

Assets Planning and Delivery Group
Engineering

DESIGN STANDARD DS 100

Suspended Flooring (Grid Mesh and Chequer Plate)

VERSION 1
REVISION 4

DECEMBER 2023

FOREWORD

The intent of Design Standards is to specify requirements that assure effective design and delivery of fit for purpose Water Corporation infrastructure assets for best whole-of-life value with least risk to Corporation service standards and safety. Design standards are also intended to promote uniformity of approach by asset designers, drafters and constructors to the design, construction, commissioning and delivery of water infrastructure and to the compatibility of new infrastructure with existing like infrastructure.

Design Standards draw on the asset design, management and field operational experience gained and documented by the Corporation and by the water industry generally over time. They are intended for application by Corporation staff, designers, constructors and land developers to the planning, design, construction and commissioning of Corporation infrastructure including water services provided by land developers for takeover by the Corporation.

Nothing in this Design Standard diminishes the responsibility of designers and constructors for applying the requirements of the Western Australia's Work Health and Safety (General) Regulations 2022 to the delivery of Corporation assets. Information on these statutory requirements may be viewed at the following web site location:

[Overview of Western Australia's Work Health and Safety \(General\) Regulations 2022 \(dmirs.wa.gov.au\)](https://dmirs.wa.gov.au)

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Head of Engineering

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REVISION STATUS

The revision status of this standard is shown section by section below:

REVISION STATUS						
SECTION	VER/ REV	DATE	PAGES REVISED	REVISION DESCRIPTION (Section, Clause, Sub-Clause)	RVWD	APPRVD
1	1/0	30.06.10	All	Original (First) Version		
	1/1	14.06.13	8, 10, 11, 12	1.1, 1.2.1, 1.4.5 to 1.4.24 revised and 1.4.25 added to this revision		
All	1/3	12.06.23	N/A	Scheduled review, no change required	JD	JD
2	1/0	30.06.10	All	Original (First) Version		
3	1/0	30.06.10	All	Original (First) Version		
	1/1	14.06.13	14, 15, 16, 18, 20, 21	3, 3.4, 3.5.1, 3.6, 3.6.1, 3.6.2, 3.8.1 revised and 3.10 added to this revision		
	1/2	08.06.17	15	Revised 3 b) to replace reference Appendix 1 with updated drawing KE97-91-3.		
4	1/0	30.06.10	All	Original (First) Version		
	1/1	14.06.13	22, 23	4.1, 4.1.1, 4.1.3 revised		
	1/4	27.11.23	24	Making fixings coloured made mandatory	AA	AA
5	1/0	30.06.10	All	Original (First) Version		
	1/1	14.06.13	24	5.3 revised		
6	1/0	30.06.10	All	Original (First) Version		
	1/1	14.06.13	26, 27	6.1, 6.2 revised and 6.5, 6.6, 6.7 added to this revision		
	1/2	08.06.17	26, 27	6.5 revised to remove references to Suspended Floor Compliance Plaque; 6.5a revised to refer to 3.1; 6.7c revised to include Sikaflex sealant.		
App 1	1/0	30.06.10	All	Original (First) Version		
	1/1	14.06.13	28	Page number changed		
App 2	1/0	30.06.10	All	Original (First) Version		
			29-32			
App 3	1/0	30.06.10	All	Original (First) Version		
	1/1	14.06.13	37-39	Rearranged and revised		

REVISION STATUS						
SECTION	VER/ REV	DATE	PAGES REVISED	REVISION DESCRIPTION (Section, Clause, Sub-Clause)	RVWD	APPRVD
	1/2	08.06.17	37-39	Removed 'Suspended Floor Compliance Plaque Rating' table and references; revised load rating plaque template.		
App 4	1/0	30.06.10	All	Original (First) Version		
	1/1	14.06.13	40-41	Rearranged and revised		
App 5	1/0	30.06.10	All	Original (First) Version		
	1/1	14.06.13	43-44	Rearranged and revised		
		08.06.17	45	Compliance plaque reference removed from design checklist		
App 6	1/1	14.06.13	All (46-55)	Added to this version		
	1/2	08.06.17	49, 54, 56	Revised to add missing drawings from list of drawings, updated with amended drawing KE97-91-3		

DESIGN STANDARD DS 100

Suspended Flooring

(Grid Mesh and Chequer Plate)

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1 SCOPE AND GENERAL

1.1 Scope

This Design Standard sets out Water Corporation requirements for design and installation of suspended grid mesh and chequer plate flooring for safe working at places normally used by operating, inspection, maintenance and servicing personnel including places having controlled access to public with foot traffic, equipment and vehicular loads limited to loads permitted in AS1170.0, as well as ladders and stair treads. It also sets out requirements for the selection of flooring materials.

This Standard does not address flooring or stair treads made from materials other than those listed as permissible in the Standard - reinforced concrete for example. It does not address requirements for mobile equipment - mobile platforms neither for example - nor for associated support systems that may have suspended flooring components but do not form part of fixed Corporation water infrastructure assets.

1.2 References

The following documents are indispensable for the application of the Standard.

1.2.1 Water Corporation Standards and Specifications

DS 30-02	General Design Criteria Mechanical
DS 80	WCX CAD Standard
S151	Prevention of Falls Standard
WS-1	Metal Arc Welding
DS95	Standard for the Selection, Preparation, Application, Inspection and Testing of Protective Coatings on Water Corporation Assets

1.2.2 Australian Standards

AS

1657	Fixed platforms walkways, stairways and ladders – Design, construction and installation
1664	Aluminium structures - Limit state design
1734	Aluminium and aluminium alloys - Flat sheet, coiled sheet and plate
3600	Concrete structures
3661	Slip resistance of pedestrian surfaces - Guide to the reduction of slip hazards
3700	Masonry structures
4100	Steel structures
4360	Risk Management Guidelines
4680	Hot-dip galvanised coatings on fabricated ferrous articles

AS NZS

1170	Structural Design Actions
3678	Structural steel—Hot-rolled plates, floor plates and slabs
3679.1	Structural steel Part 1: Hot-rolled bars and sections
3679.2	Structural steel Part 2: Welded I sections
4586	Slip resistance classification of new pedestrian surface materials

ASTM

A240	Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
B209	Standard Specification for Aluminium and Aluminium-Alloy Sheet and Plate

- B221 Standard Specification for Aluminium and Aluminium-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
- D732 Standard Test Method for Shear Strength of Plastics by Punch Tool
- E84 Standard Test Method for Surface Burning Characteristics of Building Materials

1.2.3 Regulations and Codes of Practice

Commission for Occupational Safety and Health

Prevention of falls at workplaces – Code of practice

Safe design of buildings and structures – Code

Worksafe WA – Occupational Safety and Health Regulations 1996

Regulation 3.56 – Grid mesh and checker plate flooring panels

1.3 Guidance Information

Supplementary background information on flooring and stair tread design, product selection and installation practices may be referenced in the following documents. Wherever this information conflicts with anything in this Standard, the requirements of the Standard shall prevail.

AS HB 197: An introductory guide to the slip resistance of pedestrian surface materials.

British Standards (BS)

- 4592.0 Industrial type flooring and stair treads – Common design requirements and recommendations for installations.
- 4592.1 Industrial type flooring and stair treads – Metal open bar gratings – Specifications
- 4592.2 Industrial type flooring and stair treads – Expanded metal sections – Specifications
- 4592.4 Industrial type flooring and stair treads – Glass reinforced plastic (GRP) open bar gratings – Specifications
- 4592.6 Industrial type flooring and stair treads – Glass reinforced plastic (GRP) moulded open mesh gratings – Specifications

ANSI/NAMM (*National Association of Architectural Metal Manufacturers*)

MBG 532-00 Heavy Duty Metal Bar Grating

1.4 Definitions

The following definitions shall apply to the application of this Standard. Details of selected definitions are illustrated in Appendix 1.

1.4.1 Aperture

An opening in mesh flooring material defined by the boundary of the load bars and cross-rods (steel and pultruded fibre reinforced grid mesh) and by the load bars (moulded fibre reinforced grid mesh) or the strands and knuckles (raised expanded metal mesh).

1.4.2 Banding

A banding bar that is welded or, in the case of FRP grid mesh, bonded to the load bars.

1.4.3 Cross-rod

Twisted rod forged across the top of and at right angles to the load bars of steel grid mesh.

1.4.4 Cut- Out

1.4.5 Section of flooring that has been cut out from panel outer edges to allow;

- positioning of panels to avoid interference with structural members and equipment; or
- penetration of a service or equipment item.

1.4.6 Edge Protection

Edge protection (often referred to as a guard rail system including toe board) is used to reduce the risk of a person falling from one level to another.

1.4.7 Fixed

The state of an asset component that is mechanically attached to an asset support structure or to an adjoining fixed components in such a way as to prevent its ready removal or displacement as a result of incidental or routine asset operation, repair and maintenance operations.

1.4.8 Fixing

A weld, clip, disc, stud, bolt or other component applied in order to mechanically attach a panel to an associated asset support structure or to adjoining fixed components.

1.4.9 Flat Expanded Metal Mesh

Mesh formed by passing raised expanded metal mesh through a rolling mill.

1.4.10 Floor

The uppermost or surface element of a platform, walkway or landing that is exposed to pedestrian, equipment or vehicular traffic.

1.4.11 Grid Mesh

Grid mesh panels that consist of load bars and cross-rods made from mild steel, galvanised mild steel, stainless steel, aluminium or fibre reinforced plastic (FRP) or load bars in both directions made from FRP which form a square or rectangular mesh pattern in plan.

1.4.12 Knuckle

An area of raised expanded metal mesh where strands of mesh interconnect.

1.4.13 Load Bar

A flat bar oriented in the vertical plane which provides grid mesh with its primary load-bearing structural properties and strength.

1.4.14 Long Way Mesh (LWM)

The (long) aperture dimension between raised expanded metal mesh knuckles.

1.4.15 Opening

An unprotected void in a flooring panel that results when a removable or hinged section of floor, designed to provide access to equipment, is opened.

1.4.16 Panel

A sheet of flooring which has been cut to specific standardised or nominated dimensions.

1.4.17 Pitch

The centre to centre or edge to edge spacing between grid mesh load bars.

1.4.18 Platform

An area of flooring intended to provide access to elevated parts of fixed infrastructure assets for the purposes of infrastructure operation and maintenance.

1.4.19 Raised Expanded Metal Mesh

Mesh formed by slitting and stretching a flat metal plate in a single continuous process.

1.4.20 Short Way Mesh (SWM)

The (short) aperture dimension between the knuckles of raised expanded metal mesh.

1.4.21 Strand

Slit section of plate of expanded metal mesh fixed that forms the primary boundary of the mesh opening (aperture).

1.4.22 Structure

A designed assembly of load bearing members and associated load bearing components which support panels and to which panels are fixed.

1.4.23 Support

An individual component member of a structure that supports flooring.

1.4.24 Walkway

A level or sloping area of that adjoins floors at the same or different levels flooring passageway. A walkway structure may be at one level or stepped with landing platforms at multiple levels.

1.4.25 Work Area

An infrastructure asset site area which is likely to require access by operational and maintenance workers at least once weekly, except as otherwise determined by the Operational Representative.

1.4.26 Engineering Design Process

The Corporation's Engineering Design Process – Manual of Requirements and associated documents - that define and detail the processes which shall apply to Corporation infrastructure asset designs.

1.5 Risk Management

The Water Corporation's Risk Management Process – PCY135 Risk Management, Risk Management Guidelines and the Corporate Risk assessment Criteria – shall be applied to assess whole of business risks arising from flooring configurations that are not specifically addressed by this Standard.

1.6 Standard Details and Example Drawings

The standard details and example drawings that form part of this standard are included in Appendix 6.

The standard details contain information which is complementary to that contained in the text and shall therefore be read in conjunction with the corresponding parts of the standard.

The example drawings provide details of information to be included on the design / fabrication drawings.

Designer and Contract Superintendent shall ensure that they have the latest issue of the drawings.

2 ASSET OPERATION REQUIREMENTS

Designers shall consider the functional and operational needs of an infrastructure asset to ensure that its flooring components remain fit for purpose over the expected life of the asset. The operational and maintenance requirements of flooring shall be determined in consultation with the Corporation's Design, Operational and Maintenance Representatives. The flooring components shall be designed to maintain asset functional and operational needs over the required asset life. The following environmental, usage, physical and maintenance requirements shall be established and addressed as part of flooring design.

- a) Geographical location – to determine the relevance of AS/NZS 1170.2 & AS/NZS 1170.3
- b) Design life of the system as required by the Corporation
- c) Public and private (i.e. Corporation employees or alliance sub-contractors) access.
- d) The exposure of flooring to various environments (e.g. chemicals, water retention/ponding, condensation, high temperatures, temperature variations and sunlight) and fabrication processes
- e) Service deflection and upper surface slip resistance requirements.
- f) Asset utilization and flooring exposure to imposed pedestrian and vehicular traffic point and distributed loads arising from personnel and equipment movements during planned and unplanned operational and maintenance activities.
- g) Provision for openings in flooring for the purposes of access and service operations.

3 DESIGN REQUIREMENTS

Designers shall provide the appropriate design outputs as required by the Engineering Design Process and the following;

- a) A certificate of design conformance with the (Worksafe) Code of Practice for the Safe Design of Buildings and Structures 2008;
- b) A drawing that shows typical load Rating Plaque detail and format for application to the individual platform rating plaques to be shown, together with installation positioning details, on the design drawings in accordance with Drawing KE97-91-3. Completed Design Check list included in Appendix 5, duly completed and signed by the Designer or Structural engineer nominated by the Water Corporation.

3.1 Structural Design

The design of platforms, walkways, stairways, ladders, handrails and of associated structures, supports and fixings shall comply with the requirements of AS/NZS 1170, AS1657, AS4100, AS1664, AS3600, AS3700 and Water Corporation Design Standards and Specifications, as appropriate.

Flooring structures shall be designed for dead load permanent action plus imposed live load action based on;

- a) General non-public access as defined in AS1657 - not less than 2.5kPa uniformly distributed or 1.1kN concentrated load – whichever produces the greater stress or deflection;
- b) The requirements of Table 3.1 and Table B1 of AS/NZS 1170.1 where the floor is likely to be loaded in excess of the stipulation in (a) above;
- c) The guidance provided by Section C3.1 of AS/NZS 1170.1 Supp 1:2002 for public access and heavy frequent traffic demands where the loads are not known and where the type of occupancy is not covered in Table 3.1 and Table B1 of AS/NZS 1170.1.

Wherever a platform may be exposed to mobile plant or equipment, the plant or equipment shall be considered fixed for the purposes of dead load calculation. The calculated concentrated load shall be assumed to apply through a 100mm x 100mm loading area.

3.2 Design Philosophy

Flooring designers shall consider the requirements of DS 100 and manufacturer supplied information. The requirements of DS 100 and nominated Corporation Standards shall prevail wherever there may be in conflict with manufacturer supplied information, proprietary flooring load deflection data and with other standards. Designers shall design panels on a simple support basis to safely support;

- a) Loads and deflections at the locations of maximum stress and deflection within the panels;
- b) Impact and vibration loads transmitted by equipment (including reciprocating or rotating equipment) that may be in contact with or supported by the flooring;
- c) Significant extraordinary (e.g. plant and equipment) loads imposed in addition to pedestrian loads, irrespective of loading frequency, except where it is determined by means of an operability risk assessment involving the Corporation, as asset owner, that the loading risk is acceptably low or that the possibility of imposed loading has been eliminated;

Flooring panel deflections that may arise due to extraordinary albeit infrequent imposed loads shall not exceed the specified permissible deflection values, except where it may be shown by means of an operability risk assessment, involving the Corporation as asset owner, that higher service deflections are unlikely to cause slip, trip or fall hazards.

