



CLARE & GILBERT
VALLEYS COUNCIL

Request for Tender

**For the Construction of Bridge Replacements at
Clare Caravan Park.**

Tender Number: T11-2022

Closing Date: 2pm Wednesday 27th July 2021

Clare & Gilbert Valleys Council
4 Gleeson Street, Clare
Ph: 8842 6400
admin@cgvc.sa.gov.au

Invitation to Tender

The Clare & Gilbert Valleys Council invite tenders for the Construction of two Bridge Replacements at Clare Caravan Park

Background

The calling of a tender for the construction of Bridge Replacements at Clare Caravan Park is in response to Council's responsibility to meet its procurement requirements as part of the Clare & Gilbert Valleys Council 2022/23 capital works program.

Specifications

- 1.1 Contractors are invited to submit schedule of rates for the Construction of Bridge Replacements at Clare Caravan Park. Refer to Appendix 2 – Schedule of Rates Clare Caravan Park Bridges.
- 1.2 For detailed designs and specifications Refer to Appendix 1 - Engineering Specification Clare Caravan Park Bridges. This has been prepared for CGVC by Magryn Engineering Consultants.
- 1.3 Additional quantities required to be charged at appropriate schedule rate (e.g. \$ per m², lm).
- 1.4 Contractors need to comply with Clare & Gilbert Valleys Council preferred contractor management system.
- 1.5 The Council reserves the right to select Contractors based upon;
 - 1.5.1 Contract price;
 - 1.5.2 Contractor availability at time of work offer;
 - 1.5.3 Performance based criteria; and / or,
 - 1.5.4 Alliance with Council operations.
 - 1.5.5 The Contractor will be required go through Council's induction process for preferred contractors
 - 1.5.6 Contractor's willingness to comply with all Council policies and procedures
 - 1.5.7 Contractors will also be scored as per the attached tender evaluation matrix.

- 1.6 Contractor to provide all traffic management requirements including temporary fencing / barriers etc. and ensure traffic management plans and setup are in accordance with AS1732 WZTM regulations.
- 1.7 The contractor must liaise with adjoining property / business owners re the timing of the works to ensure minimal disruption. (Night or after hours works may be required)
- 1.8 Tenders shall be submitted electronically via SA Tenders and Contracts or admin@cgvc.sa.gov.au by 2.00pm Wednesday, 27th July 2022.
- 1.9 For further information, please contact Kym Holbrook on 8842 6400.

Selection

Contractors shall comply with Clare & Gilbert Valleys Councils Contractor Management and WHS systems.

The Council reserves the right to select Contractors based upon;

- Contract price.
- Contractor availability at time of work offer.
- Contractors proposed project management plan (PMP)
- Contractors demonstrated qualifications and experience.
- Performance based criteria; including contractors previous works for the Council.
- Contractor's willingness to comply with all terms of the Tender, Council policies and procedures.

The Contractor will be required to go through Councils induction process for preferred contractors.

A draft selection criteria matrix that will be used in the contractor selection process is attached.

Timing

The Works are required to start in early October 2022 and to be completed within 8 weeks. The Southern bridge closure for the works should be for maximum 2 weeks only.

It is a Council priority to ensure that bridge access remains closed for the minimum amount of time, contractors confirmed timing plan is a key component of the tender selection process.

If any contractor is only available to work before or after the proposed timeline, please submit your tender with proposed work schedule to be considered by the Council.

A detailed project management plan is required to be submitted with the tender and will for a key part of the selection criteria.

A site inspection with Council staff will be arranged on Wednesday 13th July at 11am. All tenderers are invited to attend and a pre-booking will be required which can be made through admin@cgvc.sa.gov.au.

Questions and requests for clarification can be submitted to admin@cgvc.sa.gov.au by Monday 18th July 2022 at 12 noon. Answers will be shared with all tenderers via email by Wednesday 20th July 2022.

Tenders shall be submitted electronically via SA Tenders or admin@cgvc.sa.gov.au by 2.00pm Wednesday 27th July 2022.

Site Review and Set out

The Contractor is deemed to have visited the site during the Tender period to ascertain local conditions and the works involved. No claims for extra payments will be considered on grounds of lack of knowledge of the actual site, the scope of the Works or of the conditions under which the Works are to be executed.

The Contractor shall familiarise itself with the availability of temporary access, temporary lighting and power, telephone services, water supply, waste disposal facilities, labour supply, weather conditions, etc. and make allowance in its quotation for provision of any services required to enable the Works to be performed.

The Contractor shall ensure that all plant, equipment, materials, temporary workshops, stores and offices are kept within the confines of the site. The cost to provide the Contractor's temporary power, water and any other services required to execute the works shall be borne by the Contractor.

The Contractor shall be responsible for:

- All matters relating to the establishment of site facilities to service the works in accordance with the WHS Act.
- Securing and maintaining site facilities in a clean and orderly condition and in a satisfactory state of repair.
- Any losses occurring from the site.
- Delivery of all materials used in the works and allocating sufficient storage space for same.

Where the Contractor has commenced any component of the Works, it shall be deemed that the Contractor has reviewed all dimensions and has accepted responsibility.

The Contractor shall reinstate any structure or road furniture which may have been disturbed or damaged by its work. In any doubt, prior to start work consult with the Principal.

Project Management

The Contractor shall prepare a Project Management Plan (PMP) for the works incorporating a detailed work method statement outlining how the Contractor proposes to carry out the works.

The PMP shall clearly address the following items:

- Work, Health and Safety
- Quality control processes
- Environmental management Plan
- Traffic Management plan
- Detailed Construction Program with daily and weekly milestones – (MS Project format preferred).
- Communication plan

A detailed draft PMP shall be included in the Tender response and will be a key component of the tender evaluation.

The Contractor shall submit to the Superintendent a copy of the Final PMP within ten working days of contract award and prior to taking possession of the site.

Traffic Management

The Contractor shall provide for the continuous operation of normal traffic and pedestrian movements along detour roads, and pedestrian and vehicular access to properties included in or affected by the Contract. The Contractor shall, where necessary, provide and maintain side-tracks to the satisfaction of the Superintendent. The work site shall be fully barricaded from pedestrian or vehicular access at all times with appropriate signage.

The Contractor shall prepare and submit to the Superintendent as part of its PMP, detailed Traffic Management Plans to cover all works in accordance with all relevant legislation, regulations, guidelines, codes of practice and Australian Standards.

The Contractor shall be responsible for the safety of all pedestrians and vehicular traffic at or adjacent to the site of the Works, or in any way affected by the execution of the Works.

Notwithstanding any action that the Superintendent may take in this regard, the Contractor shall be liable for damages arising out of any accident in connection with the carrying out of the Works.

General Construction

The Contractor shall act in compliance with all legislation, regulations, codes and industry guidelines applicable to all works and provide all required notices and pay all required fees, evidence of which shall be submitted to the Superintendent.

All works shall be carried out in accordance with the Specification and Drawings, the applicable Australian Standards and Codes. In the absence of any details provided in the aforementioned documents the Contractor shall provide details of alternative recognised standards including but not limited to Department of

Planning, Transport and Infrastructure (DPTI) Institute of Public Works Engineering Australia (IPWEA), Engineers Australia (EA) and/or manufacturer's recommendations.

