

## **Install Guide**

### **Tools & Equipment**

- Ø5mm steel drill bit
- Battery powered drill with a low torque setting
- Battery powered rivet gun to suit Ø4.8mm rivet
- PentaForce self-drilling tek setting tool
- Hacksaw or battery powered reciprocating saw
- Laser
- Tape measure
- Marking paint
- String line and pegs
- Spirit level
- Metal file
- Clamps
- Zinc rich epoxy primers paint



### **Hazards**

- Contact with underground services during excavation of post footings. *Controls:* Based on a site specific risk assessment complete dial before you dig searches, carry out underground service location, mark services on site plan, mark services on the ground with color coded marking paint, and seek plans from property owner. Induct all persons digging holes.
- Vehicles or pedestrians moving around the work area. *Controls:* Based on a site specific risk assessment deploy safety signage, safety barriers, workers to wear hi-viz, carry out higher risk work at lower traffic periods, develop a traffic management plan.
- Injury to workers or cyclists due to cyclists colliding with workers. *Controls:* Based on a site specific risk assessment safety signage instructing cyclists to dismount well in advance of the work area, safety barriers, use hi-viz, minimise plant in the work area, carry out higher risk work at lower traffic periods, and keep the path clear of obstructions.

### **Reference Documents**




- Bluedog CycSafe Product Sheet
- Bluedog document "Review of Requirements for Cycleway Safety Fencing"
- Bluedog Factory Packing List.

### **Drawings**

- Bluedog drawings CSF-01 to CSF-09

## IG-750-003 48.3mm Bluedog CycSafe Cycleway Fencing Install Guide

### Material checklist

Item	Component Name	Image	Quantity
1	In-fill panel (full barrier version)	1200mm high x 2400mm long.	1 per assembly (full barrier).
2	Mid-rail (partial barrier version)	40x40x1.6mm x 2400mm tube long.	1 per assembly (partial barrier).
3	In-fill panel bracket		4 per assembly (full barrier). 2 per assembly (partial barrier). Connects the rail of the infill panel or the mid rail (partial barrier) to the post. Each bracket requires three self drilling tek screws (see item 5)
4	Splayed Rail Bracket		4 per change of direction (full barrier). 2 per change of direction (partial barrier). At a change of direction this bracket connects the rail of the infill panel or the mid rail (partial barrier) to the post. Each bracket requires three self drilling tek screws (see item 5)
5	Tamper resistant 12g self-drilling tek screw		3 per in-fill panel bracket or splayed rail bracket

6 Swaged Bump Rail



1 per assembly. Ø48.3mm 1.6 x 2540mm long.  
One end of the rail is swaged (reduced in diameter) the other end is plain. This allows consecutive units to be inter-connected with out the need for joiners. The swage also allows sweeping bends to be achieved, mild changes in gradient and to accommodate variance in the post spacing.

7 Standard bump rail bracket



1 per post on a straight run.  
This bracket connects to the post and supports the bump rail.  
Each bracket requires four self drilling tek screws (see item 8)

8 Tamper resistant 12g self-drilling tek screw



4 per standard bump rail bracket

9 Bump rail U-clip



1 per standard bump rail bracket. 5mm x 53mm.  
Connects the Standard Bracket to the Bump Rail.  
Each clip requires two rivets (see item 10)

10 Ø4.8mm stainless steel rivets



2 per standard bump rail bracket.  
Used to fix the U-clip to the bump rail.  
The rivet should be used not a tek screw given the wall thickness of the bump rail and the dynamic loads on the bump rail when in service.

10 Change of direction (Ball) bracket



1 per post at each change of direction or change of gradient. In combination with two Dome Bases it acts like a universal joint.  
Used at changes of direction and connects to the post and supports the bump rail.  
Each bracket requires four self drilling tek screws (see item 11)

11 Tamper resistant 12g self-drilling tek screw



4 per Ball Bracket

12 Dome Base



2 per Ball Bracket.

Connects the Bump Rail to the Ball Bracket using the rivets. The two legs fit inside the bump rail and the domed face matches the bracket.

Each bracket requires 4 x Ø4.8mm stainless steel rivets (Item 13): 2 are internal and connect the Dome Base to the Ball Bracket; 2 are external and connect the Bump Rail to the Dome Base.

13 Ø4.8mm stainless steel rivets



4 per Ball bracket

14 End Loop



1 per termination post 340 x 350 x 90mm.