3.3 Permissible Deflections

The service deflection at the centre of a panel under design live loading shall not exceed:

- 5 mm for steel, FRP grid mesh or raised expanded metal mesh flooring;
- 10 mm for chequer plate flooring

3.4 Flooring Material Selection

The flooring and fixing material selection process in Appendix 2 shall be applied to determine the appropriate flooring and fixing materials for a flooring project. Any flooring material or fixing arrangement selection ambiguity or conflict shall be referred to the Corporation nominated Design Representative for determination.

Grid mesh shall be used on all suspended flooring in preference to expanded metal mesh or chequer plates. Flat expanded mesh shall not be used for walkways.

Chequer plates can be used at locations where the suspended floor is required to prevent water or gas leaks.

3.4.1 Durability

Flooring, structural support and fixing materials shall be selected to deliver the required durability (e.g. nominated system design life) in the nominated operating environment in accordance with the following Tables, with Sections 12, 18 and 49 of DS 30-02 and by reference to the process charts provided in Appendix 2, subject to the durability and exposure requirements of a particular application as appropriate.

Table 3.1 – Acceptable Grid Mesh Material Specifications

Galvanised mild steel (GMS)	AS3679 Grade 250 or equivalent Galvanizing to AS/NZS 4680 Compliance with the durability requirements of Section 12 of DS 30-02
Aluminium (AL)	ASTM B221 Grade 6063-T6
Stainless steel (SS)	ASTM A240/A240M Grade 316L
Fibre reinforced plastic (FRP)	ASTM D635 ; ASTM D732 ; ASTM E84 Isophthalic Polyester resin Vinyl Esther resin Phenolic resin

Table 3.2 – Acceptable Raised Expanded Metal Mesh Material Specifications

Galvanised mild steel (GMS)	AS3678 Grade 250 or equivalent Galvanizing to AS/NZS 4680 Compliance with the durability requirements of Section 12 of DS 30-02
Stainless steel (SS)	ASTM A240/A240M Grade 316L
Aluminium (AL)	ASTM B209 Grade6063-T6

Table 3.3 – Acceptable Chequer Plate Material Specifications

Galvanised mild steel (GMS)	AS/NZS 3678 Grade 250 or equivalent Galvanizing to AS/NZS 4680 Compliance with the durability requirements of Section 12 of DS 30-02
Stainless steel (SS)	ASTM A240/A240M Grade 316L
Aluminium (AL)	ASTM B209 Grade6063-T6

3.5 Panels

3.5.1 Aperture

The design of flooring which is elevated above an infrastructure asset site area, defined as a work area, shall provide for:

- Grid mesh load bar pitch not exceeding 40mm;
- Positive flooring aperture protection - e.g. a lightweight false floor underneath the primary (structural) floor - to prevent objects falling through the floor to the work area below.

Where such protection is required, aperture dimensions shall not exceed:

- a) 10 mm for the minor axes of expanded metal;
- b) 12 mm × 12 mm for the openings of square grid or wire mesh;
- c) 20 mm for punched plate hole diameter.

Guidance for aperture size of grid mesh intended for pedestrians can be obtained from AS 3996.

3.5.2 Size and Shape

The size, shape and mass of panels should be standardized across an infrastructure asset wherever practicable. Panels should comprise standard sheet widths as appropriate to panel material wherever practicable in order to minimise cutting and banding work and associated risks.

Standard flooring panel widths of 600mm, 900mm and 1200mm shall be preferred. A panel width less than 300mm shall not be permissible. Standard panel structural support spans of 900mm, 1200mm and 1500mm shall be preferred. Flooring design drawings shall show configuration and fabrication details of structural support systems that have been specifically designed for panels that are non-standard size e.g. panels less than 0.6m² in area.

Panels intended for manual removal shall not exceed 15kg in weight. Panels to be removed by mechanical means shall be designed to;

- a) Facilitate removal by means of lifting equipment that is readily available to the asset operators;
- b) Prevent slip, trip and fall hazards;
- c) Be within the rated capacity of the available equipment;
- d) Provide access and space availability of operation of the equipment to be used

Designers shall select standard flooring sheet wherever practicable and shall select appropriate load bar and strand characteristic sizes, spans and weights that;

- Minimize flooring manufacturing/fabrication costs;
- Maximize the use of standard flooring components;
- Minimize the need to cure or band grid mesh flooring on site.

Moulded FRP panel designs should provide for load bars around all panel edges in order to eliminate any need for banding or sealing.

Table 3.4 – Steel Grid Mesh Standard Sheet Sizes

Material	Sheet Size (mm)	Load Bar Size (mm)
Galvanised mild steel (GMS)	1200 x 6000	25 x 5 ; 32 x 5 ; 40 x 5 ; 50 x 5 ; 65 x 5
Stainless steel (SS) 316L	Non-standard stock	30 x 5 ; 32 x 5 ; 40 x 5
Aluminium (AL)	1200 x 6000	25 x 5 ; 32 x 5 ; 40 x 5

Table 3.5 – FRP Standard Sheet Sizes

Material	Sheet Size (mm)	Load Bar Size (mm)
Moulded fibre reinforced plastic (FRP)	915 x 3050	25 x 6 ; 38 x 6
	1200 x 3660	
	1220 x 3660	
Pultruded fibre reinforced plastic (FRP)	1219 x 6096	25 x 6 ; 38 x 6 ; 50 x 6

Table 3.6 – Raised expanded metal mesh Standard Sheet Sizes

Material	Sheet Size (mm)	Mesh Size (mm)	Strand Size (mm)
Galvanised mild steel (GMS) and 316L Stainless Steel (SS)	1200 x 2400 2300 x 900 2300 x 1200	45 x 135	11
	3000 x 900 3000 x 1200	30 x 75	10.5

Table 3.7 – Chequer Plate Standard Sheet Sizes

Material	Sheet Size (mm)	Thickness (mm)
Galvanised mild steel (GMS)	1800 x 6000	6 ; 8
316L Stainless Steel (SS)	1800 x 6000	6 ; 8

3.6 Flooring Structure

Designers shall design each panel to be supported so as to preclude overturning in normal operational service and to preclude dependence on floor fixings to prevent overturning. Flooring support shall be provided at two opposite - load bar - ends and at all corners of each flooring panel. At least 80% of metal grid mesh load bars and of raised expanded metal mesh knuckles shall be supported by designed structural components subject to unsupported length at a location not exceeding the space between 04 load bars for metal grid mesh and 04 strands for raised expanded metal mesh.

Designers shall submit details of all proposed deviations from specified flooring structural support and overhang requirements herein, duly supported by design calculations, for prior consideration by the Corporation’s Design Representative.

3.6.1 Bearing Support for Flooring

Flooring structure designs shall provide the following minimum bearing requirements:

- 25 mm for metal grid mesh load bars of depth 25-40mm;
- 40 mm for metal grid mesh load bars of depth 45-65mm;
- 30 mm for raised expanded metal mesh load bars;
- 40 mm for FRP grid mesh load bars;
- 50 mm for chequer plate.

3.6.2 Overhang

Flooring overhangs shall not be permissible:

- On raised expanded metal mesh and FRP grid mesh;
- In the direction of the cross-rods for steel grid mesh.

Wherever it proves impracticable to terminate steel grid mesh flooring panel edges flush with support edges, flooring overhangs shall not exceed the maximum overhang values tabulated in the Tables below. To keep to best practice the overhang values have been limited to 250mm.

Table 3.8 – Overhang - Load Bar Size 25 x 3 x 30 pitch

Permissible Overhang (mm)		Panel Width (mm)		
		600	900	1200
Span (mm)	900	20	30	40
	1200	40	60	80
	1500	60	100	130

Table 3.9 – Overhang - Load Bar Size 25 x 5 x 30 pitch

Permissible Overhang (mm)		Panel Width (mm)		
		600	900	1200
Span (mm)	900	40	60	80
	1200	70	100	140
	1500	110	165	220

Table 3.10 – Overhang - Load Bar Size 32 x 5 x 30 pitch

Permissible Overhang (mm)		Panel Width (mm)		
		600	900	1200
Span (mm)	900	50	70	100
	1200	90	130	170
	1500	135	200	250
	1800	200	250	250

Table 3.11 – Overhang - Load Bar Size 40 x 5 x 30 pitch

Permissible Overhang (mm)		Panel Width (mm)		
		600	900	1200
Span (mm)	900	60	90	120
	1200	100	160	200
	1500	160	240	250
	1800	240	250	250
	2100	250	250	250

Table 3.12 – Overhang - Load Bar Size 25 x 5 x 40 pitch

Permissible Overhang (mm)		Panel Width (mm)		
		600	900	1200
Span (mm)	900	30	45	60
	1200	50	80	100
	1500	80	125	160

Table 3.13 – Overhang - Load Bar Size 32 x 5 x 40 pitch

Permissible Overhang (mm)		Panel Width (mm)		
		600	900	1200
Span (mm)	900	35	50	75
	1200	65	100	130
	1500	100	150	200
	1800	150	220	250

Table 3.14 – Overhang - Load Bar Size 40 x 5 x 40 pitch

Permissible Overhang (mm)		Panel Width (mm)		
		600	900	1200
Span (mm)	900	45	70	90
	1200	80	120	160
	1500	130	190	240
	1800	180	250	250
	2100	240	250	250

3.7 Openings, Cut-outs and gaps

Designers shall design flooring panel openings and cut-outs in accordance with the specified load and deflection requirements. Grid mesh load bar ends exposed by cutting shall be banded.

3.7.1 Openings

Design of flooring shall comply with Water Corporation Standard S151 – Prevention of Falls. Provision for edge protection and tether point requirements at removable floor panels shall be assessed and made

as appropriate. Designs shall provide fixed temporary edge protection that does not present slip, trip or fall hazards where permanent edge protection cannot be provided.

Flooring design shall provide for:

- a) Hinged floor hatches wherever practicable.
- b) Banding of openings in steel grid mesh;
- c) Configuration of openings in FRP so as to be bounded by load bars;
- d) FRP flooring with no hinged floor hatches, except where supported by an appropriate structural frame
- e) Raised expanded metal mesh flooring that has no openings.

Removable flooring hatches shall be inherently restrained by lugs or other mechanical means that preclude lateral movement when in a closed position;

3.7.2 Cut-outs

Flooring shall be designed to comply with the load, deflection, edge protection and other requirements of this Standard, having due regard to all panel removals and cut-outs that may be designed to avoid conflict with other infrastructure components, obstructions, services and equipment.

3.7.3 Gaps

The requirements of AS 1657 Clauses 3.3.1.4 and 3.3.1.5 shall apply to the configuration of gaps between panels and other infrastructure components and between adjoining panels. Toe-boarding shall be provided as an integral part of banding wherever a gap exceeds 40mm.

3.8 Banding

3.8.1 Grid mesh

Steel and aluminium mesh panel load bars shall be banded with banding bars of the same size as load bars and shall be finished flush with load bar upper surfaces, except where they serve as toe-boards.

The structure of banding bars and of interconnections with load bars shall be designed to wholly support flooring loads wherever banding is not directly supported by structural components that have been designed to support the design loads, in accordance with the requirements of AS/NZS 1170.1.

The boundaries of FRP panels should be 15 mm maximum from the load bars and cross bars. The support members should be arranged so that the FRP panels have the bearing support complying with Clause 3.6.1.

Unsealed and cut FRP load bar surfaces shall be sealed with a repair resin compatible with the filler resin of the grid mesh in accordance with the FRP flooring manufacturer supplied repair specification.

3.8.2 Raised expanded metal mesh

Banding shall not apply to raised expanded metal mesh.

3.8.3 Chequer Plate

Banding shall not apply to chequer plate.

3.9 Top Surface

The top surface of grid mesh panels used for pedestrian traffic shall be designed for slip resistance in accordance with AS/NZS 3661 and the requirements set out herein. Requirements in AS/NZS 4360 and information in AS HB 197 should also be considered to minimise slip, trip and fall hazard risks.

The following flooring material enhancements may be applied where expressly accepted by the Corporation's Design Representative for nominated flooring projects:

- Mild steel (MS), galvanised mild steel (GMS), aluminium (AL) and stainless steel (SS) 316L grid mesh that has a serrated edge to an acceptable specification;
- Fibre reinforced plastic (FRP) mesh that has a non-slip surface comprising a coarse grit of an acceptable specification embedded into the upper surface of the FRP load bars;
- A Water Corporation specified surface treatment selected to enhance the non-slip characteristics of chequer plate.

3.10 Edge Protection

All fixed platforms, walkways and stairways shall be provided with edge protection on all open sides to meet the requirements in Appendix 6.

4 FIXING REQUIREMENTS

Panels shall be designed to be securely and completely restrained by means of:

- Mechanical attachment of panels to designed structural supports; or
- Design of panel and structural support configuration so as to inherently restrain any panel from physical movement within the flooring plane without the panel being fully raised above floor level.

Whether inherently restrained or mechanically attached by fixings, flooring shall be designed to:

- a) Prevent lateral movement of any flooring panel;
- b) Preclude any dependence on adjacent panels for restraint;
- c) Preclude reliance on removable panels to support or stabilise any flooring section.

Where flooring panels are mechanically fixed, they shall be designed to:

- a) Preclude reliance on fixings to support removable flooring panels;
- b) Meet or exceed panel manufacturer recommended number of fixings per panel;
- c) Prevent transmission of any vertical loads to fixings.

4.1 Types of Fixing

Where panels are inherently unrestrained, the material selection tables in Appendix 2 shall apply to the selection of appropriate flooring and fixing materials for particular applications. Drawings in Appendix 6 show typical fixing arrangements for incorporation into design detail / fabrication drawings, as appropriate.

Consideration of other fixing arrangements shall require prior submission to and acceptance by the Corporation's Design Representative of a justified design and installation methodology proposal.

4.1.1 Grid mesh

The fixings shall be selected in such a way that fixings can be installed, inspected and maintained from top only. A list of permissible fixing methods is given below in preferred order of fixing arranged from highest to least preferred method;

- a) Studs and fastening disc / saddle (self-penetrating threaded studs to metal support member with threaded fastening disc) – typically Hilti or similar;
- b) Bolting - drilled base plates inserted into modified grid mesh apertures together with rivet or bolt fixing arrangement.
- c) Anti-vibration clips wherever flooring may be subject to repetitive mechanical vibration
- d) Clips – typically WebForge, Fibergrate or acceptable equivalent
- e) Welding or riveting (applicable only where steel or aluminium panels are used). Welding and riveting is the least preferred method of fixing panels due to the potential to compromise the corrosion protection of pre-coated structural products, risk of poor welding due to thickness of coating and the difficulty and cost involved in reinstatement of protective coatings.

Welding and riveting should only be considered where:

- vibration from plant operations is likely to dislodge other types of fixings and where grid mesh panels are not required to be removed for operational and maintenance purposes.
- fire hazard and ergonomics can be adequately managed on site in the instance of welding;

- protective coatings of adjoining structures on site are not compromised by stray arc or welding spatter; and

Flooring fixings shall be configured so as to provide at least:

- a) One fixing at each corner no farther than 200mm from the corner.
- b) Four fixings per square metre of panel for panel spans equal to or greater than one metre;
- c) Six fixings per square metre for panel less than one metre;
- d) Fixings generally spaced no farther apart than 600 mm.

Designers shall select grid mesh panel fixing configurations (number and type) that provide for exposure to mobile plant and equipment including provision for vibration intensity and temperature variations as appropriate. The fixing locations must be marked with suitable colour to easily locate, inspect and maintain the fixings.

4.1.2 Raised Expanded Metal Mesh

Expanded metal mesh strands shall be welded to structural support systems at a rate of at least one weld to every fourth strand.

