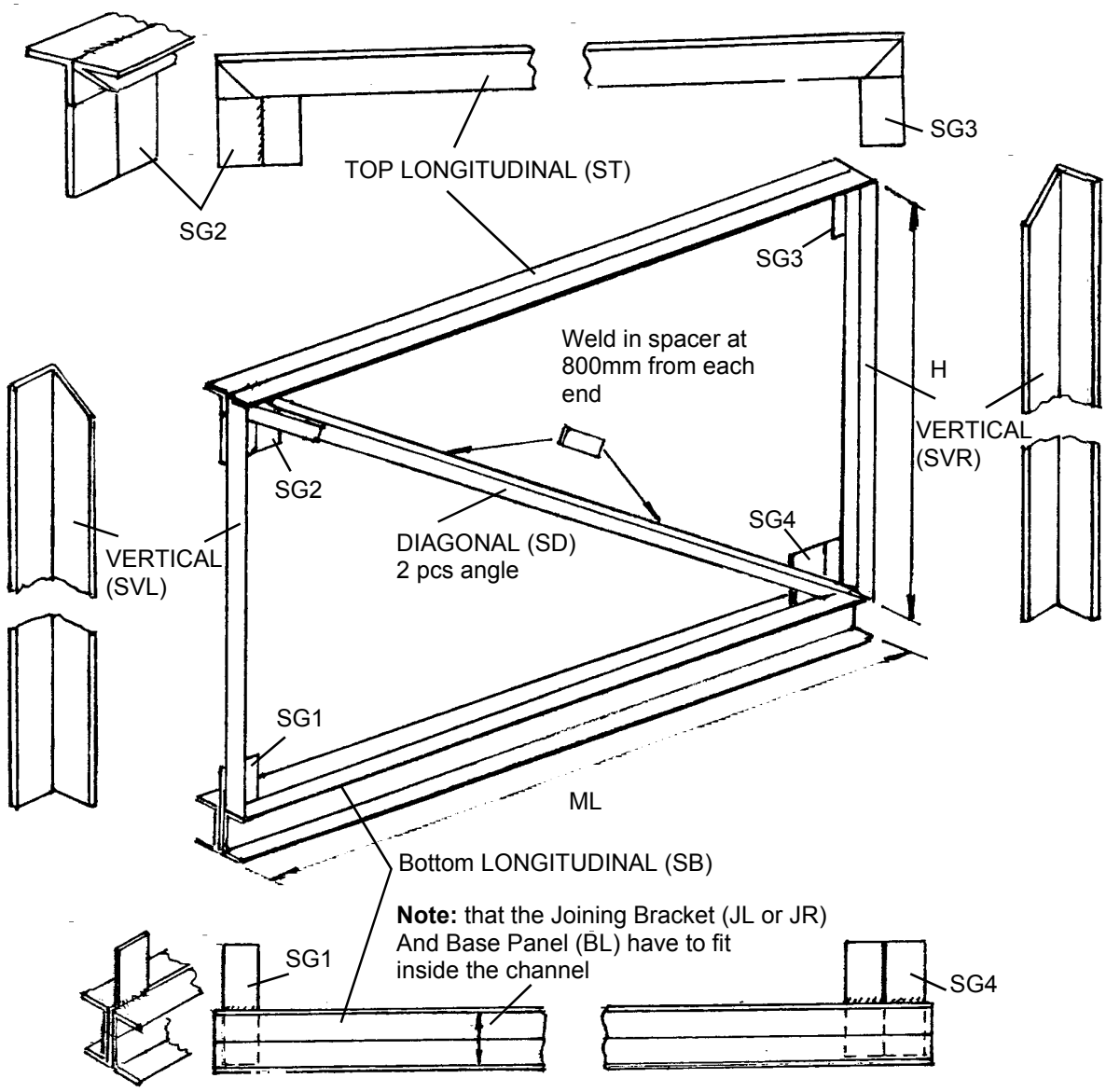
Member	Materials for 1.4m wide Footbridge			Materials for 2.1m wide Footbridge		
	Section	**Length**	**Number**	**Section**	**Length**	**Number**
Bottom Longitudinals (SB)	50x50x6mm angle	ML	4	60x60x6mm angle	ML	4
Top Longitudinals (ST)	60x60x6mm angle	(ML–12)mm (2)	2	60x60x6mm angle	(ML–12)mm (2)	2
Verticals (SL & SR)	50x50x6mm angle	1,450mm	2	50x50x6mm angle	1,750mm	2
Diagonals (SD) (1)	50x50x6mm angle	Measure and fit	2	50x50x6mm angle	Measure and fit	2
Gusset SG1	60x6 flat bar	220mm	1	60x6 flat bar	240mm	1
Gusset SG2	60x6 flat bar	120mm	2	60x6 flat bar	120mm	1
Gusset SG3	60x6 flat bar	120mm	1	60x6 flat bar	120mm	1
Gusset SG4	60x6 flat bar	220mm	2	60x6 flat bar	240mm	1
Spacer SS	60x6 flat bar	40mm	2	60x6 flat bar	40mm	2

Notes: (1) The outside of the panel should be welded up first and then the required length of the diagonals measured. The approximate lengths for material requirements are:

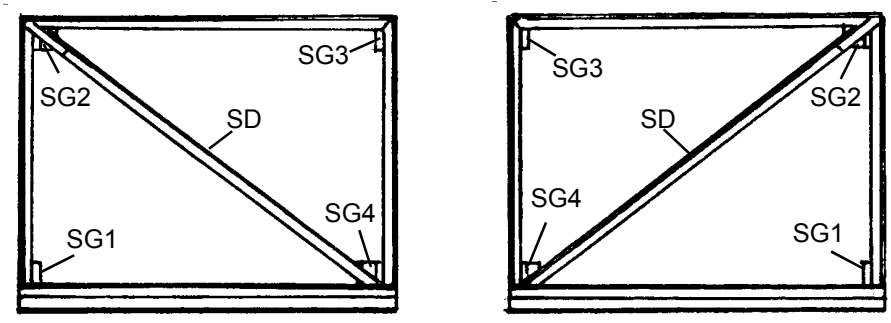
1.4m wide bridge – 2.23m for ML= 1.7m, to 2.48m for ML = 2.0m
2.1m wide bridge – 2.45m for ML = 1.7m, to 2.66m for ML =2.0m

(2) The length is 2 thicknesses of angle (2 x 6mm) less than ML to allow for the Vertical members at each end.

Figure B4: Gives instructions for the manufacture of the members of the Side Panel. Note that drilling is carried out in STAGE 4 and assembly and welding in STAGE 5.



Note:
The number of Side Panels needed is given in Table B1. Half will have diagonals Sloping from top left to bottom right (Type A) and half bottom left to top right (Type B) as shown below



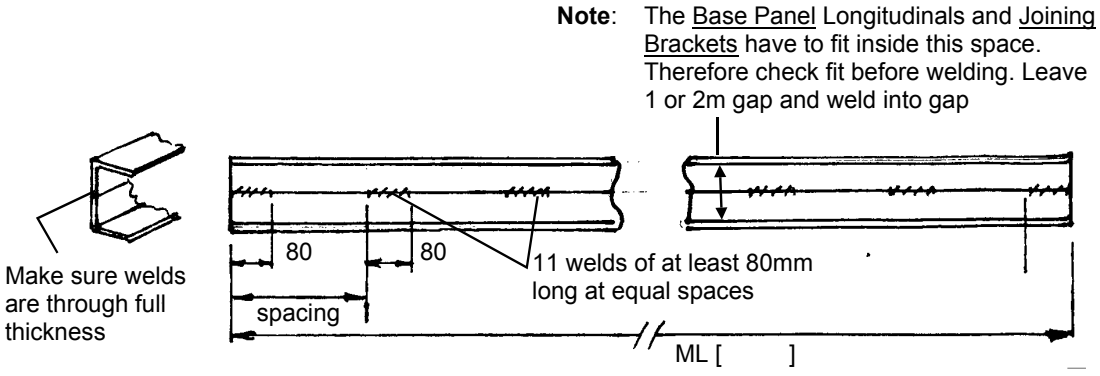
Side Panel A Side Panel B

Side Views from OUTSIDE Bridge

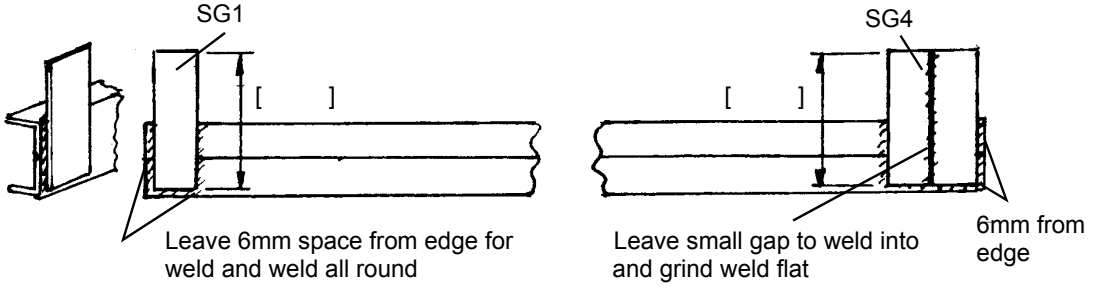
Figure B3: Details of Construction of Side Panel

1. Bottom Longitudinal (SB)
(Note: half as shown (A) and half with Gussets SG2 and SG3 reversed (b))

1.1 Cut 2 pcs angle (see Table B2) x ML long and stitch weld together to form channel section



1.2 Weld on Gussets from 60 x 6mm flat bar



1.3 Make up second channel as in 1.1 (this has no gussets attached)

1.4 Clamp second channel accurately in position to gussets of first and weld at gussets

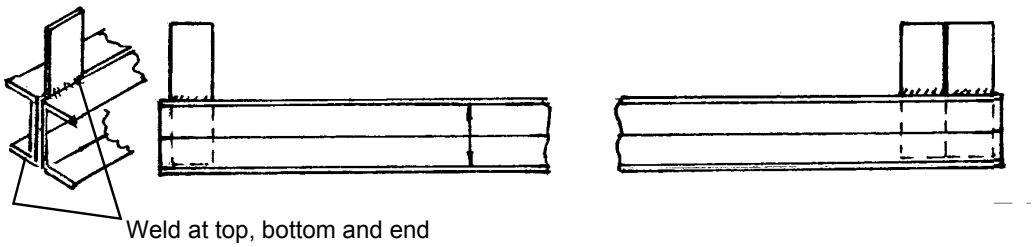
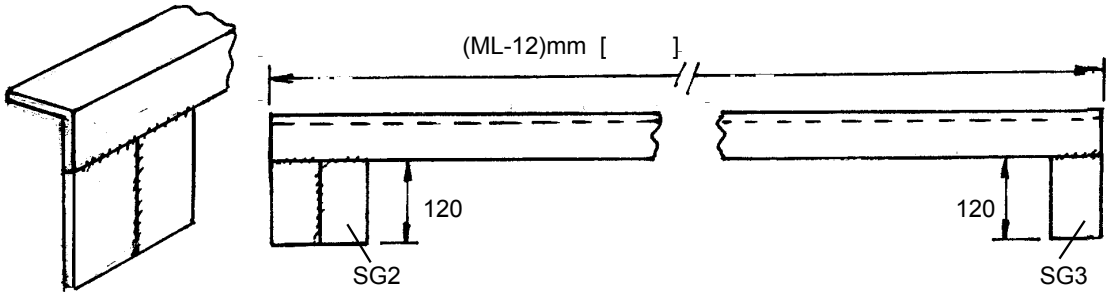


Figure B4 (Sheet 1): Manufacture of Members for Side Panels

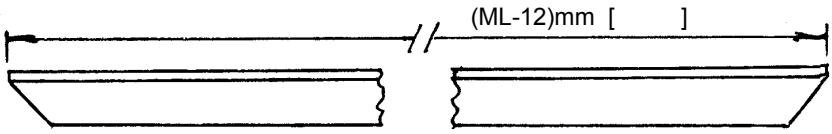
2. Top Longitudinal (ST)

2.1 Cut length of 60 x 60 x 6 angle of length (ML-12)mm

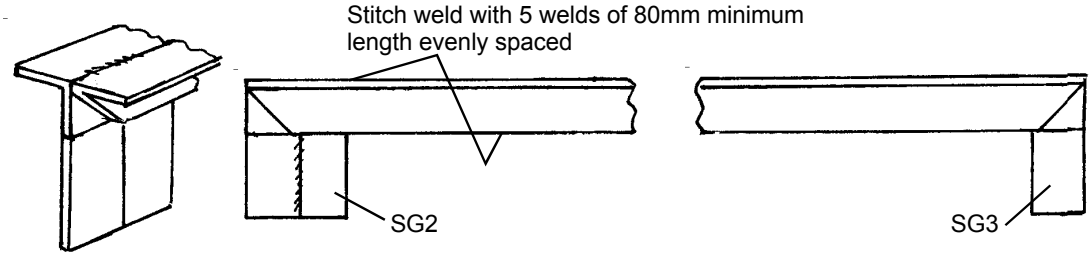
Weld on gussets cut from 60 x 6mm flat bar



