TECHNICAL USER MANUAL

for

NON-STATION FOOTBRIDGES AND NON-MAINLINE-STATION FOOTBRIDGES

Standard Detail and Design Drawings

Summary

This technical user manual is applicable to non-station footbridges and non-mainline-station footbridges. It provides guidance on the selection and application of Network Rail's suite of standard drawings. The standard designs and details within these drawings will generally be used for new-build structures, however elements may also be used for part replacement e.g. deck replacement.

Issue record

This technical user manual will be updated when necessary by distribution of a complete replacement.

A vertical black line in the margin will mark amended or additional parts of revised pages.

Revision	Date	Comments
P1	June 2007	First Draft
P2	March 2008	Final Draft
A	April 2008	First issue

CONTENTS

1 INTRODUCTION

A library of standard designs and details for non-station footbridges and non-mainline-station footbridges has been produced. This document contains guidance on the use of these standard drawings, including advice on the following:

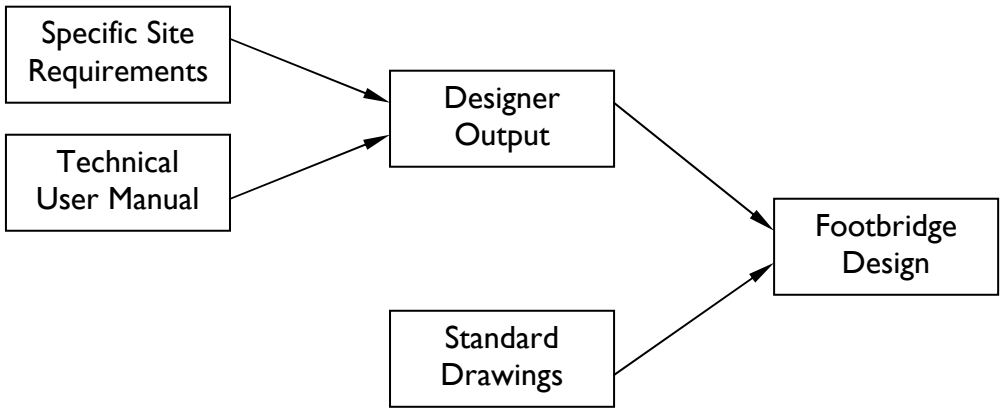
* The elements and options contained within the suite of standard designs and details.
* Instruction on configuring a design using the standard designs and details.
* Specific design restrictions and design assumptions.
* Advice on circumstances when the standard designs and details may not be used.
* Installation guidance.
* Safety/CDM/environmental issues.

The library will be maintained and distributed by Network Rail to its stakeholders and key external suppliers for adoption across the network at a national level.

The standard designs and details and the advice within this document are in accordance with the SRA Code of Practice "Train and Station Services for Disabled Passengers" except where noted in this document. Although it is not necessary for non-station footbridges to comply with this advice, it has been assumed as best practice and should be adopted unless specific site constraints prevent this. All standard designs and details for the non-mainline-station footbridges comply with the SRA Code of Practice.

2 USE OF NETWORK RAIL STANDARD DESIGNS AND DETAILS

The following flowchart demonstrates the use of the technical user manual and standard drawings. The Designer should analyse the constraints and requirements that exist for the specific project site. This information should be used in conjunction with the design advice contained within the technical user manual, to decide which elements can be taken from the suite of standard designs and details and which items, if any, need bespoke design. This Designer output, and the series of standard drawings can be combined to produce the final footbridge solution.