The Contractor is fully responsible for choosing the appropriate plant, equipment and work methods for the purpose and environment for which they are to be used.

The Contractor shall be fully responsible for the construction of the works and ensure that acceptable work practices are used.

Contractors are required to update the Principal on the work progress and progress photos as when required as per their schedule of works.

Completion

On completion of the works, the Contractor shall remove all rubbish, debris, surplus materials from the site of the works. The site shall be left in a neat and tidy condition to the satisfaction of the Superintendent. The Superintendent will inspect the site at

At the conclusion of the contract. Any outstanding clean up works required to leave the site in a satisfactory condition that is not carried out by the Contractor will be completed by others and the cost of that work will be a charge levied against the Contractor.

Pricing Schedule

Price payable by the Council for the Goods as quoted in the pricing schedule and as agreed between the Council and the Contractor and in keeping with Payment Terms Negotiated with the Council.

This Contract is a Lump Sum Contract for the whole of the Works and not subject to rise and fall. All fees and charges necessary for the successful completion of the Works shall be deemed to be included in the Lump Sum

The Contractor shall pay the Construction Industry Training Board (CITB) Levy pertaining to the Works under this Contract in accordance with the Construction Industry Training Fund Act 1993.

This purchase price will be authorised once the invoice for work has been authorised by the Works Project Manager.

Prices must be listed exclusive of GST unless shown otherwise

Contractor shall in their response provide a detailed schedule of rates with a breakdown of the costs for all fixed and variable costs (if applicable).

Work, Health and Safety Requirements

Formal Work Health & Safety Requirements

Under the Work Health & Safety Act 2012 (SA), the Councils have a duty as a "person conducting a business or undertaking" (PCBU) to provide and maintain, so far as is reasonably practicable, a safe working environment for its employees, tenderers, contractors, sub-contractors, consultants, visitors and members of the

public. To align with The Councils' WHS duties, the successful Tenderer must comply and ensure that others comply with the following:

1. The Tenderer engaged in providing the Services must identify and discharge their own duties as a PCBU;
2. The Tenderer must ensure through a documented and systematic approach, that it complies with any Acts, regulations, local laws and by-laws or Guidelines applicable to the performance of the Services; and
3. The Tenderer must comply with any reasonable directions of The Council's Contract Representative relating to safety and environmental matters if they arise.

General Advice

It is the responsibility of the contractor to comply with relevant state WHS legislation, relevant codes of practice, Australian standards and for reporting unsafe or unsatisfactory working conditions, hazards and incidents.

The Contractor is to complete and provide all relevant Safe Work Method Statement (SWMS), Job Safety Analysis (JSA), Risk Assessment (RA) or Safe Work Instruction (SWI) paperwork to the Council.

Safe Work Method Statement (SWMS) is a document which records the significant (prescribed) information relating to WHS for a construction project.

Job Safety Analysis (JSA) simply means looking at the work task and considering what is the safest way to complete it. It is a way of becoming aware of the hazards involved in doing the job and taking action to prevent an injury. The JSA form will allow you to record that the safety assessment has been carried out.

A Risk Assessment (RA) identifies the hazards and evaluates likelihood and consequences of a potential incident.

A Safe Work Instruction (SWI) lists the possible issues for a known work situation or environment and allows you to check that there are no changes that may create new hazards or issues that compromise safety.

The above documents will assist in deciding the following:-

Eliminate the risk

The most effective control measure involves eliminating the hazardous manual task and its associated risk.

Minimise the risk

If it is not reasonably practicable to eliminate the risk, then you must minimise the risk so far as is reasonably practicable.

More Information on WHS is available at www.safework.sa.gov.au

The Tenderer shall provide copies of safe work procedures and practices relating to the Works to be undertaken as part of the Tender.

Reporting Hazards / Issues / Near Misses

In the instance of any incident, assessed hazard or near-miss the Councils Superintendent should be contacted as soon as safely practicable and informed of

the situation so that the Council can ensure the appropriate steps have been taken and the incident recorded and reported.

Conflict of Interest

Contractors must inform Council of any circumstances or relationships which will constitute a conflict or potential conflict of interest if the Contractor is successful. If any conflict or potential conflict exists, the Contractor must advise how it proposes to address this.

If any conflict or potential conflict of interest is omitted, Council may suspend the whole or any part of the Works if considered necessary.

Format of Tender Response

Tender responses will be assessed and rated using Councils Tender Evaluation Matrix.

It is strongly encouraged for Contractors to address each of the topics listed below in their tender response so that the tender can be assessed thoroughly and fairly

- 1: Schedule of Rates
- 2: Breakdown of Schedule of Rates for all elements of construction – Appendix 2
- 3: Detailed draft PMP including Construction Schedule and milestones
- 4: Confirmation of Site inspection
- 5: Confirmation of Compliance with WHS requirements
- 6: Examples of Contractors site Safety management systems
- 7: Details of previously completed similar projects
- 8: Contact details for References for previous similar works completed

Schedule of Rates – (complete and return)

Construction of Clare Caravan Park Bridges

Tender Number: T11-2022

Before completing this Pricing Schedule, Respondents should ensure that they have read and understood the entire Tender.

The rates must remain constant for the Term of the proposed Contract for Works.

Clare and Gilbert Valleys Council cannot and will not guarantee the completeness or accuracy of the Schedule and therefore it can only be used as a guide. It is therefore the Contractor's responsibility to add items as appropriate to ensure that all items necessary to complete the Works, as provided within the requirements of the Tender documents.

Contract payments will be made based on the rates provided in this Priced Schedule. The total provided will be used as the base price for assessing Quotes and awarding the Contract. The rates provided may also be used for the purpose of calculating variations to the Contract.

If any item contained in this Schedule is not priced it shall be deemed either (a) the cost has been included elsewhere, or (b) no payment is required in respect to that item.

I/We the undersigned, do hereby tender to perform the abovementioned work in accordance with the Tender Documents.

TOTAL OF SCHEDULE OF RATES –Northern Bridge	\$
TOTAL OF SCHEDULE OF RATES –Southern Bridge	\$
GOODS & SERVICES TAX (GST)	\$
TOTAL CONTRACT SUM	\$

Tenderer's Trading Name:

ABN:

Contact Person:

Address:

Telephone No: Email.....

Signature: Witness:

Dated theday of 2022

Appendix 1

Engineering Specification Clare Caravan Park Bridges prepared for CGVC by Magryn Engineering Consultants.