2.2 Cut second pc 60 x 60 x 6mm angle with 45° angles at each end for mitre joints with verticals.



2.3 Weld angle sections together along top and bottom joints.



3. Vertical members (SVL and SVR)

3.1 Cut 2 pcs 50 x 50 x 6mm angle to length H (see Table B2). Cut top end at 45° angle for Mitre joints with Top Longitudinal

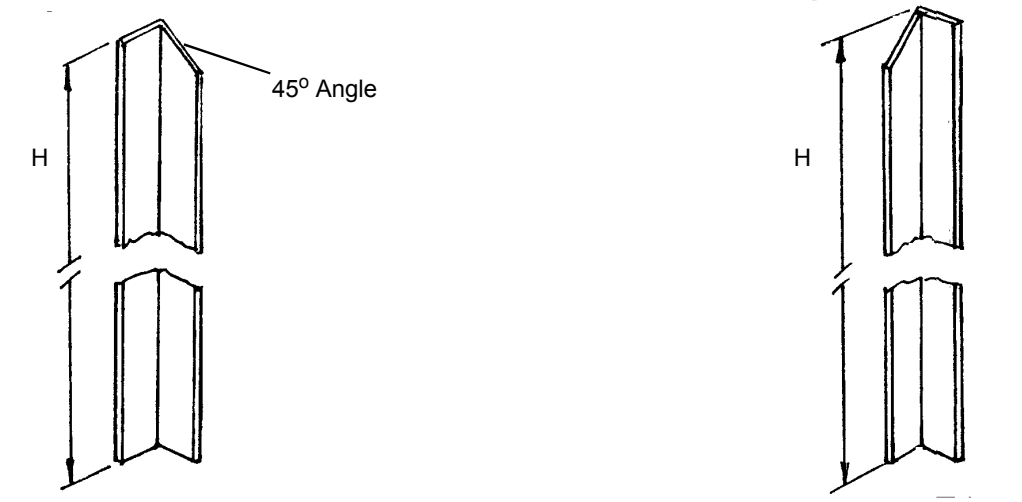
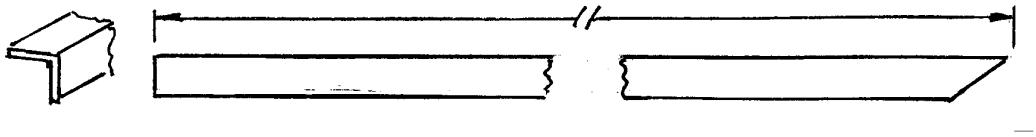


Figure B4 (Sheet 2): Manufacture of Members for Side Panels

4. Diagonal (SD) (Cut when panels are being assembled and welded in Stage 5)

4.1 Weld up outside frame of Side Panel and measure length of diagonal. Cut pc 50 x 50 x6mm angle for deck side of panel for full length of diagonal.



4.2 Cut pc 50 x 50 x 6mm angle for Outside of panel. This is a little shorter than first pc since it fits on Gusset SG2 and buts up against the edges of the angles of the Top Longitudinal (SV) and Vertical (SV). Cut short length of 40 x 40 x 6mm angle to make up the full length into the corner joint..

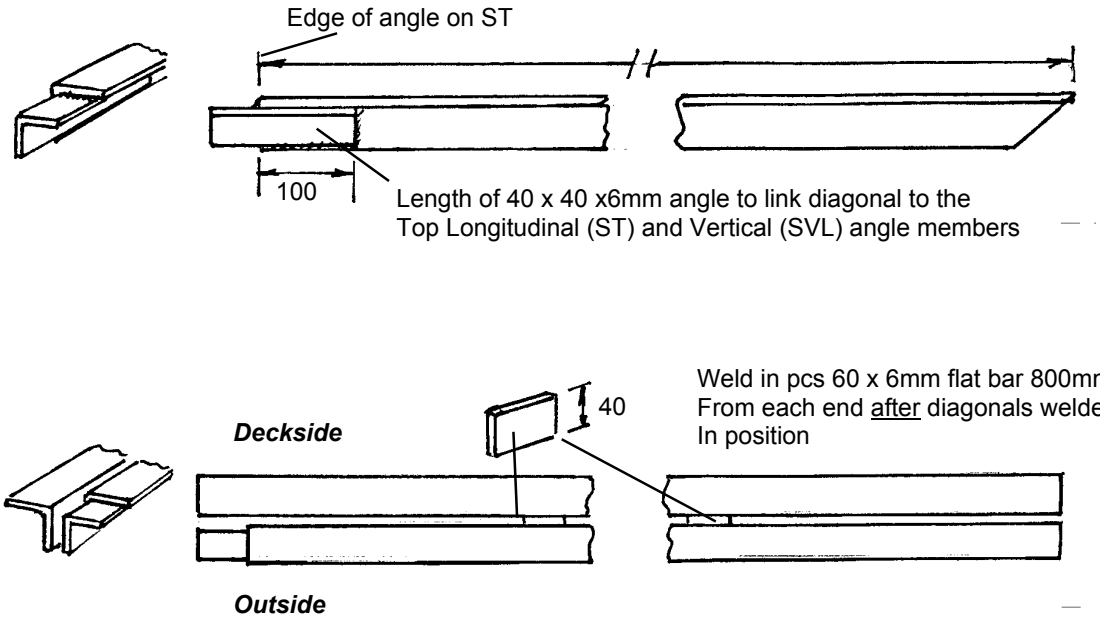


Figure B4 (Sheet 3): Manufacture of members for Side Panels

STAGE 2: Construction of End Panel

Figure B5: Shows the details of the End Panel assembly and members. Note that there are 4 End Panels. 2 have diagonals sloping bottom left to top right and 2 have bottom right to top left.

Table B3: Gives the materials list for an end panel.

Table B3: Materials List for End Panel (*Single panel*)

Member	1.4m Wide Footbridge			2.1m Wide Footbridge		
	Section	Length	Number	Section	Length	Number
Bottom Longitudinals (EB)	50x50x6mm angle	ML/2	4	60x60x6mm angle	ML/2	4
Vertical (EV)	50x50x6mm angle	1,450mm	1	50x50x6mm angle	1,750mm	1
Diagonal (ED)	50x50x6mm angle	Measure and fit (1)	2	60x60x6mm angle	Measure and fit	2
Gusset EG1	60x6 flat bar	210mm	1	60x6 flat bar	240mm	1
Gusset EG2	60x6 flat bar	260mm	1	60x6 flat bar	300mm	1
Gusset EG3	60x6 flat bar	220mm	2	60x6 flat bar	220mm	2
Gusset EG4	60x6 flat bar	180mm	1	60x6 flat bar	200mm	1

Note: (1) Weld the Vertical to the Base Longitudinal then measure up and cut the Diagonal to fit neatly into position. The approximate lengths for material requirements are:

1.4m footbridge – 1.68m for ML=1.7m to 1.77m for ML=2m
2.1m footbridge – 1.95m for ML= 1.7m to 2.02m for ML = 2m

Figure B6: Shows details of the manufacture of the End Panel members.

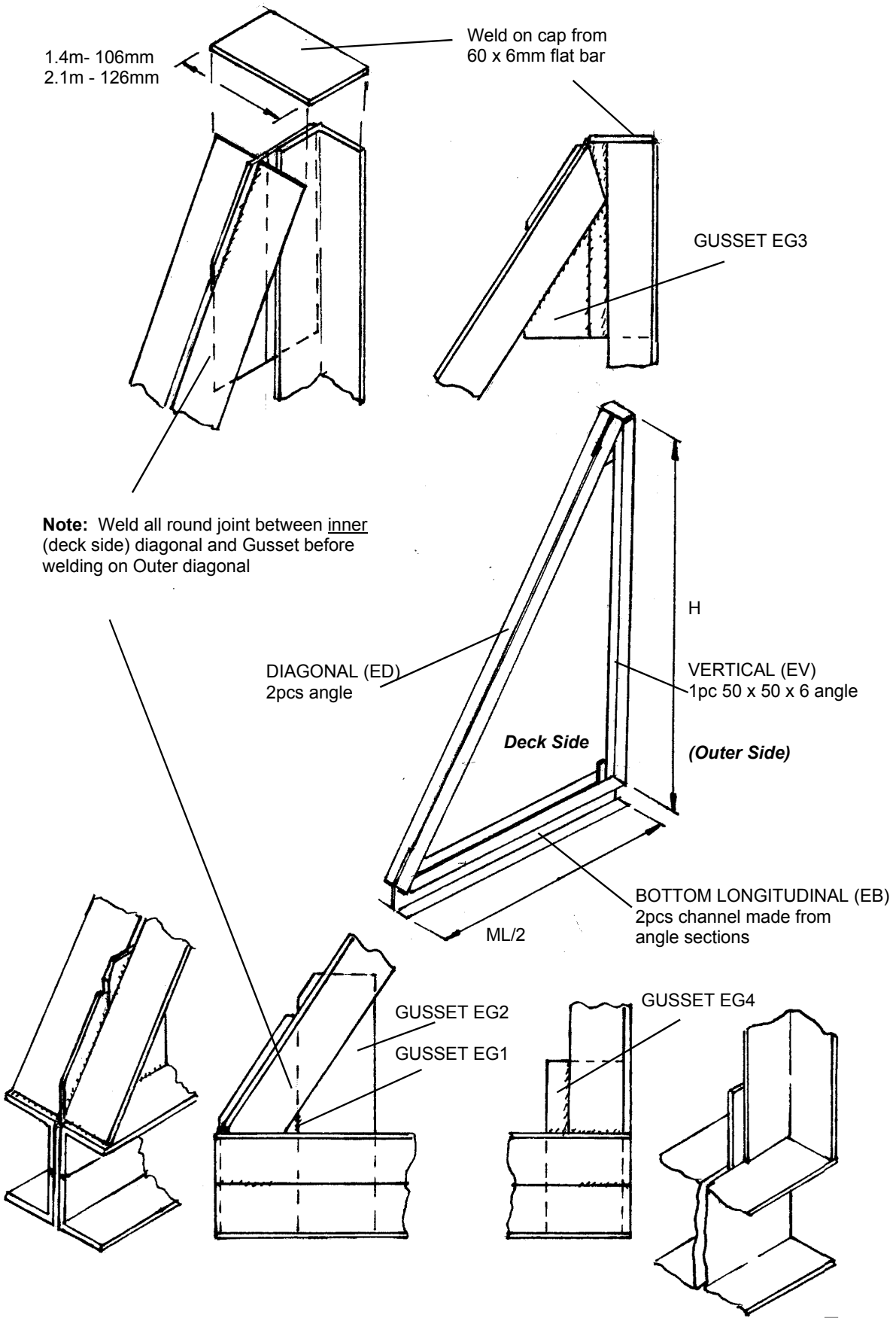
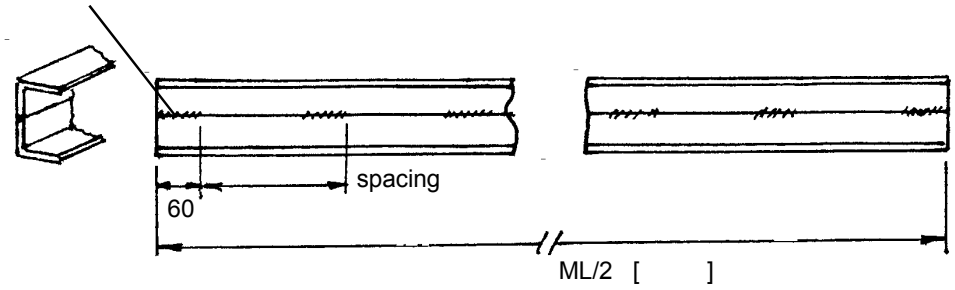


Figure B5: Details of Construction of End Panel (see Table B3 for materials)

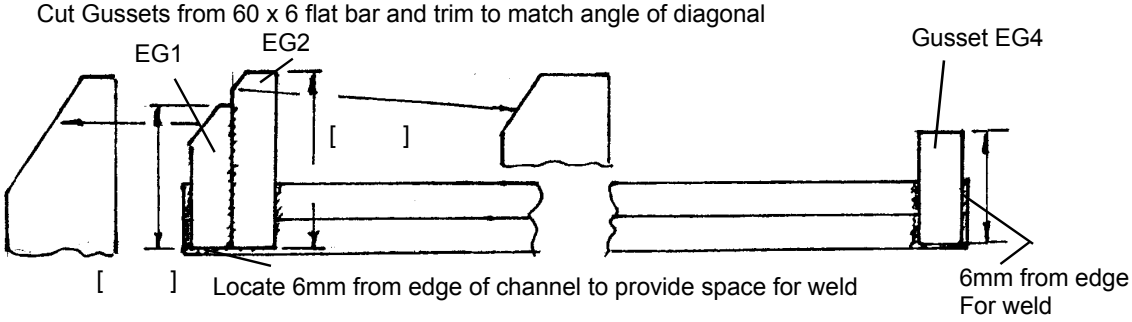
End Panel Members

1. ***Base longitudinal (EB)*** - 2 pcs channel made from angle sections (see Table B3)