Flowchart to show the use of Network Rail's Standard Details and Designs

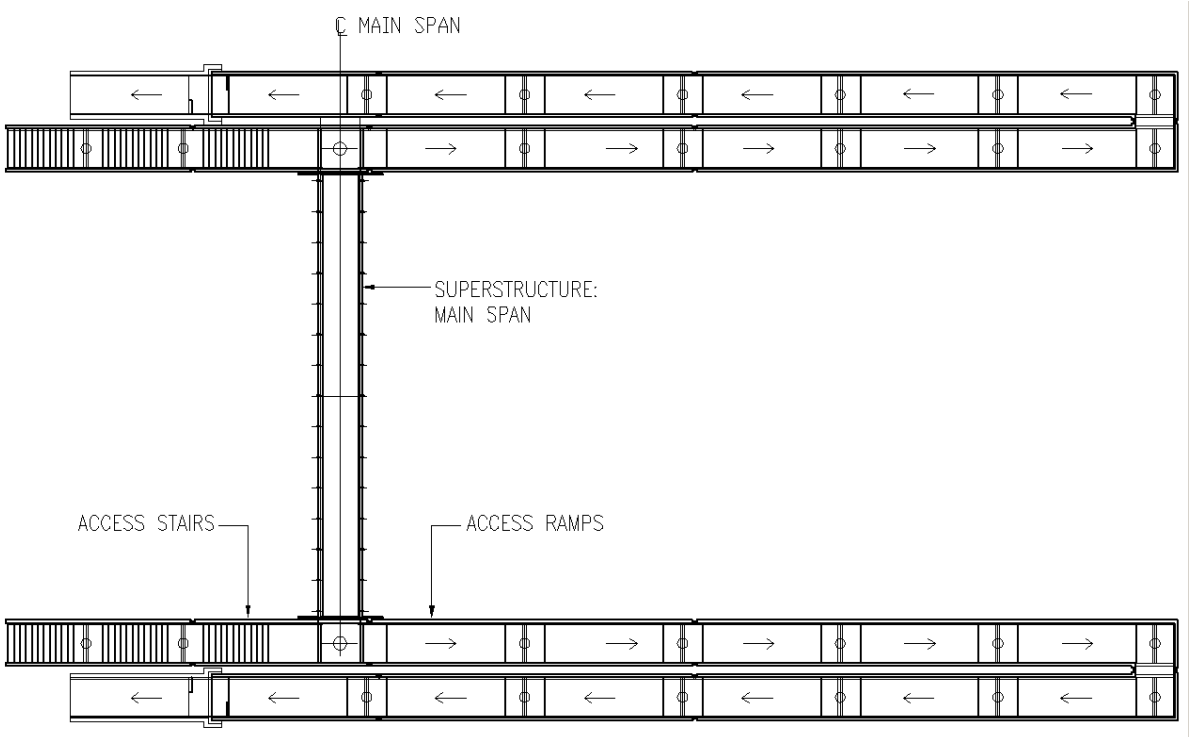
3 BRIDGE ELEMENTS

The standard designs and details have been divided into the following three categories:

* Superstructure. This comprises the bridge deck.
* Substructure. This comprises supports for the deck, stairs and ramps, including holding down details. Note that foundations are not included in the suite of standard designs and details.
* Access routes. This comprises staircases, ramps and lifts.

Within the suite of standard designs and details are different options for each of the above to accommodate a range of site requirements (refer to section 4 & 5).

The staircases are connected directly to the supports and will always be present. The top of the staircase section incorporates the main span landing. If ramps or lifts are present they will be connected to the main span landing edge, opposite the staircase access. The main span is connected to the trackside edge of the main span landing. The staircases with and without ramps/lift will be stable on the supports without the main span present i.e. during initial construction or deck removal.



3.1 Drawing Selection Table.

Table for selecting the drawings of the structural elements of the bridge.

Bridge	Landing	Stairs	Ramps
Option 1 (with in flight steps) 401, 405, 410, 490, 491, 495, 496, 498	Circular hollow section (CHS) supports (no provision for ramp) 420, 454 CHS supports (with provision for ramp) 420, 455	Stringer staircase Straight 430, 450, 452, 453 90/180 degree turn 430, 451,452, 456	Ramp 430, 480, 483, 484, 485, 486, 487. 90/180 degree turn 481, 482
Option 1 (with in flight steps) 401, 405, 410, 490, 491, 495, 496, 498	CHS supports (no provision for ramp) 420, 474 CHS supports (with provision for ramp) 420, 475	Truss staircase Straight 430, 470, 472 90/180 degree turn 430. 471, 472, 473	Ramp 430, 480, 483, 484, 485, 486, 487. 90/180 degree turn 481, 482
Option 1 (with in flight steps) 401, 405, 410, 490, 491, 495, 496, 499	Trestle supports (no provision for ramp 421, 422, 460 Trestle supports (with provision for ramp) 421, 422, 461	Stringer staircase Straight 431, 450, 452, 459 90/180 degree turn 431, 451, 452, 462	Ramp 431, 480, 483, 484, 485, 486, 487, 488. 90/180 degree turn 481, 482
Option 1 (with in flight steps) 401, 405, 410, 490, 491, 495, 496, 499	Abutment/cill beam landing (no provision for ramp) 440 Abutment/cill beam landing (with provision for ramp) 441	Stringer staircase Straight 431, 450, 452, 459 90/180 degree turn 431, 451,452, 462	Ramp 431, 480, 483, 484, 485, 486, 487, 488. 90/180 degree turn 481, 482
Option 2 (straight deck) 402, 405, 406. 410, 490, 491, 495, 496, 498	CHS supports (no provision for ramp) 420, 457 CHS supports (with provision for ramp) 420, 458	Stringer staircase Straight 430, 450, 452, 453 90/180 degree turn 430, 451,452, 456	Ramp 430, 480, 483, 484, 485, 486, 487. 90/180 degree turn 481, 482
Option 2 (straight deck) 402, 405, 406. 410, 490, 491, 495, 496, 498	CHS supports (no provision for ramp) 420, 476	Truss staircase Straight 430, 470, 472 90/180 degree turn 430. 471, 472, 473	Ramp 430, 480, 483, 484, 485, 486, 487. 90/180 degree turn 481, 482

	CHS supports (with provision for ramp) 420, 477		
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Furniture, tactile strip location, drainage philosophy and lifting point drawings are common for all options

3.2 Geometric Limits

The structure has been designed for a maximum span of 28m measured between the centre of the stair landings and a maximum vertical clearance of 6.3m from the top of the running rail to the bridge soffit.