TECHNICAL SPECIFICATION

FOR

BRIDGE REPLACEMENT – NORTH & SOUTH BRIDGES

DISCOVERY PARK, CLARE

8511 HORROCKS HIGHWAY, CLARE

JULY 2022

Clare and Gilbert Valleys Council

ENGINEERING DOCUMENTATION

FOR

Clare Valley Discovery Park Bridges

AT

Clare

Project No.: 21414

Contents:

Drawings 21414-1-8 REV E
Technical specification
Calculations

Date:

2/05/2022
2/05/2022
2/05/2022

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GENERAL NOTES

- G1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS. ALL DISCREPANCIES SHALL BE REFERRED TO THE ENGINEER FOR DECISION BEFORE PROCEEDING WITH THE WORK.
- G2. ALL DIMENSIONS RELATIVE TO SETTING OUT AND OFF SITE WORK SHALL BE VERIFIED BY THE CONTRACTOR BEFORE CONSTRUCTION AND FABRICATION IS COMMENCED. THESE DRAWINGS SHALL NOT BE SCALED.
- G3. DURING CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE SURFACE IN A SAFE AND STABLE CONDITION AND SHALL ENSURE THAT NO PART IS OVERSTRESSING.
- G4. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE RELEVANT SA CODES AND LOCAL STATUTORY AUTHORITIES.
- G5. ANY SUBSTITUTIONS SHALL BE MADE OR SIZES OF STRUCTURAL MEMBERS VARIED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER. THE APPROVAL OF A SUBSTITUTION FROM THE ENGINEER SHALL NOT BE AUTHORITY FOR ANY EXTRA WORK COMMENCED.
- G6. ALL DIMENSIONS SHALL BE APPROVED BY THE ENGINEER BEFORE WORK COMMENCES. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE. ALL LEVELS ARE EXPRESSED IN METRES, AND ARE TO THE STRUCTURAL SURFACE UNLESS NOTED OTHERWISE.

CONCRETE

- C1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600. ALL CONCRETE SHALL BE TESTED BY AN APPROVED NATA INDEPENDENT TESTING LABORATORY.
- C2. COVER TO STEEL REINFORCEMENT SHALL BE 40mm UNLESS SHOWN OTHERWISE ON THE DRAWINGS. EXPOSURE CLASSIFICATION TO AS3600-2009 IS B1.
- C3. CONCRETE ADDITIVES SHALL NOT BE USED WITHOUT THE APPROVAL OF THE ENGINEER.
- C4. FINISHES TO ALL CONCRETE SURFACES SHALL BE BROOM FINISH.
- C5. CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND USED ONLY WHERE SHOWN OR SPECIFICALLY APPROVED BY THE ENGINEER. THEY SHALL BE VERTICAL IN SLABS AND BE SCABBLED AND CLEANED, AND SHALL HAVE A NEAT CEMENT-WATER SLURRY BRUSHED ON BEFORE POUR CONTINUES.
- C6. FREE DROPPING OF CONCRETE FROM A HEIGHT GREATER THAN 1200mm SHALL NOT BE PERMITTED.
- C7. CONCRETE SHALL BE COMPACTED WITH SUITABLE MECHANICAL VIBRATORS TO AS3600.
- C8. CONCRETE SHALL BE PLACED IN ONE CONTINUOUS POURING OPERATION BETWEEN SPECIFIED CONSTRUCTION JOINTS.
- C9. REINFORCEMENT SHALL BE SUPPORTED ON APPROVED PLASTIC STOOLS OR MORTAR BLOCKS OF EQUAL STRENGTH AND DURABILITY TO THE CONCRETE MIX, AT NOT MORE THAN 800mm CENTRES.
- C10. CURE CONCRETE (WATER TO BE POTABLE) FOR 7 DAYS AFTER FINAL POUR.
- C11. CONCRETE SHALL NOT BE PLACED IN THE WORKS IF THE TEMPERATURE OF THE SURROUNDING AIR FALLS BELOW 5 DEGREES(C) CELSIUS(C), OR IS HIGHER THAN 32°C OR WIND SPEEDS EXCEED 23km/h.
- C12. REINFORCING SYMBOLS:
N – GRADE 500, HOT ROLLED DEFORMED BAR, COMPLYING WITH AS4671.
- C13. THE CONTRACTOR SHALL ARRANGE FOR THE ENGINEER TO INSPECT THE REINFORCEMENT AND OBTAIN HIS APPROVAL PRIOR TO POURING CONCRETE.
- C14. USE N32 GRADE CONCRETE UNLESS NOTED OTHERWISE.

PRECAST CONCRETE

- PC1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600. ALL CONCRETE SHALL BE TESTED BY AN APPROVED NATA INDEPENDENT TESTING LABORATORY. AS3850, NATIONAL PRECAST-PCRECAST CONCRETE HANDBOOK AND ALL OTHER RELEVANT STANDARDS AND CODES TO BE ADHERED TO.
- PC2. CONCRETE SHALL BE N32 GRADE.
- PC3. COVER TO STEEL REINFORCEMENT SHALL BE 40mm ON THE EXPOSED FACE UNLESS SHOWN OTHERWISE ON THE DRAWINGS. EXPOSURE CLASSIFICATION TO AS3600-2009 IS A2.
- PC5. NO CHANGES OR SUBSTITUTIONS MAY BE MADE TO ANY ELEMENT DOCUMENTED IN THESE PRECAST CONCRETE DRAWINGS WITHOUT REFERENCE TO AND APPROVAL BY THE STRUCTURAL ENGINEER.
- PC6. AN EXPERIENCED SHOP DETAILER SHALL PREPARE SEPARATE SHOP DETAIL DRAWINGS FROM THE STRUCTURAL DRAWINGS. FABRICATION SHALL NOT COMMENCE UNTIL THE STRUCTURAL ENGINEER AND ARCHITECT SO ADVISE. SHOP DRAWINGS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER AND ALLOW AT LEAST 14 WORKING DAYS FOR APPROVAL. SIZES OF CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES AND SHALL NOT BE ALTERED WITHOUT THE APPROVAL OF THE ENGINEER.
- PC8. THE PANELS HAVE BEEN DESIGNED FOR THE IN PLACE CONDITION. THE CONTRACTOR TO MAKE ASSESSMENT FOR ANY EXTRA REINFORCEMENT THAT MAY BE REQUIRED FOR TRANSPORT, HANDLING OR ERECTION.
- PC9. THE PANELS MUST BE STACKED IN A WAY WHICH ENSURES THAT CRACKING AND WARPING DOES NOT OCCUR IN EXCESS OF THAT GIVEN IN RELEVANT CODES.
- PC10. THE CONTRACTOR SHALL SUPPLY AND INSTALL LIFTING FIXTURES AS REQUIRED. THEY ARE TO BE INSTALLED IN THE FACE NOT EXPOSED TO VIEW IN THE FINAL POSITION.
- PC11. AFTER USE ALL LIFTING FIXTURES SHALL BE PROTECTED WITH TO AVOID CORROSION AND STAINING.
- PC12. GROUT SHALL BE AN APPROVED NON SHRINK CEMENTITIOUS GROUT WITH A 28 DAY STRENGTH OF AT LEAST 32MPa AND SHALL BE OF A CONSISTENCY SUCH THAT IT CAN PROVIDE UNIFORM BEARING UNDER THE ENTIRE SURFACE.
- PC13. REINFORCING SYMBOLS:
N – GRADE 500, HOT ROLLED DEFORMED BAR, COMPLYING WITH AS4671.

