DCSTRUCTURESSTUDIO

PEDESTRIAN & CYCLE FRIENDLY

FOOTBRIDGE DESIGN SET

Are you a landscape architect, developer, or local council looking to create or improve a public space?

Do areas of your design require pedestrian or cycle friendly bridges?

Does your project budget make engaging bridge engineers difficult at this stage of your design process?

THE "DCSS PEDESTRIAN BRIDGE"

Our standard bridge design sets are simple and cost effective bridge solutions for use in parks and urban landscapes. They are designed to New Zealand standards by experienced and qualified bridge engineers and bridge architects. The aim of this bridge design is to establish a baseline pedestrian bridge design for New Zealand that can be easily implemented into most New Zealand design situations.

The bridge design is a steel beam system supporting timber joist and decking. The bridge can carry pedestrians and cyclists and allows spans of up to 18m and usable widths up to 3m. Various balustrades designs are provided and the colour of the steelwork is fully customisable without further design inputs.

This bridge set is intended to help designers who need a simple cost effective bridge for their overall masterplan but who do not want to commission a bridge engineer or bridge architect in the early stages. In many cases the design can be successfully modified using variations of colour and balustrade type to fit the specific context without further design inputs being required.

The design is intended to help the following professionals:

- Landscape Architects
- Councils & Local Boards
- Developers
- Design and Build Contractors

Why do we need a baseline pedestrian bridge design in NZ?

These designs are intended to be used for concept and feasibility stages of urban and landscape design projects. Landscape designers and councils often ask us if there are any basic bridge designs they can use to begin setting their overall masterplan and capital budgets. Until now the answer has always been "no". As of 2017 none of the local councils of NZ or the NZ Transport Agency have standard designs for pedestrian or cycle bridges that are readily available to designers.

In the early stages of a project; councils, developers, and landscape designers want simple and reliable bridge options that fit to, and help set, their overall budgets.

Making this design set freely available to all professionals is aimed at encouraging and more easily enhancing public spaces in and around NZ. This set aims to enable landscape architects and urban designers to setup public space masterplans and overall capital budgets that their clients can readily understand and hopefully accept prior to engaging other professionals.

So you have set a masterplan and you have agreed a capital budget using this bridge design... what next?

The bridge beams, decking and balustrades of this design set are pre-designed ready for construction to New Zealand standards as outlined in the New Zealand Building Code (as of January 2017). This approach to the design is intended to save your project time and money. At building consent stage and in accordance with the New Zealand Building Code a Designer Producer Statement (PS1) for the bridge structure and PS1 for Geotechnical work will be required. Such services can be provided by your existing chartered professional engineering professionals (CPEng) once they have satisfied themselves that the design is compliant. Alternatively, you can contact us at DC Structures Studio Ltd to provide these services.
Prior to resource consenting a small geotechnical study will be necessary to confirm the ground conditions, geotechnical design parameters and provide bridge foundation recommendations. This is likely to consist of two borehole tests (one at each abutment location) followed by a small report summarising the ground conditions, geotechnical properties, and substructure recommendations. This study will then be used by your structural engineering design professional to design and detail a suitable abutment to support the bridge.

NZ PEDESTRIAN FOOTBRIDGE WITH HORIZONTAL WIRE BALUSTRADE

This balustrade option features horizontal balustrade wires. Horizontal wires are a cost effective and low maintenance option for NZ bridges. The horizontal wire infill system is common place on New Zealand cycle bridges as they allow a lightweight aesthetic whilst proving a safe restraint to users*.

Because the infill wires are made from stainless steel they provide optimal long-term durability compared to contemporary painted steel rod or steel plate infill systems. Using this system reduces overall fabrication and whole of life maintenance costs for the bridge.

Fully code compliant.
Designed for New Zealand conditions in accordance with New Zealand Design Standards.

Spans up to 18m.
Reduce by multiples of 1.8m for smaller spans e.g. can also work for 16.2m, 14.4m, etc.

Designed for 3.0m wide footways.
Can be easily reduced to other widths without further design

Balustrade heights of 1.1m.
Posts are fabricated by cutting universal beams to reduce welding and fabrication costs.

Architectural flexibility.
Alternative balustrade designs can be incorporated to enable the implementation of customised – but cost effective – project specific architectural merit.

Full colour versatility.
The steelwork can be finished to a vast array of different colours including most of the Resene and/or Dulux colour palettes.

Includes full superstructure design drawings.
Enables fast and simple detailed design and fabrication stages.

3D models available.
SKP files can be provided so that the design can be quickly added to landscape architect or urban developer masterplans.

Thoughtful economic Vs. aesthetic balance.
Only the visible elements of the steelwork are painted. All of the internal steelwork is galvanized or zinc sprayed. This provides an excellent balance of aesthetics to cost.