In addition there are height limits on the CHS columns (measured from top of foundation to top of column) depending upon the section used and location.

Location	Section	Maximum Height
Main span landing	660 CHS 24 Thick	8.2m
Main span landing	508 CHS 16 Thick	5.4m
Stringer stairs and ramps	508 CHS 10 Thick	6.5m
Stringer stairs and ramps	406.4 CHS 10 Thick	3.25m

3.3 Passenger Flow Rate

The bridge has been designed for a passenger flow rate of 120 people per minute. Assuming a flow rate of one person per second per metre width (from HSE Contract Research Report 53/1993 Managing Crowd Safety in Public Venues). If the expected passenger flow rate exceeds this then the standard bridge details should not be used.

3.4 Drainage philosophy

The bridge has been designed with a fall across all elements including stair treads and landings. If all drainage outlets should become blocked water will still find its way from the centre of the main span to the foot of the stairs/ramp following the falls in the structure.
Drainage holes are provided under the handrails in the main span and at ramp and stair landings and at every fourth going in the stairs.

It is generally assumed that positive drainage to standard footbridges will only be provided in non-mainline station applications where a specific requirement is identified by Network Rail. Further guidance on the use of positive drainage is provided in section 4.6.

3.5 Safety/CDM and Environmental.

The general (non site specific) risks associated with the bridge design, construction and operation are listed on drawing 400 and 700. In addition there may be others arising from site-specific considerations, such as the presence of Overhead Line Equipment (OHLE) or vulnerable services.

Environmental issues can only be determined on a site by site basis but should include looking into the effect the additional land required for the ramp will have on the locality, whether the protective coating needs to be changed to avoid the possibility that its renewal may contaminate watercourses and the aesthetic effect of the bridge's presence, which may have requirements for bridge colouration or other details.

The effect of renewing the protection scheme on the environment, particularly any watercourses, should be taken into consideration during the selection of the elements of the protection scheme.

4 NON-STATION FOOTBRIDGES & NON-MAINLINE STATION FOOTBRIDGES: OPTIONS AVAILABLE WITHIN THE STANDARD DETAILS SUITE

4.1 Superstructure

Two main span options are available:

* Option 1: with in-span stairs.
* Option 2: without in-span stairs.

Option 1 with in-span stairs does not comply with the SRA Code of Practice "Train and Station Services for Disabled Passengers".

Option 2 must be used where ramps or lifts are provided or where ramps or lifts may be provided in future.

4.2 Substructure

For new bridge construction there are two options for support types. The first uses CHS and the second uses trestles comprising rectangular hollow section (RHS). The same type of support should be used throughout the structure.

4.2.1 Main Span Supports

There are three options available for the main span supports:

* A single CHS column.
* A four-leg trestle comprising square hollow section (SHS) and RHS.
* Abutment/Cill beam comprising a landing made up of RHS sections with 4 SHS feet at the corners. This is to be used for decks spanning onto high cuttings or similar situations where a column to ground level is not required.

4.2.2 Intermediate Access Supports

The top landing of the staircase is directly connected to the main span support, with the superstructure and ramp/lift (if present) cantilevered from the landing edges.

There are two options for staircase intermediate supports and ramp supports:

* A single CHS column.
* A two-leg trestle comprising SHS and RHS.

4.3 Access Stairs, Ramps and Lifts

4.3.1 Staircases

Staircases will be provided in all cases. Two forms of staircase are available:

* A stringer staircase for multiple spans.
* A truss staircase for single spans.

Stringer and truss staircases may be straight or incorporate 180° turns.
The 180° turn is accommodated on two half landings, which are separately supported. A link landing section is provided as part of the standard details and can provide up to 2m separation between the two half landings if required to accommodate site features.

4.3.2 Ramps

Ramps may be incorporated in the initial construction or added at a later stage. Three gradients are dimensioned on the drawings:

* 1:20
* 1:15
* 1:12

Ramps may be straight or incorporate 180° turns. Ramp gradients steeper then 1:20 must be agreed with Network Rail, 1:12 is the steepest ramp gradient permitted in the codes.