SITWORKS

- SW1. ALL SHRUBS, VEGETATION AND OTHER DELETERIOUS MATERIAL SHALL BE REMOVED PRIOR TO FILLING AND REGRADING OF SITE.
- SW2. FILL MATERIAL SHALL BE FREE OF ORGANIC MATTER, TREE STUMPS, ROOTS, RUBBISH, LARGE STONES, BUILDING MATERIAL AND EXCESSIVE CLAY OR SILT.
- SW3. QUARRY RUBBLE SHALL BE 20mm RUBBLE WHICH SHALL COMPLY IN ALL RESPECTS WITH THE DIT SPECIFICATION NUMBER PM2/2006. FINE CRUSHED ROCK SHALL COMPLY IN ALL RESPECTS WITH THE DIT SPECIFICATION NUMBER PM1/2006.
- SW4. COMPACTIONS NOTED ARE % MDD (MODIFIED MAXIMUM DRY DENSITY) IN ACCORDANCE WITH AS 1289.
- SW5. FILLING SHALL BE UNDERTAKEN IN LAYERS NOT EXCEEDING 150mm THICKNESS (COMPACTED DEPTH). UNLESS NOTED OTHERWISE ON THE STRUCTURAL DRAWING, QUARRY RUBBLE SHALL BE COMPACTED TO 95% MAXIMUM DRY DENSITY (MODIFIED). CRUSHED ROCK SHALL BE COMPACTED TO 98% MAXIMUM DRY DENSITY (MODIFIED). EACH LAYER SHALL BE COMPACTED AND APPROVED PRIOR TO THE NEXT LAYER BEING LAID OVER. ALL COMPACTON TESTS TO AS1289.
- SW6. TO ACHIEVE THE ABOVE COMPACTON, VIBRATING SMOOTH DRUM ROLLERS (FOR GRANULAR MATERIAL) OF VIBRATING SHEEPS FOOT ROLLERS (FOR CLAYS) ARE REQUIRED. CONTRACTOR TO TAKE CARE WITH VIBRATING ROLLERS AROUND EXISTING STRUCTURES. FILL COMPACTON SHALL BE TESTED AT THE RATE OF ONE TEST PER 50 CUBIC METRES OF FILL, OR ONE TEST PER TWO LAYERS FOR AREAS UP TO 100 SQUARE METRES, WHICH EVER REQUIRES THE GREATER NUMBER OF TESTS.
- SW8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR QUALITY CONTROL TO ENSURE THAT ALL WORKS COMPLY WITH THE DRAWINGS AND SPECIFICATION. WHEN, IN THE OPINION OF THE CONTRACTOR, THE SPECIFIED COMPACTON HAS BEEN ACHIEVED HE SHALL ARRANGE FOR COMPACTON TESTING TO BE UNDERTAKEN. THE SUPERINTENDENT SHALL HAVE THE RIGHT TO NOMINATE THE EXACT LOCATION AT WHICH SAMPLES SHALL BE TAKEN. THE COST OF ALL TESTING SHALL BE AT THE CONTRACTORS EXPENSE. THE TESTING SHALL BE UNDERTAKEN BY A NATA REGISTERED LABORATORY.

ASPHALT PAVEMENT

- AP1. WHERE BITUMEN IS INDICATED ON DRAWINGS, SEAL THE AREAS OF THE SITE WITH A PRIME AND ASPHALT CONCRETE SEAL.
- AP2. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PREVENT BITUMEN OR OTHER MATERIALS USED IN THE SEALING WORK, FROM ENTERING OR ADHERING TO OTHER WORKS.
- AP3. PRIME IS TO COMPRISE OF A HOT CUT BITUMEN (60% RESIDUAL BITUMEN) APPLIED AT A RATE OF APPROXIMATELY 1.1 LITRES PER SQUARE METRE (75-100°C) AND COVERED WITH CLEAN SAND SUFFICIENT TO PREVENT ADHESION TO SUBSEQUENT TRAFFIC AND TO COVER ANY AREA OF PUDDLED BITUMEN. NO BITUMEN SPRAYING SHALL BE CARRIED OUT ON A WET OR DUSTY PAVEMENT, WHILE RAIN APPEARS IMMINENT, DURING DUST STORMS OR WHILST EITHER THE SHADE AIR TEMPERATURE OR PAVEMENT TEMPERATURE IS BELOW 20°C.
- AP4. ASPHALT SEAL IS TO BE MIX DESIGNED, SUPPLIED AND LAID IN ACCORDANCE WITH AS2743 "ASPHALT (HOTMIX) PAVING – GUIDE TO GOOD PRACTICE" TO THE THICKNESS AS NOTED.

SAFETY-IN-DESIGN REVIEW

MAGRYN & ASSOCIATES (MAGRYN) HAVE CONDUCTED A PRELIMINARY SAFETY-IN-DESIGN REVIEW OF THE DESIGN SHOWN ON THESE DRAWINGS. THE REVIEW IS BASED GENERALLY ON THE PROCEDURE OUTLINED IN THE SAFE WORK AUSTRALIA PUBLICATION "SAFE DESIGN OF STRUCTURES CODE OF PRACTICE (JULY 2012).

THE DESIGN HAS NOT BEEN REVIEWED WITH A CONTRACTOR/BUILDER AT THE TIME OF ISSUE FOR TENDER OR CONSTRUCTION. CONSTRUCTION METHODS VARY BETWEEN CONTRACTORS SO IT IS POSSIBLE FOR MAGRYN TO PERFORM EXHAUSTIVE SAFETY DESIGN OR FOR THE CONTRACTOR TO PERFORM A REVIEW OF THE DESIGN WITH THEIR SUB-CONTRACTORS TO IDENTIFY SAFETY RISKS DURING CONSTRUCTION AND DURING THE LIFE OF THE BUILDING.

CONTRACTORS ARE RESPONSIBLE TO REVIEW THEIR PROPOSED ERECTION PROGRAMS/SEQUENCE AND FOR THE TEMPORARY FRAMING TO SUPPORT STRUCTURAL ELEMENTS.

CONTRACTORS SHALL PROVIDE DOCUMENTATION THAT OUTLINE HOW THE PROJECT WAS BUILT SO THAT THE DEMOLITION CONTRACTOR CAN ADEQUATELY EVALUATE RISKS DURING DEMOLITION PLANNING AT THE END OF THE LIFE OF THE BUILDING.

CONSTRUCTION OR IN-SERVICE LOADS DESIGNED FOR

1. THE FOOTINGS FOR THIS STRUCTURE HAVE NOT BEEN DESIGNED TO SUPPORT CRANE LOADING. IF REQUIRED THE CONTRACTOR SHOULD CONTACT MAGRYN TO DESIGN THE STRUCTURE TO SUPPORT SUCH LOADS OR ENGAGE AN INDEPENDENT ENGINEER.



LOCATION OF UNDERGROUND AND ABOVE GROUND SERVICES

1. MAGRYN HAS NOT CARRIED OUT A DIAL-BEFORE-YOU-DIG REVIEW DURING THE DESIGN PHASE. THE CONTRACTOR SHALL UNDERTAKE A REVIEW OF THEIR OWN TO VERIFY EXISTING SERVICES AROUND THE STRUCTURE THAT MAY BE AFFECTED.
2. DIAL-BEFORE-YOU-DIG DOES NOT CONFIRM THE LAYOUT OF SERVICES WITHIN THE SITE. THE CONTRACTOR SHALL ALLOW TO ENGAGE A SERVICES LOCATION CONTRACTOR TO CONDUCT A SURVEY OF ALL SERVICES ON THE SITE.