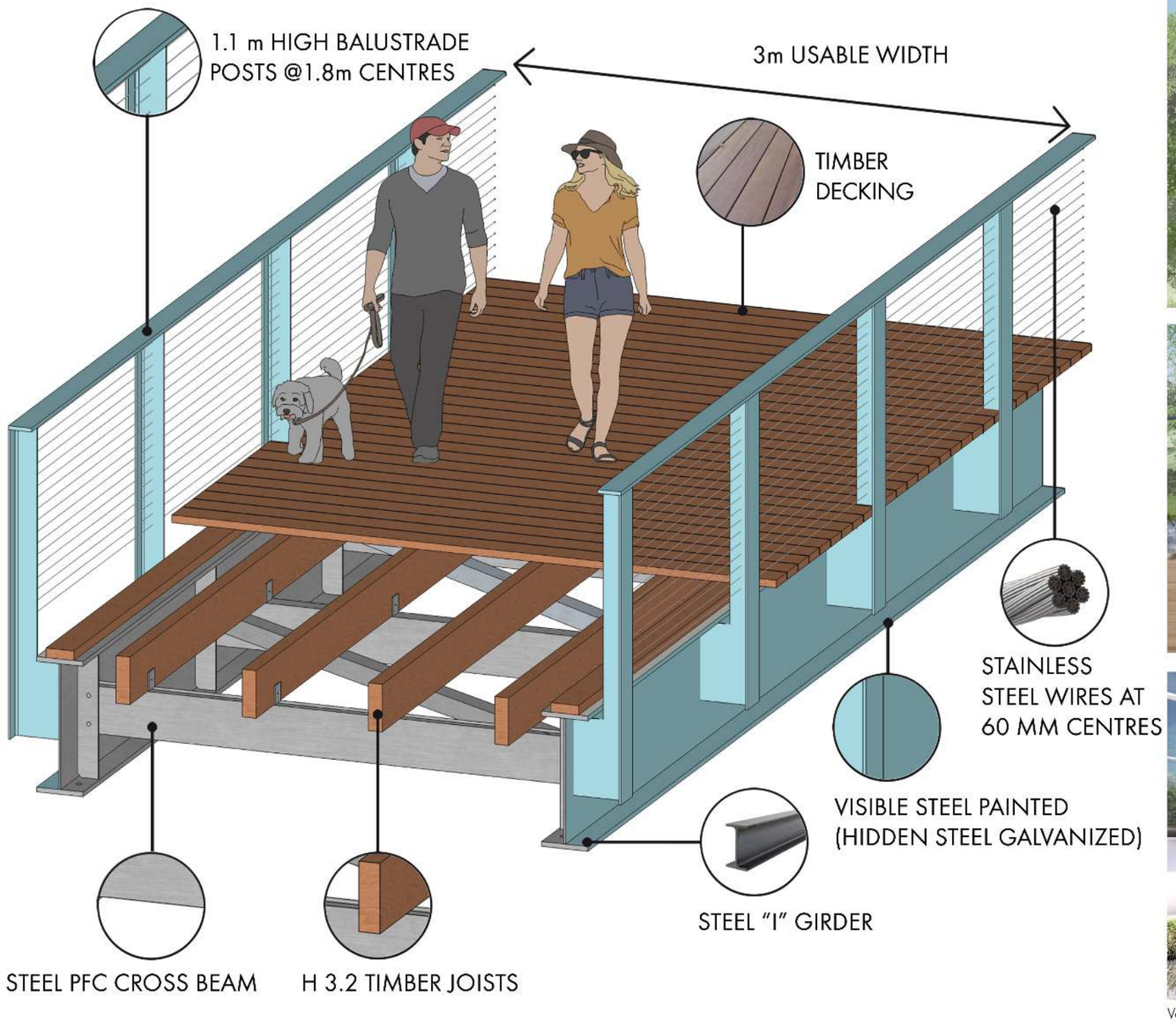
Environmentally friendly.
Acrylic elastomeric paint systems can be used directly over the existing paint system during bridge maintenance and touch-ups which prevents the need for sand blasting over waterways.

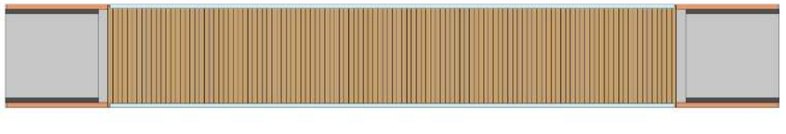
Good "whole of life" cost.
The 100 year overall design life exceeds the NZ Building Code (NZBC) requirement of 50 years. Achieved with minimal additional cost thus providing good whole of life cost for clients. Time to first maintenance for steelwork paint systems is 40 years and timber replacement after 50 years.

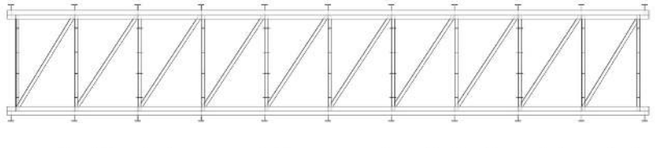
Cost effective solution.
The estimate for this bridge is approximately $3,500 per metre square. Our estimates are provided by True-Cost NZ and they include allowance for a concrete abutment with piled foundations, wingwalls to tie into existing ground levels, structural design, geotechnical design, and fabrication/erection costs (this is a full "no surprises" estimate). Examples:
- 14.4m x 2m wide bridge ≈ NZ$100,000
- 18m x 3m wide footbridge ≈ NZ$190,000

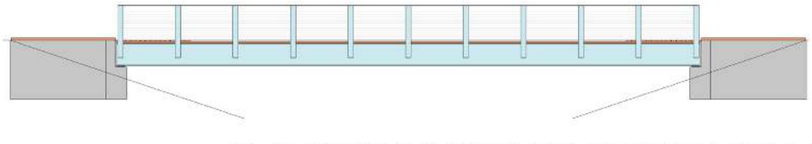
Contact us for more details relating to the estimate assumptions.

Safe and quick construction.
Time on site can be significantly reduced by fabricating the entire superstructure (including balustrades) offsite. Bridge is designed to be transportable in single piece (depending upon site access). It can be lifted into place once the abutments are complete.









*Please note that this system incorporates a horizontal infill system that is not strictly in accordance with NZBC F4. We strongly recommend that this system is pre-agreed with your consenting authority at the earliest opportunity. Since bridges are not strictly speaking buildings (as intended by the NZBC) and the presence of unaccompanied children under 6 years of age is less likely, councils often agree to the use of horizontal wires because of the improved durability and lower capital costs incurred. We have numerous examples where this has been accepted by Council.

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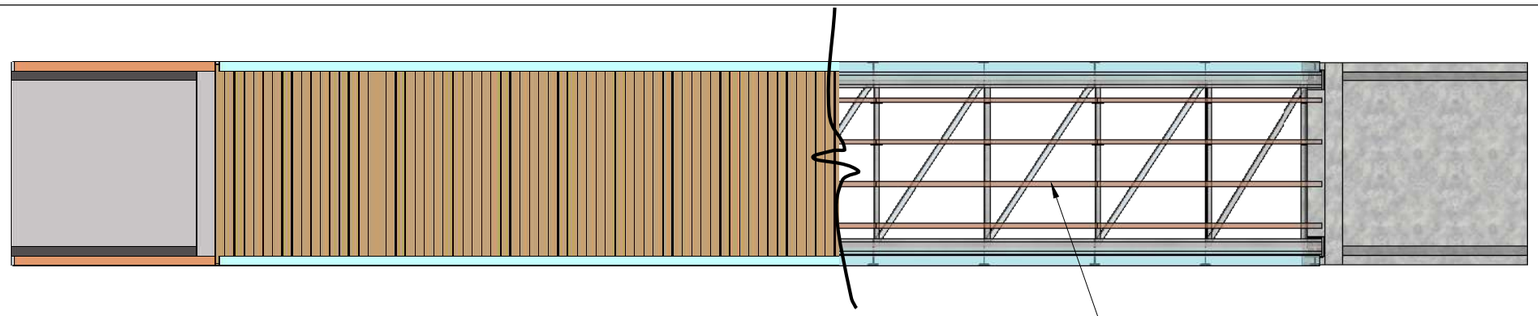
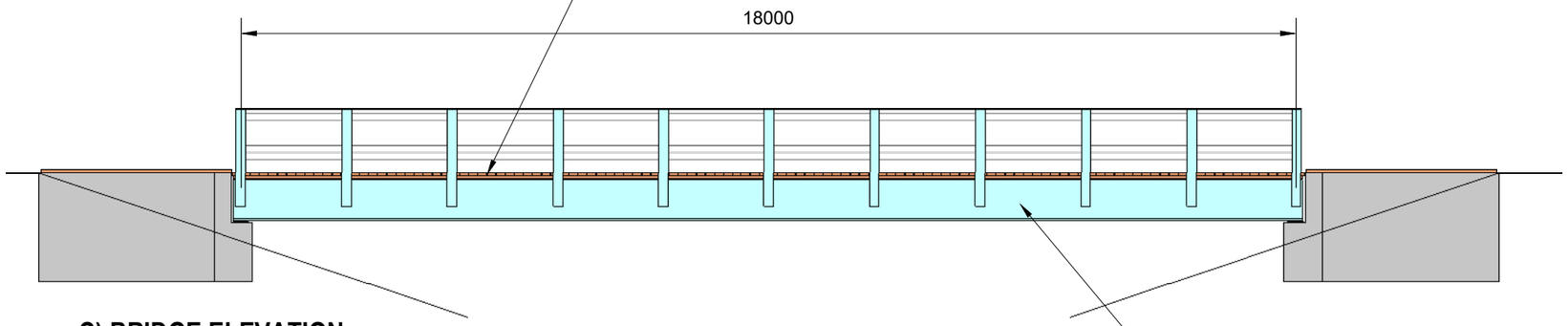