As with the stairs the 180° turn is accommodated on two separately supported half landings, similarly a linking section is available to provide up to 2m separation between the half landings if required.

4.3.3 Lifts

Lifts do not need to be provided with non-station footbridges but the requirement for them at Non-mainline stations must be considered in consultation with Network Rail.

The standard designs do not include the lift structure itself. However a lift for Non-mainline station footbridges maybe incorporated instead of a ramp or it may be included at a later date if a ramp has not been added. A 1.5m long link span is provided for installation between the main span landing and a separate lift structure and uses the same stair to landing connection detail provided for the ramp enabling either one to be fitted at the same location.

It should be noted that any lift should be designed as a freestanding structure. The footbridge structure should not used to transfer loads from the lift to ground level.

4.4 Furniture

The following furniture "add-on" details are available:

* Fully enclosed mesh canopy.
  For use on the superstructure and/or access routes. To prevent pedestrian access and objects falling onto the track.
* Chevaux de frise.
  For use at either end of the enclosed canopy. To prevent pedestrian access onto the enclosed canopy.
* Anti-trespass partial screening.
  For use on the superstructure. To prevent pedestrian access and objects falling onto the track.
* Parapet height extension.

For use on the superstructure only. To prevent objects falling onto the track. The extension piece consists of solid infill panels and extends the parapet height by 250mm.

* OHLE protective screening.
  For use on access routes on the trackside.

The use of these elements is dependent on particular site requirements. It is expected that these add-ons will be specified in the original design. If it is desired to add these elements to a standard detail bridge after completion it may be done but it will require considerable site work as the fixings for these details will need to be welded to the superstructure and access stairs/ramp (together with the removal/reinstatement of the steelwork protective coatings).

4.4.1 Anti-Vandal Systems

Depending on the level of potential vandalism at the site, the Designer should choose from the following systems:

* Fully enclosed canopy on deck, stairs and ramps with a chevaux de frise at either end of the canopy.
* Fully enclosed canopy on deck only with a chevaux de frise at each end of the canopy.
* Partial screening on the deck only.
* Parapet extension on the deck only.

4.4.2 OHLE Protection

In the presence of OHLE, the Designer may include the following protective measures:

* If a fully enclosed mesh canopy is to be used on the access routes, no further protective measures are required.
* If a canopy is not provided, OHLE protective screening on the access routes on the side adjacent to the track.

Whether the measures are required will need to be decided on a site-specific basis depending upon proximity to the OHLE.

The elements of the structure will need to be effectively electrically bonded together in accordance with GC/RC5510.

All elements of the bridge are connected together using metal-to-metal bolted joints and provision is made for bonding of the main-span landing substructure to the traction return rail or earth wire.

If further electrical bonding is required this will need to be determined and detailed by the scheme designer.

4.5 Lighting

Lighting does not need to be provided on non-station footbridges. However the lighting design that has been specified for the non-mainline-station footbridges is suitable for direct

use on non-station footbridge main spans and may be adapted for use on the access stairs or ramps if required.

The preferred method of lighting stairs and ramps for non-mainline station footbridges will be to use existing platform lighting arrangements with additions if necessary. There are two forms of lighting for the main span: -

* Bulkhead lights positioned below the parapet level and either recessed into the web with the lighting cable carried in an RHS welded to the main span top chord, or bulkhead lights mounted on the inside face of the web and projecting into the main span with the lighting cable attached to the inside face of the web. Only the former option is shown on the standard details drawings as the latter option does not require any changes to the structure of the main span to implement, the latter option is not suitable for stations where the risk of vandalism is high.
* Lights placed within the full enclosure canopy (where the latter is provided).

All light fittings are to be vandal and weather resistant. The following products are presented as examples of appropriately specified light fittings that may be considered for use in the identified applications: -

* Recessed Bulkhead lights- Designplan Tuscan T5
* Overhead Canopy Lighting – Concord:Marlin triton cage TC-D BW with polycarbonate diffuser.

Alternative similar approved fittings may also be considered for use by Scheme Designers.

In all applications where lighting to footbridges is required Scheme Designer's are to provide the details of the proposed light fittings in the project specific Form A/B submission for acceptance by Network Rail,

4.6 Positive Drainage

Positive drainage should be considered as an option and NOT a mandatory requirement. Scheme Designer's, in conjunction with the Network Rail Asset Steward will determine whether or not it is to be provided. Generally this only where water flows from the main span; stair and ramp spitter pipes will present problems by ponding on the station platforms.

Positive drainage details are described in standard drawing NR/CIV/SD/710-717 and are compatible with the NR/CIV/SD/400 series Standard Footbridge. They may be installed on initial construction or retro fitted at a later date.