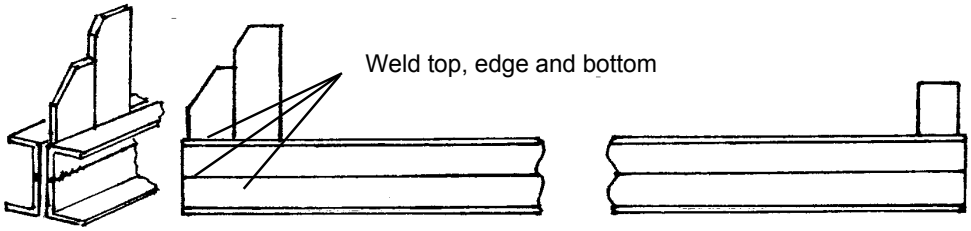
1.1 Cut 2 pcs angle x ML/2 (see Table B1) long and stitch weld to form channel. 8 welds at least 60mm long at equal spacing. Leave gap of 1 to 2mm between angle pieces to weld into



1.2 Cut Gussets from 60 x 6 flat bar and trim to match angle of diagonal



1.3 Make up second length of channel section as in 1.1 (this has NO gussets). Position accurately and weld to gusset plates



2. ***Diagonal (ED)*** - 2 pcs angle (see Table B3). Measure and cut to length during assembly (Stage 5)

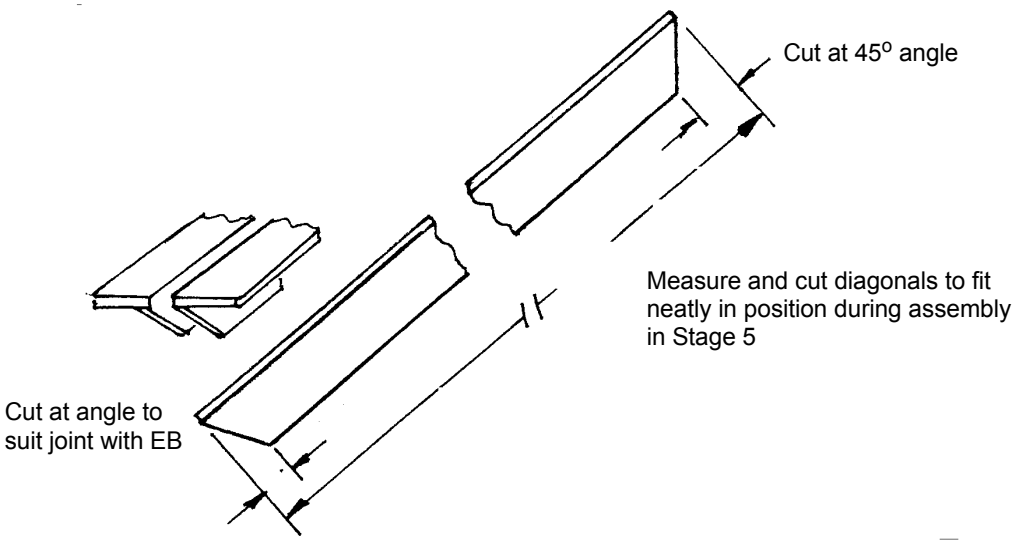
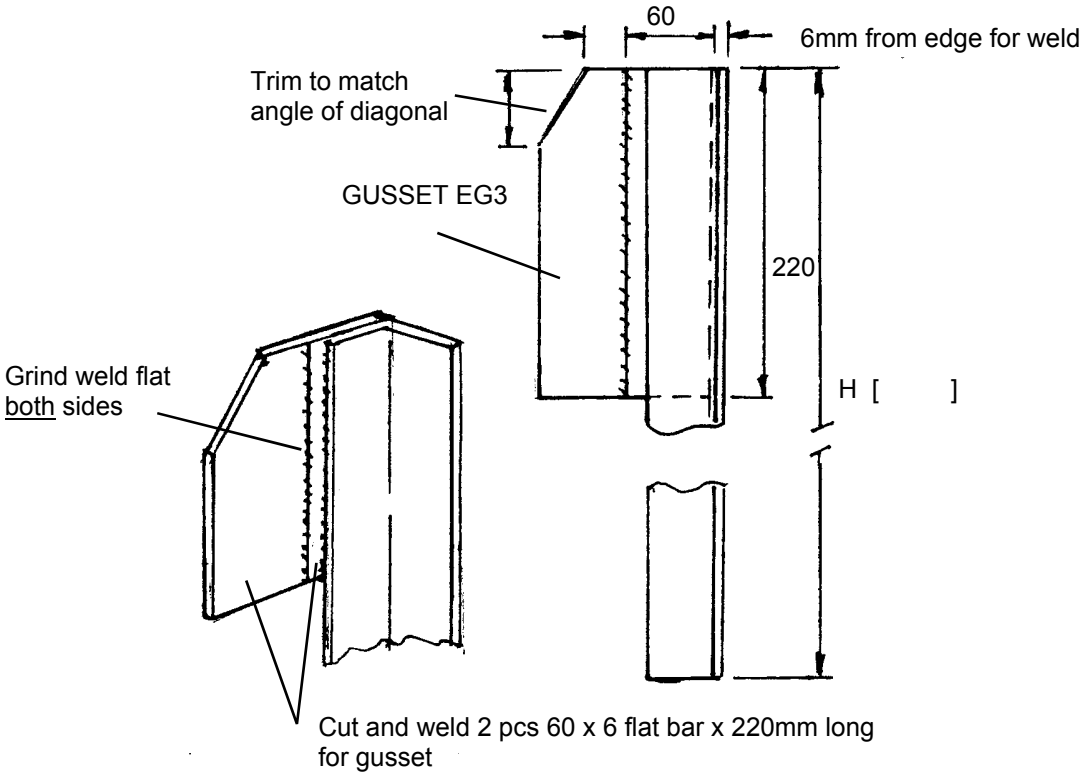


Figure B6 (Sheet 1): Members for End Panel

3. ***Vertical (EV) -*** 1 pc 50 x 50 x 6mm angle

3.1 Cut pc of angle of length H (see Table B3)

3.2 Cut 2 pcs of 60 x 6 flat for Gusset EG3 and weld in position



Note: A LH and RH Vertical are needed for each End Panel as shown below

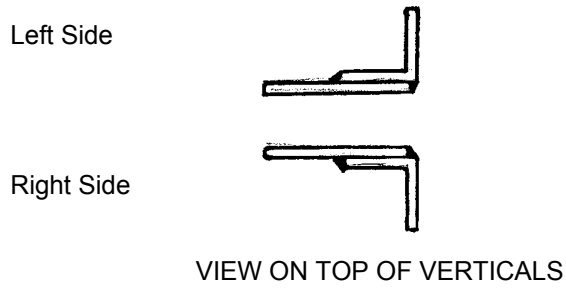


Figure B6 (Sheet 2): Members for End Panel

STAGE 3: Construction of Base Panel

Figure B7: Shows the details of the Base Panel assembly and members. The length of the Panel (ML) is obtained from Table B1 and the width from Table B4.

Table B4: Gives the materials list for a Base Panel

Table B4: Materials List for Base Panel (*Single Panel*)

Member	1.4m Wide Footbridge			2.1m Wide Footbridge		
	Section	Length	Number	Section	Length	Number
Bottom Longitudinals (BL)	40x40x6mm angle	ML	4	50x50x6mm angle	ML	4
Stiffeners for longitudinal	30x3 flat bar	500mm	4	40x3 flat bar	500mm	4
Diagonals (BD)	50x50x6mm angle	Measure and fit (1)	4	60x60x6mm angle	Measure and fit	2
Cross members (BC)	60x60x6mm angle	1,486mm	2	60x60x6mm angle	2,186mm	2
Gusset BG1	60x6 flat bar	200mm	2	60x6 flat bar	200mm	2

Note: (1) Weld the outside of the panel, longitudinals and cross members, then measure and cut the diagonals to fit. The approximate lengths for material requirements are:

1.4m footbridge – 1.1m for ML = 1.7m to 1.3m for ML = 2.0m
2.1m footbridge – 1.3m for ML = 1.7m to 1.5m for ML = 2.0m

Figure B8: Shows the details of the manufacture of the members of the Base Panel.

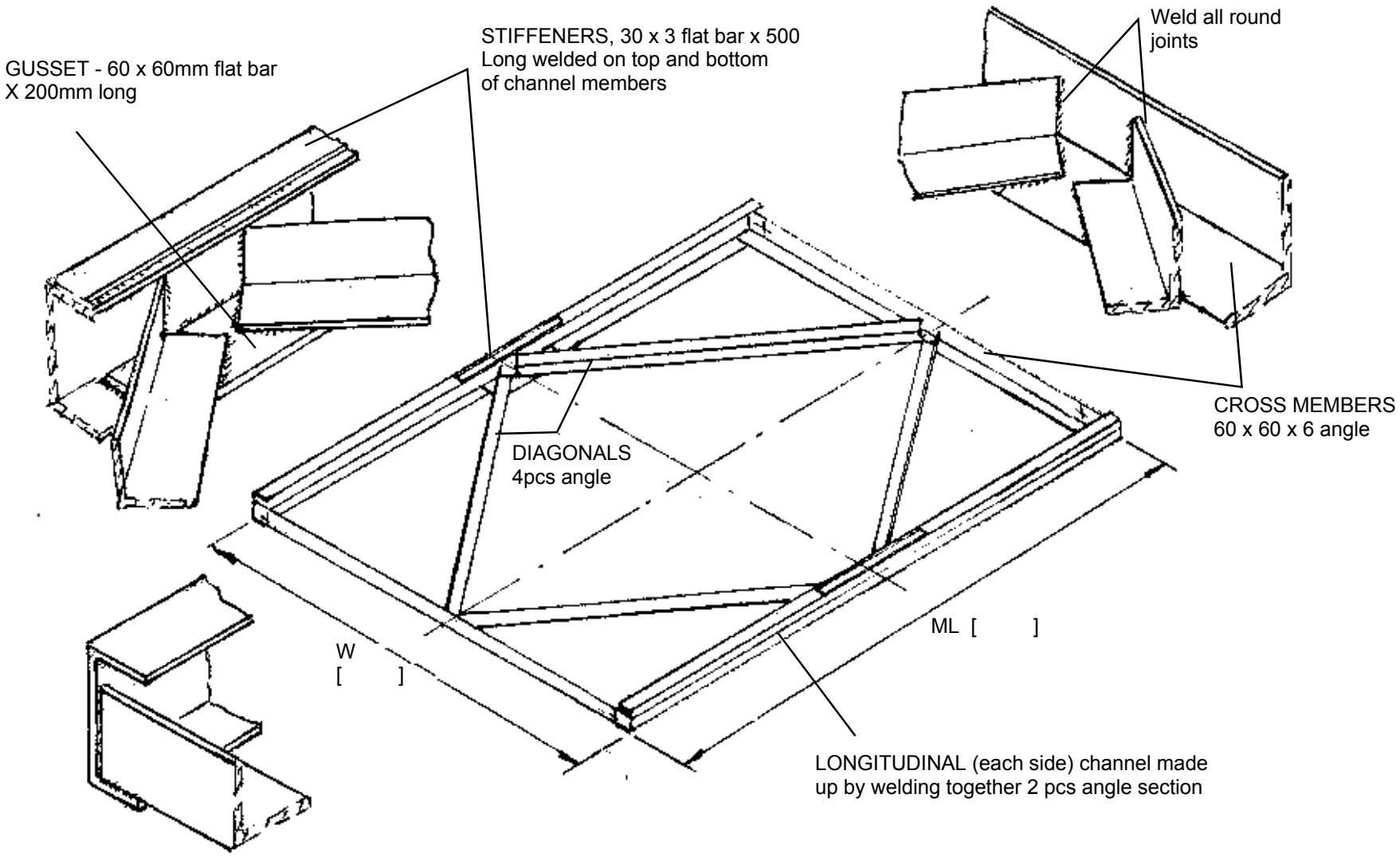
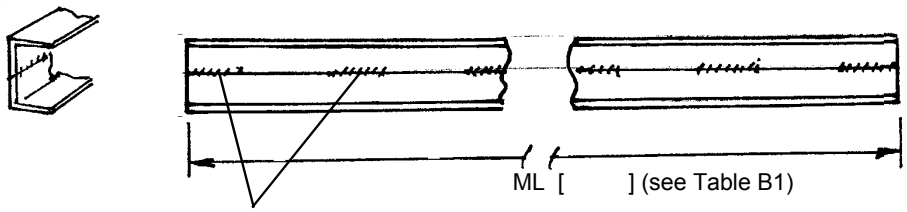