4.1.3 Chequer Plate

Chequer plate edges shall be uniformly stitch-welded to structural support systems so that at least 20% of panel edges are fixed.

Where this is not practicable, studs (self-penetrating threaded studs with threaded fixing disc) – typically Hilti or equivalent – shall be used to fix the plate in place.

5 WORKMANSHIP

5.1 General

All work shall be carried out by tradespeople, supervised by supervisors that have flooring installation qualifications and experience acceptable to the Corporation. All materials shall be new and free of defects. The surface finish of all fabricated items including mesh panel banding, supports and ladder styles shall be smooth and free from projections and sharp edges likely to cause personal injury.

5.2 Fabrication, Modification and Repair

Design of modifications to existing flooring shall include assessment of its structural strength and that of flooring modifications for compliance with the requirements of this Standard. Flooring sheets that comprise multiple joined (e.g. welded, riveted) panels shall not be permissible.

5.2.1 Grid Mesh

Fabrication and repair of grid mesh flooring shall, where applicable, comply with nominated product standards and manufacturer supplied fabrication and repair specifications including the following:

- Galvanised mild steel (GMS) and 316L stainless steel (SS) - Water Corporation welding Specification WS-1 and Sections 18 and 58 of Design Standard 30-02;
- Aluminium (AL) – flooring manufacturers recommended specifications;
- Fibre reinforced plastic (isophthalic Polyester resin, vinyl ester resin or phenolic resin FRP) – Water Corporation FRP Structural Specification;
- Raised Expanded Metal Mesh and Chequer Plate - Water Corporation Welding Specification WS-1 and Section 58 of Design Standard 30-02;

5.3 Drawings

Drawings shall be prepared and produced using AutoCAD (Version 2000 or later) or MicroStation in accordance with Design Standard DS 80 WCX CAD Standard.

The detail design drawings of suspended floors shall be complemented by shop drawings that will be certified by the Designer or a structural Engineer nominated by the Water Corporation. Fabrication and installation of suspended floors shall not commence before acceptance of the following by the Water Corporation.

- Shop drawings and calculations.
- A certificate of design conformance with the (Worksafe) Code of Practice for the Safe Design of Buildings and Structures 2008;
- Completed Design Check list included in Appendix 5, duly completed and signed by the Designer or Structural engineer nominated by the Water Corporation.

The drawings shall include but not limited to the following sub clauses.

5.3.1 General Information

The drawings shall show flooring fabrication details including:

- a) Design loads (dead and live) - included as drawing notes;
- b) Details of structural members that have been designed to support the flooring;
- c) Details of floor-strengthening bars at openings and cut-outs;
- d) A bill of materials that clearly indicates:
 - Flooring material selections

- Sizes and spacing of grid mesh load bars and sizes of raised expanded metal mesh strands and apertures
 - Panel sizes
 - Floor fixing components and materials
- e) Areas of flooring that can be subjected to higher loads, including details of signage to be provided to delineate flooring areas that have different load ratings.

5.3.2 Panel Information

- a) Mesh or chequer plate detailed specification;
- b) Direction of load bars;
- c) Perimeter dimensions (inside and outside) of all panels which have openings and cut-outs;
- d) Banding bar details at the edges and at cut-outs;
- e) Method of fixing in accordance with the Drawings and manufacturer fixing recommendations;
- f) Arrangement, positions and details of all fixings.

6 INSTALLATION

Panels shall be positioned and fixed to structural support systems as shown on the Drawings. Designers shall, by means of supplied drawing notes and technical specifications, require flooring fabricators and installers to attain a standard of workmanship that complies with the following.

6.1 Grid Mesh

- a) Load bars shall be placed in the direction shown on the drawings;
- b) Cross-rods shall face upwards;
- c) All longitudinal panel edges shall be flush fitted.

6.2 Raised Expanded Metal Mesh

Long way opening shall be placed in the direction as shown on the drawings.

6.3 Chequer Plate

Panels shall be installed with the chequer pattern facing upwards.

6.4 Finish

- a) Level transition panels and fixings shall be configured to preclude the occurrence of slip, trip and fall hazards;
- b) The level difference between adjacent panels, not subject to live loads, shall not exceed 5 mm.

6.5 Plaques

- a) Areas subjected to higher (e.g. extraordinary, plant and equipment) or lower loads than that specified in section 3.1 shall be marked and provided with an appropriate rating plaque as shown on the drawings. Refer to Appendix 3
- b) The plaques are to be legible with a minimum font size of 4mm.
- c) Plaques are to be suitably located in agreement with the Asset Manager

6.6 Welding

- a) Unless noted otherwise on drawings or specifications, carbon structural steel work welds shall be structural purpose (SP) to AS1554.1 and in accordance with Water Corporation welding specification WS-1 – Metal Arc Welding.
- b) Stainless steel work welds shall be structural purpose (SP) to AS1554.6 and in accordance with Water Corporation Welding Specification WS-1 - Metal Arc Welding. Welding as per AS1544.6 shall be “Weld Category 1” and finish shall be “Category IIa”
- c) Aluminium work welds shall be to AS/NZS1665 and in accordance with Water Corporation welding specification WS-1 – Metal Arc Welding.

- d) Stainless steel welds and heat affected zones shall be cleaned and passivated after welding in accordance with AS 1554.6.
- e) Welding splatter and slag shall be removed from surfaces.
- f) Where a weld joint is required, all edges of the metal faces in contact shall be welded.
- g) All tubular sections shall have 3mm seal plates. Adequate drainage holes shall be provided for galvanising
- h) Weld procedures shall developed to suit joint details and shown on shop drawings. Use prequalified weld procedures to AS/NZS1554.1 clause 4.3 or develop qualification of weld procedure by testing to AS/NZS1554.1 clause 4.2.
- i) Unless noted otherwise all interfaces between steel sections to be connected with 6mm continuous fillet welds (CFW) all round, both sides
- j) Unless noted otherwise all grid mesh elements e.g load bars, banding bars etc. welds shall be minimum 3mm continuous fillet weld (CFW) all round, both sides.
- k) Unless noted otherwise butt welds to be complete (full) penetration butt welds (CPBW).
- l) Welds shall be inspected by accredited/qualified welding inspector as per Water Corporation's WS-1. Signed inspection test plan by the welding inspector shall be provided.
- m) Welding symbols are to AS1101.3. "cfw" indicates continuous fillet weld. "fsbw" indicates full strength butt weld which is equivalent to cpbw. "cpbw" indicates complete penetration butt weld
- n) Unless noted otherwise Guardrails shall be completed with minimum 4mm CFW at the rail to stanchion joint and 5mm CFW at base plate to stanchion joint.

6.7 Galvanising

- a) Unless noted otherwise on drawings or in specification, all steelwork shall be hot dipped galvanized to AS/NZS 4680 and to the requirements of coating specification H2 of Water Corporation's Standard DS95.
- b) Hot galvanized steel to be in contact with concrete shall be passivated by dipping in 0.2% sodium dichromate solution
- c) Items to be hot dip galvanized shall be provided with
 - vent/drain holes at top and bottom extremities for hollow sections. Provide rubber seals, plugs or seal with Sikaflex 11FC or similar approved material all vent/drain holes that remain exposed.
 - drilled suspension holes in end plates, etc

Appendix 1 - Definition Diagrams

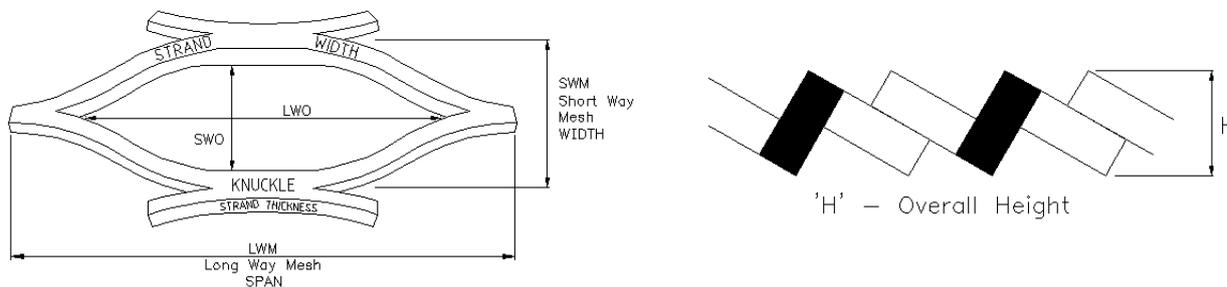


Figure A1 - 1: Raised Expanded Metal Mesh Definitions

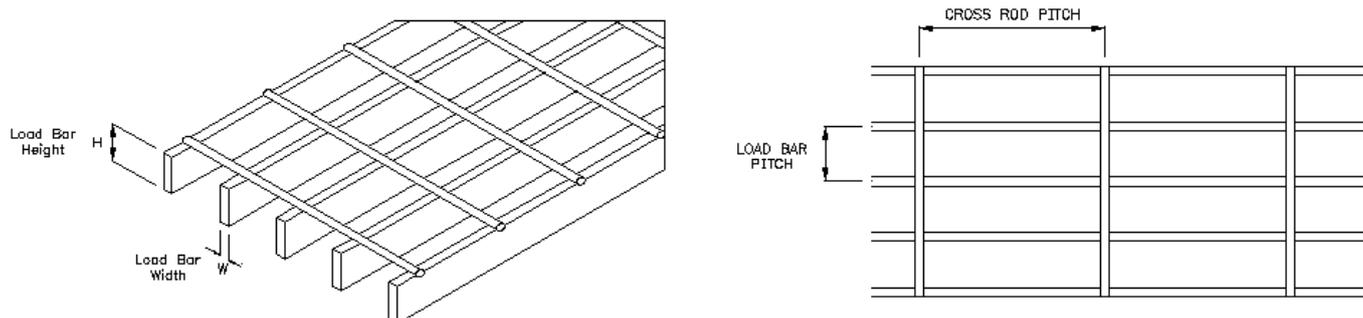


Figure A1 - 2: Grid Mesh Definitions

Appendix 2 - Flooring and Fixing Material Selection Tables

Table A2 - 1 and Table A2 - 2 should be used to select the preferred material for flooring, fixing and supports based on chemical compatibility. Table A2 - 3 is then used to further refine the selection based on other properties.

The following abbreviations, definitions and symbols apply to the tables in this Appendix.

Abbreviations

Abbreviation	Meaning
GMS	Galvanised Mild Steel
FRP	Fibre Reinforced Plastic
SS	316L Stainless Steel

Symbols

Symbol	Meaning
√√√	Preferred
√	Accepted
O	Not Recommended
X	Not Suitable

Definitions

Rating	Meaning
High	When applied appropriately will exhibit this property for up to 50 years
Medium	When applied appropriately will exhibit this property for up to 20 years
Low	When applied appropriately will exhibit this property for up to 1 year

Primary Environmental Exposure	Material Compatibility										
	Flooring				Support				Fixing		
	GMS	FRP	AL	SS	GMS	FRP	AL	SS	GMS	FRP	SS
Activated sludge	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Aluminium sulphate	X	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Ammonia solution	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Anhydrous ammonia	X	√√√	X	√	X	√√√	X	√	X	√√√	√
Bore water	X	√√√	O	√	X	√√√	O	√	X	√√√	√
Calgon (Sodium hexametaphosphate)	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Carbon dioxide	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Chlorine dioxide	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Chlorine gas	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Chlorine solution	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Digester gas	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Excess activated sludge	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Ferric chloride	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Ferric sulphate	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Flocculant (Polyelectrolyte)	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Fluorosilicic acid	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Foul air	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Fuel Oil	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Garnet	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Grit	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Hydrochloric acid	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Hydrogen sulphide	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Ion exchange resin	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Lime water	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Liquefied petroleum gas	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Milk of lime slurry	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Mixed liquor	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√

Oxygen	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Ozone	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Pellets	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Polyaluminium chloride	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Potable water	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Potassium permanganate	X	√√√	X	√	X	√√√	X	√	X	√√√	√
Powdered activated carbon	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Primary effluent	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Primary sludge	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Raw wastewater	X	√√√	O	√	X	√√√	O	√√√	X	√√√	√
Reclaimed effluent	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Return activated sludge	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Secondary effluent	X	√√√	O	√	X	√√√	O	√	X	√√√	√
Skimmings	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Sludge wastewater	X	√√√	O	√	X	√√√	O	√	X	√√√	√
Sodium carbonate solution	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Sodium chloride (Brine)	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Sodium hydroxide	X	√√√	X	√	X	√√√	X	√	X	√√√	√
Sodium hypochlorite	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Sodium silica fluoride	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Sodium silicate	X	√√√	X	√	X	√√√	X	√	X	√√√	√
Solids treatment liquor	√√√	√√√	O	√	√√√	√√√	O	√	√√√	√√√	√
Sulphur dioxide	X	√√√	X	X	X	√√√	X	X	X	√√√	X
Sulphuric acid	X	√√√	X	X	X	√√√	X	X	X	√√√	X

Table A2 - 1: Material Compatibility

Material	Characteristic				
	Thermal Conductivity	Electrical Conductivity	Magnetic	Sparking	Light Weight
GMS	Yes	Yes	Yes	Yes	No
SS	Yes	Yes	Yes	Yes	No
FRP	No	No	No	No	Yes

Table A2 - 2: Specific Characteristics

Material	Characteristic	
	Impact and Load	Direct Sunlight
GMS	High	High
SS	High	High
FRP	Medium	Medium

Table A2 - 3: General Characteristics

Appendix 3 – Load Rating Plaque

THIS FLOORING HAS BEEN DESIGNED FOR A
WORKING LOAD LIMIT
DISTRIBUTED LOAD _____ kg/m² AND
POINT LOAD OF _____ kg
INSTALLATION DATE: _____
DESIGNED BY (COMPANY): _____
TELEPHONE: _____

Load Rating Plaque

Appendix 4 Appendix 4- Edge Protection

A4.1 Scope

This Appendix provides the requirements for the provision of edge protection also referred as guard rails/balustrades on Water Corporation assets.

A4.2 Material

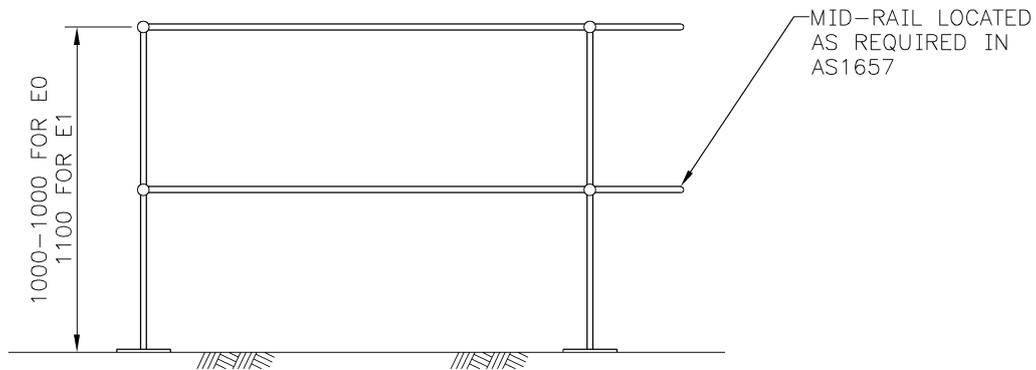
The material for edge protection shall be selected following the process similar to that for selecting flooring material as detailed in Section 3.4 of this standard. The material specification shall be as provided in Table 3.1 of this standard.