Only the necessary details required to provide a positive drainage route for water from the structure down to ground level are provided. This is in the form of galvanised steel pipes fixed to the footbridge that pick up water from the structure's spitter pipes.

Management of the water beyond this point is outside the scope of the standard details. It is predominantly dependant on the existing drainage provision of a specific site and the Scheme Designer's should agree an adopted approach with Network Rail. Specific details should be addressed in a project specific Form A/B submission.

5 GEOMETRY CONFIGURATION

5.1 Clearances

The following clearances must be provided:

5.1.1 Horizontal Clearances

The standard designs and details have been produced assuming a horizontal clearance of 4.5m between the trackside face of the supports and the nearest running rail. This assumption negates the need to for supports to be designed to resist impact loading from derailed trains. If this 4.5m clearance cannot be achieved, the Designer must ensure that the bridge supports can withstand derailed train impact forces or that suitable derailment protection is provided. The impact loading should be agreed with Network Rail (refer to GC/RC/5510 Appendix H).

5.1.2 Vertical Clearances

All structural elements have been designed to allow for a vertical clearance of up to 6.3m between the top of the highest running rail and the bridge soffit. If a larger vertical clearance is required, the standard designs and details cannot be used and the design must be bespoke.

When establishing vertical clearances for structures due consideration should be given to the minimum required clearance dimension from Overhead Line Equipment (OLE). This may vary considerably depending upon site specific constraints. Guidance on the preferred dimension to OLE is provided in the Network Rail Track Design Handbook NR/SP/TRK/0049 (refer to A.4.8. Electrical Clearance – 25kV). Unless otherwise agreed with Network Rail all new footbridges must comply with its recommendations. Where it is not possible to do so, this is generally recorded in a Contract's Project Manager's Remit along with an indication of an OLE clearance dimension that is acceptable to Network Rail. Where no guidance is provided by Network Rail, Scheme Designers should agree an acceptable configuration with Network Rail. In all cases this dimension should be validated by Scheme Designers at Form A/B stage as appropriate.

Scheme Designer's should also endeavour to set vertical clearance dimensions to allow for future network requirements wherever possible i.e. providing in excess of the traditional 4780mm clearance to structures on non electrified OLE lines to allow for future electrification or improved clearance on all lines for greater future gauge height.

Platform Clearances

In addition to the above, at stations it is required that there is a minimum clearance between the edge of the bridge stairs/ramp/support columns and the platform edge of 2.5m where the line speed is less then or equal to 100mph and a clearance of 3m where the line speed is greater then 100mph (refer GI/RT/7014 Part D).

5.2 Setting The Geometry

* Determine the span based on the track layout and horizontal clearance required. Ensure that the span length falls within the limits of the standard designs.

* Determine the deck soffit level based on track position and vertical clearance required.
* Choose the deck option and hence determine the main span landing level.
* Choose the type of support.
* Determine the height of the supports based on the main span landing level and local ground levels. Ensure that the support height falls within the limits of the standard designs.
* Decide the layout of the staircases and ramps (including turns) based on site constraints, for example, limit of Network Rail land, obstructions etc.
* Determine the staircase and ramp rise required based on the main span landing level and local ground levels.
* Choose the number ramp flights/landings based on the restrictions in section 6.3.2 and the dimensions on drawing NR/CIV/SD/480.
* Choose the number of staircase flights, number of steps within a flight and riser depth based on the restrictions in section 6.3.1 and the dimensions on drawing NR/CIV/SD/450 & 451.
* Choose the position of the intermediate access supports and determine the height of these supports based on staircase intermediate landing level and local ground levels. Ensure that the support height falls within the limits of the standard designs.

6 SPECIFIC DESIGN RESTRICTIONS

6.1 Superstructure Restrictions

Both deck options are suitable for simply supported, single spans up to 28m between support centrelines i.e. for crossing up to 4 adjacent tracks with a clearance of 4.5m between the trackside edge of the supports and the nearest running rail.

It is recommended that deck option 1 with in-span steps should be used to achieve maximum efficiency since this option reduces the staircase and ramp rise required. Deck option 2 without in-span steps should always be used when ramps or lifts are provided or when they may be added at a later stage.

6.2 Substructure Restrictions

6.2.1 CHS Supports

Two diameters are available for main span CHS supports: 660mm diameter and 20mm thick and 508mm diameter and 16mm thick. The 660mm diameter CHS are suitable for heights of up to 8.2m above the foundations. The 508mm diameter CHS are suitable for heights up to 5.4m above the foundations.

Two diameters are available for intermediate access CHS supports: 508mm and 406.4mm.

For each type a maximum height has been specified and the appropriate profile should be chosen based on local ground levels.
The main span support profiles may vary from the intermediate access supports. Where several intermediate supports are required within a structure, for example,

multiple span staircases or footbridges with ramps and staircases, a consistent profile should be chosen for all intermediate supports.