Connects to the termination post, the Standard Bracket and Bump Rail. The End Loop reduces the likelihood of more serious injury to a cyclist if they ride into the end of the bump rail. Each bracket requires 2 x Ø4.8mm stainless steel rivets (Item 13):

15 Dome base



1 per termination post  
Used to fix the End Loop to the post.  
Each bracket requires 4 x Ø4.8mm stainless steel rivets (Item 16):

16 Ø4.8mm stainless steel rivets



4 per End Loop fixing to post. 2 are internal and connect the Dome Base to the Post; 2 are external and connect the End Loop to the Dome Base.

17 Un-swaged bump rail



Ø48.3mm x 1.6 x 2600mm long This item may need to be used to assist achieving changes of direction depending on the acuteness of the angle.

## **SOME GENERAL PRINCIPLES**

1. Some general principles when installing the fencing include:
  - a. Set the height of the posts or change the prevailing ground level to make the gradient as consistent as possible and match the grade of the cycle path. This will make installation of the fence easier and will achieve a better visual outcome.
  - b. Position the posts to make the changes of direction as gradual and uniform as possible and match the grade of the path. This will again make fence installation easier and achieve a better visual outcome.
  - c. Changes of direction of up to 5 degrees can be absorbed in the Swaged Rail without the need for a Ball Bracket.
  - d. Keeping the joins in the Bump Rail as close as possible to brackets to limit deflection in the Bump Rail.
  - e. Set out the fence so as to minimise the hazard to the users of the cycleway (see "Review of Requirements for Cycleway Safety Fencing" and AusRoad guidelines).

## **INSTALL OF FULL BARRIER SAFETY FENCING**



2. Measure the distance of each run and draw up a plan if there is not already one. Calculate the number of posts in each run. Refer to the drawings for post spacing: 2480mm centres are standard to suit 2400mm long panels and 65x65mm posts (this allows a 15mm gap). Use the post spacing template supplied for the standard intermediate post spacing. Manipulate the position of the fence posts to achieve the best all round outcome. Take into consideration:
  - a) Achieving a 300mm gap (min.) between the barrier and the edge of the path.
  - b) Achieving a top height of the bump rail of 1200-1450mm above the surface of the cycleway.
  - c) Any fall along the run so that you can potentially step or rake panels so as to maintain clearances under the fence.
  - d) Changes of direction in the run. Ideally try and achieve a full panel either side of a change of direction and keep the bend as sweeping as possible.
  - e) Setting back the last two panels of each run from the cycleway to reduce the likelihood of injury to cyclists hitting the start of the barrier.



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- f) If you can shorten or lengthen the run to avoid having to cut panels and rails.
- g) The location of underground services where you may need to shorten bays to accommodate.
- h) Hazards along the cycleway such as trees and embankments.



Ideally the first two panels of the run are splayed away to about 1 metre from the edge of the cycleway path.



A sweeping bend is divided into short runs of two full panels between changes in direction.

3. Using a laser, take levels along the alignment to establish what the fall is if any over the run. A 3 degree fall will result in about a 150mm fall over a run of 2400mm panel. Subject to a site risk assessment and client requirements we recommend a maximum gap of 150mm under the panel. Panels can be raked or cut short to maintain this clearance. Try and break the run into sections of the same gradient to make install easier and achieve a better aesthetic outcome. Measure the difference in height at each end of the run and divide by the number of footings to calculate the step at each post assuming a consistent gradient.
4. Set up string lines in relation to the proposed alignment and any boundaries (normally with the string on the outside face of the posts). Try to position the posts so as to keep changes of direction as gentle (obtuse) as possible. Clearly mark any underground services along the alignment. Mark the centre of the holes. Double check all measurements and then excavate. After excavation of holes we recommend again checking the post spacing.
5. Place the posts along each run. Use the laser or string line to set these posts to height to achieve the desired gradient of the fence and achieve the desired height of the bump rail above the riding surface. Concrete the posts in place, finishing the top of the footing neatly about 100mm below ground level. Check the posts are in line and plumb. **Note:** Orientate change of direction posts so as to bisect (halve) the change of direction angle for a neater outcome. Leave the posts at the splayed ends square to the path.





Full barrier assembly. The posts have been set at height to achieve even stepping of the in-fill panels down the gradient and to suit the adjacent riding surface.