Use of timber edge protection will not be permitted on Water Corporation assets

A4.3 Types of Edge Protection and Criteria for use

Edge protection shall be of three types. The criteria for their and design requirements are as follows

- (a) Type E0-This type of edge protection referred as guard rails shall include posts top rail, mid rail and toe board as for guard rails detailed in AS 1657 and designed to the loading requirements of Clause 2.1.2.2 of AS1657 without any consideration of extra severe loading. The height from base/top of floor shall be in the range 1.0 – 1.1 metre. Refer to Figure A6.1.
- (b) Type E1- This type of edge protection referred as guard rails shall include posts top rail, mid rail and toe board as per details in AS 1657 but designed to the loading requirements for barriers in AS1170.1. The height from base/floor shall be in the range 1.0-1.1 metre. Refer to Figure 4.1
- (c) Type E2 - This type of edge protection shall include posts top rail, bottom rail at height 100 mm from the base/floor, vertical members spaced with gaps not exceeding 100 mm as per details in AS 1926.1 and designed to the loading requirements for barriers in AS1170.1. The height from base/floor shall not be less than 1.2 metre. Refer to Figure A4.2



TYPES E0 & E1
EDGE PROTECTION
(TOE BOARD NOT SHOWN)

Figure A4.1



Figure A4.2

A4.4 Criteria for Use

Types E0 and E1 edge protections shall be used for safe working at places normally used by operating, inspection, maintenance and servicing personnel including places having controlled access to public.

Type E2 edge protection shall be used at locations that have unrestricted public access.

Provision edge protection at Water Corporation urban main drainage assets shall be in accordance with the requirements in Design Standard 66- Urban Main Drainage Standards

A4.5 Welding and Sleeving

Notwithstanding the requirements to meet welding standard/specification joints of edge protection shall be seal welded.

All joints shall be sleeved.

Joints at the joint of rail/ stanchion and sleeves shall be complete with 4mm continuous fillet weld.

Appendix 5 – Design Check List

SUSPENDED FLOORS DESIGNED IN ACCORDANCE WITH WATER CORPORATION’S DESIGN STANDARD DS 100 DESIGN CHECK LIST					
PROJECT NAME: PROJECT NO: DESIGNER(BRANCH/COMPANY) COMPLETED BY (Structural Engineer):					
ITEM NO.	REQUIREMENTS	YES	NO	N/A	COMMENTS
1	Material				
1.1	Has exposure to various environments of the suspended floor and supports been considered?				
1.2	Has operational requirements been determined in consultation with Water Corporation’s Operational and Maintenance Representatives?				
1.3	Has the material of suspended floor been selected considering material selection process in Appendix 2 of DS100?				
1.3	Has the selection of FRP for use in external environment been subjected to a durability study?				
1.4	Are detailed information (grade, standard etc) on material of grid mesh and chequer plate provided on drawings or specification?				
2	Floor Lay Out				
2.1	Has the floor layout been designed to permit adequate access for use/movement of equipment?				
2.2	Is there adequate space between equipment for easy movement by personnel?				
2.3	Is the workplace layout large enough to accommodate safe work practices?				
2.4	Are aisles/walkways wide enough for equipment and pedestrian traffic?				
2.5	Has all penetrations through the suspended floor been determined?				
2.6	Have removable panels and hinged panels requirement for operation and maintenance access been determined.				
2.7	Have panels that have to be manually removed been identified.				
2.8	Have equipment for removal of panels that are not to be manually handled been determined?				
2.9	Have access and space for operation of the equipment determined under above item been considered?				
2.10	Have prevention of fall provisions been considered at access openings and at locations of removable panels?				

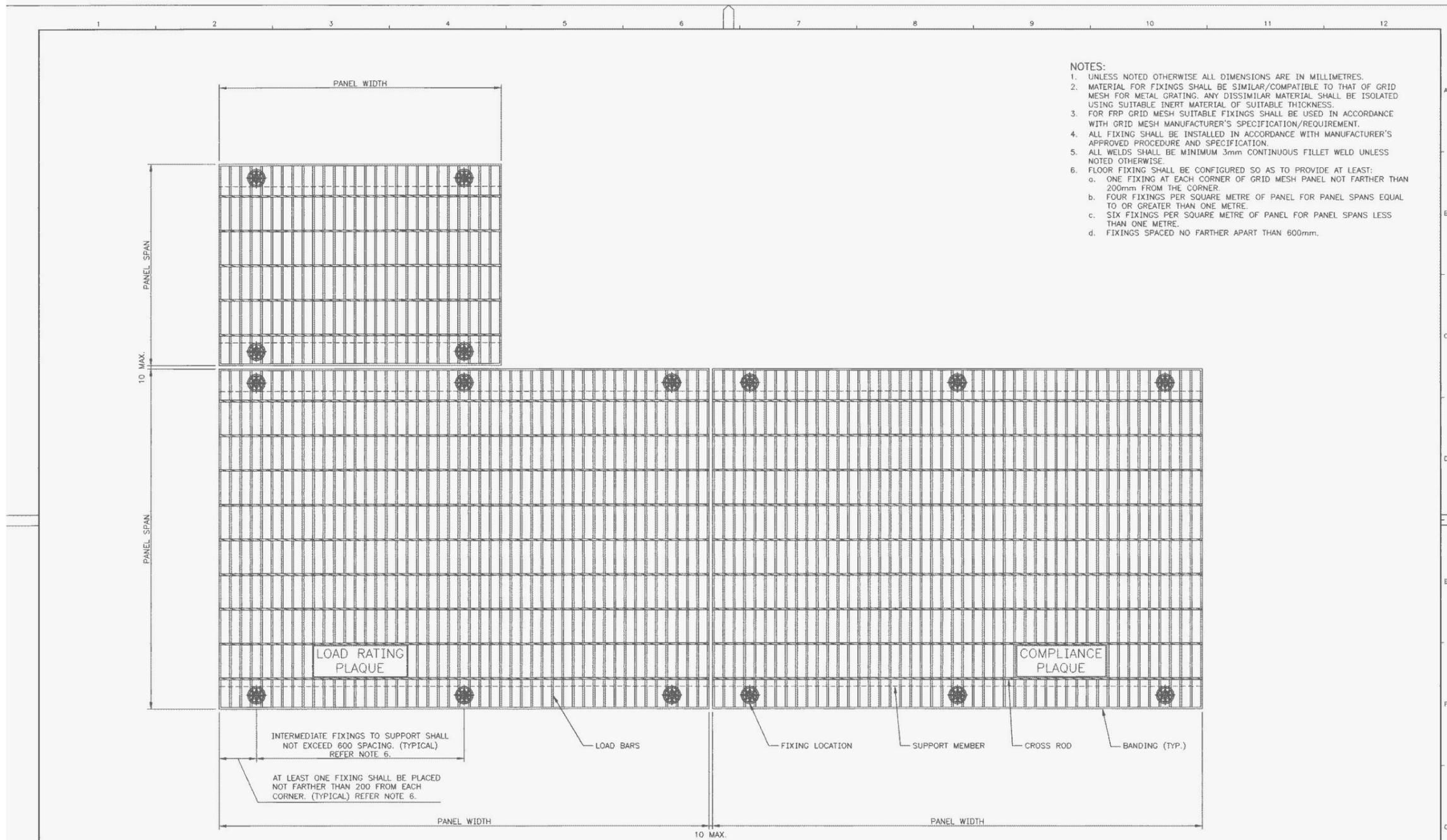
3	Design				
3.1	Are aperture sizes of grid mesh within the limits specified in the standard?				
3.2	Have areas subjected to significantly higher loads due to plant and equipment (maintenance/movement) been considered?				
3.3	Have design load stresses and deflection of suspended floor and supporting members been considered?				
3.4	If raised expanded metal or chequer plate is used, is the use justified in preference to grid mesh				
3.5	Do the support for load bars of metal grid mesh, raised expanded metal mesh knuckles and chequer plate exceed the limits specified?				
3.6	Are the sizes of panels adequate to provide bearing supports and gaps as specified?				
3.7	Are the overhangs of steel grid mesh within the limits specified?				
3.8	Is the number of fixings for a grid mesh panel exceeding that specified?				
3.9	Are there one fixing at each corner of grid mesh panel not farther than 200mm from the corner?				
3.10	Is the spacing of fixings on grid mesh panel not farther apart than 600mm?				
3.11	If grid mesh panels are fixed by welding, is the method of fixing justified in preference to other type of fixings?				
3.12	Has likely vibration on selected panels been considered in the design of fixings and anti vibration provisions made?				
3.13	Has slip resistance been considered and appropriate treatment/provisions made?				
3.14	Have trip hazards been considered and eliminated?				
3.15	Are there adequate stiffener bars or support beams to compensate for sections of suspended floor “cut-outs”				
4	Information on Drawing				
4.1	Are design loads for all parts of the suspended floor shown as notes on the drawings?				
4.2	Are areas subject to higher loads demarcated on the suspended floor plan?				
4.3	Are load bar directions for all grid mesh panels shown?				
4.4	Are dimension of all the panels shown?				
4.5	Do load bars of panel have adequate bearing on support members?				
4.6	Are load bar sizes and spacing or proprietary product designation numbers provided for all grid mesh panels?				
4.6	Are proprietary product designation numbers provided for all expanded metal mesh panels?				
4.7	Are thicknesses and surface finish or proprietary product designation numbers been provided for all chequer plate panels?				
4.8	Has rating plaque information been provided?				

I hereby certify that the information provided on the completed list above is correct.

.....
Designer/Structural Engineer
Company

Appendix 6 – STANDARD AND EXAMPLE DRAWINGS

Drawing Number	Issue	Description Drawing Title
KE97-91-1-1	B	Standard Grid Mesh Details- Sheet 1 of 4 – Typical Grid Mesh Panel Fixing Layout
KE97-91-1-2	A	Standard Grid Mesh Details- Sheet 2 of 4 – Typical Grid Mesh Panel Fixing details
KE97-91-1-3	A	Standard Grid Mesh Details- Sheet 3 of 4 – Typical Grid Mesh Floor Layout and Clearances
KE97-91-1-4	A	Standard Grid Mesh Details- Sheet 4 of 4 – Typical Penetration and cut out details
KE97-91-1-5	--	Not used
KE97-91-1-6	--	Not used
KE97-91-1-7	--	Not used
KE97-91-1-8	A	Standard Grid Mesh Details – Miscellaneous details sheet 1 of 2 – Guardrail / Handrail and Stair details
KE97-91-1-9	A	Standard Grid Mesh Details – Miscellaneous details sheet 2 of 2 – Guardrail / Handrail and Stair details
KE97-91-1-10	--	Not used
KE97-91-1-11	A	Standard Grid Mesh Details – General notes 1 of 2
KE97-91-1-12	A	Standard Grid Mesh Details – General notes 2 of 2
KE97-91-2-1	B	Standard Grid Mesh Details – General Assembly and Details – Example drawing
KE97-91-3-1	A	Mesh Rating Plaque



- NOTES:
- UNLESS NOTED OTHERWISE ALL DIMENSIONS ARE IN MILLIMETRES.
 - MATERIAL FOR FIXINGS SHALL BE SIMILAR/COMPATIBLE TO THAT OF GRID MESH FOR METAL GRATING. ANY DISSIMILAR MATERIAL SHALL BE ISOLATED USING SUITABLE INERT MATERIAL OF SUITABLE THICKNESS.
 - FOR FRP GRID MESH SUITABLE FIXINGS SHALL BE USED IN ACCORDANCE WITH GRID MESH MANUFACTURER'S SPECIFICATION/REQUIREMENT.
 - ALL FIXING SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S APPROVED PROCEDURE AND SPECIFICATION.
 - ALL WELDS SHALL BE MINIMUM 3mm CONTINUOUS FILLET WELD UNLESS NOTED OTHERWISE.
 - FLOOR FIXING SHALL BE CONFIGURED SO AS TO PROVIDE AT LEAST:
 - ONE FIXING AT EACH CORNER OF GRID MESH PANEL NOT FARTHER THAN 200mm FROM THE CORNER.
 - FOUR FIXINGS PER SQUARE METRE OF PANEL FOR PANEL SPANS EQUAL TO OR GREATER THAN ONE METRE.
 - SIX FIXINGS PER SQUARE METRE OF PANEL FOR PANEL SPANS LESS THAN ONE METRE.
 - FIXINGS SPACED NO FARTHER APART THAN 600mm.

INTERMEDIATE FIXINGS TO SUPPORT SHALL NOT EXCEED 600 SPACING. (TYPICAL) REFER NOTE 6.

AT LEAST ONE FIXING SHALL BE PLACED NOT FARTHER THAN 200 FROM EACH CORNER. (TYPICAL) REFER NOTE 6.

LOAD BARS

FIXING LOCATION

SUPPORT MEMBER

CROSS ROD

BANDING (TYP.)

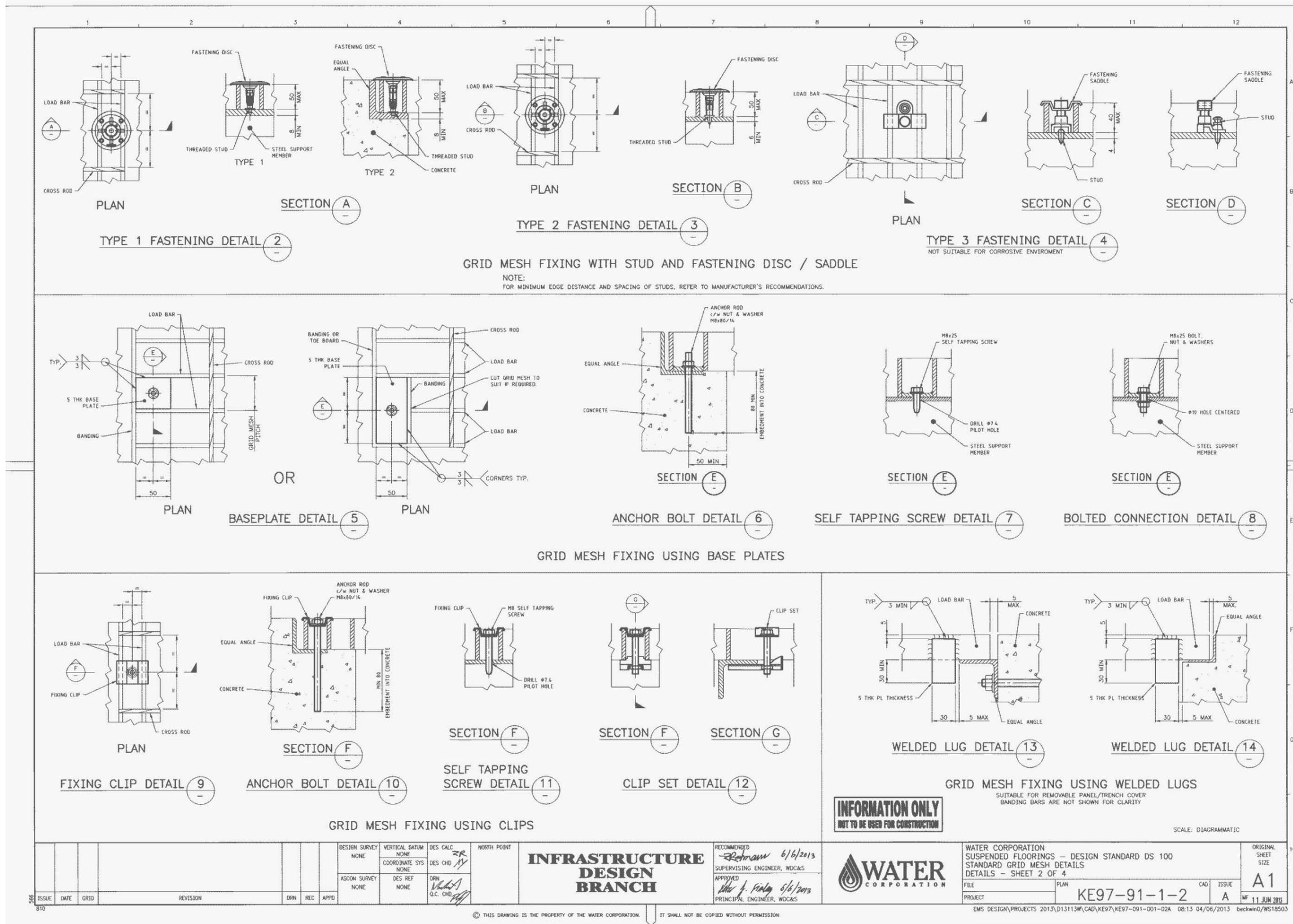
TYPICAL GRID MESH PANEL FIXING LAYOUT (1)
(MINIMUM REQUIREMENTS)