EXCAVATIONS

1. BATTER SLOPES SHALL BE IN ACCORDANCE WITH GEOTECHNICAL RECOMMENDATIONS AND SHALL BE INSPECTED BY THE GEOTECHNICAL ENGINEER TO CONFIRM ADEQUACY (INCLUDING REVIEW OF PROPOSED DURATION OF BATTER).
2. EXCAVATIONS GREATER THAN 1.0m DEEP REQUIRE SHORING AND SHALL NOT BE ACCESSED BY PERSONNEL WITHOUT APPROPRIATE CONFINED SPACE TRAINING.
3. PROVIDE BARRIERS TO ALL EXCAVATIONS, TO PREVENT FALLS.
4. ENSURE MEASURES TO PROTECT ADJACENT STRUCTURES ARE FOLLOWED STRICTLY IN ACCORDANCE WITH THESE DRAWINGS. IF IN DOUBT CONTACT MAGRYN.
5. CONTACT MAGRYN IF GROUND WATER IS ENCOUNTERED DURING EXCAVATION.

VERIFICATION OF SOIL CONDITIONS

1. THE CONTRACTOR SHALL HAVE THE SOIL DESIGN PARAMETERS VERIFIED DURING EXCAVATION. ALLOW TO ENGAGE THE GEOTECHNICAL ENGINEER TO CONDUCT A REVIEW OF THE SOIL DURING CLEARING / EXCAVATION OF THE SITE.

PRECAST CONCRETE FORMWORK AND ERECTION

1. THE CONTRACTOR SHALL ENGAGE A NPER REGISTERED ENGINEER WITH KNOWLEDGE AND EXPERIENCE IN THE ERECTION OF STRUCTURES TO ACT AS THE ERECTION ENGINEER. THE ERECTION ENGINEER SHALL DEVELOP THE ERECTION PROCEDURE, CERTIFY THE ERECTION DESIGN AND INSPECT AND VERIFY THE INSTALLATION ON SITE.
2. DO NOT REMOVE TEMPORARY SUPPORT WITHOUT SIGN OFF FROM THE ERECTION ENGINEER.
3. THE CONTRACTOR SHALL REVIEW HAZARDS SUCH AS OVERHEAD POWER AND CRANING LOGISTICS RELATED TO THE INSTALLATION OF THESE ITEMS.
4. WE HAVE TRIED TO MINIMIZE THE TIME SPENT WORKING FROM HEIGHTS BY DESIGNING WITH FURTHER CONSIDERATION FOR PANEL CONNECTIONS. IF THE CONTRACTOR WANTS TO CONSIDER FURTHER OPTIONS FOR PANEL CONNECTION THEY SHOULD CONTACT MAGRYN TO DISCUSS AMENDING THE DESIGN DOCUMENTATION.

PRECAST CONCRETE DESIGN

1. WE HAVE DESIGNED THE PRECAST CONCRETE PANELS FOR IN-SERVICE LOADS THAT THE STRUCTURE WILL EXPERIENCE IN THE PERMANENT CONDITION AND DURING THE SERVICE LIFE OF THE STRUCTURE.
2. WE HAVE NOT DESIGNED THE PANELS FOR TEMPORARY LOADS EXPERIENCED DURING CASTING, TRANSPORT, LIFTING OR PROPPING NOR HAVE WE DESIGNED THE PROPS OR ANCHORS SUPPORTING THE PROPS.
3. THE PRECASTER AND ERECTION ENGINEER ARE RESPONSIBLE FOR PROVIDING ADEQUATE CAPACITY TO SUPPORT THE TEMPORARY LOADS AND TO VERIFY THE SAFETY OF THE ERECTION PROCEDURE.
4. PRECAST PANEL CONNECTIONS ARE TO BE FIRE RATED.

E	NO CHANGES	TH	29.04.22
D	AMENDMENTS	TH	20.04.22
C	FOR CONSTRUCTION DRAWING	CT	18.02.22
A	SITWORKS NOTE	TH	15.02.22
B	PRELIMINARY ISSUE	TH	02.02.22
ISSUE	AMENDMENTS	INT./DATE	



ENGINEERING CONSULTANTS

267 BRIGHTON ROAD
SOMERTON PARK, SA 5044
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COUNCIL

PROJECT:

INFRASTRUCTURE PROJECTS

PROJECT ADDRESS:

CLARE VALLEY
DISCOVERY PARK

TITLE:

NOTES

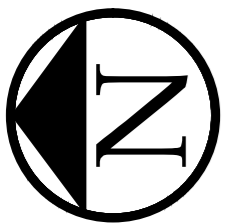
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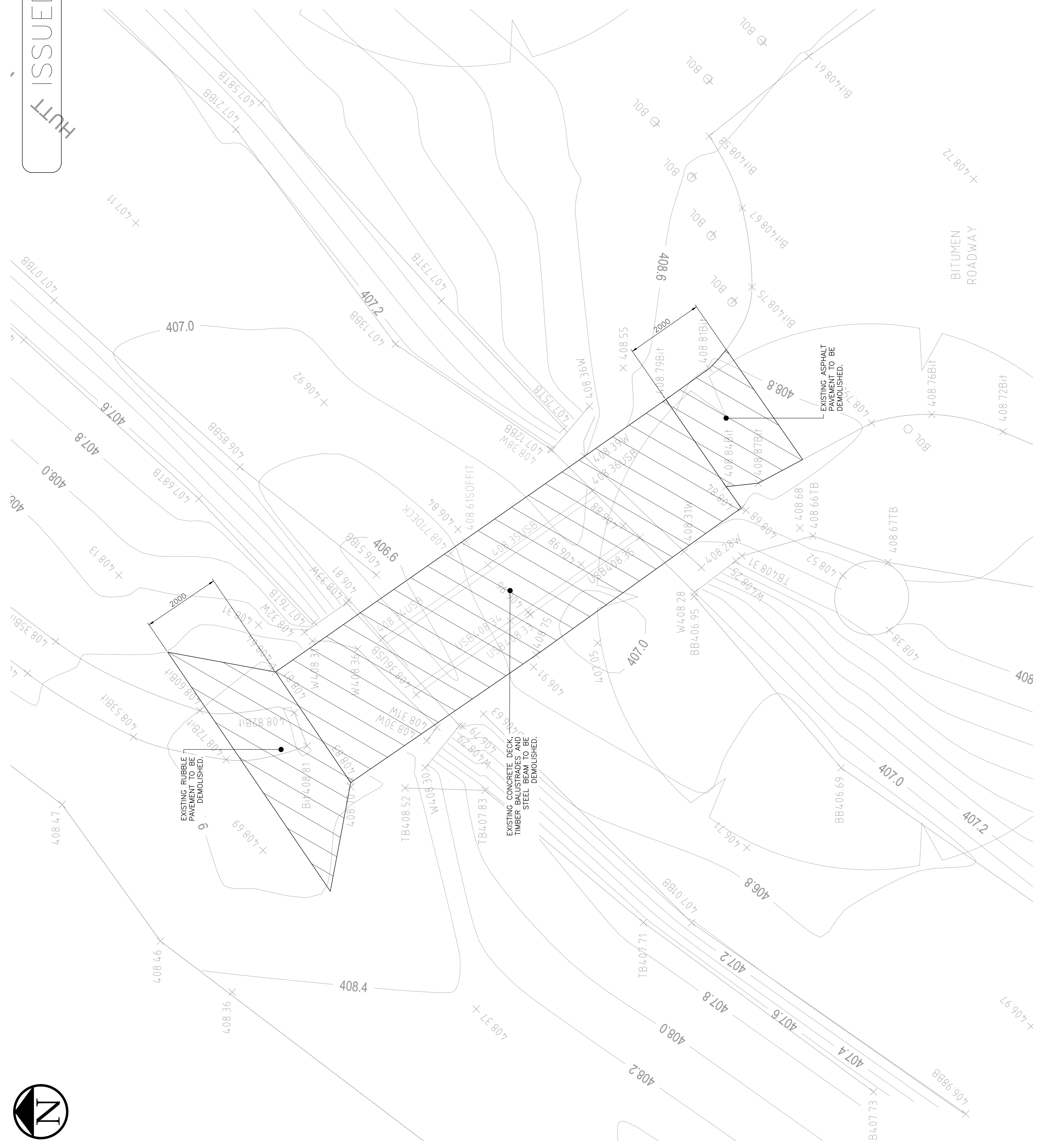
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REVISION: E