## **INSTALLING THE INFILL PANELS**

6. As a general rule, we recommend the first two panels be splayed so that the first post (P1) is about 1 metre back from the edge of the path. This will ordinarily result in a Ball Bracket at the third post (P3). P3 should be set square to the path.
7. For the install of Full Barrier fencing, we suggest working from left to right facing the fence standing on the cycle way (refer to CSF-06 & 08). Measure down from the top of the left hand post (P1). Fix the top panel bracket to P1. The bracket fixes to the backside of the post with 2 x 12g tek screws into the post and one into the top rail of the panel. Place the top left end of the panel into this bracket. Place a bracket on the other three ends of the panel. Place a spirit level on the top rail of the panel and bring the panel to level.
8. Fix the top right panel bracket to the right hand post (P2). We suggest only installing one tek screw at this stage in each bracket (in case you need to adjust later). Where the run is level, the top bracket for the next panel will be level with the opposing bracket on the same post. Where the run is sloped, the opposing bracket will be lower or higher to suit the gradient of the terrain (see image above right).
9. Use the Splay Bracket to install panels to change of direction posts.



View from backside of the post showing the brackets fixed to the post and stepped to suit the gradient of the path.

## **INSTALLING THE BUMP RAIL**

10. Affixing the bump rail brackets: We suggest working from left to right, facing the fence standing on the cycle path. Refer to DWG CSF-06 & 08. Measure down from the top of P1 so that the top height of the Bump Rail will be between 1250-1400mm above the surface of the cycleway when sitting on the Standard Bracket. Fix the Bump Rail bracket to the post using 4 tek screws (see image below right).  
**Note:** These brackets are always installed in the middle of the post and plumb (not on an angle). You may want to affix a bracket at the end of each run and then run a string line between them, then set the brackets to this string so as to get a consistent gradient of bump rail.



Measuring down from top of post to locate the Standard Bracket and correct height of the Bump Rail.



Fixing a Standard Bracket to the post with self drilling tek screws.

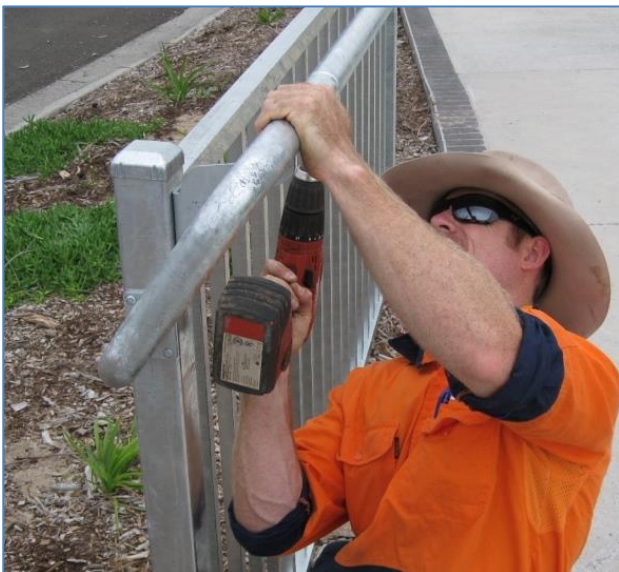
**INSTALLING THE 'LEFT HAND' TERMINATION**



The join in the pieces of swaged rail are positioned over the Standard Bracket so that the U-clip straddles the two.



The completed Standard Bracket to bump rail assembly with two rivets.



Drilling Ø5mm holes through the U-clip in to the End Loop to secure the End Loop to the Bracket.



The completed End Loop assembly fixed to the Standard Bracket with a U-clip and rivets and to the first piece of Bump Rail.

11. Affix a Standard Bracket to the second post (P2) at the desired height. Take a piece of Swaged Rail (Rail 1) and insert the swaged end into the End Loop. Mark where the End Loop is to be affixed to the side of P1. Affix a Dome Base to P1 at this location using 2 x Ø4.8mm stainless steel rivets. Insert the End Loop over the Dome Base, drill and fix with 2 x Ø4.8mm stainless steel rivets.
12. Take a U-clip and place through the first Bracket at P1. Drill 2 x Ø5mm holes through the U-Clip into the Bump Rail and fix with 2 x Ø4.8mm stainless steel rivets. The End Loop is now fixed to P1 in two locations.





The End Loop (left hand end) secured to Termination Post (P1) and sitting on the Standard Bracket. Ready for swaged end of Rail 1 to be inserted.