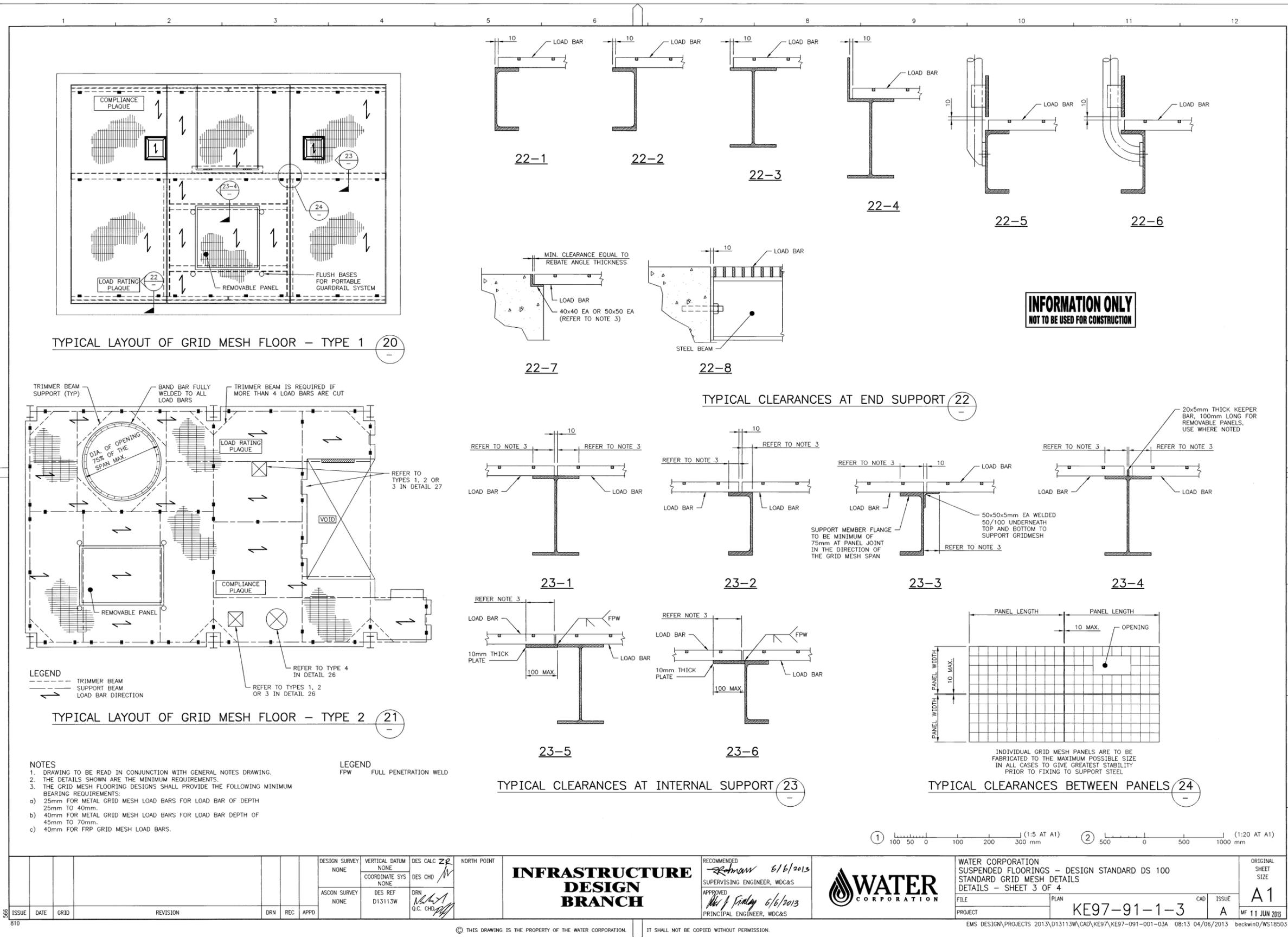
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B 02/2013 REDRAWN FOR DS100 REVISION		DESIGN SURVEY	VERTICAL DATUM	DES CALC	NORTH POINT	RECOMMENDED	16/08/2010	WATER CORPORATION		WATER CORPORATION	ORIGINAL SHEET SIZE
		NONE	NONE	DES CHD		J. PALMER (SIGNED)		SUSPENDED FLOORINGS - DESIGN STANDARD DS 100		STANDARD GRID MESH DETAILS	A1
		ASCOS SURVEY	DES REF	DRN	M. BICKLEY	APPROVED	16/08/2010	DETAILS - SHEET 1 OF 4			
		NONE	NONE	Q.C. CHD	C. GARNETT	K. WHEATCROFT (SIGNED)		FILE		PLAN	
ISSUE DATE GRID REVISION DRN REC APPD						IDB PROJECT DIRECTOR		PROJECT		KE97-91-1-1	ISSUE B
								EMS DESIGN\PROJECTS 2013\013113W\CAD\KE97\KE97-091-001-01B		08:13 04/06/2013	beckwin0/WS18503

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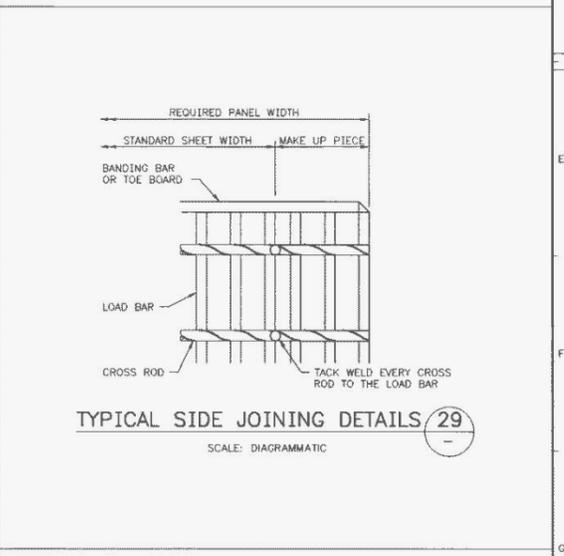
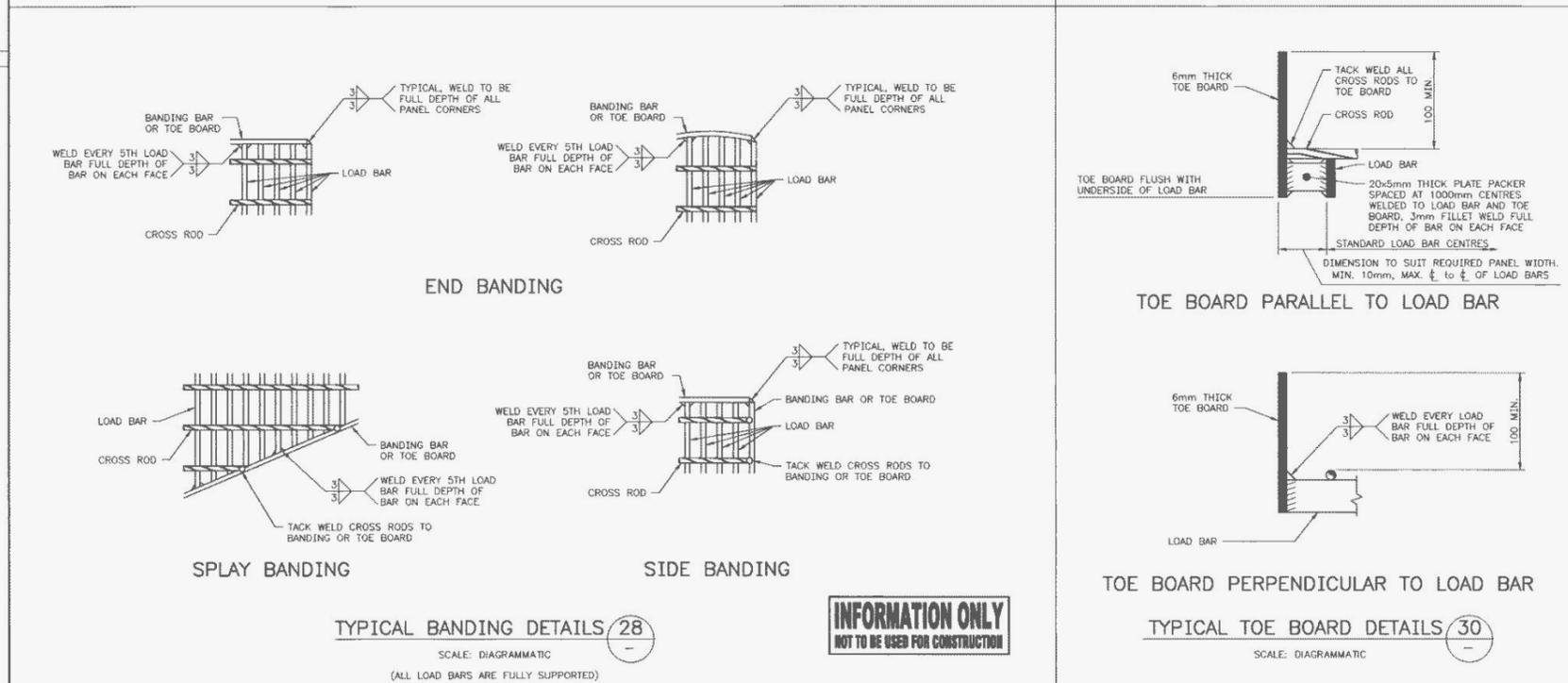
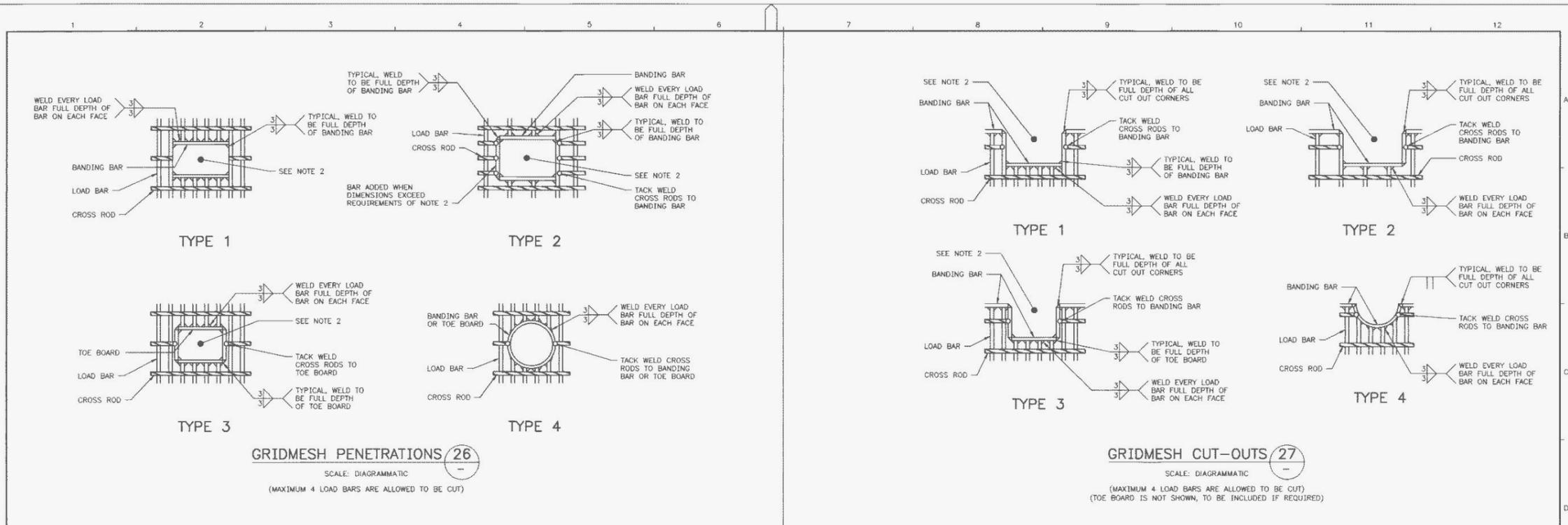


DESIGN SURVEY NONE	VERTICAL DATUM NONE	DES CALC ZZ	NORTH POINT	RECOMMENDED 6/6/2013		WATER CORPORATION SUSPENDED FLOORINGS – DESIGN STANDARD DS 100 STANDARD GRID MESH DETAILS DETAILS – SHEET 3 OF 4	ORIGINAL SHEET SIZE A1
ASCON SURVEY NONE	DES REF D13113W	DES CHD M		SUPERVISING ENGINEER, WDC&S APPROVED 6/6/2013 PRINCIPAL ENGINEER, WDC&S			
ISSUE	DATE	GRID	REVISION	DRN	REC	APPD	FILE PROJECT PLAN KE97-91-1-3 CAD ISSUE A MF 11 JUN 2013

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- NOTES**
1. THESE DETAILS TO APPLY UNLESS OTHERWISE NOTED ON GRID MESH DETAIL AND/OR LAYOUT DRAWINGS.
 2. ALL PENETRATIONS AND CUT OUTS ARE TO BE ENLARGED TO THE NEAREST LOAD BAR WHEN THEY FALL WITHIN 40mm OF THAT LOAD BAR.
 3. NO WELDS TO PROTRUDE BELOW UNDERSIDE OF GRID MESH.
 4. ALL BANDING BARS TO BE 5mm THICK. ALL TOE BOARDS TO BE 6mm THICK.
 5. PLAIN GRID MESH IS TO BE Banded WITH PLAIN BARS. SERRATED GRID MESH IS TO BE Banded WITH SERRATED BARS.
 6. WELD SIZE 3mm IS MINIMUM REQUIREMENT.