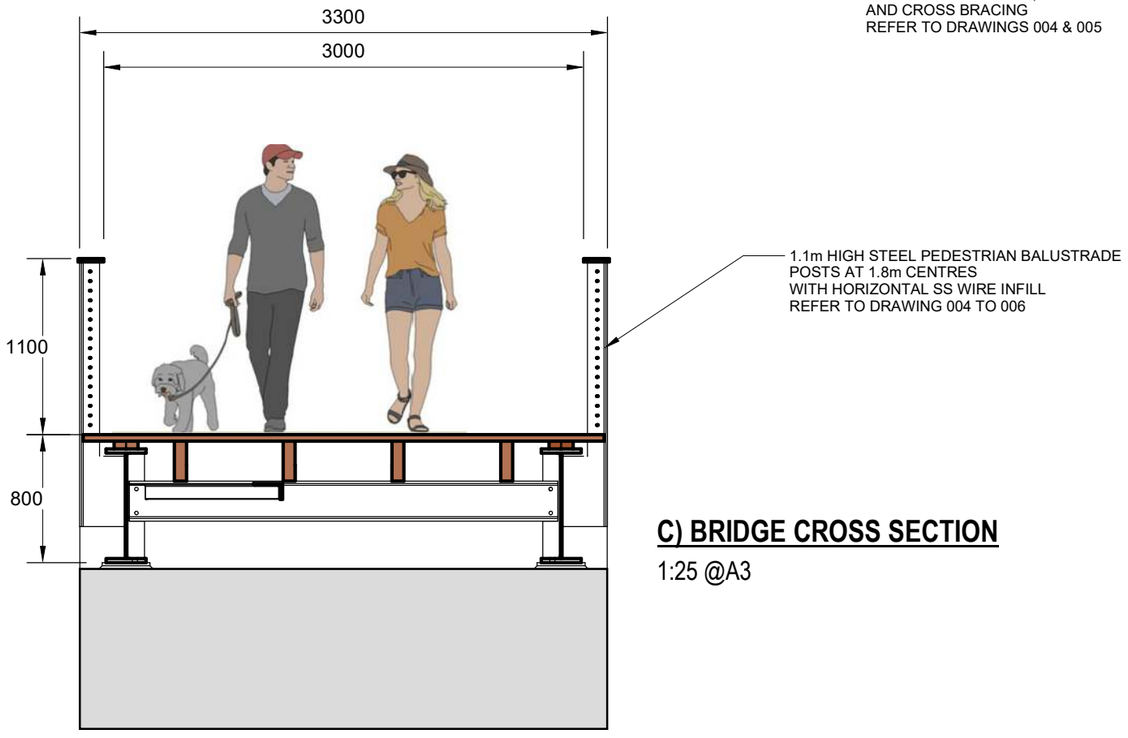
A) BRIDGE PLAN

1:100 @A3



C) BRIDGE ELEVATION

1:100 @A3



C) BRIDGE CROSS SECTION

1:25 @A3

NOTES (APPLICABLE TO ALL DRAWINGS):

1 - GENERAL NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL DRAWINGS

2 - DESIGN LOADING:

VERTICAL LOADING:

LOADINGS ARE BASED ON AS/NZS1170.1 AS SUMMARISED BELOW:

LOAD TYPE	LOAD	SLS FACTOR	ULS FACTOR
STEEL WT.	77 KN/M³	1.0	1.2
TIMBER WT.	5 KN/M³	1.0	1.2
PEDESTRIAN LIVE LOAD	5 KPa	1.0	1.5

BARRIER LOADING:

LOADINGS ARE BASED ON AS/NZS1170.1 AND AS5100.2 AS SUMMARISED BELOW.:

LOAD TYPE	LOAD	SLS FACTOR	ULS FACTOR
TOP RAIL - HORIZONTAL & VERTICAL COMBINED	0.75 KN/M	1.0	1.8
INFILL - HORIZONTAL	1.0 KPA	1.0	1.8
INFILL – POINT LOAD	0.5 KN	1.0	1.8

SEISMIC CRITERIA:

CRITERIA AS PER AS/NZS1170.5:

IMPORTANCE FACTOR	1
DESIGN LIFE	100 YEARS
DESIGN EQ RETURN PERIOD	250 YEARS (Ru = 0.75)
ZONE FACTOR	≤0.13
SOIL CLASS	C
PERIOD OF VIBRATION	<0.5 SECS
DUCTILITY	μ = 1.0

REV	DESCRIPTION	DATE
A	FOR CONCEPT	26.02.17

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DC Structures Studio Ltd, Cambridge, NZ
Find out more at dcstructuresstudio.com or dcss.nz