Figure B7: Details of Base Frame

Base Frame Members

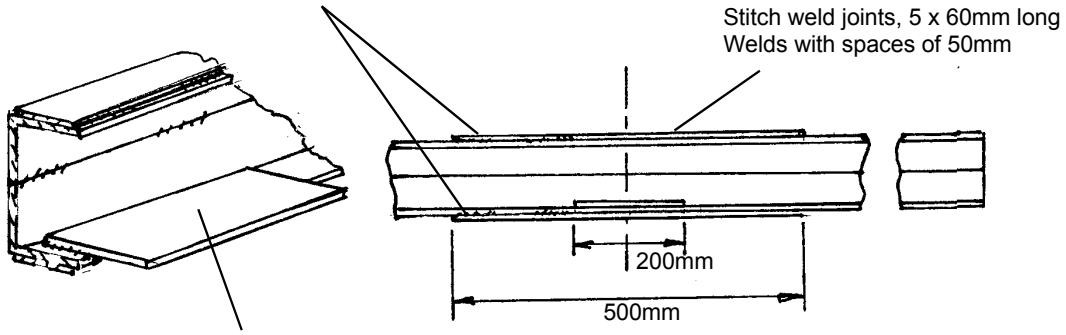
1. Longitudinals (BL)

1.1 Cut 2 lengths angle (see Table B4) and stitch weld together to form channel section. 2 pcs needed



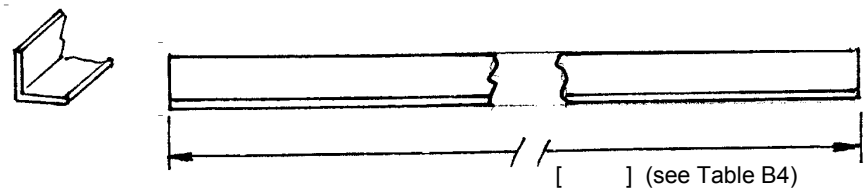
Stitch weld - 11 welds at least 60mm long at equal spacing

1.2 Weld on stiffeners, 30 x 3 flat bar x 500 long, top and bottom at centre of longitudinal.



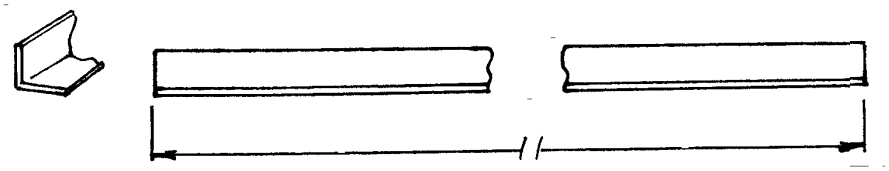
Weld on gusset, 60 x 6mm flat bar x 200mm long, at centre of bottom flange of channel

2. Cross-Members (BC)



2 pcs 60 x 60 x 6 angle

3. Diagonals (BD)



Measure and cut to fit during assembly (Stage 5)

4 pcs angle (see Table B4)

Figure B8: Members for Base Panel

STAGE 4: Construction of Joining Brackets and drilling of Joining Members.

Figure B9: Shows the details of the construction of the Joining Brackets (JL and JR) and of the drilling template needed for drilling the holes for bolting the modules together.

Table B5: Gives the materials list for the Joining Bracket

Table B5: Materials List for Joining Bracket

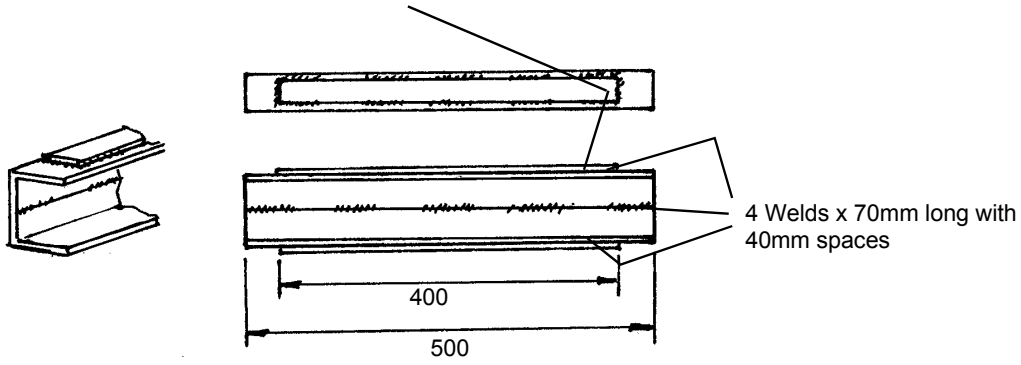
Member	1.4m Wide Footbridge			2.1m Wide Footbridge		
	Section	Length	Number	Section	Length	Number
Joining bracket	40x40x6mm angle	500mm	2	50x50x6mm angle	500mm	2
Stiffeners for bracket	30x3 flat bar	400mm	2	40x3 flat bar	400mm	2
Joining bolts/joint	M16	50mm	8	M20	50mm	8

Figure B10: Shows the details of the construction of the templates for drilling the Vertical members of the Side Panels (SV) and the cross-members of the Base Panels (BC).

1. Joining Bracket

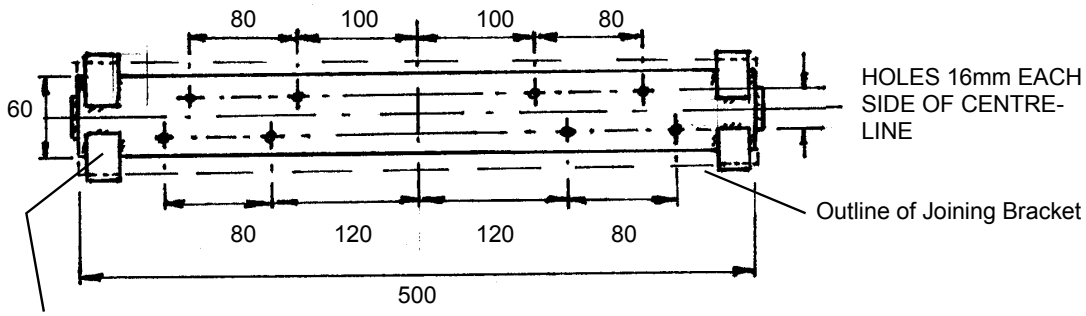
1.1 Cut 2 pcs angle (see Table B5) x 500mm and stitch weld to form channel

1.2 Weld on stiffeners, 30 x 3 (or 40 x 3) flat bar x 400mm long on top and bottom



***2. Drilling Template for Side Panel Joints* (1 needed)**

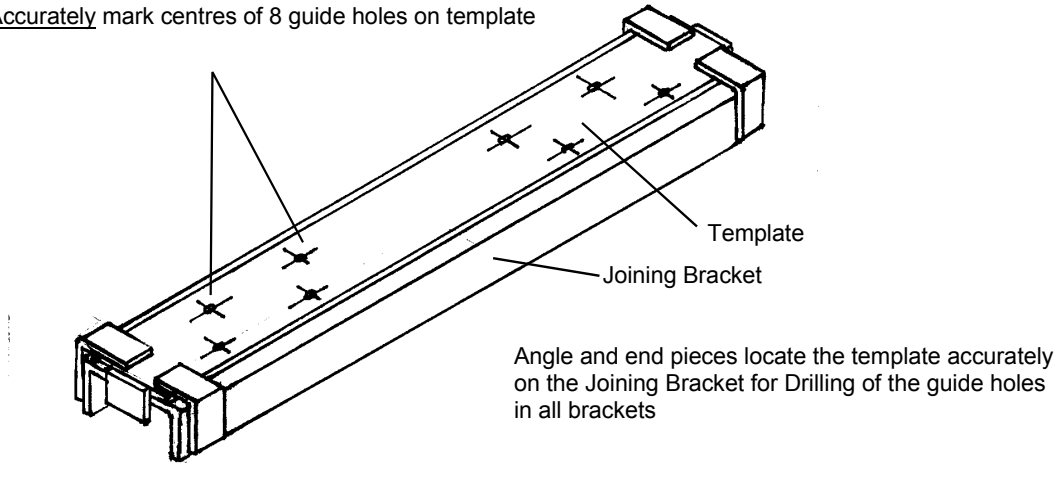
2.1 Cut pc 60 x 6mm flat bar x 500mm long



2.2 Weld on 4 pcs 40 x 40 x 6mm angle x 25mm long to locate the template centrally on the Joining Bracket

2.3 Weld on pc 30 x 3mm flat bar x 25mm long at each end of template

2.4 Accurately mark centres of 8 guide holes on template

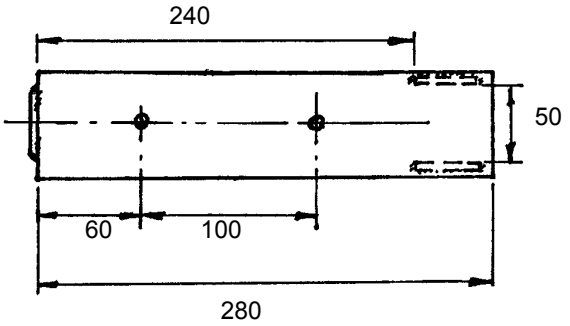


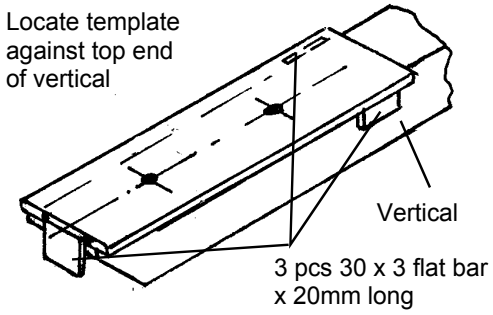
2.5 Drill guide holes 6 to 8mm diameter

Figure B9: Details of Joining Bracket and Drilling Template

3. Template for Drilling Vertical Members (1 needed)

3.1 Cut pc 60 x 6mm flat bar x 280mm long

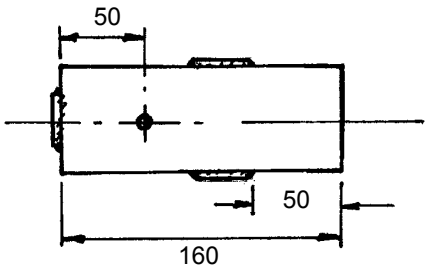


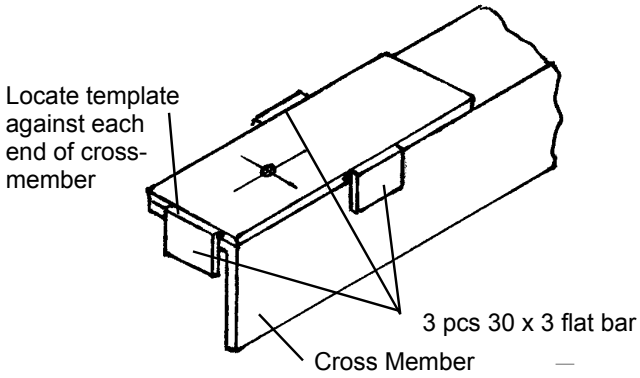


3.2 Weld on 3 pcs 30 x 3 flat bar x 20mm long to locate template on 50 x 50 x 6mm angle.

3.3 Accurately mark centres of 2 guide holes and drill 6 to 8mm diameter

4. Template for Drilling Cross Members of Base Panel (1 needed)





4.1 Cut pc 60 x 6mm flat bar x 160mm long

4.2 Weld on 3 pcs 30 x 3 flat bar x 20mm long to locate template on 60 x 60 x 6 angle cross-member

4.3 Accurately mark centre of guide hole and drill 6 to 8mm diameter

Figure B10: Details of Templates for Drilling Vertical Members of Side Panels and Cross-Members of Base Panels

5. Drill holes for joining Side Panels - starting at LH end

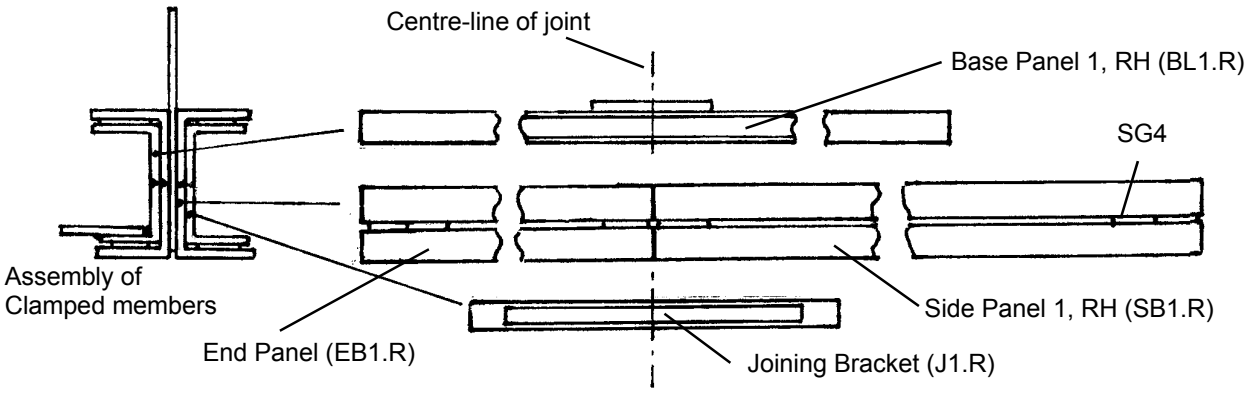
The panels and modules are bolted together by 8 bolts at each joint between the modules on each side of the footbridge as indicated in Figures B1 and B2.