DESIGN SURVEY NONE	VERTICAL DATUM NONE	DES. CALC. ZR	NORTH POINT	RECOMMENDED 6/6/2013	WATER CORPORATION	ORIGINAL SHEET SIZE A1
COORDINATE SYS NONE	DES. REF D13113W	DES. CHD /16		SUPERVISING ENGINEER, WDC&S	FILE	PLAN
ASCON SURVEY NONE	DRN G.C. CHD			APPROVED 6/6/2013	PROJECT KE97-91-1-4	ISSUE A
ISSUE	DATE	GRID	REVISION	DRN	REC	APPD

INFRASTRUCTURE DESIGN BRANCH

WATER CORPORATION

WATER CORPORATION
SUSPENDED FLOORINGS - DESIGN STANDARD DS 100
STANDARD GRID MESH DETAILS
DETAILS - SHEET 4 OF 4

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STANCHIONS AT 2000mm CENTRES (MAX). STANCHIONS TO BE EQUALLY SPACED WHERE POSSIBLE

GUARDRAIL/HANDRAIL - DN32 PIPE (42.4mm O.D., 3.2mm W.T.)
STANCHION - DN40 PIPE (48.3mm O.D., 3.2mm W.T.)
KNEERAIL - DN25 PIPE (33.7mm O.D., 3.2mm W.T.)
TOE BOARD - 100x6mm THICK FLAT BAR, WELDED OR BOLTED (2xM12 BOLTS, 4.6/5)
TOE BOARD SUPPORT BRACKET
DN50 PIPE SLEEVE MED. GAUGE PIPE
2xM12 BOLTS, 8.8/5 (TYP)

FINISHED FLOOR LEVEL
TOE BOARD (TYP)
CHANNEL UNIVERSAL BEAM OR UNIVERSAL COLUMN
OFFSET TO SUIT STRUCTURE
WELDED - '4'

STAIR STANCHION AND ANGLE CLOSURE BEND. PREFERRED ANGLE 'α' = 37°
REFER TO MANUFACTURER'S SPECIFICATIONS
SHALL BE WIDE ENOUGH TO BOLT FROM TOP ONLY WITHOUT OBSTRUCTION
ANGLE MOUNTED - 'AM'

STANDARD 90° BEND: 'A' & 'B' = 300mm
NON STANDARD 90° BEND: 'A' & 'B' = 6500mm MAX.
'A' OR 'B' MINIMUM = 200mm
STANCHION CENTRES REMAIN AT 2000mm DESPITE BEND LENGTH

COMPLIMENTARY ANGLE TO STAIR ANGLE
STANDARD 90° BEND: 'A' & 'B' = 300mm
NON STANDARD 90° BEND: 'A' & 'B' = 6500mm MAX.
'A' OR 'B' MINIMUM = 200mm
STANCHION CENTRES REMAIN AT 2000mm DESPITE BEND LENGTH

TYPICAL STAIR AND PLATFORM GUARDRAIL/HANDRAIL DETAIL
TYPICAL STANCHION/GUARDRAIL/HANDRAIL JOINT
TYPICAL 90° STANDARD AND NON-STANDARD BENDS (SEE NOTE 7)
TYPICAL STANDARD AND NON-STANDARD ANGLE BENDS
TYPICAL TOE BOARD SPLICE
TYPICAL GUARDRAIL/HANDRAIL SPLICE
TYPICAL CLOSURE GUARDRAIL/HANDRAIL JOINT

NOTES
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH GENERAL NOTES DRAWINGS KE97-91-1-11 AND KE97-91-1-12.
2. THE DETAILS SHOWN ON THIS DRAWING ARE BASED ON REQUIREMENTS OUTLINED IN A.S.1657 (S.A. CODE FOR FIXED PLATFORMS, WALKWAYS, STAIRWAYS AND LADDERS) AND ARE MINIMUM ACCEPTABLE.
3. CONTACT SURFACES OF GUARDRAIL/HANDRAILS SHALL BE SMOOTH AND FREE FROM BURRS AND SHARP CORNERS.
4. ALL GUARDRAIL/HANDRAIL STANCHIONS AND RAILING TO BE HOT DIPPED GALVANISED U.O.N.
5. TYPE '3' STANCHIONS ARE NOT RECOMMENDED WHERE CUT-OUTS IN THE FLOORING ARE REQUIRED FOR STANCHION INSTALLATION.
6. IF BENT PIPE IS NOT CONTINUOUS THROUGH STANCHION BALL OR JOINT, USE SPLICE (DETAIL 45) OR FULLY WELD PIPE TO STANCHION.

**INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION**

DESIGN SURVEY	VERTICAL DATUM	DES. CALC	NORTH POINT	RECOMMENDED	WATER CORPORATION	ORIGINAL SHEET SIZE
NONE	NONE	2R		Supervising Engineer, WDCAS	SUSPENDED FLOORINGS - DESIGN STANDARD DS 100 STANDARD GRIDMESH DETAILS MISCELLANEOUS DETAILS - SHEET 1 OF 2	A1
ASCON SURVEY	COORDINATE SYS	DES. CHD		Principal Engineer, WDCAS		
DES. REF	DES. REF	DRN			FILE	ISSUE
D13113W	D13113W	164/2013			PLAN	A
		O.C. CHD			PROJECT	
					KE97-91-1-8	MF 11 JUN 2013

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<p>1.0 GENERAL</p> <p>1.1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH REFERENCE DRAWINGS (AND SPECIFICATIONS WITH ALL OTHER DRAWINGS IF APPLICABLE). DISCREPANCIES SHALL BE REFERRED TO THE PRINCIPAL/SUPERINTENDENT FOR A DECISION BEFORE PROCEEDING WITH THE WORK.</p> <p>1.2 ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES TO AND U.N.O.</p> <p>1.3 WORK SHALL BE CARRIED OUT IN A SAFE MANNER IN ACCORDANCE WITH APPLICABLE STATUTORY REGULATIONS, BY-LAWS OR RULES. THE CONTRACTOR IS RESPONSIBLE FOR OCCUPATIONAL HEALTH AND SAFETY OF SITE PERSONNEL AND GENERAL PUBLIC IN ACCORDANCE WITH LEGISLATIVE REQUIREMENTS, INDUSTRIAL AGREEMENTS AND ACCEPTED INDUSTRY PRACTICE.</p> <p>1.4 SHOP DRAWINGS SHALL BE PREPARED BASED ON REFERENCED DETAIL DESIGN DRAWINGS TO SHOW RELEVANT DETAILS OF EACH ASSEMBLY, COMPONENT AND CONNECTION, TOGETHER WITH INFORMATION RELATIVE TO FABRICATION, SURFACE TREATMENT AND ERECTION, INCLUDING IDENTIFICATION, STEEL TYPE AND GRADE, DIMENSIONS OF ITEMS, LOCATION, TYPE AND SIZE OF WELDS OR BOLTS, WELD CATEGORIES AND BOLTING CATEGORIES, WELD PROCEDURES, SURFACE PREPARATION METHODS AND COATING SYSTEM, VENT/DRAIN HOLES FOR HOT DIP GALVANISING, PROPOSED JOINTS IN STEEL MEMBERS, etc.</p> <p>1.5 DIMENSIONS RELEVANT TO SETTING OUT AND OFF SITE WORK (FABRICATION) SHALL BE VERIFIED BY THE CONTRACTOR BEFORE SHOP DRAWINGS, FABRICATION AND CONSTRUCTION IS COMMENCED. DETAILS SHALL NOT BE SCALED FROM THE REFERENCED DRAWINGS.</p> <p>1.6 WHEN SHOP DRAWINGS ARE PREPARED FABRICATION SHALL NOT BE COMMENCED UNTIL SHOP DRAWINGS AND CALCULATIONS HAVE BEEN REVIEWED AND ACCEPTED BY THE PRINCIPAL/SUPERINTENDENT OR AN ENGINEER NOMINATED BY THE PRINCIPAL/SUPERINTENDENT. THE REVIEW DOES NOT INCLUDE CHECKING OF DIMENSIONS, AND DOES NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR COMPLIANCE WITH DRAWINGS AND SPECIFICATIONS.</p> <p>1.7 REVIEW OF SHOP DRAWINGS IS OF GENERAL CONFORMANCE WITH DESIGN CONCEPT AND GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS ONLY. CONTRACTOR SHALL BE RESPONSIBLE FOR CONFIRMING AND CORRELATING QUANTITIES AND DIMENSIONS, SELECTING FABRICATION PROCEDURES AND CONSTRUCTION TECHNIQUES, AND PERFORMING WORK IN A SAFE MANNER. CORRECTIONS OR COMMENTS MADE ON SHOP DRAWINGS DO NOT RELIEVE CONTRACTOR FROM RESPONSIBILITY FOR COMPLIANCE WITH REQUIREMENTS OF CONTRACT DRAWINGS AND SPECIFICATION.</p> <p>1.8 NOMINATION OF PROPRIETARY ITEMS DOES NOT INDICATE EXCLUSIVE PREFERENCE, BUT INDICATES REQUIRED PROPERTIES OF ITEM. SIMILAR ALTERNATIVES HAVING REQUIRED PROPERTIES MAY BE OFFERED FOR APPROVAL. APPROVAL DOES NOT AUTHORISE A VARIATION TO THE CONTRACT.</p> <p>1.9 PROPRIETARY ITEMS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS AND SPECIFICATIONS.</p> <p>1.10 DURING CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING STRUCTURES IN A STABLE CONDITION AND ENSURE NO PART IS OVER STRESSED DURING CONSTRUCTION ACTIVITIES.</p> <p>1.11 STAIRWAYS, LADDERS, GUARDRAILING, HANDRAILING, PLATFORMS AND LANDINGS SHALL COMPLY WITH AS 1657, AND DS100 EXCEPT THAT GUARDRAILING HEIGHT SHALL NOT BE LESS THAN 1000mm. TOE BOARDS SHALL BE PROVIDED TO FALL EDGES OF PLATFORMS AND LANDINGS.</p> <p>1.12 DEBRIS AND WASTE MATERIAL SHALL BE REMOVED FROM THE SITE OF WORKS TO A LOCATION APPROVED BY THE PRINCIPAL/SUPERINTENDENT.</p> <p>1.13 STEEL WORK SUPPORTING SUSPENDED FLOOR SHALL BE ARRANGED/INSTALLED TO BE SELF DRAINING.</p> <p>1.14 DISSIMILAR METALS SHALL BE ISOLATED AS GENERALLY INDICATED IN WATER CORPORATION STANDARD DRAWING EJ17-1-1</p> <p>1.15 THE DRAWINGS MAY NOT SHOW DETAILS OF ALL FIXTURES, INSERTS, BASES, RECESSES OR OPENINGS etc REQUIRED. ANY RISK OF SUSPENDED FLOOR PANELS LIFTING OR FAILING SHALL BE REFERRED TO THE PRINCIPAL/SUPERINTENDENT FOR INSTRUCTIONS.</p> <p>1.16 CARE SHALL BE TAKEN OF HAZARDS ASSOCIATED WITH BURIED, CONCEALED OR OVERHEAD SERVICES. PRECAUTIONS SHALL BE TAKEN TO ESTABLISH LOCATION OF AND PROTECT EXISTING SERVICES ON SITE. SERVICES SHOWN ON DRAWINGS ARE IN APPROXIMATE LOCATIONS ONLY. SERVICES OTHER THAN THOSE SHOWN MAY EXIST ON SITE. MARK LOCATIONS OF SERVICES CLEARLY ON SITE, AND ON AS-BUILT DRAWINGS.</p> <p>1.17 ABBREVIATIONS AND LEGEND</p> <p>1.18 THE FOLLOWING WATER CORPORATION DESIGN STANDARD SHALL APPLY.</p> <p>2.0 WELDING</p> <p>2.1 UNLESS NOTED OTHERWISE CARBON STRUCTURAL STEEL WORK WELDS SHALL BE STRUCTURAL PURPOSE (SP) TO AS 1554.1 AND IN ACCORDANCE WITH WATER CORPORATION WELDING SPECIFICATION WS-1 - METAL ARC WELDING.</p> <p>2.2 STAINLESS STEEL WORK WELDS SHALL BE STRUCTURAL PURPOSE (SP) TO AS 1554.6 CLASS 2 AND IN ACCORDANCE WITH WATER CORPORATION WELDING SPECIFICATION WS-1 - METAL ARC WELDING. WELDING AS PER AS 1554.6 SHALL BE "WELD CATEGORY 1" AND FINISH SHALL BE "CATEGORY 2A".</p> <p>2.3 ALUMINIUM WORKS WELDS SHALL BE TO AS/NZS 1665 AND IN ACCORDANCE WITH WATER CORPORATION WELDING SPECIFICATION WS-1 - METAL ARC WELDING.</p> <p>2.4 STAINLESS STEEL WELDS AND HEAT EFFECTED ZONES SHALL BE CLEANED AND PASSIVATED AFTER WELDING IN ACCORDANCE WITH AS 1554.6.</p> <p>2.5 WELDING SPLATTER AND SLAG SHALL BE REMOVED FROM SURFACES.</p> <p>2.6 WHERE A WELD JOINT IS REQUIRED, ALL EDGES OF THE METAL FACES IN CONTACT SHALL BE WELDED.</p> <p>2.7 ALL TUBULAR SECTIONS SHALL HAVE 3mm SEAL PLATES. ADEQUATE DRAINAGE HOLES SHALL BE PROVIDED FOR GALVANISING.</p> <p>2.8 WELD PROCEDURES SHALL BE DEVELOPED TO SUIT JOINT DETAILS AND SHOWN ON SHOP DRAWINGS. USE PRE-QUALIFIED WELD PROCEDURES TO AS/NZS1554.1 CLAUSE 4.3 OR DEVELOP QUALIFICATION OF WELD PROCEDURE BY TESTING TO AS/NZS1554.1 CLAUSE 4.2.</p> <p>2.9 UNLESS NOTED OTHERWISE ALL INTERFACES BETWEEN STEEL SECTIONS TO BE CONNECTED WITH 6mm CONTINUOUS FILLET WELDS ALL ROUND, BOTH SIDES.</p> <p>2.10 UNLESS NOTED OTHERWISE ALL GRID MESH ELEMENTS E.G., LOAD BARS, CROSS BARS, BANDING BARS WELDS SHALL BE MINIMUM 3mm CONTINUOUS FILLET WELDS.</p> <p>2.11 UNLESS NOTED OTHERWISE BUTT WELDS SHALL BE COMPLETE (FULL) PENETRATION BUTT WELDS (CPBW).</p> <p>2.12 WELDS TO BE INSPECTED BY ACCREDITED/QUALIFIED WELDING INSPECTOR AS PER WATER CORPORATION'S WELDING SPECIFICATION WS-1. PROVIDE SIGNED INSPECTION TEST PLANS BY WELDING INSPECTOR.</p> <p>2.13 UNLESS NOTED OTHERWISE WELDS SHALL BE SHOP WELDED.</p> <p>2.14 WELDING SYMBOLS ARE TO AS1101.3. "CFW" INDICATES CONTINUOUS FILLET WELD. "FSBW" INDICATES FULL STRENGTH BUTT WELD WHICH IS EQUIVALENT TO CPBW. "CPBW" INDICATES COMPLETE PENETRATION BUTT WELD.</p> <p>2.15 GUARDRAILS SHALL BE COMPLETE WITH MINIMUM 4mm CFW AT THE RAIL TO STANCHION JOINT AND 5mm CFW AT BASE PLATE TO STANCHION JOINT.</p>	<p>3.0 GRID MESH</p> <p>3.1 MATERIAL FOR STEEL GRID MESH SHALL COMPLY WITH AS3679 GRADE 250 OR EQUIVALENT.</p> <p>3.2 MATERIAL FOR ALUMINIUM GRID MESH SHALL COMPLY WITH ASTM B221 6063-T6.</p> <p>3.3 MATERIAL FOR STAINLESS STEEL GRID MESH SHALL COMPLY WITH ASTM A240/A240M GRADE 316L.</p> <p>3.4 STEEL GRID MESH SHALL BE HOT DIP GALVANISED IN ACCORDANCE WITH AS 4680.</p> <p>3.5 THE SMALLER DIMENSION OF ANY OPENING OF GRID MESH SHALL NOT EXCEED 40mm AND THE AREA OF OPENING SHALL NOT EXCEED 5000mm².</p> <p>3.6 ALL EDGES AND CUTOUPS OF STEEL GRID MESH SHALL BE Banded WITH BANDING BARS OF SAME SIZE (MINIMUM) AS THE LOAD BARS AND SHALL BE FINISHED FLUSH WITH LOAD BAR UPPER SURFACE EXCEPT WHERE THEY SERVE AS TOE BOARDS.</p> <p>3.7 MINIMUM BEARING WIDTH OF STEEL GRID MESH LOAD BARS ON SUPPORTS SHALL BE AS FOLLOWS. 25mm FOR STEEL GRID LOAD BARS OF DEPTH 25-40mm. 40mm FOR STEEL GRID LOAD BARS OF DEPTH 45-65mm.</p> <p>3.8 MINIMUM BEARING WIDTH OF FRP GRID MESH LOAD BARS ON SUPPORTS SHALL BE 40mm.</p> <p>3.9 ANY SECTION OF FRP GRID MESH SHALL NOT OVERHANG THE SUPPORTS.</p> <p>3.10 ANY SECTION OF STEEL GRID MESH SHALL NOT OVERHANG THE SUPPORTS IN THE DIRECTION OF CROSS RODS.</p> <p>3.11 AT LOCATIONS THAT ARE LIKELY TO BE UNDER FREQUENT WET CONDITIONS THE DEPTH OF BANDING BARS MAY BE REDUCED TO ALLOW A GAP OF 10-15mm TO FACILITATE DRAINAGE.</p> <p>3.12 GRID MESH FLOOR FIXINGS SHALL BE CONFIGURED SO AS TO PROVIDE AT LEAST: a) ONE FIXING AT EACH CORNER NO FARTHER THAN 200mm FROM THE CORNER; b) FOUR FIXINGS PER SQUARE METRE OF PANEL FOR PANEL SPANS EQUAL TO OR GREATER THAN ONE METRE; c) SIX FIXINGS PER SQUARE METRE FOR PANEL LESS THAN ONE METRE; d) FIXINGS GENERALLY SPACED NO FARTHER APART THAN 600mm. DESIGNERS SHALL SELECT GRID MESH PANEL FIXING CONFIGURATIONS (NUMBER AND TYPE) THAT PROVIDE FOR EXPOSURE TO MOBILE PLANT AND EQUIPMENT INCLUDING PROVISION FOR VIBRATION INTENSITY AND TEMPERATURE VARIATIONS AS APPROPRIATE.</p> <p>3.13 ANY GAP BETWEEN ADJACENT GRID MESH PANELS SHALL NOT EXCEED 10mm.</p> <p>4.0 REINSTATEMENT/DAMAGE TO STEEL COATING</p> <p>4.1 DAMAGES TO GALVANISED COATING SHALL BE REPAIRED TO THE REQUIREMENTS OF AS/NZS4680 AND COATING SPECIFICATION H1 OF DS95</p> <p>4.2 INORGANIC ZINC SILICATE COATING SHALL BE REINSTATED TO A MINIMUM DRY FILM THICKNESS OF 100 MICRONS BY THE APPLICATION OF AN AUSTRALIAN PAINT APPROVAL SCHEME APPROVED ORGANIC ZINC RICH COATING SUCH AS "JOTUN BARRIER" (OR APPROVED EQUIVALENT) OVER A CLEAN SURFACE APPLIED IN ACCORDANCE WITH THE COATING MANUFACTURER'S RECOMMENDATIONS.</p> <p>5.0 RAISED EXPANDED METAL</p> <p>5.1 MATERIAL FOR GALVANISED STEEL EXPANDED METAL MESH SHALL COMPLY WITH AS3678, GRADE 250 OR EQUIVALENT. GALVANISING SHALL BE TO AS4680.</p> <p>5.2 MATERIAL FOR ALUMINIUM EXPANDED METAL MESH SHALL COMPLY WITH ASTM B209 GRADE 6063-T.</p> <p>5.3 MATERIAL FOR STAINLESS STEEL EXPANDED METAL MESH SHALL COMPLY WITH ASTM A240/A240M GRADE 316L.</p> <p>5.4 MINIMUM BEARING WIDTH OF EXPANDED METAL MESH BARS ON SUPPORTS SHALL BE 40mm.</p> <p>5.5 ANY SECTION OF RAISED EXPANDED METAL SHALL NOT OVERHANG THE SUPPORTS.</p> <p>6.0 CHEQUER PLATE</p> <p>6.1 MATERIAL FOR GALVANISED STEEL CHEQUER PLATE SHALL COMPLY WITH AS3678, GRADE 250 OR EQUIVALENT. GALVANISING SHALL BE TO AS4680.</p> <p>6.2 MATERIAL FOR ALUMINIUM CHEQUER PLATE SHALL COMPLY WITH ASTM B209 GRADE 6063-T.</p> <p>6.3 MATERIAL FOR STAINLESS STEEL CHEQUER PLATE SHALL COMPLY WITH ASTM A240/A240M GRADE 316L.</p> <p>6.4 MINIMUM BEARING WIDTH OF CHEQUER PLATE ON SUPPORTS SHALL BE 50mm.</p> <p>6.5 ANY GAP BETWEEN ADJACENT CHEQUER PLATES SHALL NOT EXCEED 10mm UNLESS THE PLATED ARE IS REQUIRED TO BE WITHOUT WATER OR GAS LEAKS.</p>																											
<p>INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION</p>																												
<p>NOTES FOR DESIGNER (DO NOT INCLUDE ON DETAIL DESIGN/SHOP DRAWINGS OF SPECIFIC PROJECTS)</p> <p>1. THIS DRAWING HAS BEEN DEVELOPED FOR "SUSPENDED FLOORING" PROJECTS. THE DESIGNER SHALL CARRY OUT A QUALITY REVIEW AND INCLUDE ADDITIONAL NOTES AS REQUIRED.</p> <p>2. THE NOTES ON THIS DRAWING MAY BE EDITED TO SUIT A PROJECT. ADDITIONAL NOTES FOR JOB SPECIFIC REQUIREMENTS TO BE INCLUDED AND ONLY THOSE NOTES THAT DO NOT APPLY TO BE DELETED.</p> <p>3. ADDITIONAL NOTES SHALL INCLUDE DESIGN LOADING AND ANY OTHER DESIGN CRITERIA SPECIFIC TO THE PROJECT.</p> <p>4. WATER CORPORATION DESIGN REPRESENTATIVE'S APPROVAL SHALL BE SOUGHT TO VARY ANY NOTE ON THIS DRAWING.</p>																												
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>ISSUE</th> <th>DATE</th> <th>GRID</th> <th>REVISION</th> <th>DRN</th> <th>REC</th> <th>APPD</th> </tr> <tr> <td> </td> </tr> </table>	ISSUE	DATE	GRID	REVISION	DRN	REC	APPD								<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>DESIGN SURVEY NONE</td> <td>VERTICAL DATUM NONE</td> <td>DES CALC 2P</td> <td>NORTH POINT</td> </tr> <tr> <td>COORDINATE SYS NONE</td> <td>DES REF D13113W</td> <td>DRN G.C. CHD</td> <td> </td> </tr> </table>	DESIGN SURVEY NONE	VERTICAL DATUM NONE	DES CALC 2P	NORTH POINT	COORDINATE SYS NONE	DES REF D13113W	DRN G.C. CHD		<p>INFRASTRUCTURE DESIGN BRANCH</p>	<p>RECOMMENDED <i>Rahman</i> 6/16/2013 SENIOR ENGINEER, WDC&S</p> <p>APPROVED <i>Wes J. Pridley</i> 6/14/2013 PRINCIPAL ENGINEER, WDC&S</p>		<p>WATER CORPORATION SUSPENDED FLOORINGS - DESIGN STANDARD DS 100 STANDARD GRID MESH DETAILS GENERAL NOTES - SHEET 1 OF 2</p> <p>FILE: _____ PLAN: _____ CAD: _____ ISSUE: _____ PROJECT: _____ KE97-91-1-11 A MF 11 JUN 2013</p>	<p>ORIGINAL SHEET SIZE A1</p>
ISSUE	DATE	GRID	REVISION	DRN	REC	APPD																						
DESIGN SURVEY NONE	VERTICAL DATUM NONE	DES CALC 2P	NORTH POINT																									
COORDINATE SYS NONE	DES REF D13113W	DRN G.C. CHD																										
<p>© THIS DRAWING IS THE PROPERTY OF THE WATER CORPORATION. IT SHALL NOT BE COPIED WITHOUT PERMISSION.</p>		<p>EMS DESIGN\PROJECTS 2013\013113W\CA0\KE97\KE97-091-001-11A 08:13 04/06/2013 beckwin0\WS18503</p>																										