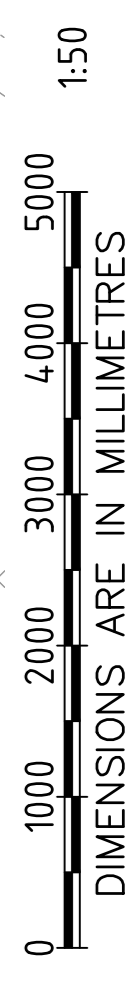
ISSUED FOR CONSTRUCTION



HUTT ISSUED FOR CONSTRUCTION



EXISTING SITE/DEMOLITION PLAN — NORTH
SCALE 1:50



E	NO CHANGES	TH 29.04.22
D	AMENDMENTS	TH 20.04.22
C	FOR CONSTRUCTION DRAWING	CT 18.02.22
B	AMENDMENTS	TH 15.02.22
A	PRELIMINARY ISSUE	TH 02.02.22
	ISSUE AMENDMENTS	INT./DATE



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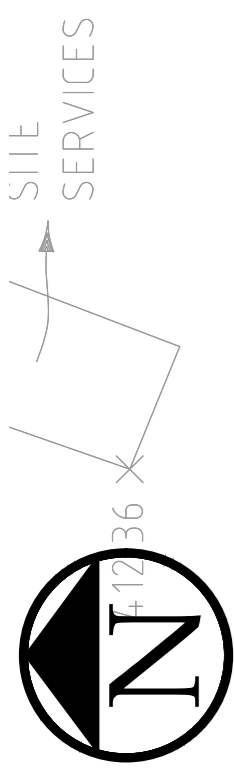
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PROJECT ADDRESS:
CLARE VALLEY DISCOVERY PARK

TITLE:
EXISTING SITE/DEMOLITION PLAN NORTH

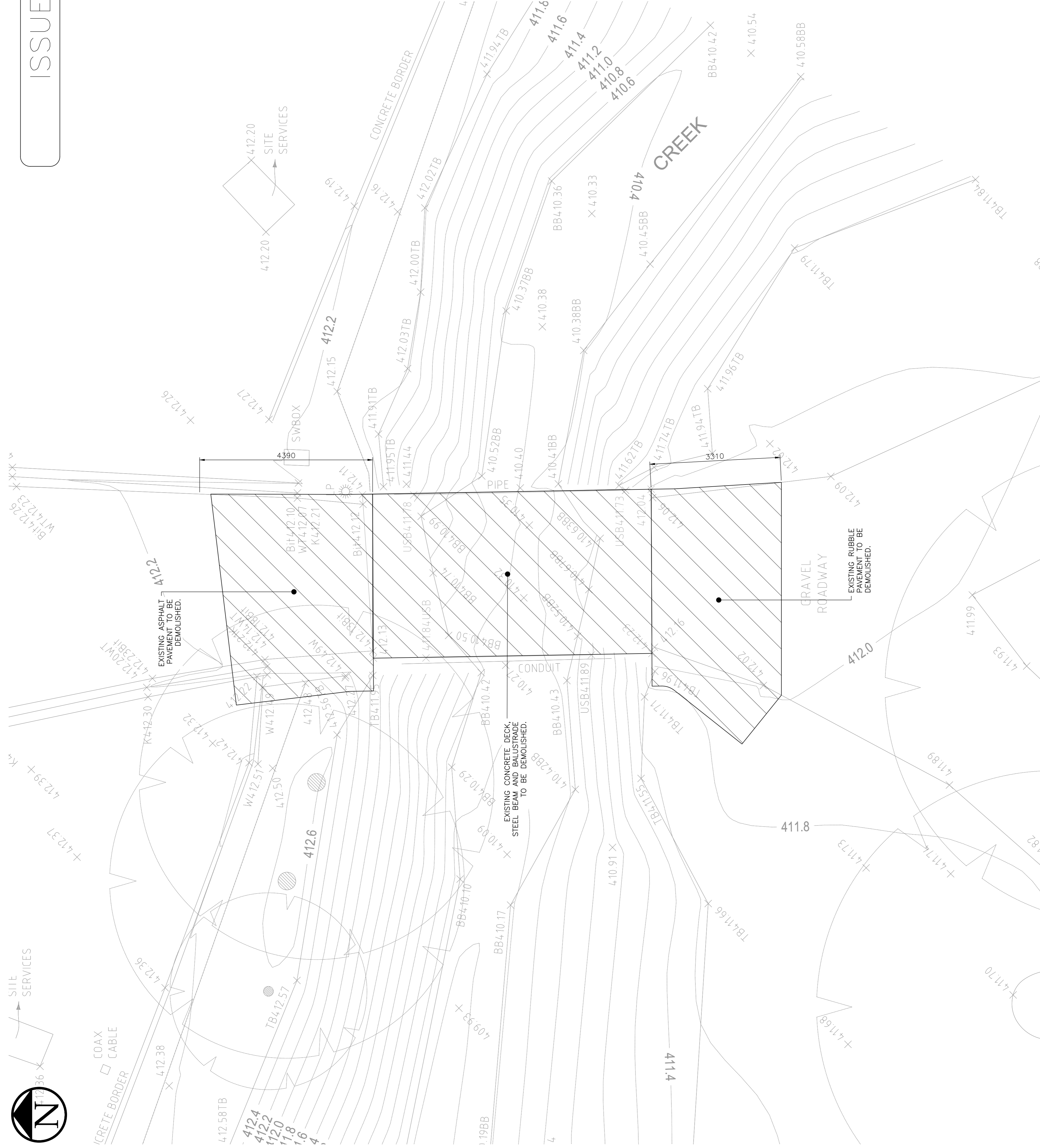
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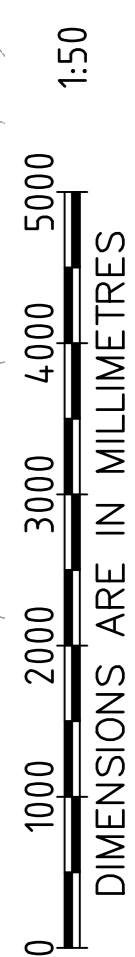
SITE SERVICES