At each joint an End Panel and Side Panel OR 2 Side Panels are bolted together by a Joining Bracket and Base Panel. The End and Side Panels are bolted together at their Bottom Longitudinals.

It is essential that the parts that bolt together are drilled together to ensure that bolt holes line up during assembly of the bridge. Drilling must be done before the panels are welded up. All parts must be clearly and permanently marked so parts are assembled in the same combination as they are drilled. There is no interchangeability of parts.

The procedure is explained in the steps below. This follows the order of modules shown in Figure B1. The joining parts at each joint are clamped accurately together and then pilot holes of 6 to 8mm diameter are drilled. Holes are then opened up to the required size:

17mm for M16 bolts for 1.4m wide bridge
21mm for M20 bolts for 2.1m wide bridge



Joint between End Panel and Side Panel 1 (Right Side)

5.1 Use drilling template to drill guide holes in Joining Bracket JI.R (No. 1, Right Side).

5.2 Accurately mark the centre lines of the Base Panel and Joining Bracket and line up with the joint of End and Side Panels. Firmly clamp the 4 members together.

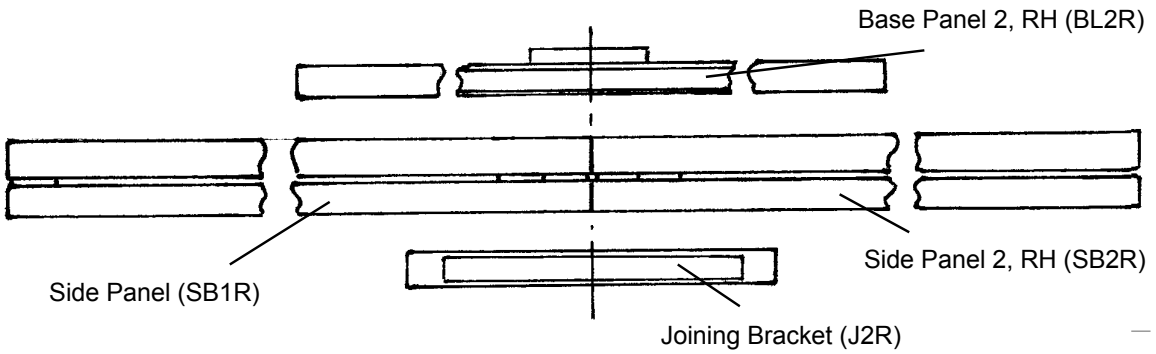
5.3 Drill through the guide holes in the Joining Bracket.

5.4 Remove clamps and drill out each hole to **17mm** diameter (1.4m wide bridge) or **21mm** (2.1m wide) in 2 or 3 stages.

5.5 Repeat Steps 1.1 to 1.4 to LH side members of Module.

5.4 Move on to joint between Modules 1 and 2

Figure B11 (Sheet 1): Procedure for Drilling Bolt Holes



5.7 Repeat Steps 5.1 to 5.4 for RH members shown in sketch and also for LH members.

5.8 Continue working in pairs of members as above to RH end of footbridge. The procedure is summarised in Table B6.

Note:
Make sure the Gussets on the Bottom Longitudinals are in the correct order for the diagonals. The diagonals attach to the double gusset. The slopes of the diagonals are shown by **/** and **** in Table B6 looking from the right side of the bridge as in Figure B1

Table B6: Procedure for Drilling Holes for Joining Bolts

RIGHT HAND SIDE OF BRIDGE				LEFT HAND SIDE OF BRIDGE			
Joint – see Figure B1	**Members that are clamped and drilled together**			**Joint – see Figure B1**	**Members that are clamped and drilled together**		
	End and/or Side Bottom Longitudinals	**Joining Bracket**	**Base Panel Longitudinal**		**End and/or Side Bottom Longitudinals**	**Joining Bracket**	**Base Panel Longitudinal**
E1.R to S1.R	EB1.R + SB1.R / \	J1.R	BL1.R	E1.L to S1.L	EB1.L + SB1.L / \	J1.L	BL1.L
S1.R to S2.R	SB1.R + SB2.R \ /	J2.R	BL2.R	S1.L to S2.L	SB1.L + SB2.L \ /	J2.L	BL2.L
S2.R to S3.R	SB2.R + SB3.R / \	J3.R	BL3.R	S2.R to S3.R	SB2.L + SB3.L / \	J3.L	BL3.L
S3.R to S4.R	SB3.R + SB4.R \ /	J4.R	BL4.R	S3.R to S4.R	SB3.L + SB4.L \ /	J4.L	BL4.L
S4.R to S5.R	SB4.R + SB5.R / \	J5.R	BL5.R	S4.R to S5.R	SB4.L + SB5.L / \	J5.L	BL5.L
S5.R to S6.R	SB5.R + SB6.R \ /	J6.R	BL6.R	S5.R to S6.R	SB5.L + SB6.L \ /	J6.L	BL6.L
S6.R to S7.R	SB6.R + SB7.R / \	J7.R	BL7.R	S6.R to S7.R	SB6.L + SB7.L / \	J7.L	BL7.L
S7.R to S8.R	SB7.R + SB8.R \ /	J8.R	BL8.R	S7.R to S8.R	SB7.L + SB8.L \ /	J8.L	BL8.L
S8.R to E2.R	SB.8R + EB2.R / \	J9.R	BL9.R	S8.R to E2.R	SB8.L + EB2.L / \	J9.L	BL9.L

Note:
This is the procedure for 9 modules (8 full modules + 2 end modules). The procedure for less or more modules follows the same pattern.

Figure B11 (Sheet 2): Procedure for Drilling Bolt Holes

6. Drill holes in Side Panel Verticals and Base Panel Cross-Members

6.1 Locate correct template accurately on each member (see Figure B10) and drill through guide hole(s).

6.2 Drill out each hole to **13mm** diameter.

6.3 Drill the holes in the vertical members for the side braces (STAGE 6).

Bolt the joining members together as shown below and drill 13mm hole for an M12 bolt at position shown.

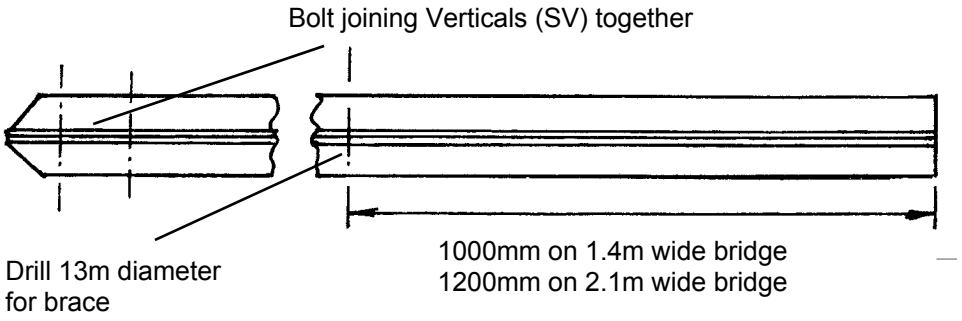


Figure B11 (Sheet 3): Procedure for Drilling Bolt Hole

STAGE 5: Construction of Assembly Jigs and Assembly of Panels

It is essential that panels are assembled and welded up on a jig to ensure shape and size are consistent.

Joining parts must be bolted together before welding to ensure holes line up when the panels are assembled.

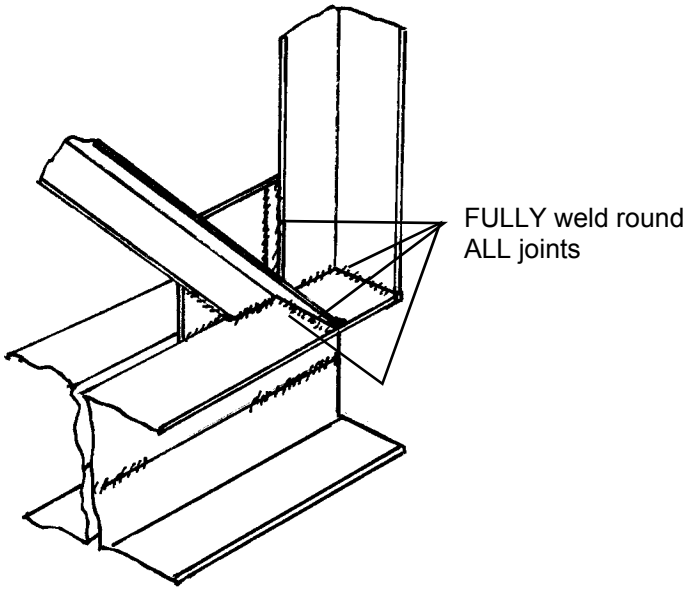
Figure B12: Shows the details of the assembly jigs

Figure B13: Shows the assembly and welding up of the base panels

Figure B14: Shows the assembly and welding up of the side panels

Note: The assembled panels are shown set up on the jig. The members are shaded so that they show up clearly.

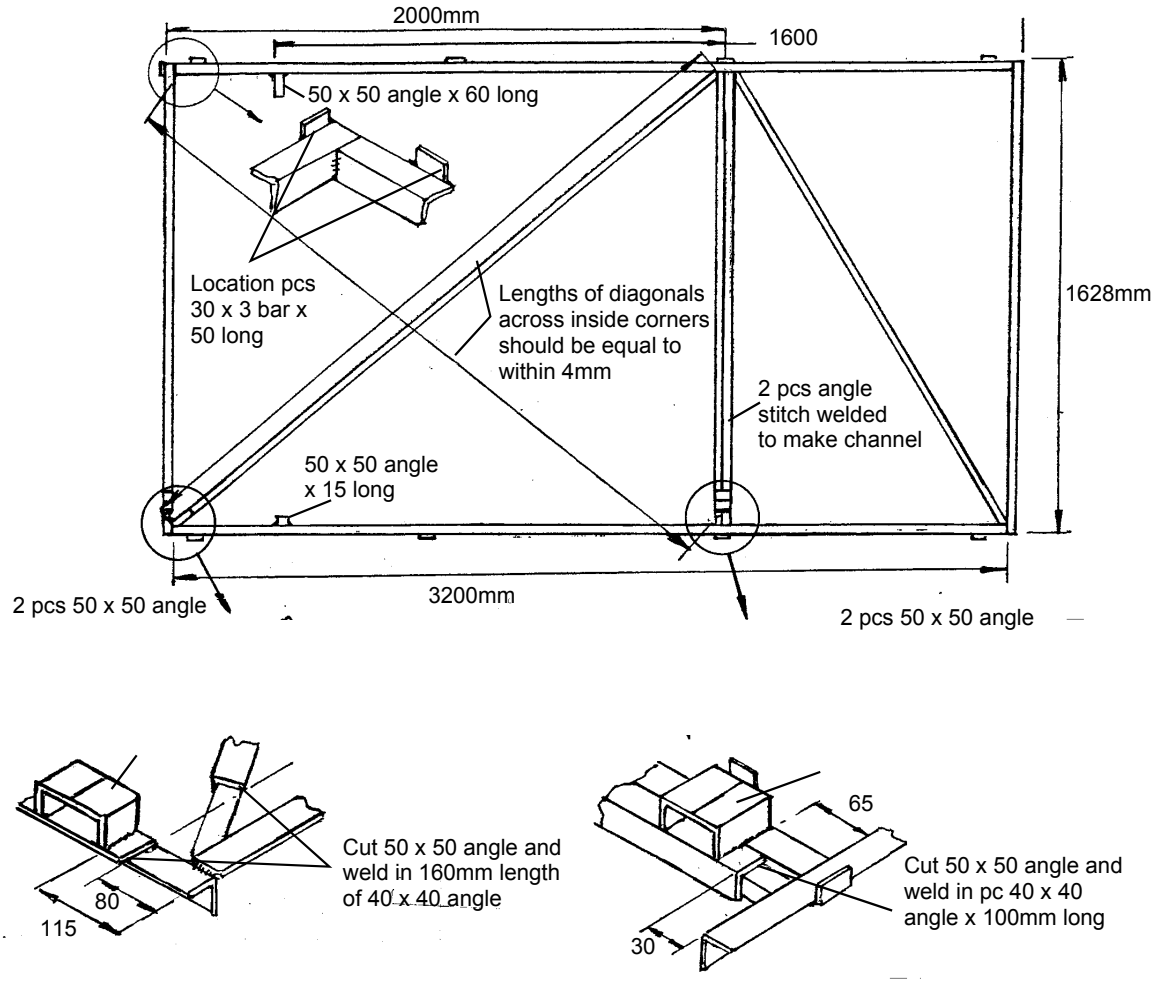
Welding Instructions



When the panel has been tack-welded and checked for correctness ALL joints should be fully Welded.