7.0 EDGE PROTECTION

- 7.1 EDGE PROTECTION ARE OF THREE TYPES (E0, E1 & E2) AS DETAILED IN DS100.
- 7.2 TYPES E0 AND E1 ARE GENERALLY TERMED GUARDRAILS AND TYPE E2 IS TERMED BALUSTRADES.
- 7.3 TYPES E0 AND E1 EDGE PROTECTION (GUARDRAILS) SHALL MEET THE REQUIREMENTS IN AS1657.
- 7.4 MEMBERS OF STEEL EDGE PROTECTION SHALL BE HOT DIP GALVANISED.

8.0 CHEMICAL ANCHORS

- 8.1 ALL CHEMICAL ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
- 8.2 UNLESS NOTED OTHERWISE, HILTI HAS ANCHOR RODS SHALL HAVE MINIMUM EMBEDMENT INTO SOUND, MONOLITHIC CONCRETE AS SPECIFIED BELOW:

HILTI HAS ANCHOR SIZE	MINIMUM EMBEDMENT INTO SOUND MONOLITHIC CONCRETE (mm)
M8	80
M10	90
M12	110
M16	125
M20	170
M24	210

TOPPING CONCRETE AND OTHER SURFACE FINISHES SHALL BE EXCLUDED FROM THE EMBEDMENT DEPTH. IN THESE INSTANCES LONGER ANCHOR RODS WOULD BE REQUIRED.

9.0 STRUCTURAL STEELWORK

- 9.1 STEEL WORK WORKMANSHIP AND MATERIALS SHALL COMPLY WITH AS4100 AND AS/NZS1554.
 - 9.2 MATERIAL FOR STEELWORK SHALL BE AS FOLLOWS
 - PLATES AND FLOOR PLATE SHALL COMPLY WITH AS/NZS3678
 - UNIVERSAL BEAMS, UNIVERSAL COLUMNS, PARALLEL FLANGE CHANNELS AND ANGLES, SHALL COMPLY WITH AS/NZS3679 PART 1, GRADE 300 OR BHP GRADE 300 PLUS.
 - OTHER MEMBERS SHALL COMPLY WITH AS/NZS3678 OR AS/NZS3679 GRADE 250 U.N.O.
 - 9.3 STEEL GRADES SHALL BE MARKED ON STRUCTURAL MEMBERS IN NON-CRITICAL AREAS USING IDENTIFICATION MARKS COMPATIBLE WITH AND VISIBLE THROUGH PAINT SYSTEM.
 - 9.4 AFTER COMPLETION OF FABRICATION, PREPARATION FOR SURFACE TREATMENT SHALL INCLUDE ROUNDING OFF ROUGH WELDS, SHARP EDGES, BURRS, ARISES, WELD SPLATTER AND SLAG, etc. AND REMOVAL OF GREASE, OIL AND OTHER CONTAMINANTS TO AS1627.1.
 - 9.5 UNLESS NOTED OTHERWISE ON DRAWINGS OR IN SPECIFICATION, ALL STEELWORK SHALL BE HOT DIPPED GALVANISED TO AS/NZS4680 AND TO THE REQUIREMENTS OF COATING SPECIFICATION H2 OF DS95.)
 - 9.6 GALVANISED STEEL TO BE IN CONTACT WITH CONCRETE SHALL BE PASSIVATED BY DIPPING IN 0.2% SODIUM DICHROMATE SOLUTION
 - 9.7 INTERNAL CORNERS OF CLEATS AND STIFFENERS, etc SHALL BE CROPPED TO FACILITATE DRAINAGE. DRAINAGE HOLES TO PREVENT WATER POOLING ON STRUCTURAL ELEMENTS DURING CONSTRUCTION SHALL BE PROVIDED AND PROPOSED HOLES SHALL BE SHOWN ON SHOP DRAWINGS.
 - 9.8 CAP PLATES 3mm THICK SHALL BE SEAL WELDED TO HOLLOW SECTIONS U.N.O.
 - 9.9 ITEMS TO BE HOT DIP GALVANISED SHALL BE PROVIDED WITH
 - VENT/DRAIN HOLES AT TOP AND BOTTOM EXTREMITIES FOR HOLLOW SECTIONS. PROVIDE RUBBER SEALS OR PLUG WELD VENT/DRAIN HOLES THAT REMAIN EXPOSED.
 - DRILLED SUSPENSION HOLES IN END PLATES, ETC
 - PRIOR TO DIPPING ADVISE OF ANY DESIGN FEATURES THAT MAY LEAD TO DIFFICULTIES DURING GALVANISING.
- VENT/DRAIN HOLES THAT REMAIN EXPOSED SHALL BE PROVIDED WITH RUBBER SEALS OR PLUG WELDED

10.0 HOT-DIP GALVANISED CARBON/MILD STEEL FASTENERS

- 10.1 FASTENER THREADS SHALL COMPLY WITH AS 1275. WASHERS SHALL COMPLY WITH AS 1237.1.
- 10.2 BOLTS AND NUTS SHALL BE HOT-DIP GALVANISED TO AS 1214 AND WASHERS SHALL BE GALVANISED TO AS/NZS 4680.
- 10.3 BOLTS UP TO AND INCLUDING M12 SHALL BE PROPERTY CLASS 4.6 AND SHALL COMPLY WITH AS 1111.1. NUTS SHALL BE PROPERTY CLASS 5 AND SHALL COMPLY WITH AS 1112.3.
- 10.4 BOLTS, NUTS AND WASHERS M14 AND GREATER SHALL COMPLY WITH AS/NZS 1252.
- 10.5 EVERY FASTENER ASSEMBLY SHALL HAVE TWO WASHERS AND ONE NUT TIGHTENED SNUG TIGHT TO AS 4100.
- 10.6 M16 AND LARGER BOLTS TO BE HIGH STRENGTH STRUCTURAL BOLTS, 8.8/S PROCEDURE AND M12 SIZE BOLTS SHALL BE COMMERCIAL BOLTS, 4.6/S PROCEDURE U.N.O.
- 10.7 MAKE BOLTED STRUCTURAL CONNECTIONS WITH 10mm THICK CLEAT PLATES AND 2 M16 8.8/S BOLTS U.N.O.
- 10.8 HOT DIP GALVANISE BOLTS, SCREWS, NUTS AND WASHERS TO AS1214. TAP GALVANISED NUTS 0.4mm OVERSIZE TO SUIT GALVANISED THREADS TO AS1214 AND LUBRICANT FOR PROTECTION. INSTALL WASHERS UNDER BOLT HEAD AND NUT. PROVIDE TWO WASHERS UNDER BOLT HEAD IF HEAD IS USED FOR TIGHTENING. USE TAPERED WASHERS AS REQUIRED. WASHERS SHALL BE LASER OR WATER JET CUT AND NOT PUNCHED MY MECHANICAL DIES.
- 10.9 USE BOLT LENGTHS SO THAT PROJECTION BEYOND NUT IS AT LEAST TWO THREADS, AND NOT MORE THAN 10mm.
- 10.10 HOLDING DOWN BOLTS TO BE GRADE 4.6 U.N.O. SUPPLY HOLDING DOWN BOLTS WITH TWO CLASS 5 HEXAGONAL HEAD NUTS AND TWO EXTRA LARGE FLAT WASHERS.
- 10.11 HOT DIP GALVANISE HOLDING DOWN BOLTS, NUTS AND WASHERS TO AS1214.
- 10.12 DRILL HOLES FULL SIZE OR REAM TO FULL SIZE AFTER SUB-DRILLING. SUB-DRILLED OR SUB-PUNCHED HOLES TO BE AT LEAST 3mm UNDERSIZE. PUNCHING AND FLAME CUTTING OF HOLES IS NOT PERMITTED. BOLT HOLE SIZE TO BE:
 - BOLT DIAMETER PLUS 2mm FOR STEEL TO STEEL CONNECTIONS.
 - BOLT DIAMETER PLUS 4mm FOR STEEL TO CONCRETE CONNECTIONS.
 - BOLT DIAMETER PLUS 6mm FOR HOLDING DOWN BOLTS.
- 10.13 USE BOLTS WITH THREADS IN COMPLIANCE WITH AS1275. BOLTS OF STRENGTH GRADE 4.6 TO BE COMMERCIAL GRADE BOLTS TO AS1111 AND 1112. BOLTS OF STRENGTH GRADE 8.8 TO BE HIGH STRENGTH STRUCTURAL BOLTS, NUTS AND WASHERS TO AS/NZS1252. MECHANICAL PROPERTIES OF BOLTS, NUTS, SCREWS AND STUDS TO COMPLY WITH AS/NZS4291.2. WASHERS TO COMPLY WITH AS1237. TIGHTENING PROCEDURES TO COMPLY WITH AS4100:
 - S SNUG TIGHT.
 - TB BEARING MODE JOINT, BOLTS FULLY TENSIONED.
 - TF FRICTION MODE JOINT, BOLTS FULLY TENSIONED. (CONTACT SURFACES OF CONNECTIONS TO BE UNCOATED.)
- 10.14 BOLTS SHALL PROTRUDE THE NUT AFTER TENSIONING BY 2 TO 5 THREADS.