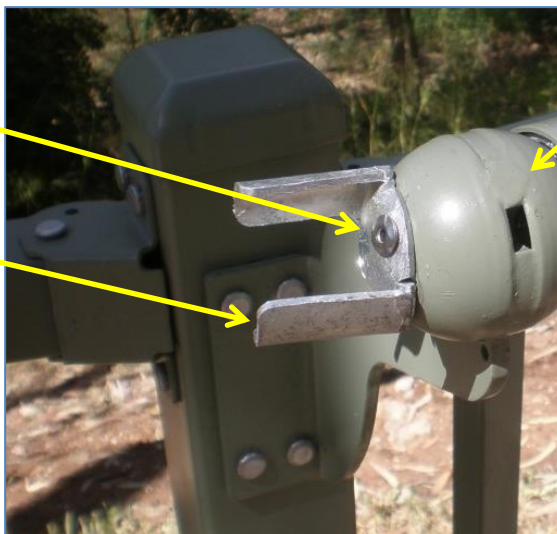
The first piece of swaged bump rail (Rail 1) is connected to the End Loop.

13. Rail 1 will extend over the bracket at P2 towards P3 due to the End Loop. There is no need to cut Rail 1. Secure the End Loop and Rail 1 by drilling 2 x Ø5mm holes about 15mm from the End Loop and secure with 2 x Ø4.8mm stainless steel rivets.
14. Take a U-clip and place through the Standard Bracket at P2. Drill 2 x Ø5mm holes through the U-clip and fix the U-clip to the Rail 1 with 2 x Ø4.8mm stainless steel rivets. Rail 1 is now secure to P1 and P2.
15. P3 will ordinarily be a change of direction post and should be set square to the path. The splayed terminations are an outward bend and will ordinarily require the use of a Ball Bracket assembly (see images below).

## HANDLING THE FIRST SPLAY

Ø4.8mm stainless  
steel rivets

Dome Base



Ball Bracket



Exploded view of the Ball Bracket to Bump Rail assembly with internal Dome Base.



Semi-assembled view



Outward bend



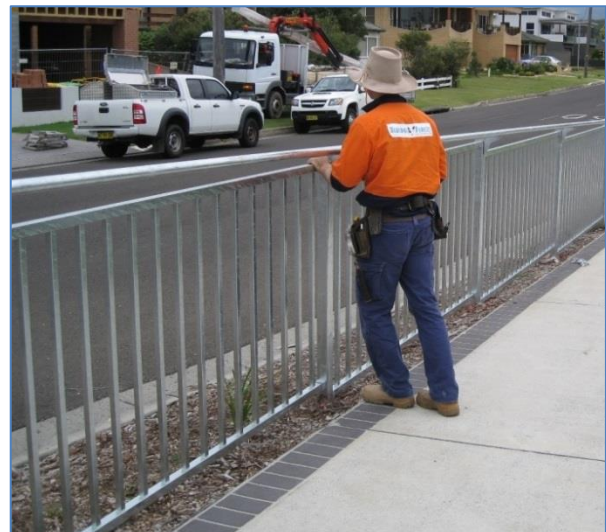
Outward bend: Adjacent sections of Bump Rail neatly meet the Ball Bracket.