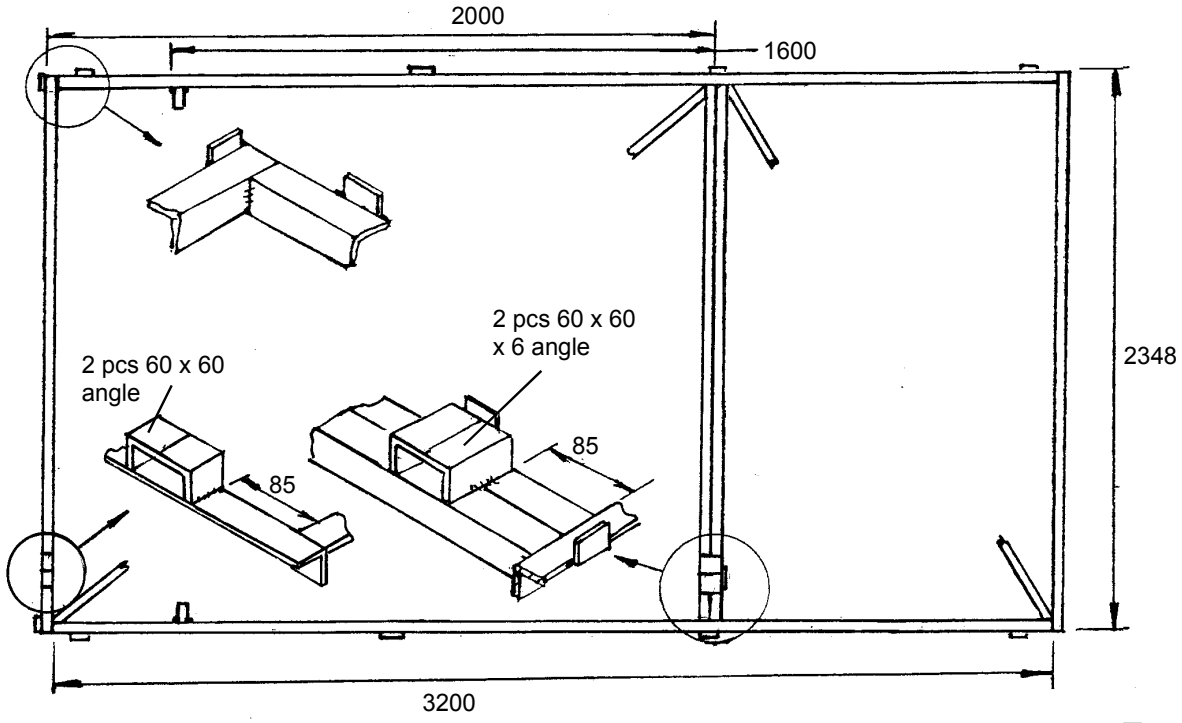
It is important to weld BOTH between Members and Gussets and also between the Members (angle to angle, angle to channel).

1. Cut main frame members from 50 x 50 x 6 angle and tack weld, checking all corners are square
2. Build jig on a flat surface so that top face for assembling panels is flat.
3. Check lengths of diagonals and when within 4mm, cut and weld in diagonals.
4. Weld up frame



(i) Jig for 1.4m Wide Footbridge

Figure B12 (Sheet 1): Details of Assembly Jigs



(ii) Jig for 2.1m Wide Footbridge

Figure B12 (Sheet 2): Details of Assembly Jigs

STAGE 5.1: Assembly of Base Panels

STEP 1: Assembly of Base Panels B1 and B2 (Left Hand End)

1.1 Bolt together: Left Side – SB1.L, SB2.L, J2.L, BL1.L, BL2.L
Right Side – SB1.R, SB2.R, J2.R, BL1.R, BL2.R

1.2 Clamp the Left side and Right side assemblies on the jig, accurately lining up the joint between SB1 and SB2 on the joint position on the jig on each side.

1.3 Bolt together the joining Cross Members for Base Panels 1 and 2 (BC1.R, BC2.L). Position accurately in the jig at the joint of the Base Panels and tack weld both in position on their respective base frames.

1.4 Position Cross Member BC1.L (undrilled member) at left hand end of Base Panel 1 and tack weld in position.

1.5 Unbolt joints to remove Base Panel 1 and Bottom Longitudinals SB1.L and SB1.R.

1.6 Measure, cut and fit diagonals for Base Panel 1 and fully weld all joints.

STEP 2: Assembly of Base Panels B2 and B3

2.1 Bolt together: Left Side – SB2.L, SB3.L, J3.L, BL2.L, BL3.L
Right Side – SB2.R, SB3.R, J3.R, BL2.R, BL3.R

2.2 Clamp Left and Right assemblies on jig, accurately lining up joints between SB2 and SB3 on the joint positions on the jig.

2.3 Bolt together Cross Members BC2.R and BC3.L. Locate accurately in position and tack weld them to their respective Base Frames.

2.4 Unbolt joints to remove Base Panel B2 and bottom longitudinals SB2.L and SB2.R.

2.5 Fit diagonals and complete welding up Base Panel B2.

STEPS 3 to 9 Assembly of Base Panels B4 – B9 (If there are 10 Side Panels).

Repeat Step 2 for each joint in sequence to the right hand of the bridge.

STEP 10: Assembly of Base Panels B10 and B11 (Right Hand End)

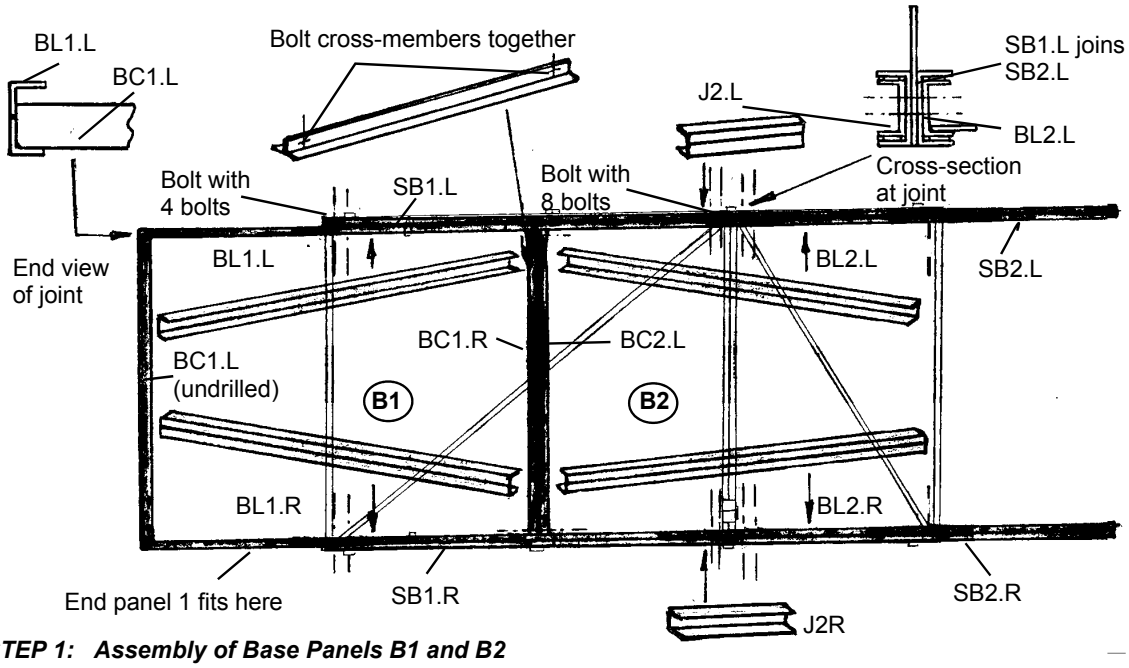
10.1 Bolt together: Left Side – SB10.L, J11.L, BL10.L, BL11.L.
Right Side – SB10.R, J11.R, BL10.R, BL11.R.

10.2 Clamp Left and Right assemblies on jig.

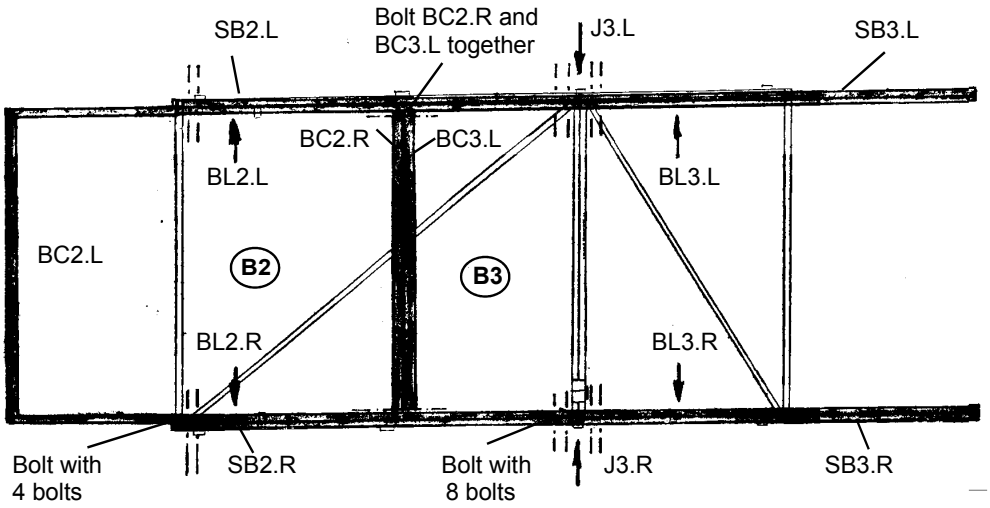
10.3 Bolt together Cross Members BC10.R and BC11.L. Fit in position and tack weld them to their respective base panels.

10.4 Fit end Cross Member, BC11.R, (undrilled) and tack weld in position.

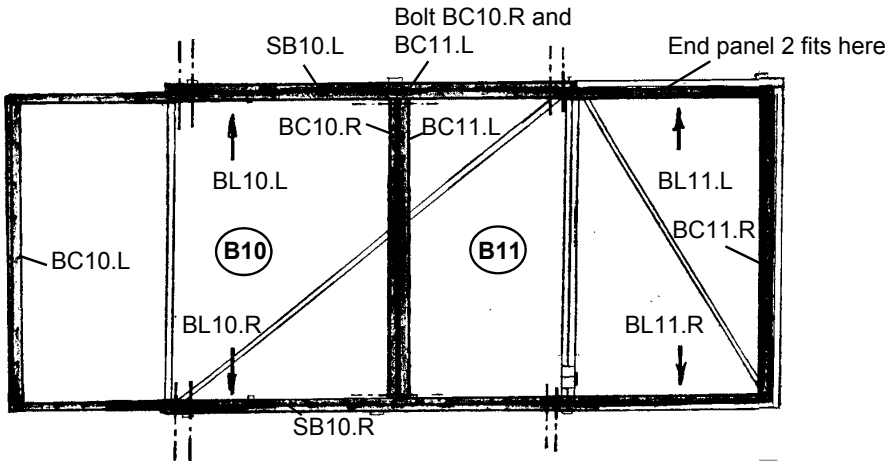
10.5 Unbolt joints, measure and cut diagonals for the 2 base panels. and complete welding of Base Panels B10 and B11.



STEP 1: Assembly of Base Panels B1 and B2



STEP 2: Assembly of Base Panels B2 and B3



STEP 10: Assembly of Base Panels B10 and B11

Figure B13: Assembly of Base Panels

STAGE 5.2: Assembly of Side Panels (Left Side)

STEP 1: Assembly of End Panel E1 (Left End)

1.1 Bolt together EB1.L, J1.L and SB1.L.

1.2 Clamp on the jig with the joint between EB1.L and SB1.L accurately located on the joint centre-line of the jig.

1.3 Bolt together verticals EV1.L and SVL1.L and locate on jig. Tack weld EV1.L to EB1.L and SVL1.L to SB1.L.

1.4 Measure and cut the outside face diagonal ED and tack weld in position on the End Panel gussets.

1.5 Unbolt joint and remove End Panel E1.L. Fit deck-side diagonal and complete welding of all joints.

STEP 2: Assembly of Side Panel S1

2.1 Bolt together Side Panel Longitudinals, SB1.L and SB2.L with Joining Bracket J2.L.

2.2 Clamp on jig with joint accurately located on the joint centre-line.

2.3 Rest Top Longitudinal ST1.L on the raised supports on the jig with the gussets resting on the supports and the mitre joint with the left side vertical aligned for welding.

2.4 Bolt together verticals SVR1.L and SVL2.L. Locate on jig with lower end lined up with the joint of the bottom longitudinals and the top end lined up for the mitre joint with the top longitudinal. Tack weld all the joints.

2.5 Measure and cut the outside face diagonal SD and tack-weld in position. Note that the upper end rests on the gusset and has a short length of 40 x 40 x 6 angle to link it to the angle pc of the Top Longitudinal.

2.6 Unbolt joint and remove Side Panel S1.L. Cut the deck-side diagonal noting that this fits directly against the angle piece of the Top Longitudinal. Fit in position and fully weld all joints.

STEPS 3 to 9:Assembly of Side Panels S2 to S9

Repeat procedure of STEP 2 for each pair of Side Panels in sequence working towards the right hand end.