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NOTES FOR DESIGNER
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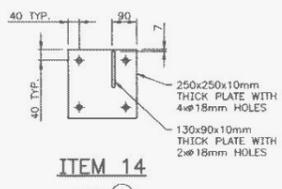
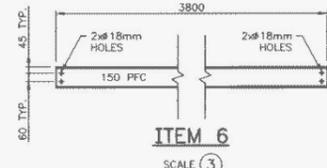
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ISSUE	DATE	GRID	REVISION	DRN	REC	APPD	DESIGN SURVEY NONE	VERTICAL DATUM NONE	DES CALC 2R	NORTH POINT	RECOMMENDED <i>Rahman</i> 6/4/2013 SENIOR ENGINEER, WDC&S		WATER CORPORATION SUSPENDED FLOORINGS - DESIGN STANDARD DS 100 STANDARD GRID MESH DETAILS GENERAL NOTES - SHEET 2 OF 2	ORIGINAL SHEET SIZE A1	
							ASCON SURVEY NONE	DES REF D13113W	DRN N.L.A. O.C. CHD		APPROVED <i>W. J. Finlay</i> 6/6/2013 PRINCIPAL ENGINEER, WDC&S			FILE	PLAN
												PROJECT	KE97-91-1-12	A	MF 11 JUN 2013

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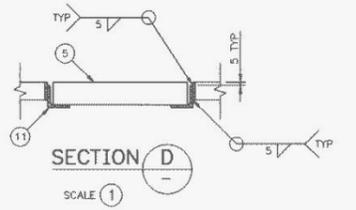
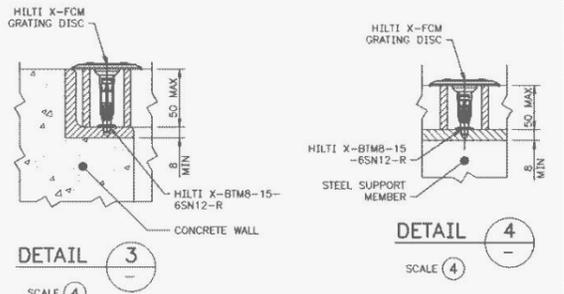
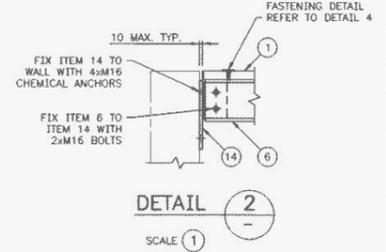
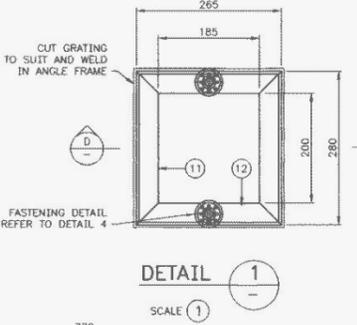
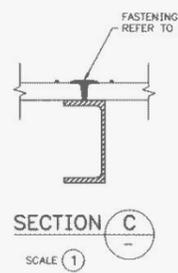
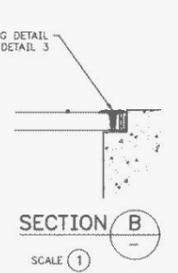
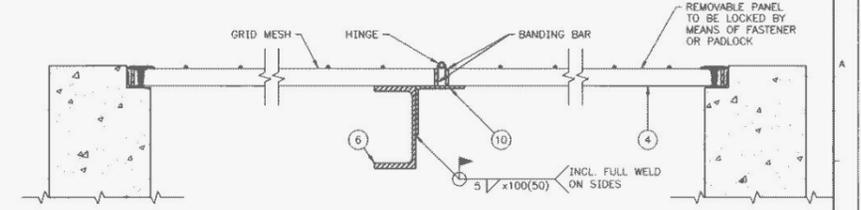
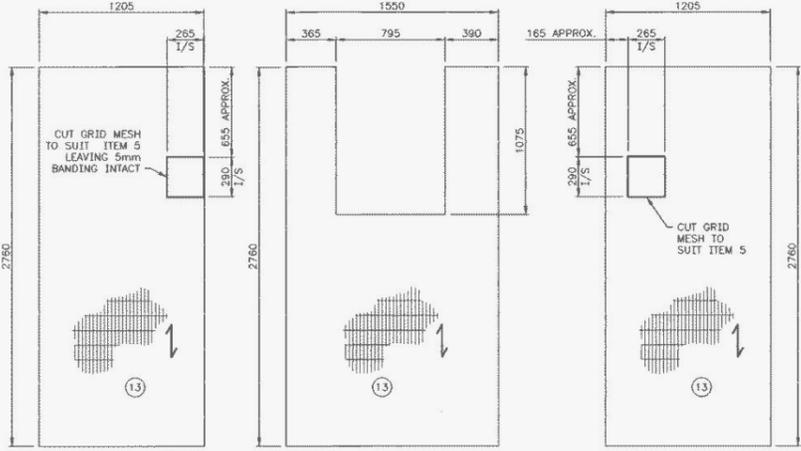
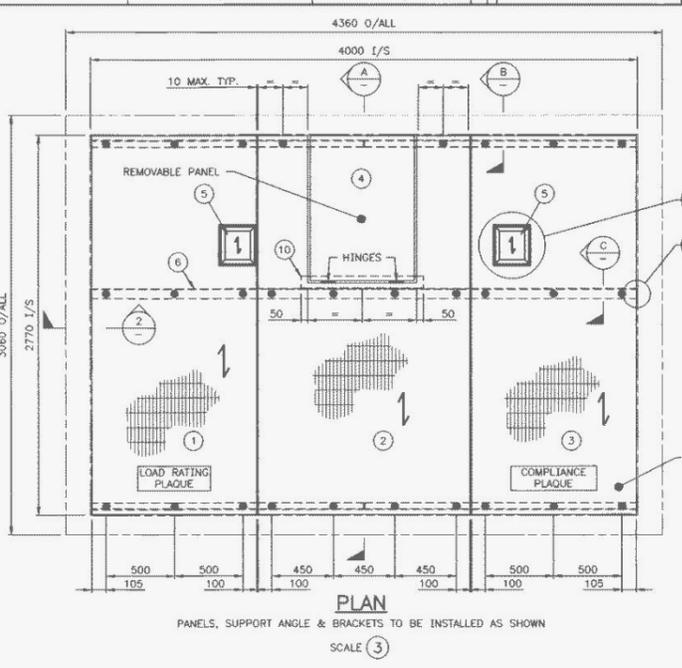
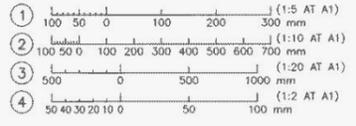
BILL OF MATERIALS				
ITEM	DESCRIPTION	SIZE	MATERIAL	QTY
1	GRID MESH C325MPG	2760x1205	AS3679 - 250	1
2	GRID MESH C325MPG	2760x1550	AS3679 - 250	1
3	GRID MESH C325MPG	2760x1205	AS3679 - 250	1
4	GRID MESH C325MPG	1060x770	AS3679 - 250	1
5	GRID MESH C325MPG	270x245	AS3679 - 250	2
6	150 PFC	4000	AS3679 - 250	1
7	HILTI X-BTMB-15-65N12-R WITH X-FCM GRATING DISC	-	-	32
8	HAS-E-F ANCHOR ROD c/w NUT & WASHER	M10x90/21	GRADE 5.8	16
9	HILTI HIT-HY150MAX CHEMICAL ANCHORING FOIL PACK	330mL	-	2
10	90x6 EA	900	AS3679 - 250	1
11	40x8 EA	290	AS3679 - 250	2
12	40x5 EA	265	AS3679 - 250	2
13	32x5 FL	50	AS3679 - 250	12
14	MOUNTING BRACKET	250x250x10	AS3679 - 250	2
15	HILTI HAS-E-F ANCHOR ROD c/w NUT & WASHER	M16x125/38	GRADE 5.8	8
16	FIXING BOLT c/w NUT AND WASHER	M16x60	GRADE 8.8	4



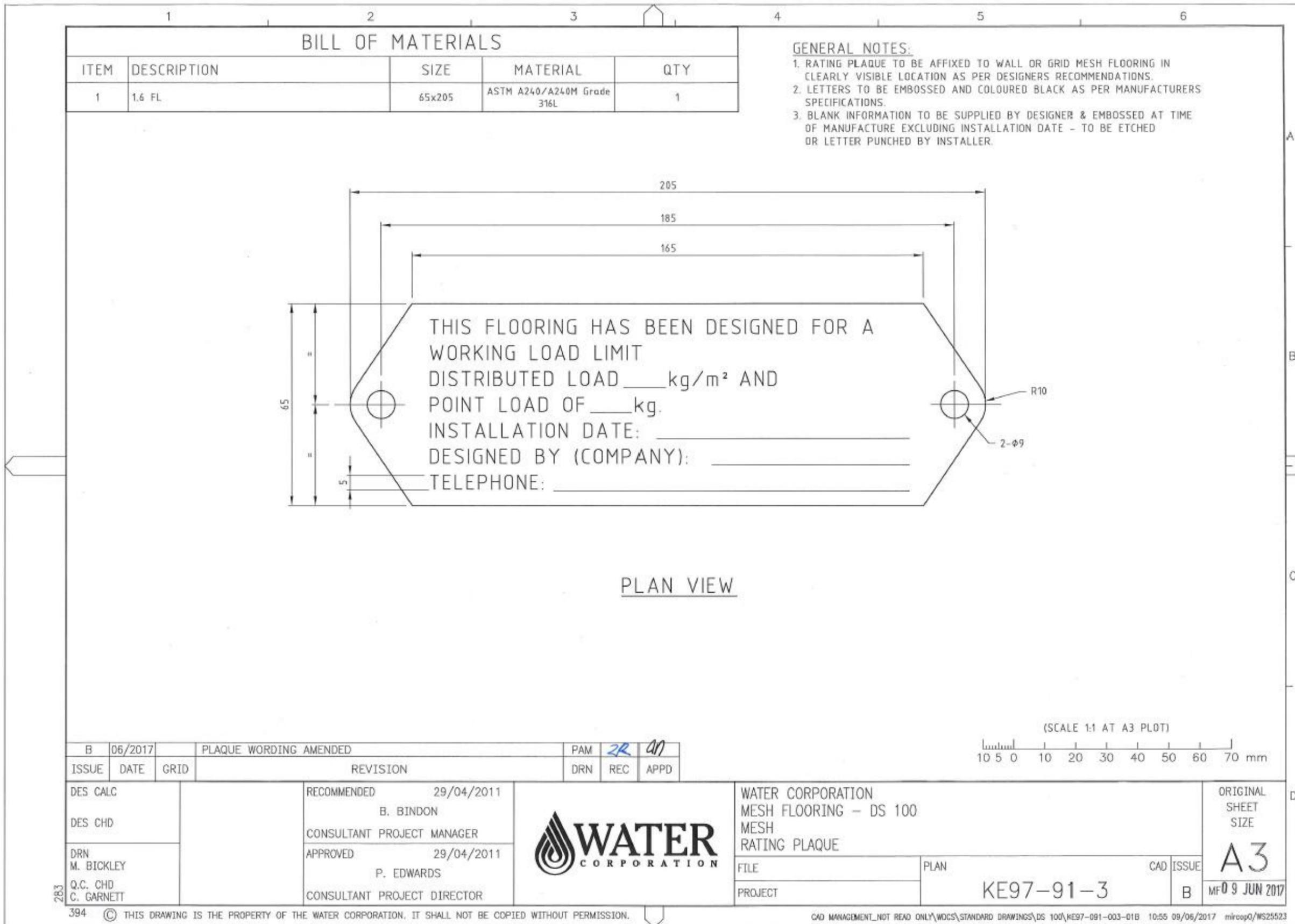
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- NOTES**
- GRID MESH TO BE WEBFORGE OR PREFERRED EQUIVALENT.
 - UNLESS NOTED OTHERWISE ALL DIMENSIONS ARE IN MILLIMETRES.
 - GRID MESH SHALL BE WEBFORGE GRIDMESH C325MPG U.O.N. AND SHALL BE TRIMMED/BANDED AT ENDS TO REQUIREMENTS OF WATER CORPORATION DESIGN STANDARD DS100.
 - ALL GRID MESH DIMENSIONS SHOWN INCLUDE TRIMMING/BANDING.
 - ALL STEELWORK SHALL COMPLY WITH AS4100 AND SHALL BE HOT-DIPPED GALVANISED AFTER FABRICATION TO AS/NZS4680 AND SPECIFICATION SECTION H1 AND H2 OF WATER CORPORATION STANDARD DS95. STEELWORK TO BE FABRICATED TO SUIT HOT-DIP GALVANISING REQUIREMENTS, INCLUDING REMOVAL OF SHARP EDGES, WELDING SLAG AND SURFACE IRREGULARITIES.
 - IF GRID MESH PANEL EXCEEDS STANDARD SIZE IN WIDTH, GRID MESH PANELS ARE TO BE JOINED BY THE NEAREST LOAD BAR ONLY IN ACCORDANCE WITH DS100.
 - ALL WELDS SHALL BE 6mm FILLET (UNO) CONTINUOUS FULL PENETRATION WELDS TO AS/NZS 1554.1:2004 STRUCTURAL STEEL WELDING - WELDING OF STEEL STRUCTURES AND WATER CORPORATION TECHNICAL SPECIFICATION WS-1.
 - GRID MESH SHALL SPAN AS INDICATED ON THE DRAWING.
 - FASTENERS SHALL BE GALVANISED TO AS 1214, WASHERS TO AS/NZS 4680.

REFERENCE DRAWINGS
KE97-91-1 MESH FLOORINGS DS100 - MESH - CLIPPING DETAILS



B 02/2013 DRAWING REVISED TO CHANGES IN DS100		DESIGN SURVEY	VERTICAL DATUM	DES CALC	NORTH POINT	RECOMMENDED	16/08/2010	WATER CORPORATION SUSPENDED FLOORINGS - DESIGN STANDARD DS 100 GENERAL ASSEMBLY AND DETAILS EXAMPLE DRAWING		ORIGINAL SHEET SIZE
		NONE	NONE	DES CHD		J. PALMER (SIGNED)				A1
		COORDINATE SYS	NONE			IDB PROJECT MANAGER				
		ASCON SURVEY	NONE	DRN	W. BICKLEY	APPROVED	16/08/2010			
		DES REF	NONE	G.C. CHD	C. GARNETT	K. WHEATCROFT (SIGNED)				
						IDB PROJECT DIRECTOR				
ISSUE	DATE	GRID	REVISION	DRN	REC	APPD		FILE	PROJECT	CAD
								KE97-91-2		B
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