6.2.2 Trestle Supports

The 4-leg trestles for the main span supports consist of 150x150x12.5 SHS columns with RHS and SHS bracing. The trestle support is suitable for heights of up to 8.2m above the foundations. The 2-leg trestles for intermediate access supports consist of 250x150x10 RHS columns with RHS and SHS bracing.

The lowest bay in all cases must be 2.4m high and contain no bracing to prevent climbing.
If the total height of the trestle will be less then 5.06m then trestle frames C & D will be used. For taller trestles, up to 7.46m frames A & B will be used.
For the ramp and stair supports, if the trestle is less then 2.75m high trestle type 4 is used. For trestle between 2.75m and 3.8m trestle type 3 is used. For trestles between 3.8m and 5.1m trestle type 2 is used. Trestle type 1 is used for trestle between 5.1m and 7.5m high.

6.2.3 Expansion Joints

Where stiff CHS supports are used (for this purpose both the standard detail CHS sections can be considered stiff) expansion joints are required between ramp sections where the ramp is provided. As expansion joints present a potential maintenance issue it is advised that stiff columns are avoided where possible and trestle supports utilised where there are no aesthetic objections to doing so.

6.3 Access Restrictions

6.3.1 Staircases

Staircase and ramp entry at ground level should be adjacent wherever possible.

The number of steps in a flight should be between three (riser number) and twelve (riser number). The number of steps in a flight may be increased to sixteen (riser number) when only one flight would be required.

There should be the same number of steps in each flight.

Riser depth may be between 150mm and 170mm but must be consistent throughout the flight or series of flights.

BD29/04 "Design Criteria for Footbridges" recommends that the maximum number of successive flights before a change of direction should be three. A 3-flight staircase with the maximum number of steps per flight (12No.) and the maximum riser height (170mm) gives a total rise of 6.12m. If this staircase is used in conjunction with deck option 2 the maximum vertical clearance is unachievable (assuming the ground level at the start of the staircase is similar to the track level). Where more than 3 successive flights are required, use of a 180° turn is recommended. Alternatively a concrete ramp may be provided at the start of the staircase where the level difference is low.

Stringer staircases should be used as a multiple span staircase. Where two successive flights are provided with no intermediate support between them, the maximum number of steps within the flights must be restricted to seven (riser number), the maximum span for the stringer staircase in the standard details is 7.25m.

6.3.2 Ramps

Three ramp gradients are available. The shallowest gradient of 1:20 should be used where site conditions allow.

The maximum ramp length between landings is 6m measured horizontally.

7 DESIGN ASSUMPTIONS

7.1 Structural Models

The deck and truss staircase have been modelled as single, simply supported spans with u-frame restraint to the compression flanges.

Each stringer of the staircase has been designed as a continuous beam. The ramp comprises separate sections each of which are supported on 3 supports. Therefore each ramp stringer has been designed as a 2-span continuous beam.

The column and trestle supports have been modelled as freestanding cantilevers.

7.2 Loading

The standard drawings assume a clearance of 4.5m will be provided between the trackside edge of the supports and the nearest running rail. As such, the components have not been designed for train impact loading.

The standard designs and details have not been designed for equestrian loading.

The maximum wind gust speed has been taken as the limit of 35m/s given in BD37/01 Cl.5.3.2.1.

Minimum and maximum air shade temperatures have been taken as -20°C and +37°C. These values correspond to the London area and represent one hundred and twenty year return period.

A total differential settlement of 25mm has been considered over the length of the staircases and ramps.

8 LOADING ON FOUNDATIONS

The foundations must be designed to withstand the following loads. All loads are unfactored and broken down into, dead (self weight of structural elements) load, surfacing load, superimposed load, live load, wind load and thermal load.

The CHS main span supported foundations must also be designed to resist an overturning moment. For the trestle main span support the horizontal and other eccentric loads will be carried by tension/compression pairs in the trestle legs.
The overturning moments on the CHS sections are broken down into those about axis parallel and perpendicular to the longitudinal axis of the bridge.

8.1 Trestle Support Loading

Trestle Support				
Loading	Maximum vertical load	Minimum vertical load (negative is uplift)	Horizontal load parallel to bridge axis	Horizontal load perpendicular to bridge axis
	kN	kN	kN	kN
Dead	92.7	-15.3	0	0
Surfacing	6.0	-1.7	0	0
Superimposed	25.5	-7.2	0	0
Live	187	-52	0	0
Wind	125	-125	16.1	19.1
Thermal	58.3	-58.3	3.4	4.0

Loading is given per leg. All loads are unfactored. Loading assumes a height of between 4.5m and 7.0m from foundations to top of square hollow sections. Maximum load occurs in the leg closest to both stair and deck. Minimum load in the leg opposite both stair and deck.