CLIENT NZ DESIGNERS

PROJECT BASIC NZ PEDESTRIAN BRIDGE HORIZONTAL WIRE BALUSTRADE

PROJECT NO. DCSS-BR-001

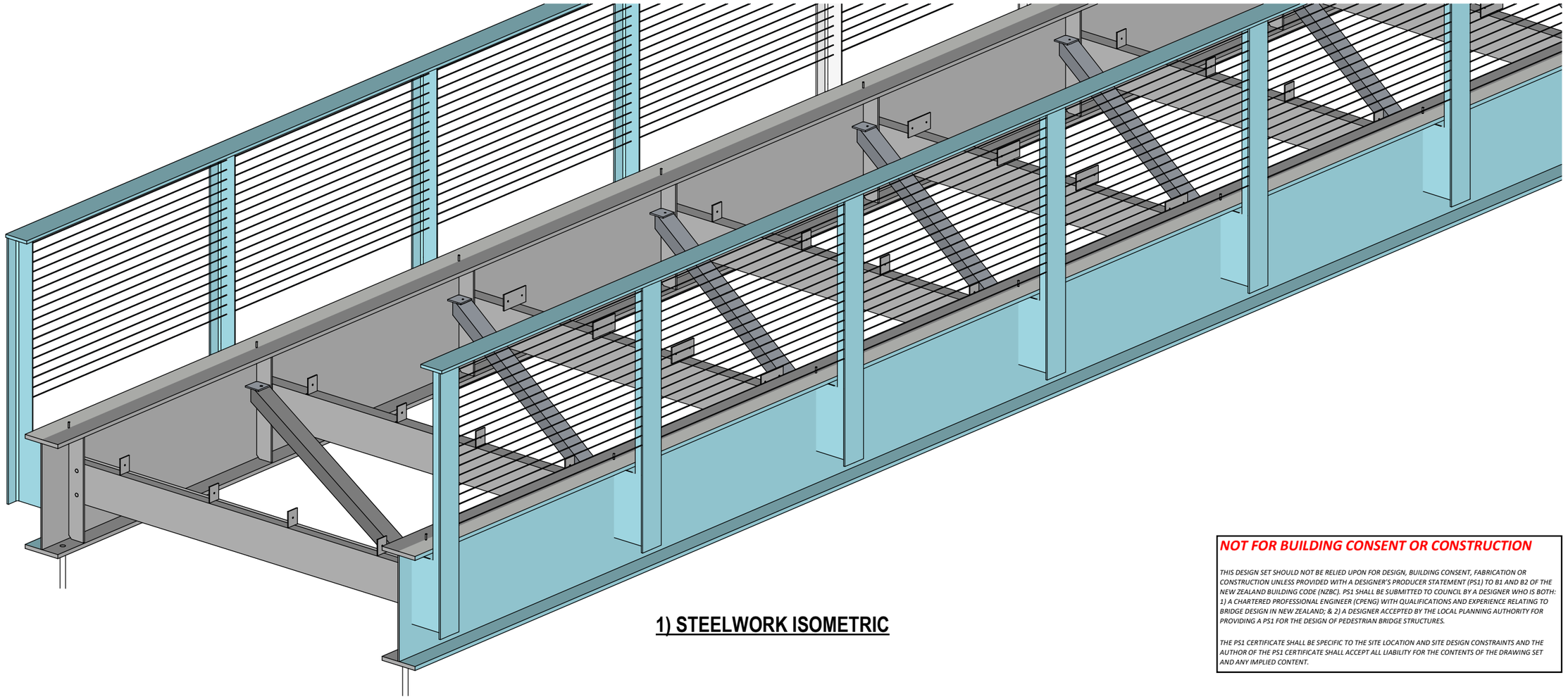
ISSUE CONCEPT

DRAWN BY DCSS

BASIC NZ PEDESTRIAN BRIDGE
GENERAL ARRANGEMENT PLAN,
ELEVATION & TYPICAL SECTION

03

Rev A



1) STEELWORK ISOMETRIC

NOT FOR BUILDING CONSENT OR CONSTRUCTION

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THE PS1 CERTIFICATE SHALL BE SPECIFIC TO THE SITE LOCATION AND SITE DESIGN CONSTRAINTS AND THE AUTHOR OF THE PS1 CERTIFICATE SHALL ACCEPT ALL LIABILITY FOR THE CONTENTS OF THE DRAWING SET AND ANY IMPLIED CONTENT.

GENERAL STEELWORK NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL STEELWORK INCLUDING (BUT NOT LIMITED TO) TOLERANCE, FABRICATION AND ERECTION SHALL BE IN ACCORDANCE WITH NZS 3404.
3. CORROSION PROTECTION SYSTEMS ARE AS PER "PROTECTIVE COATINGS FOR STEEL BRIDGES" (NZ TRANSPORT AGENCY, FEBRUARY 2014) WHICH IS CONSISTENT WITH AUSTRALIAN AND NEW ZEALAND STANDARD AS/NZS 2312 "GUIDE TO THE PROTECTION OF STRUCTURAL STEEL AGAINST ATMOSPHERIC CORROSION BY THE USE OF PROTECTIVE COATINGS".
4. CORROSION ZONE "C" HAS BEEN ASSUMED. THIS ASSUMES THE STRUCTURE IS >1Km FROM BREAKING WAVES AND WILL GENERALLY APPLY TO THE MAJORITY OF DEVELOPMENTS AND RECREATIONAL PARKS IN AUSTRALIA AND NZ. CHECK WITH YOUR BRIDGE ENGINEER IF YOU ARE UNSURE.
5. ASSUMED TIME TO FIRST MAINTENANCE OF THE SPECIFIED SYSTEMS IS 40 YEARS. THIS HIGH DURABILITY IS INTENDED TO PROVIDE GOOD WHOLE OF LIFE COST FOR COUNCILS AND DEVELOPERS IN MAINTAINING THEIR ASSETS.
6. ALL STRUCTURAL STEELWORK MUST BE SEPERATED FROM TIMBER WITH AN APPROVED DAMP PROOF MEMBRANE.
7. SHOP DRAWINGS SHALL BE PREPARED FOR ALL STEELWORK INCLUDING PRIMARY BEAMS, CROSS BEAMS, BRACING, AND BALUSTRADE ETC.

STEEL GRADES:

1. STEEL OPEN SECTIONS TO BE GRADE 300 MINIMUM IN ACCORDANCE WITH AS/NZS 3679
2. HOLLOW SECTIONS TO BE GRADE 350 MINIMUM IN ACCORDANCE WITH AS/NZS 3679
3. STEEL PLATES ARE TO BE GRADE 250 MINIMUM IN ACCORDANCE WITH AS/NZS 3679

WELDED CONNECTIONS:

1. ALL WELDS TO BE CATEGORY SP IN ACCORDANCE WITH THE REQUIREMENTS OF NZS 3104 AND CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF NZS 3404 AND AS/NZS 1554.
2. NO SITE WELDING IS PERMITTED UNLESS AGREED BY THE ENGINEER.
3. ALL WELDS SHALL BE SEAL WELDS WHETHER SHOWN ON THE DRAWINGS OR NOT.
4. ALL WELDS SHALL BE 6mm CONTINUOUS FILLET UNO. REFERENCE AS/NZS 1554.1
5. WELDING ELECTRODES SHALL BE E48XX TO AS/NZS 1553 UNO.
6. AN INDEPENDENT WELDING INSPECTOR SHALL BE ENGAGED TO UNDERTAKE ALL INSPECTIONS, TESTS (INCLUDING NDT TESTING) AND REPORTS. THIS SHALL INCLUDE ANY ADDITIONAL INSPECTIONS, TESTS AND REPORTS NECESSARY DUE TO THE PRESENCE OF ANY WELDING OR RELATED WORKMANSHIP DEFECTS. THE WELDING INSPECTOR SHALL BE QUALIFIED TO AS/NZS1554 AND SHALL OUTLINE THEIR PROPOSED INSPECTION REGIME TO BE AGREED WITH THE ENGINEER PRIOR TO FABRICATION.