CONCRETE BORDER
COAX CABLE

ISSUED FOR CONSTRUCTION



EXISTING SITE/DEMOLITION PLAN — SOUTH
SCALE 1:50



DIMENSIONS ARE IN MILLIMETRES

E	NO CHANGES	TH 28.04.22
D	AMENDMENTS	TH 20.04.22
C	FOR CONSTRUCTION DRAWING	CT 18.02.22
B	AMENDMENTS	TH 15.02.22
A	PRELIMINARY ISSUE	TH 02.02.22
ISSUE	AMENDMENTS	INT./DATE



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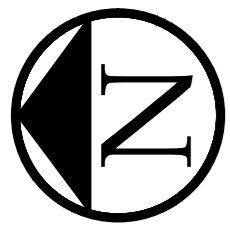
PROJECT:
INFRASTRUCTURE PROJECTS

PROJECT ADDRESS:
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TITLE:
EXISTING SITE/DEMOLITION
PLAN SOUTH

DESIGN: LW	SCALE: AS SHOWN	DATE: JAN. 2021
SHEET SIZE: A1	DRAWING NUMBER: 21414-3	REVISION: E

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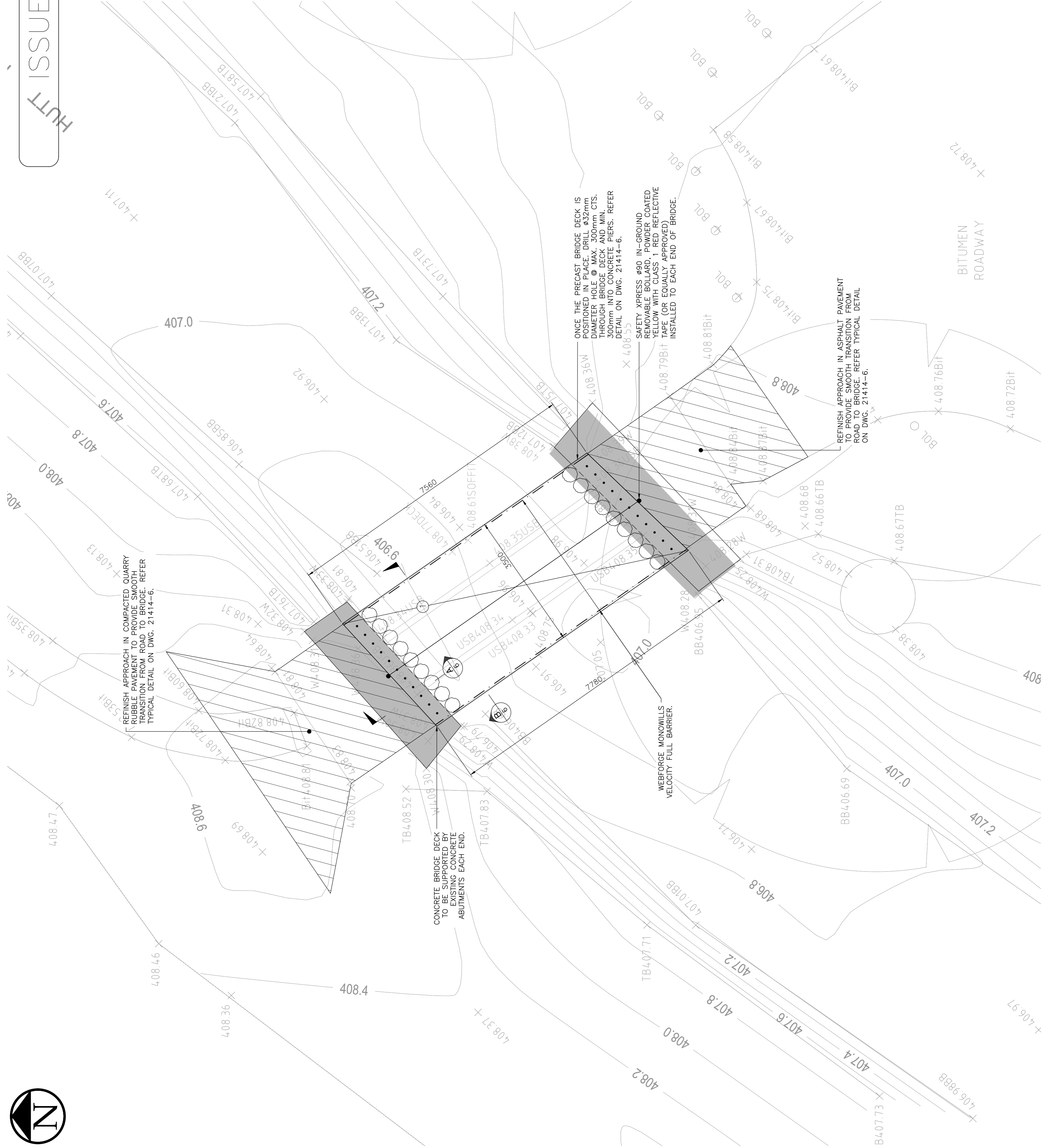
HUTT ISSUED FOR CONSTRUCTION

LEGEND

- - - - - WEBFORGE MONOWILLS VELOCITY FULL BARRIER. REFER DETAILS ON DWG. 21414-8.
- ① - 250 THICK PRECAST CONCRETE BRIDGE DECK, N32 GRADE, N20 @ 300 CTS, 40mm COVER TOP, N20 @ 125 CTS, 40mm COVER BOTTOM, N20 TRANSVERSE BARS @ 500 CTS, TOP & BOTTOM. PROVIDE WFO LIGATURES 500mm WIDE, ALONG LINE OF BARRIER @ 100 CTS.
- - - - - EXISTING CONCRETE ABUTMENT.
- - Ø350-500mm ROCK ALONG THE BASE OF CONCRETE ABUTMENT.