8.2 660mm diameter CHS Loading

660mm CHS Support					
Loading	Vertical Load	Horizontal load parallel to bridge axis	Overturning moment perpendicular to bridge axis	Horizontal load perpendicular to bridge axis	Overturning moment parallel to bridge axis
	kN	kN	kNm	kN	kNm
Dead	133.6	0	84.5	0	10
Surfacing	8.1	0	5.1	0	1.5
Superimposed	5.2	0	1.6	0	1.3
Live	253.2	0	161	0	45
Wind	41.7	53.2	365.5	65.3	452.2
Thermal	0	26.4	171.6	75	291.4

All loads are unfactored. Loading assumes a height of 6,5m from foundations to top of circular hollow section.

8.3 508mm diameter CHS Loading

508mm CHS Supports					
Loading	Vertical Load	Horizontal load parallel to bridge axis	Overturning moment perpendicular to bridge axis	Horizontal load perpendicular to bridge axis	Overturning moment parallel to bridge axis
	kN	kN	kNm	kN	kNm
Dead	121.2	0	84.5	0	10
Surfacing	8.1	0	5.1	0	1.5

Superimposed	5.2	0	1.6	0	1.3
Live	253.2	0	161	0	45
Wind	41.7	52.3	274.8	64.4	314
Thermal	0	23.8	114.3	66.2	166.8

All loads are unfactored. Loading assumes a height of 4.8m from foundations to top of circular hollow section.

If heights different from those given are used then it may be necessary to recalculate the loading due to dead, wind and thermal effects. In particular it should be noted that the effects of thermal loading increase rapidly with reduced height.

8.4 Stair/Ramp Loading on supports.

Loading	Vertical Load	Horizontal load parallel to stair/ramp axis	Overturning moment perpendicular to stair/ramp axis	Horizontal load perpendicular to stair/ramp axis	Overturning moment parallel to stair/ramp axis.
	kN	kN	kNm	kN	kNm
Dead	45.4	0		0	
Surfacing	3.1	0		0	
Superimposed	14.4	0		0	
Live	100	0		0	
Wind	16.6	9.5		48.9	
Thermal	0				

All loads are unfactored, the above assumes that a single footing is provided for both feet of the trestle (if used) and as the self weight of the column section is minimal all three options are included in the above table.

The foundation loading can be determined on a project specific basis using the loading for each element included below.

8.5 Deck Loading.

Loading	kN/m
Dead	5.25
Surfacing	0.32
Superimposed (including canopy)	0.97
Live	10.0
Wind (vertical loading)	1.51
Wind (horizontal loading)	4.52

8.6 Truss Staircase

Loading	kN/m
Dead	3.79
Surfacing	0.32
Superimposed (including canopy)	1.58
Live	10.0
Wind (vertical loading)	1.66
Wind (horizontal loading)	4.3

8.7 Stringer Staircase

Loading	kN/m
Dead	3.66
Surfacing	0.32
Superimposed (including canopy)	1.58
Live	10.0
Wind (vertical loading)	1.66
Wind (horizontal loading)	4.32

8.8 Ramp

Loading	kN/m
Dead	1.99
Surfacing	0.32
Superimposed (including canopy)	1.43
Live	10.0
Wind (vertical loading)	1.66
Wind (horizontal loading)	4.32

8.9 CHS supports

Support	Dead load stiffeners /plates kN	Dead load column section kN/m	Horizontal wind load kN/m
406.4*10	1.30	0.98	0.19
508*10	1.73	1.22	0.23
508*16	1.73	1.95	0.23
660*20	2.51	3.22	0.30

8.10 Main span trestle supports

Support	Dead load bracing kN	Dead load legs kN/m	Horizontal wind load kN on bracing	Horizontal wind load kN/m on legs
Support up to 5m high	10.2	2.1	2.81	0.97
Support up to 7.5m high	19.34	2.1	5.61	0.97

8.11 Ramp/Stair trestle supports

Support	Dead load bracing kN	Dead load legs kN/m	Horizontal wind load kN on bracing parallel to stair	Horizontal wind load kN/m on legs parallel to stair	Horizontal wind load kN/m on legs perpendicular to stair
Support up to 2.4m high	0.47	1.02	0	0.81	0.49
Support up to 3.6m high	1.13	1.02	0.47	0.81	0.49
Support up to	2.73	1.02	1.35	0.81	0.49

5m high					
Support up to 7.5m high	4.51	1.02	2.35	0.81	0.49

Thermal loading is dependent upon both type of supports, their height and the distance between supports and should be calculated on a project specific basis.
Thermal loading may be neglected for ramps, which contain expansion joints between each section.