BOLTED CONNECTIONS:

1. ALL BOLTS SHALL BE M20-8.8/TB UNLESS NOTED OTHERWISE. THREADS MAY BE INCLUDED IN SHEAR PLANES. BOLTING ABBREVIATIONS ARE TO AS 1511.
2. ALL HOLES SHALL BE DRILLED & SHALL BE 2mm LARGER THAN THE BOLT DIAMETER.
3. HOLES FOR THE 30 DIA ABUTMENT HOLD DOWN BOLTS MAY BE 6mm LARGER THAN THE BOLT DIAMETER TO AID ERECTION.
4. TIGHTENING PROCEDURE SHALL COMPLY WITH AS 1511 AND ALL BOLTS SHALL HAVE AT LEAST ONE THREAD PROJECTING THROUGH NUTS.
5. ALL BOLTS, NUTS & WASHERS SHALL BE HOT DIP GALVANISED BY THE MANUFACTURER TO CONFORM TO AS 1214.

HIDDEN STEELWORK CORROSION PROTECTION SYSTEM:

HIDDEN STEELWORK COVERS ELEMENTS THAT ARE ONLY VISIBLE BETWEEN THE PRIMARY BEAMS AND INCLUDE:

A) INSIDE FACE OF PRIMARY BEAM WEB

B) ALL CROSS BEAMS AND ASSOCIATED CONNECTIONS

D) ALL BRACING ELEMENTS AND ASSOCIATED CONNECTIONS

1. AS/NZS 2312 SYSTEM = TSZ100 OR HDG600 IN ACCORDANCE WITH AS2312

VISIBLE STEELWORK CORROSION PROTECTION SYSTEM:

VISIBLE STEELWORK INCLUDES:

A) OUTSIDE FACE OF PRIMARY BEAM WEB

B) ALL SURFACES OF BOTTOM FLANGE

C) UNDERSIDE AND OUTSIDE EDGE OF TOP FLANGE

D) ALL BALUSTRADE STEELWORK

1. AS/NZS 2312 SYSTEM = TSZ100S + 75 MICRON GRAFFITI RESISTANT HIGH GLOSS POLYURETHANE TOP COAT IN ACCORDANCE WITH AS2312

.2. 2 NO. REFERENCE PLATES OF THE CHOSEN SYSTEM AND COLOUR SHALL BE ISSUED TO THE DESIGNER FOR APPROVAL AT LEAST 2 WEEKS PRIOR TO FABRICATION COMMENCING.

3. COLOUR OF TOP COAT TO BE:

.....

.....

REV	DESCRIPTION	DATE
A	FOR CONCEPT	15.01.17

DCSTRUCTURESSTUDIO

DC Stroutures Studio Ltd, Cambridge, NZ
Find out more at dcstructuresstudio.com or dcss.nz

CLIENT
NZ DESIGNERS

PROJECT
BASIC NZ PEDESTRIAN BRIDGE
HORIZONTAL WIRE BALUSTRADE

PROJECT NO.
DCSS-BR-001

ISSUE
CONCEPT

DRAWN BY
DCSS

BASIC NZ PEDESTRIAN BRIDGE
STEELWORK SHEET - 1

04

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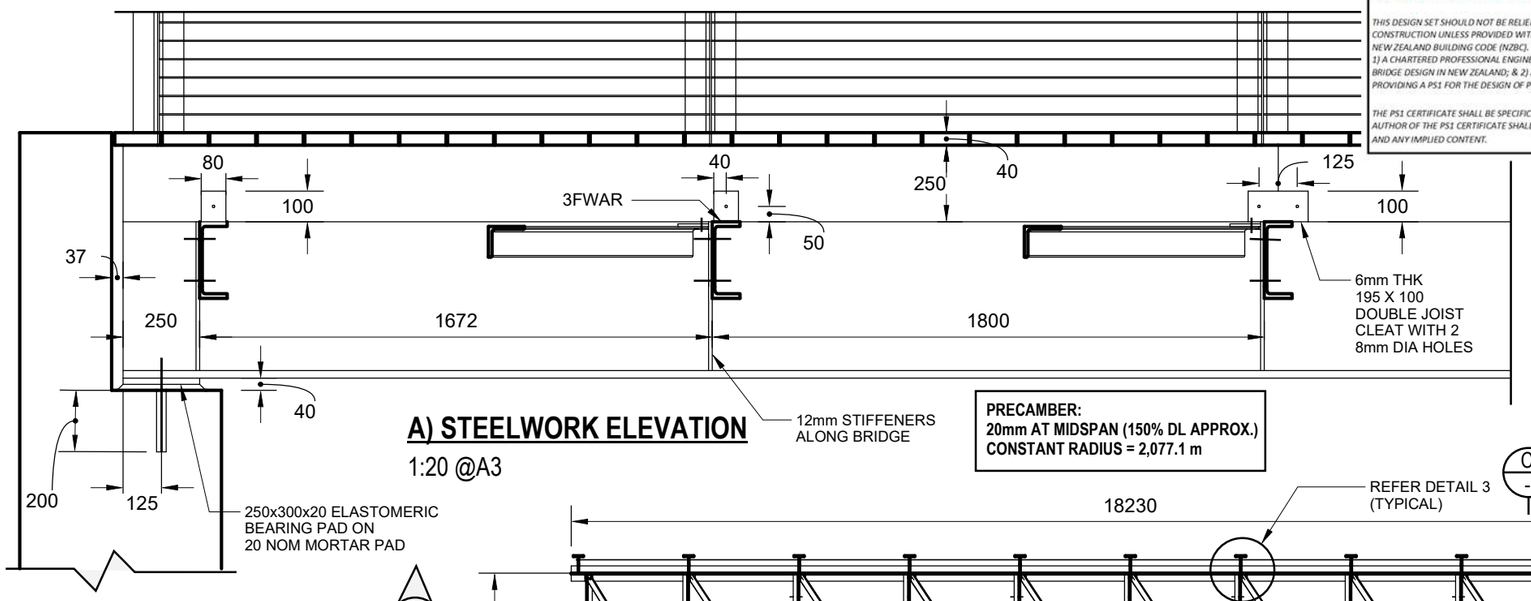
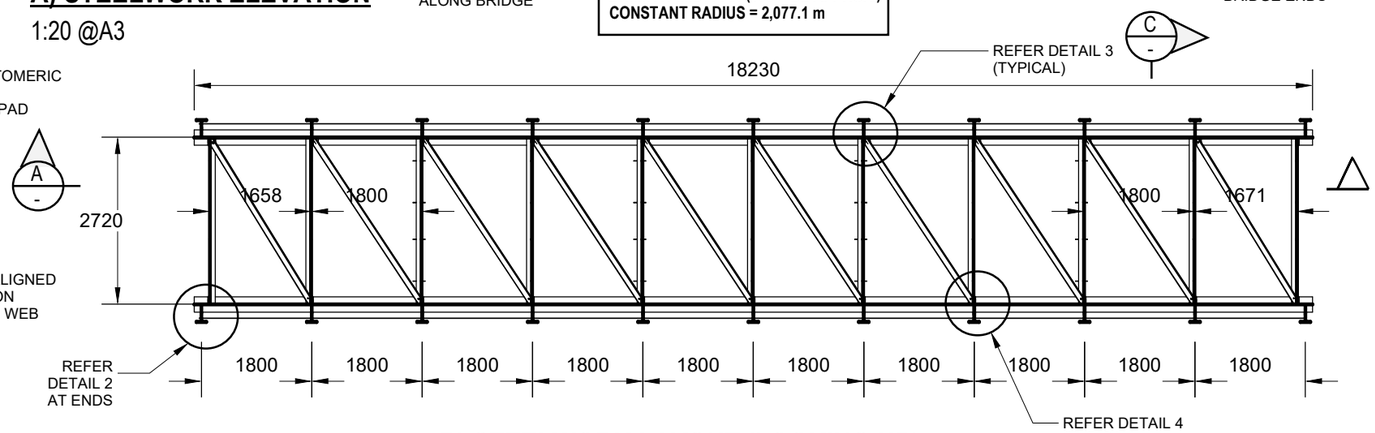
A) STEELWORK ELEVATION
1:20 @A3