16. Take a Ball Bracket and clamp it to P3 at the desired height so as to get a consistent height of bump rail through the change of direction in the fence run.
17. Take Rail 2 and inter-connect the swaged end with Rail 1. The plain end of Rail 2 will need to be cut so that it neatly meets the face of the Ball Bracket with little or no gap. File the cut end and apply zinc rich epoxy coating. Mark where the rail contacts the face of the Ball Bracket to locate the Dome Base. Position the Dome Base on the Bracket to achieve the desired angle of Rail 2. Drill 2 x Ø5mm holes through the Dome Base and fix to the Ball Bracket with 2 x Ø4.8mm stainless steel rivets.
18. Unclamp the Ball Bracket and insert the Dome Base into Rail 2 so that it neatly meets the Bracket. Re-clamp the Ball Bracket to the post is in the desired position. Fix the Ball Bracket to P3 using 4 x tek screws. Check there is no gap between rail and the bracket. Drill 2 x Ø5mm holes about 15mm from the end of Rail 2 to pick up the internal Dome Base. Drill on opposing sides and fix with 2 x Ø4.8mm stainless steel rivets.
19. Take a piece of Swaged Bump Rail to fit to the right of the Ball Bracket on P3. Place the un-swaged end so that it neatly meets the face of the Ball Bracket. Mark the face of the Ball Bracket to locate the Dome Base. Position the Dome Base on the Bracket to achieve the desired angle of the Bump Rail. Drill 2 x Ø5mm holes through the Dome Base and fix to the Ball Bracket with 2 x Ø4.8mm stainless steel rivets.
20. Due to the outward bend, this piece of rail will ordinarily not extend as usual to the next Standard Bracket. This is not a problem as the shortfall can be absorbed in the swaged joint. Simply shuffle the next few pieces of Bump Rail to the left toward P3 Ball Bracket so that the gap at the swaged joint is about 20mm rather than the standard 10mm (refer detail 3 on CSF-08). Using this method over the next couple of panels a return to the standard positioning of the swaged joint over the bracket can be achieved.
21. Affixing the bump rail along a straight run: Having absorbed any shortfall the standard procedure applies. Locate the Bump Rail so that the left hand end extends ~5mm to left of the Standard Bracket on P4 (see detail 1 on CSF-02). Take a U-clip and place through the Bracket. Drill 2 x Ø5mm holes through the U-clip and fix the U-clip to the Bump Rail with 2 x Ø4.8mm stainless steel rivets. Rail 3 is now secured. Repeat this process for each successive piece of Bump Rail.



Pieces of Swaged Bump rail being laid out on top of the Standard Bump Rail brackets.



A run of swaged rail laid out on the standard bump rail brackets. Note the consistent gradient.

## **HANDLING THE 'LAST' SPLAY**

22. As a general rule the last two panels of a fence run should be splayed so that the last post (P10) is 1 metre back from the edge of the path (CSF-07 & 09). This will ordinarily mean there will be a Ball Bracket at the third last post (P8). P8 should be set square to the path.
23. Clamp a Ball Bracket to P8. Measure Rail 8 and cut the swaged end so that it neatly meets the face of the Ball Bracket on P8 with little or no gap. The plain end of Rail 8 will inter connect with Rail 7.
24. Position the Dome Base on the Ball Bracket to achieve the desired angle of Rail 8 and mark. Drill 2 x Ø5mm holes through the Dome Base into the Ball Bracket and fix to the Ball Bracket with 2 x Ø4.8mm stainless steel rivets.
25. Unclamp the Ball Bracket. Connect Rail 8 to Rail 7. Insert the Dome Base at the other cut end of Rail 8 so that it neatly touches the Ball Bracket. Re-clamp the Ball Bracket to the post in the desired position. Fix the Ball Bracket to the post using 4 x tek screws. Drill 2 x Ø5mm holes about 15mm from the end of the Rail 8 to pick up the internal Dome Base. Drill and fix with 2 x Ø4.8mm stainless steel rivets. Rail 8 is now installed to P8.
26. Affix a Standard Bracket to the second last post (P9) and last post (P10) at the desired height.
27. Take a piece of Swaged Rail (Rail 9) and marry up the plain end to the Ball Bracket at P8. Mark the Ball Bracket. Position the Dome Base on the Ball Bracket to achieve the desired angle of Rail 9 and mark. Drill 2 x Ø5mm holes through the Dome Base into the Ball Bracket and fix to the Ball Bracket with 2 x Ø4.8mm stainless steel rivets. Rail 9 will extend beyond P9.
28. Take a piece of Swaged Rail (Rail 10) and connect with the swaged end of Rail 9.
29. Take an End Loop and place the longer end on the Standard Bracket at P10.
30. Take Rail 10 and integrate with the End Loop. Measure and cut Rail 10 so integrate neatly with Rail 9.
31. Mark where the End Loop is to be affixed to the side of P10. Affix a Dome Base to P10 at this location using 2 x 12g teks. Insert the End Loop over the Dome Base, drill and fix with 2 x Ø4.8mm stainless steel rivets.
32. Take a U-clip and insert in the Bracket at P10. Drill 2 x Ø5mm holes through the U-clip and fix the U-clip to the End Loop with 2 x Ø4.8mm stainless steel rivets. The End Loop is now secure to P10.
33. Take a U-clip and insert in the Bracket at P9. Drill 2 x Ø5mm holes through the U-clip and fix the U-clip to the Bump Rail with 2 x Ø4.8mm stainless steel rivets.
34. Where Rail 9 and 10 join drill 2 x Ø5mm holes 15mm from the join Rail 9 and fix with 2 x Ø4.8mm stainless steel rivets. Rails 9 and 10 are now secure and the right hand splay is complete (see detail 13 on CSF-09).