8.12 Differential settlement of foundations.

The foundations must be designed so that the anticipated settlement will not cause one main span foundation to move 20mm with respect to the other, or to cause adjacent stair/ramp foundations to move 10mm with respect to each other.
Each elements foundation must be designed to avoid differential settlement that would cause the element to top to move 10mm horizontally.

9 INSTALLATION GUIDANCE

9.1 Installation Sequence

The installation sequence should be as follows:

* Prepare site for construction work: clear vegetation, remove obstacles etc.
* Install foundations (not included in the remit for the standard designs and details). The anchor plates and sleeved holding down bolts the supports should be cast into the foundations.
* Lift access staircase supports into place onto shims and bolt down.
* Lift staircase modules into place and bolt down.
* Lift deck section into place and bolt down.
* Lift ramp supports/lift superstructure into place onto shims and bolt down.
* Lift ramp modules/lift link into place and connect to supports and main span landing.
* Grout under support columns and remove shims as necessary.
* Installation of positive drainage system at station sites if required.
* Installation of lighting and M&E if required.

ANNEXE 1 SCHEDULE OF STANDARD DRAWINGS

Drawing	Description
/400	Footbridge Non-Station Introduction
/401	Option 1 - Main Span Stepped Deck
/402	Option 2 - Main Span Flat Deck
/405	Main Span Structural details sheet 1 of 2
/406	Main Span Structural details sheet 2 of 2
/410	Main Span Furniture details
/420	Main Span Support CHS Columns
/421	Main Span Support Four Leg Trestle sheet 1 of 2
/422	Main Span Support Four Leg Trestle sheet 2 of 2
/430	Stair/Ramp Support CHS Columns
/431	Stair/Ramp Support Two Leg Trestle
/440	Abutment/Cill beam Support Landing Details For Option 1 No Future Ramp
/441	Abutment/Cill beam Support Landing Details For Option1 With Future Ramp
/442	Abutment/Cill beam Support Landing Details For Option 2 No Future Ramp
/443	Abutment/Cill beam Support Landing Details For Option 2With Ramp
/450	Stringer Staircase General Arrangement
/451	Stringer Staircase 180° Turn
/452	Stringer Stair Details
/453	CHS Landing Details
/454	CHS Main Span Landing Option 1 No Future Ramp
/455	CHS Main Span Landing Option 1 With Future Ramp
/456	CHS Half Landing Details
/457	CHS Main Span Landing Option 2 No Future Ramp
/458	CHS Main Span Landing Option 2 With Future Ramp
/459	Trestle Stair Details
/460	Trestle Stair Details Option 1 No Future Ramp
/461	Trestle Stair Details Option 1 With Future Ramp
/462	Trestle Half Landing Details
/463	Trestle Main Span Landing Option 2 No Future Ramp
/464	Trestle Main Span Landing Option 2 With Future Ramp
/470	Truss Stair General Arrangement Straight
/471	Truss Stair General Arrangement 180° Turn
/472	Truss Staircase Details
/473	Truss Stair Half Landing Details
/474	Truss Stair Main Span Landing Option 1 No Future Ramp
/475	Truss Stair Main Span Landing Option 1 with Future Ramp
/476	Truss Stair Main Span Landing Option 2 No Future Ramp
/477	Truss Stair Main Span Landing Option 2 with Future Ramp
/480	Standard Ramp General Arrangement

/481	Ramp 180° Turn Up General Arrangement
/482	Ramp 180° Turn Down General Arrangement
/483	Ramp at Main Landing General Arrangement
/484	Bottom Ramp
/485	Typical Ramp Details sheet 1 of 4
/486	Typical Ramp Details sheet 2 of 4
/487	Typical Ramp Details sheet 3 of 4
/488	Typical Ramp Details sheet 4 of 4
/490	Drainage Philosophy
/491	Corduroy Tactile Surface Locations
/495	Lifting Point Details sheet 1 of 2
/496	Lifting Point Details sheet 2 of 2
/498	Erection Sequence CHS supported Footbridge
/499	Erection Sequence Trestle supported Footbridge
/700	Footbridge Non Mainline-Station Introduction
/710	Surface Drainage Overview
/711	Drainage Details Main Span Option 1
/712	Drainage Details Main Span Option 2
/713	Drainage Details Stairs sheet 1 of 2
/714	Drainage Details Stairs sheet 2 of 2
/715	Drainage Details Ramps sheet 1 of 2
/716	Drainage Details Ramps sheet 2 of 2
/717	Drainage Details Supports
/720	Lighting General Arrangement
/721	Lighting details sheet 1 of 2
/722	Lighting details sheet 1 of 2
/723	Trunking details sheet 1 of 2
/724	Trunking details sheet 2 of 2
/730	Lift Link Platform General Arrangement