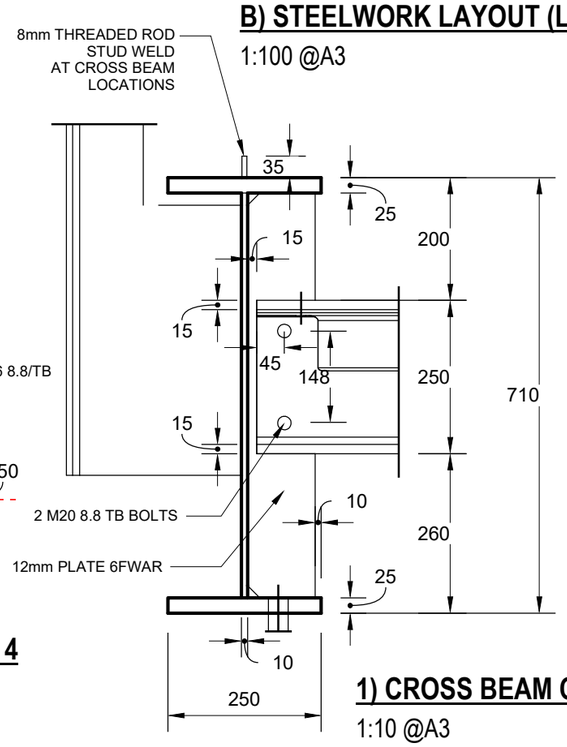
PRECAMBER:
20mm AT MIDSPAN (150% DL APPROX.)
CONSTANT RADIUS = 2,077.1 m



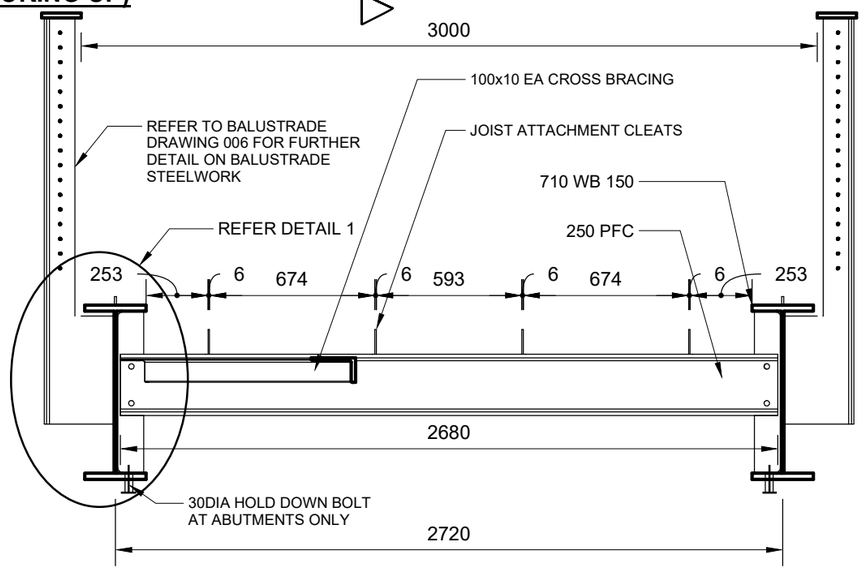
NOTES:

1. REFER TO DRAWING 003 FOR GENERAL NOTES & EXCLUSIONS.
2. REFER TO DRAWING 004 FOR STRUCTURAL STEELWORK NOTES.

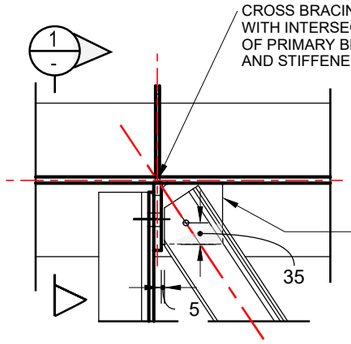
B) STEELWORK LAYOUT (LOOKING UP)
1:100 @A3