STEP 10: Assembly of Side Panel S10.L and End Panel E2.L (Right Hand End)

10.1 Bolt together Bottom Longitudinals SB10.L and EB2.L with Joining Bracket J11.L.

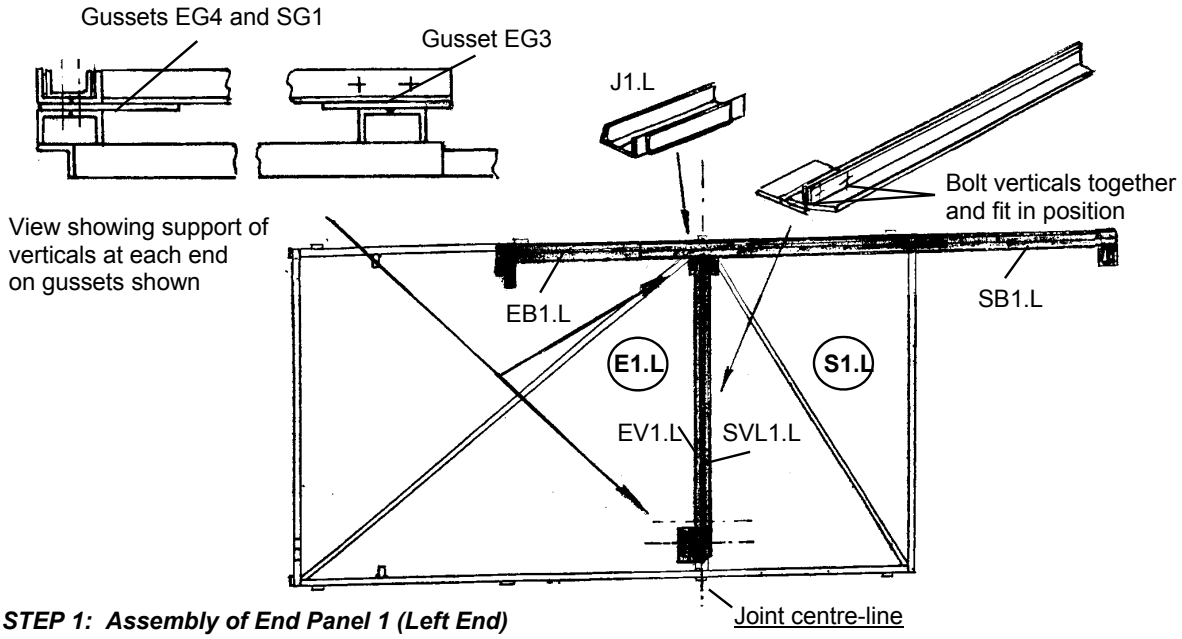
10.2 Clamp on jig with the joint accurately positioned.

10.3 Locate Top Longitudinal ST10.L in position on supports, aligning mitre joint with SVL10.L.

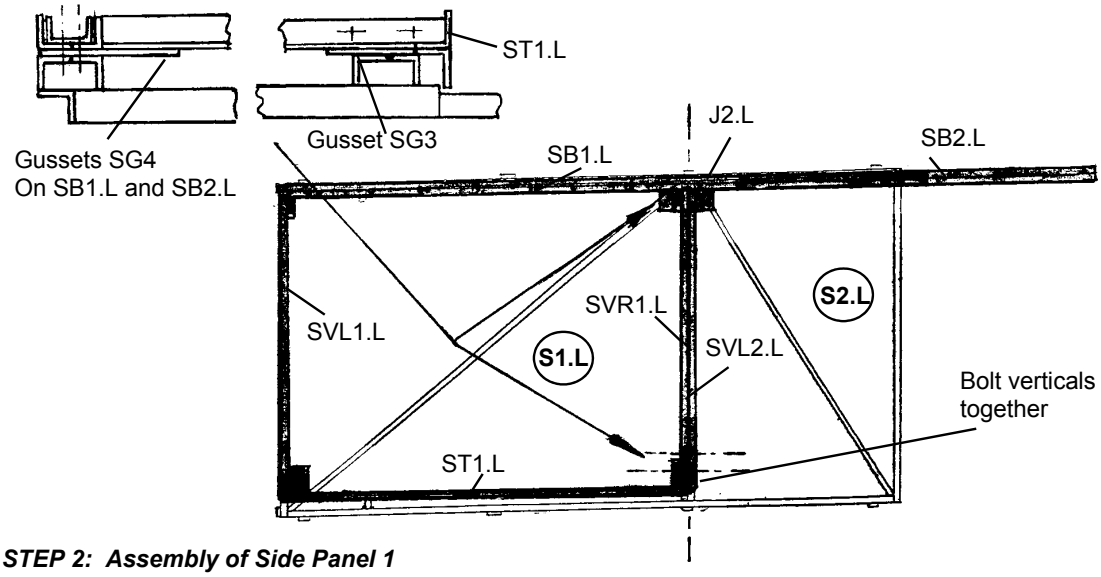
10.4 Bolt together Verticals SVR10.L and EV2.L and locate on jig lining up joints to top and bottom longitudinals. Tack weld bottom ends to their respective Bottom Longitudinals. Tack weld verticals for Panel S10 to Top Longitudinal.

10.5 Measure and cut outside face diagonals SD10 and ED2 and tack weld them in position on the Side and End Panels respectively.

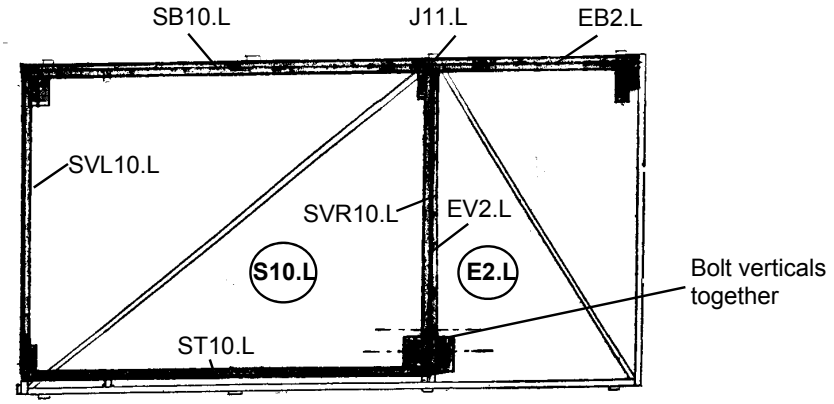
10.6 Unbolt joint. Complete Side Panel S10.L and End Panel E2.L by fitting deck-side diagonals and welding up all joints.



STEP 1: Assembly of End Panel 1 (Left End)



STEP 2: Assembly of Side Panel 1



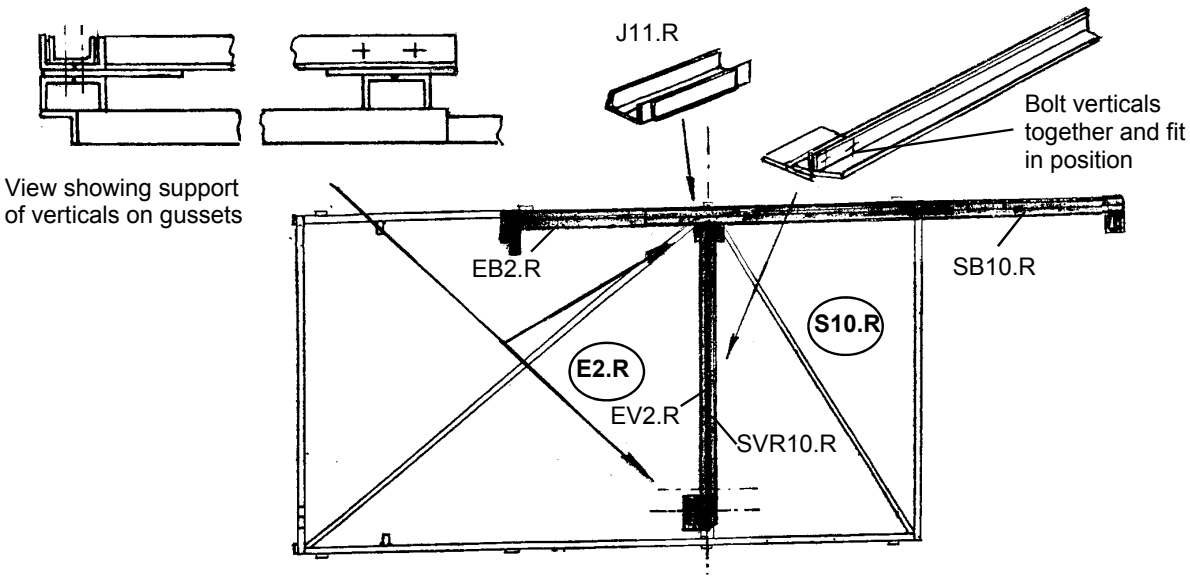
STEP 10: Assembly of Side Panel S10 and End Panel E2 (Right End)

Figure B14: Assembly of Side Panels (Left Side)

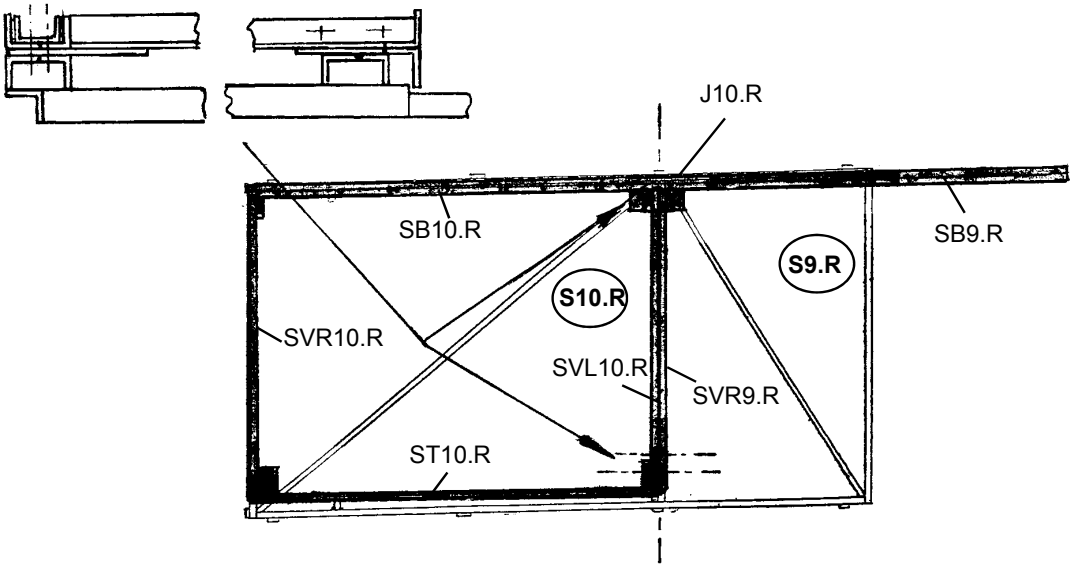
STAGE 5.3: Assembly of Side Panels (Right Side)

This follows the same procedure as for the Left Side panels but starting from the Right Hand end and then working in sequence to the Left Hand end.

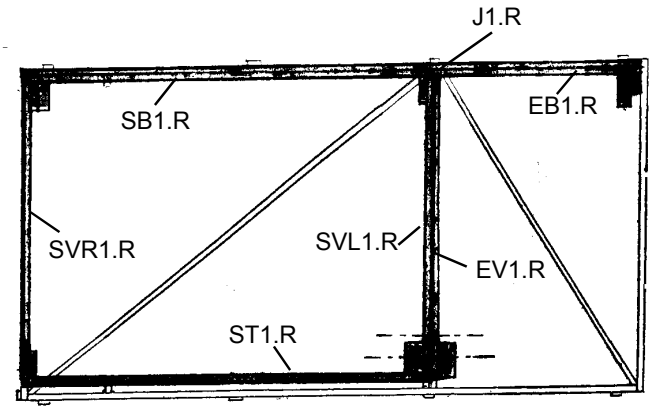
Therefore STEP 1 is the assembly of the right hand End Panel 2 and Step 10 the assembly of Side Panel 1 and Left hand End Panel 1.



STEP 1: Assembly of End Panel 2 (Right hand end)



STEP 2: Assembly of Side Panel 10



STEP 10: Assembly of Side Panel 1 and End Panel 1 (Left Hand end)

Figure B15: Assembly of Side Panels (Right Side)

STAGE 6: Assembly and Testing of Footbridge

When all panels have been completed the footbridge should be fully assembled at the workshop. This has three purposes:

1. To ensure that all panels bolt together before transporting the footbridge to site.

2. To complete the construction of the footbridge by adding the bearing feet at each end and the stiffening braces for the verticals.

   The bearing feet are best fitted when the bridge is assembled to ensure that they sit evenly on the ground. The stiffening braces are best fitted after proof testing so that they are not in the way of the footbridge deflection whilst testing.