## **HANDLING AN 'OUTWARD' CHANGE OF DIRECTION**

35. Using the Ball Brackets: When setting the posts at changes of direction along the run (not the end splays), orientate the post so that it bisects the change of direction angle. Use the Splay Brackets to fix the infill panels to either side of the post at the required angle.
36. We suggest working from left to right. Take a piece of un-swaged bump rail (alternatively use a Joiner) to the left of the Ball Bracket. This is because the distance between the brackets is increased because of the outward bend. You will need to cut the un-swaged bump rail so as to neatly connects to the Ball Bracket (see CSF-03).
37. Take a Ball Bracket and clamp it to the change of direction post at the desired height so as to get a consistent height of bump rail through the change of direction in the fence run.
38. Measure and cut the Un-swaged Bump Rail so that it neatly meets the face of the Ball Bracket with little or no gap. Mark the face of the Ball Bracket to locate the Dome Base. Position the Dome Base on the Bracket to achieve the desired angle of the Bump Rail. Drill 2 x Ø5mm holes through the Dome Base and fix to the Ball Bracket with 2 x Ø4.8mm stainless steel rivets.



Bump Rail (left) cut to neatly terminate with the Ball Bracket.



Dome Base fixed to the Ball Bracket with 2 x Ø4.8mm stainless steel rivets.



An outward bend with a splayed post



Outward bend: Adjacent sections of Bump Rail neatly meet the Ball Bracket.

39. Unclamp the Ball Bracket and insert the Dome Base so the Bump Rail neatly meets the Bracket. Connect the bump rail with the preceding pieces. Re-clamp the Ball Bracket to the post in the desired position. Fix the Ball Bracket to the post using 4 x tek screws. Check there is no gap between rail and bracket. Drill 2 x Ø5mm holes about 15mm from the end of the Bump Rail to pick up the internal Dome Base. Drill on opposing sides and fix with 2 x Ø4.8mm stainless steel rivets.
40. Take a piece of Swaged Bump Rail to fit to the right of the Ball Bracket. Place the un-swaged end so that it neatly meets the face of the Ball Bracket. Mark the face of the Ball Bracket to locate the Dome Base. Position the Dome Base on the Bracket to achieve the desired angle of the Bump Rail. Drill 2 x Ø5mm holes through the Dome Base and fix to the Ball Bracket with 2 x Ø4.8mm stainless steel rivets.
41. Due to the outward bend, this piece of rail will not extend as usual to the next Standard Bracket. This is not a problem as the shortfall can be absorbed in the swaged joint. Simply shuffle the next few pieces of Bump Rail to the left toward the Ball Bracket so that the gap at the swaged joint is about 20mm rather than the standard 10mm. Use this method over the next couple of panels a return to the standard positioning of the swaged joint over the bracket can be achieved.

## **HANDLING AN 'INWARD' CHANGE OF DIRECTION**

42. We suggest working from left to right. Refer to CSF-04. You can use a piece of swaged or un-swaged bump rail for an inward bend. In both cases you will need to cut the rail to marry up to the Ball Bracket (cut off the swaged end if using a piece of swaged rail). This is because the distance between brackets is reduced due to the inward bend.
43. Take a Ball Bracket and clamp to the change of direction post at the desired height so as to get a consistent height of bump rail through the change of direction in the fence run.
44. Measure and cut the Bump Rail so that it neatly meets the face of the Ball Bracket with little or no gap. Mark the face of the Ball Bracket to locate where the Dome Base is to be positioned to achieve the desired angle of the Bump Rail. Drill 2 x Ø5mm holes through the Dome Base and fix to the Ball Bracket with 2 x Ø4.8mm stainless steel rivets.
45. Unclamp the Ball Bracket and insert the Dome Base so the Bump Rail neatly touches the Bracket. Re-clamp the Ball Bracket to the post in the desired position. Fix the Ball Bracket to the post using 4 x 12 gauge self drilling anti-tamper tek screws. Drill 2 x Ø5mm holes about 15mm from the end of the Bump Rail to pick up the internal Dome Base. Drill and fix with 2 x Ø4.8mm stainless steel rivets.
46. Take another piece of Bump Rail. Position the un-swaged end to the right of the Ball Bracket. Mark the face of the Ball Bracket to locate the Dome Base. Position the Dome Base on the Bracket to achieve the desired angle of the Bump Rail. Drill 2 x Ø5mm holes through the Dome Base and fix to the Ball Bracket with 2 x Ø4.8mm stainless steel rivets.
47. Insert the Bump Rail over the Dome Base so that it neatly touches the Bracket. Drill 2 x Ø5mm holes about 15mm from the end of the Bump Rail to pick up the internal Dome Base (see image below right). Drill on opposing sides and fix with 2 x Ø4.8mm stainless steel rivets. (**Note:** You may need to shorten the Bump Rail to the right of the Ball Bracket before fixing to suit the distance to the next post after the change of direction).