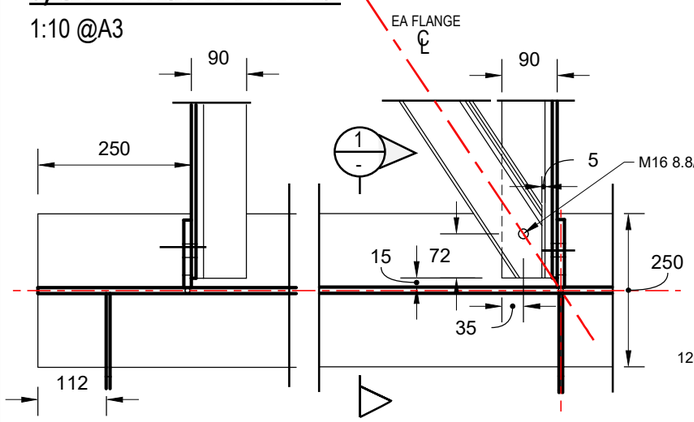
1) CROSS BEAM CONNECTION
1:10 @A3



C) STEELWORK SECTION
1:25 @A3



3) STEELWORK DETAIL 3
1:10 @A3



2) STEELWORK DETAIL 2
1:10 @A3

4) STEELWORK DETAIL 4
1:10 @A3

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HORIZONTAL WIRE BALUSTRADE

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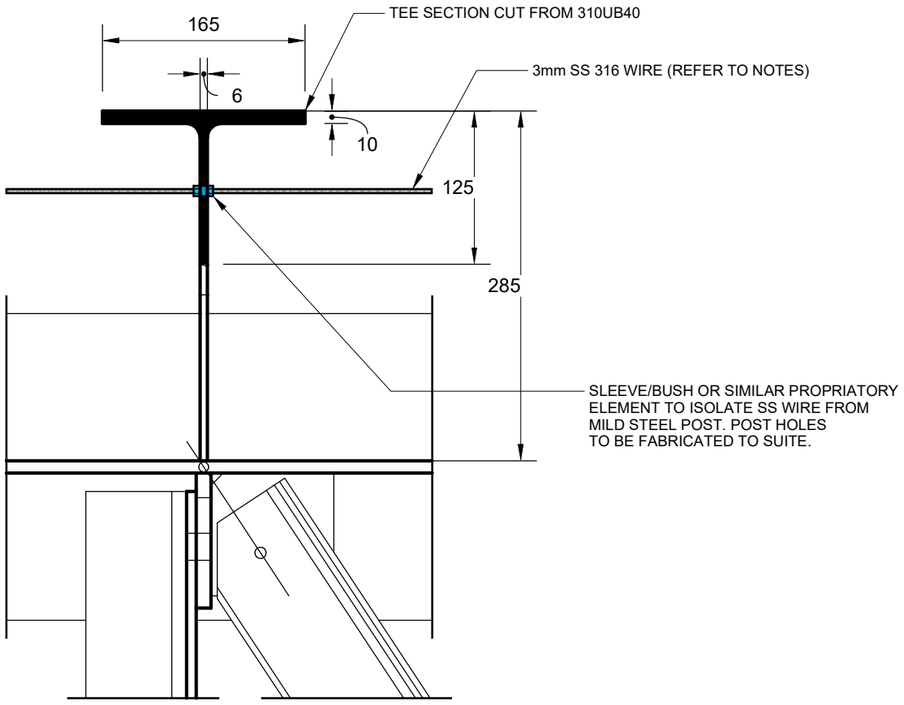
BASIC NZ PEDESTRIAN BRIDGE
STEELWORK SHEET 2

05
Rev A



2) BARRIER PLAN SECTION

1:5 @A3

1) BARRIER CROSS SECTION

1:10 @A3

NOTES:

GENERAL NOTES:

1 REFER TO DRAWING 003 FOR GENERAL NOTES & ASSUMED BALUSTRADE LOADS.

2 REFER TO DRAWING 004 FOR STRUCTURAL STEELWORK NOTES.

STAINLES STEEL GRADE 316 WIRE:

3 A MINIMUM 3mm DIAMETER GRADE 316 STAINLESS STEEL WIRE IS TO BE USED AT 60mm VERTICAL SPACING.

4 GRADE 316 TURNBUCKLES FOR STRESSING THE WIRES ARE TO BE PROVIDED AT EACH END.

5 SS WIRE HOLES ARE TO BE FABRICATED AND CORROSION PROTECTED IN THE POST PRIOR TO INSTALLATION OF BALUSTRADE SYSTEM.

6 WIRES AND TURNBUCKLES ARE TO BE ISOLATED FROM PAINTED STEEL POST USING PROPRIATORY NYLON BUSHES (OR SIMILAR) WHEN PASSING THROUGH STEEL POST HOLES.

7 WIRE IS TO BE TENSIONED TO 1025 KN. THIS SHALL BE CONFIRMED BY DEMONSTRATING THAT A 2KG MASS SUPPORTED AT THE CENTRE OF ANY STRAND DOES NOT DEFLECT MORE THAT 7mm.

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PEDESTRIAN BRIDGE
HORIZONTAL WIRE BALUSTRADE

PROJECT NO.
DCSS-BR-001

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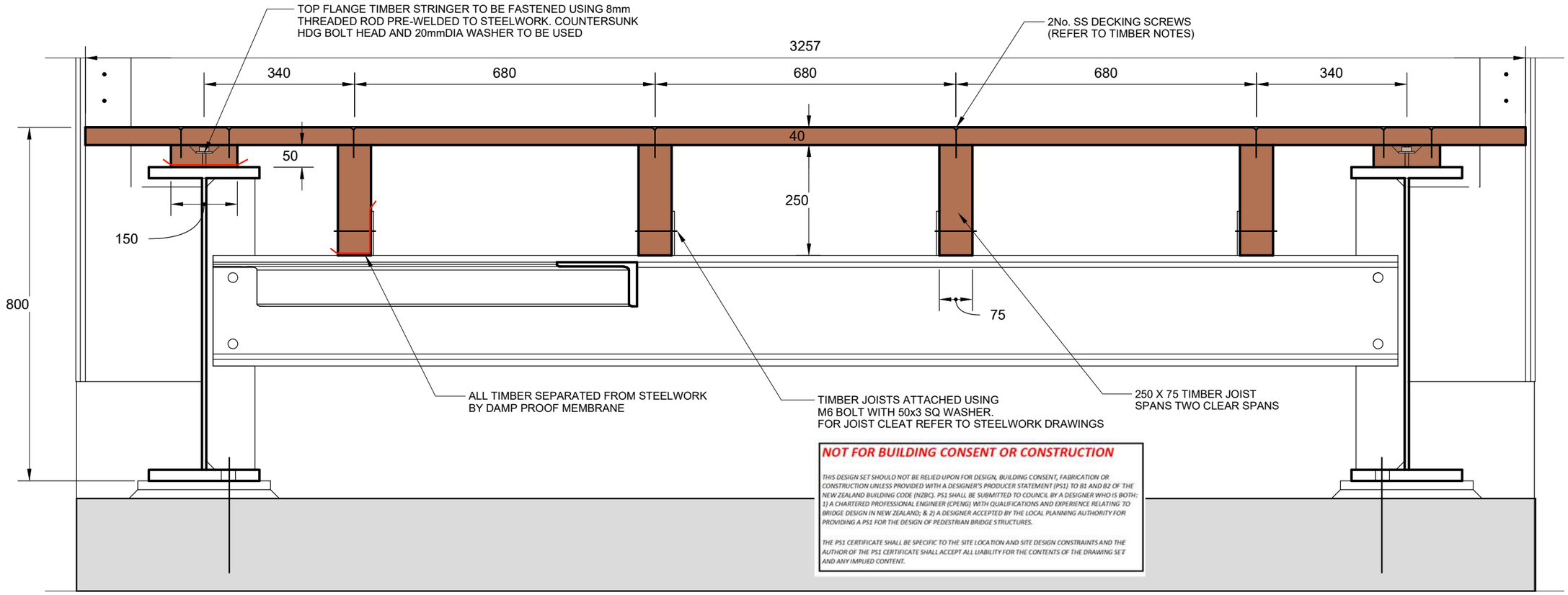
BASIC NZ PEDESTRIAN BRIDGE
BALUSTRADE DETAILS