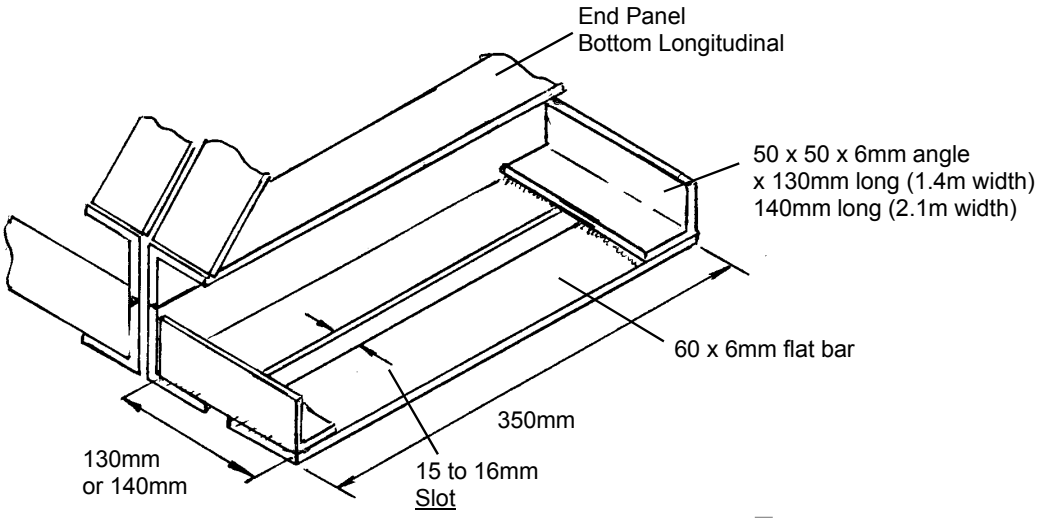
3. To proof test the footbridge (see Section 5.2.7)

6.1 Fitting Bearing Feet

The construction is shown in Figure B16. A bearing foot is required at each side at each end of the bridge, 4 in total.

6.2 Fitting the Stiffening Braces for the Verticals

The details of the Stiffening Braces are shown in Figure B.17. At each module joint a cross-beam is clamped under the bottom longitudinals to which are bolted angle braces to the Verticals on each side of the footbridge. The braces provide sideways support to the pair of verticals that are bolted together at each joint.



***Bearing Feet* at each end corner of bridge**

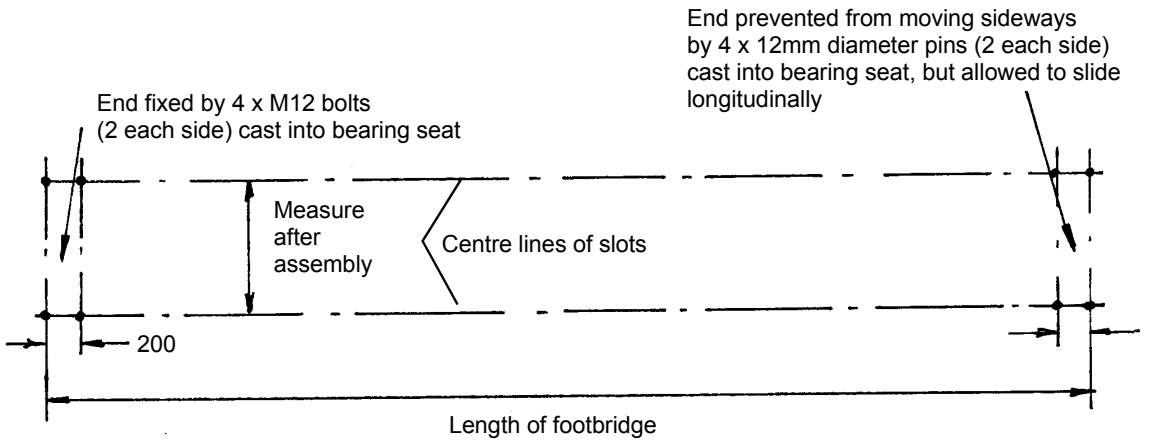
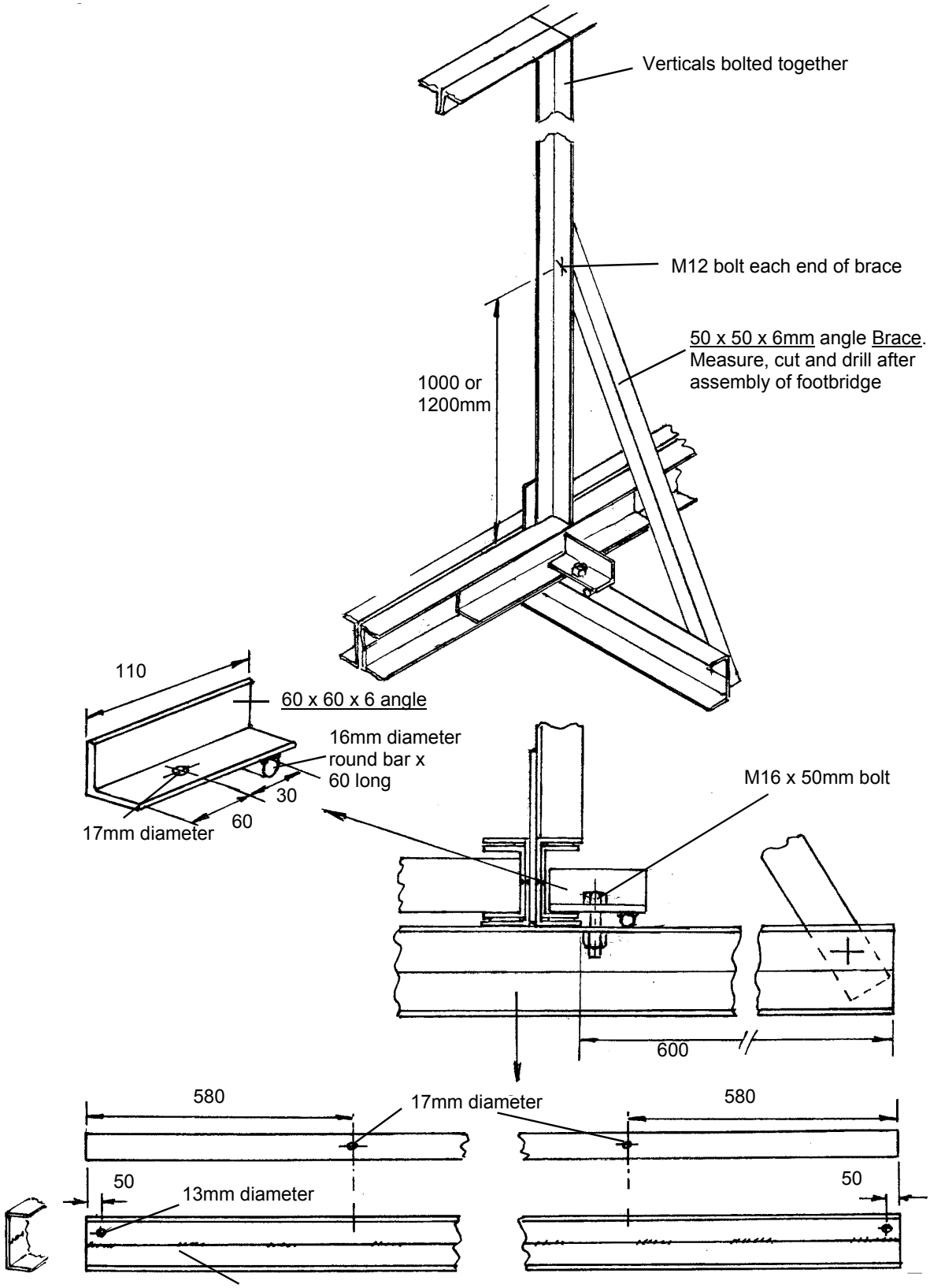


Figure B16: Bearing Supports and Anchors for Footbridge



Channel made by stitch welding together 2 pcs of 60 x 60 x 6mm angle. Measure and cut after assembly of bridge. Note: it protrudes 600mm each side of bridge.

Figure B17: Details of Stiffening Braces for Verticals

STAGE 7: Fitting the Decking

7.1 Design of Decking

Good quality hardwood planks should be used for the decking. It should be installed by competent local carpenters.

The cross planks are supported at each end on the bottom longitudinals of the end and side panels. Since the planks are not supported at the centre it is important to use planks that are strong enough to support the bridge user loads over the relatively long span between the longitudinals.

Because of the quite large sections of the cross planks it will probably be more economical to use these at spaced intervals to support smaller section longitudinal runners rather than to have a continuous deck of cross planks.

The recommended arrangement is shown in Figure B18. The required sections for the deck planks for the 1.4 and 2.1m wide footbridges are listed in Table B7 below.

Table B7: Timber Plank Sizes for Decking

Longitudinal Runners		**Cross Beams**			**Kerb**
Section Width x Thickness	**Number across deck**	**Spacing (1)**	**Section Width x Thickness**	**Length**	**Section Width x Thickness**
1.4m Wide Footbridge					
150x50mm	8 with gaps of about 11mm	600mm	150x75mm or 200x75mm	1.6m	150x50mm
2.1m Wide Footbridge					
150x50mm	12 with gaps of about 15mm	400mm	200x100mm or 150x125mm	2.3m	150x50mm
OR 150x75mm	12 with gaps of about 15mm	750mm	200x100mm or 150x125mm	2.3m	150x50mm

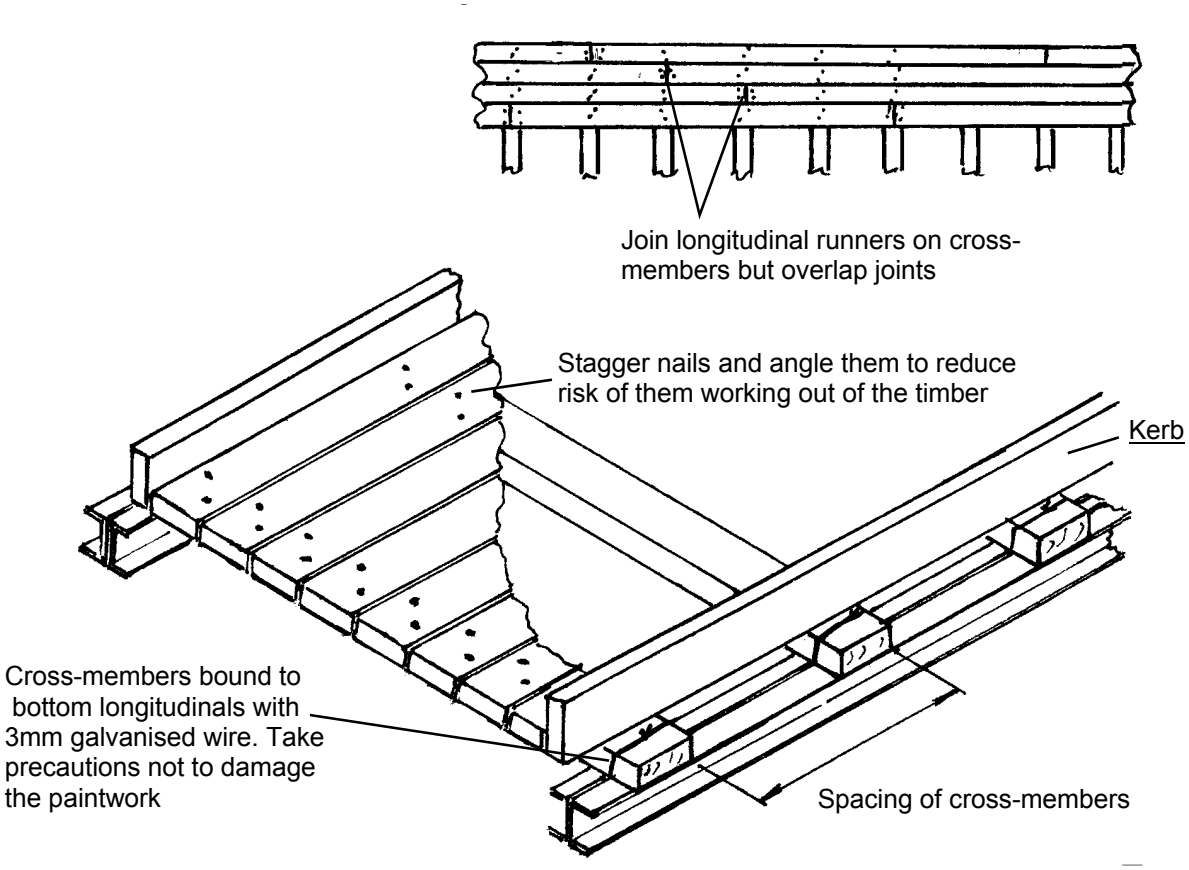
Note: (1) The spacing between cross-beams depends on the support needed for the longitudinal runners. Therefore increasing the section and strength of the longitudinal runners increases the spacing that can be allowed between the cross-beams.

7.2 Protective Treatment of Timber Decking

Protective treatment of the timber planks is likely to be limited to simple hand brushing methods. These are unlikely to achieve significant penetration into hardwood surfaces but may provide some protection. The methods suggested are:

1. Soaking the planks in a bath of engine sump oil or brushing on sump oil; or (2) Brushing on creosote.

2. The end grains are the most vulnerable surface and could be protected with a coating of bitumen, such as bitumen paint.



B18: Details of Fixing Timber Decking