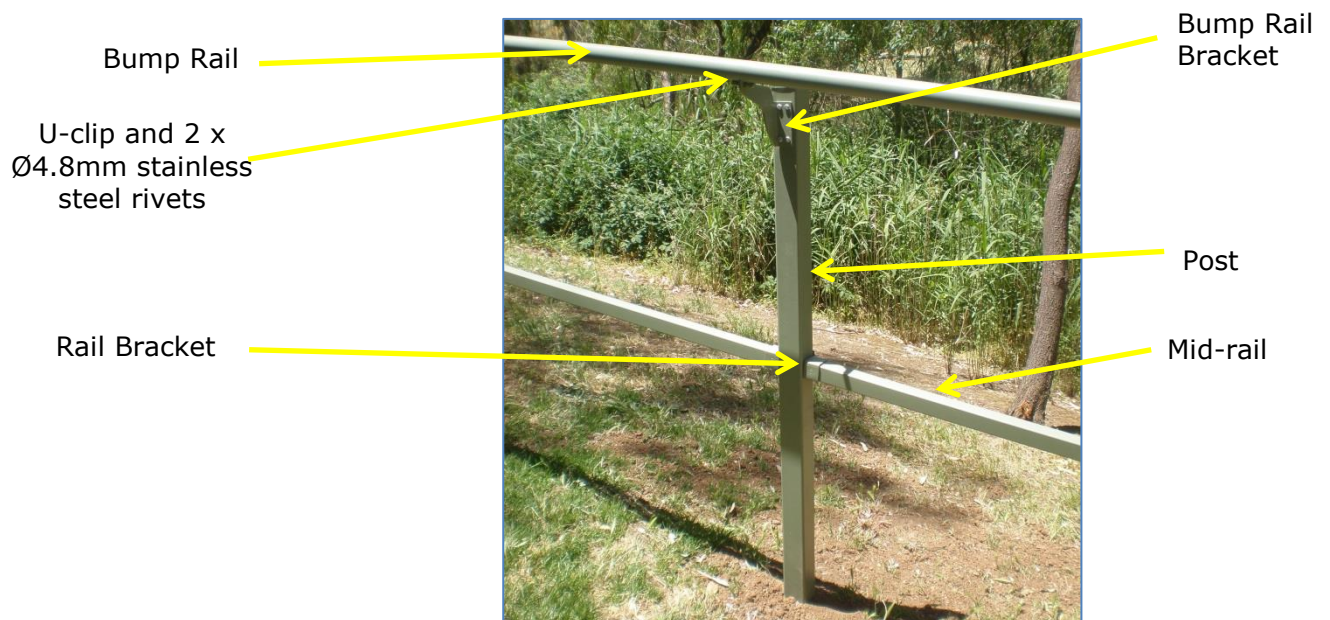




Inward bend: 2 x Ø4.8mm stainless steel rivets in back of Bump Rail picking up the internal Dome Base.

## INSTALLING THE PARTIAL BARRIER

48. For the install of Partial Barrier fencing the process is exactly the same as installing Full Barrier except there is a Mid Rail rather than an In-fill Panel. The Mid-rail is 2400mm long: the same length as a standard In-fill panel, so posts are set at the same centres. The Mid-rail is connected to the post with the same sort of bracket used to connect the In-fill panel to the post.



## Revisions

REV.	SECTION	SUB-SEC.	PARA.	DATE	AUTHORISED BY
A (original)	-	-	-	14/8/14	S. Belfield
B	-	-	-	5/10/14	S. Belfield