06

Rev A



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A) CROSS SECTION SHOWING TIMBER SETOUT AND CONNECTIONS

1:10 @A3

GENERAL TIMBER NOTES:

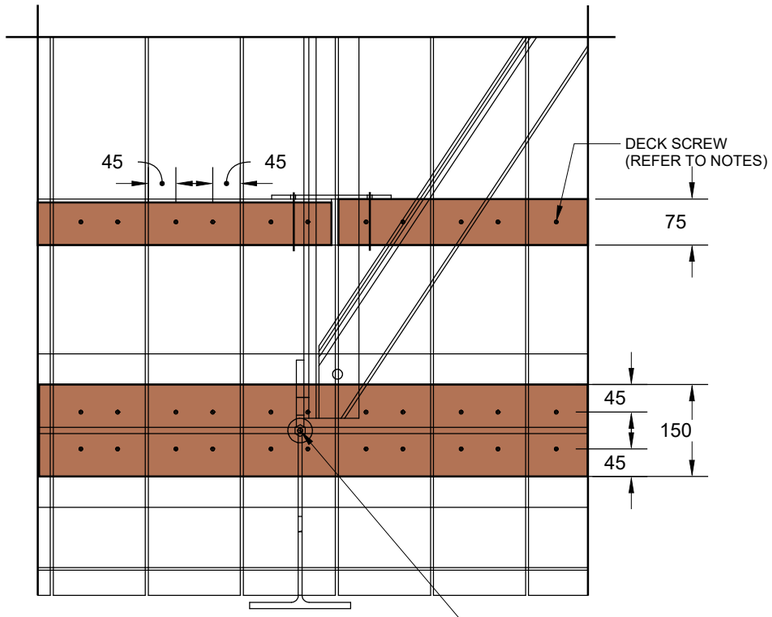
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL TIMBER MUST BE SEPERATED FROM STRUCTURAL STEELWORK WITH AN APPROVED DAMP PROOF MEMBRANE.
3. ANY PENCIL MARKS OR OTHER MARKINGS MADE TO TIMBER DURING CONSTRUCTION SHALL BE REMOVED PRIOR TO HANDOVER.
4. CROSS-SECTIONAL DIMENSIONS NOTED ARE THE ACTUAL FINISHED SIZES OF THE TIMBER. IF THESE CANNOT BE SOURCED, VERTICAL ALINGMENT OF STEELWORK CROSS BEAMS MAY NEED TO BE MODIFIED (OR PACKERS USED) TO PROVIDE THE REQUIRED FINISH HEIGHT OF TIMBER DECKING.

TIMBER JOISTS:

1. ALL TIMBER JOISTS TO BE TREATED TO H3.2 IN ACCORDANCE WITH NZS3602:2003.
2. ALL TIMBER JOISTS TO BE VSG8 RADIATA PINE GREEN GRADED TO NZS3622 IN ACCORDANCE WITH NZS3602.
5. TIMBER JOISTS CUT ON SITE SHALL BE LIBERALLY COATED WITH A CONCENTRATED SOLUTION OF NAPTHENATE PENTACHLOROPHENAL OR APPROVED EQUIVALENT.
6. ALL BOLTS ATTACHING THE JOIST TO THE STEEL CLEATS SHALL HAVE A 50X50X3 SQUARE WASHER BOTH ENDS.

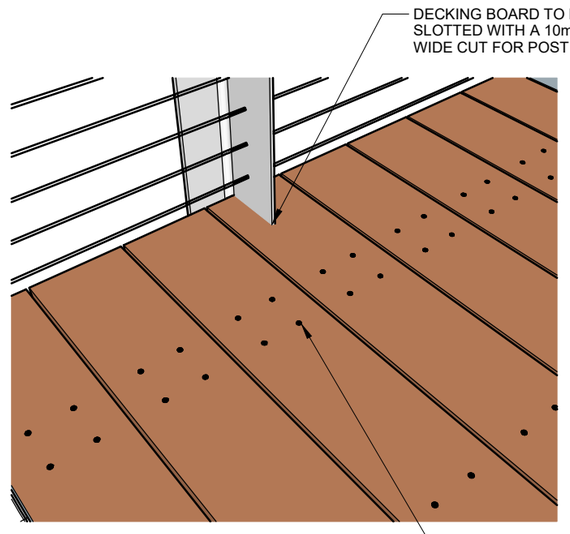
TIMBER DECKING:

1. TIMBER DECKING TO BE 150x40 VITEX OR TONKA HARDWOOD DECKING TO STRENGTH GROUP S3, IN ACCORDANCE WITH AS2878-2000 (73MPa BENDING STRENGTH, 12,400 MODULUS OF ELASTICITY).
2. TIMBER DECKING TO BE ATTACHED DIRECTLY TO TIMBER JOISTS USING 75 LONG STAINLESS STEEL GRADE 316 10g SCREWS WITH SQUARE DRIVE.
3. DECK SCREWS SHALL BE SET OUT USING STRING LINES OR EQUIVALENT ALONG THE DECK TO PROVIDE CONSISTENT ALIGNMENT.



B) DECK FIXING PLAN

1:10 @A3



C) DECKING ISOMETRIC

REV	DESCRIPTION	DATE
A	FOR CONCEPT	15.01.17

DCSTRUCTURESSTUDIO
DC Structures Studio Ltd, Cambridge, NZ
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CLIENT
NZ DESIGNERS

PROJECT
BASIC NZ PEDESTRIAN BRIDGE
HORIZONTAL WIRE BALUSTRADE

PROJECT NO.
DCSS-BR-001

ISSUE
CONCEPT

DRAWN BY
DCSS

BASIC NZ PEDESTRIAN BRIDGE
TIMBER DETAILS
DECKING & JOISTS

07
Rev A