NOTE:
 ALL PROPRIETARY BARRIERS AND BOLLARDS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

NOTE:
 THE NORTHERN BRIDGE WAS DESIGNED FOR THE FOLLOWING LOADS:
 DEAD LOAD: SELF WEIGHT OF THE STRUCTURE
 LIVE LOADS: 5KPG OR 2.2KN/m
 ADDITIONAL POINT LOAD FROM SMALL GARDENER'S VEHICLE: 15KN
 BARRIER LOAD: 30KN CRUSHING LOAD



E	AMENDMENTS	TH	29.04.22
D	AMENDMENTS	TH	20.04.22
C	FOR CONSTRUCTION DRAWING	CT	18.02.22
B	AMENDMENTS	TH	15.02.22
A	PRELIMINARY ISSUE	TH	02.02.22
	ISSUE	AMENDMENTS	INT./DATE



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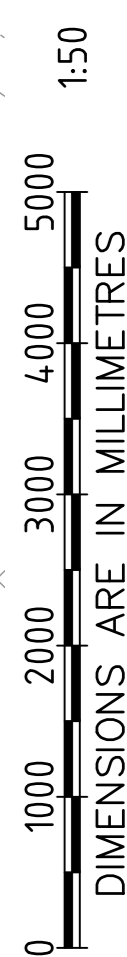
PROJECT:
 INFRASTRUCTURE PROJECTS

PROJECT ADDRESS:
 CLARE VALLEY DISCOVERY PARK

TITLE:
 SITE PLAN NORTH

CONTRACTORS MUST VERIFY ALL DIMENSIONS PRIOR TO ANY OFF SITE FABRICATION.	
DESIGN: LW	SCALE: AS SHOWN
SHEET SIZE: A1	DRAWING NUMBER: 21414-4
	REVISION: E
	DATE: JAN. 2021

SITE PLAN - NORTH
 SCALE: 1:50



1:50

ISSUED FOR CONSTRUCTION

LEGEND

- IN-GAL CIVIL PRODUCTS ZEE PARK GUARD POST AND RAIL. REFER DETAILS ON DWG. 21414-7.
- IN-GAL CIVIL PRODUCTS ZEE PARK POST WITH HANDRAIL AND ANTI-CLIMB MESH 1300H. REFER DETAILS ON DWG. 21414-7.
- WEBFORGE MONOWILLS VELOCITY FULL BARRIER. REFER DETAILS ON DWG. 21414-8.
- ② 275 THICK PRECAST CONCRETE BRIDGE DECK, N32 GRADE. N20 @ 300 CTS. 40mm COVER TOP. N24 @ 125 CTS. 40mm COVER BOTTOM. N20 TRANSVERSE BARS @ 500 CTS. TOP & BOTTOM. PROVIDE W10 LIGATURES 650mm WIDE, ALONG LINE OF BARRIER @ 100 CTS.
- ③ 200 THICK CONCRETE, SL102 TOP, N32 GRADE PATH
- 600mm WIDE x 2100mm DEEP CONCRETE PIERS AT EACH END OF BRIDGE DECK. PROVIDE N20 BARS AT 150mm CTS. EACH WAY, EACH FACE.
- MIN. 50mm COVER EACH FACE, N32 GRADE.
- PRECAST KERB & WATERTABLE. REFER DETAIL ON DWG. 21414-6.

K&WT

NOTES:

CONCRETE PIERS MUST BE FOUNDED 600mm BELOW ROCK LAYER. ALL PROPRIETARY BARRIERS AND BOLLARDS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

NOTE:

THE SOUTHERN BRIDGE WAS DESIGNED FOR THE FOLLOWING LOADS:
 DEAD LOAD: SELF WEIGHT OF THE STRUCTURE
 LIVE LOADS: 5kPa OR 2.2kN/m²
 ADDITIONAL POINT LOAD FROM WASTE AND EMERGENCY VEHICLE: 49kN
 BARRIER LOAD: 190kN CRUSHING LOAD

AMENDMENTS	TH	29.04.22
D	AMENDMENTS	TH 20.04.22
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A	PRELIMINARY ISSUE	TH 02.02.22
ISSUE	AMENDMENTS	INT./DATE



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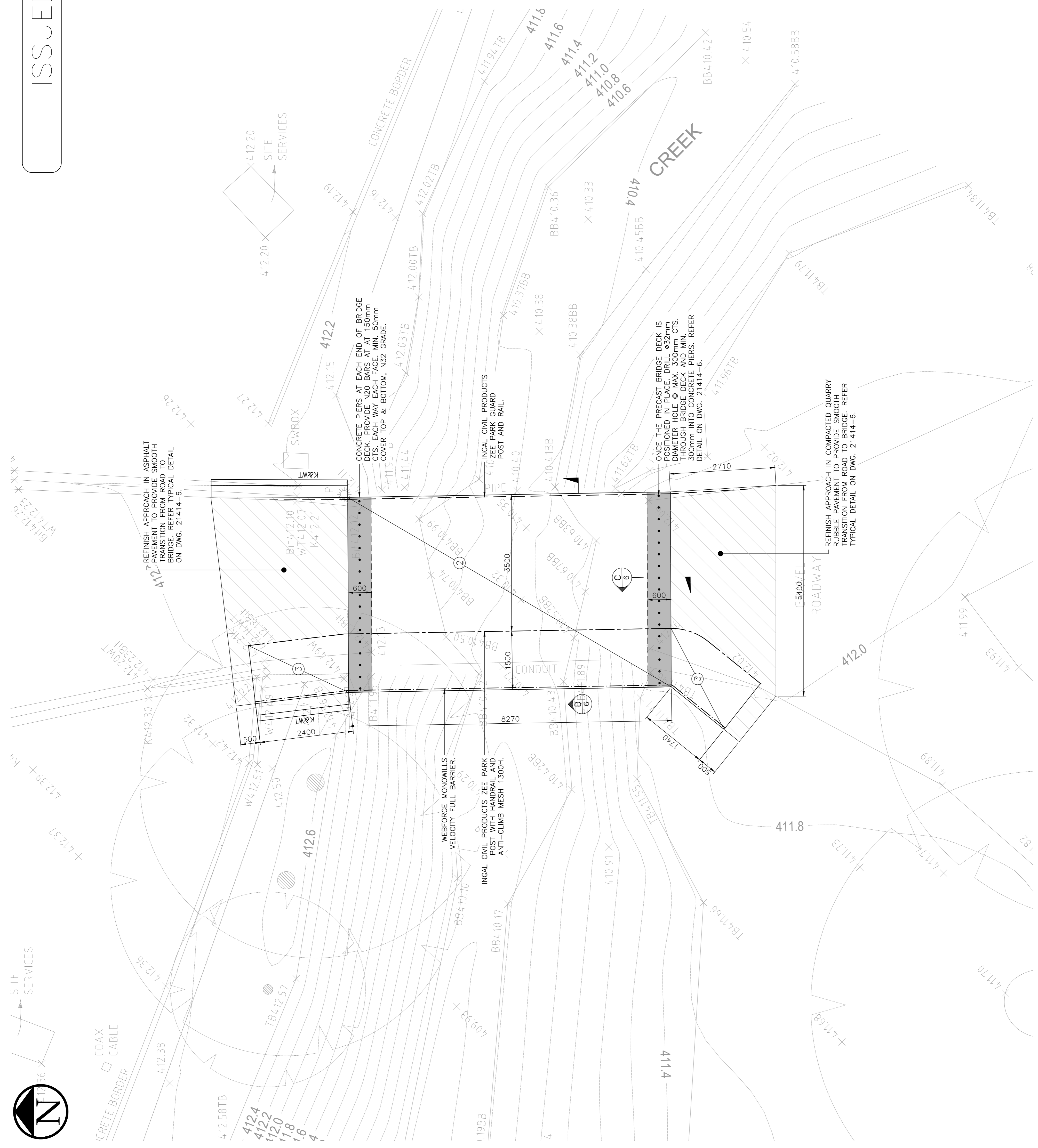
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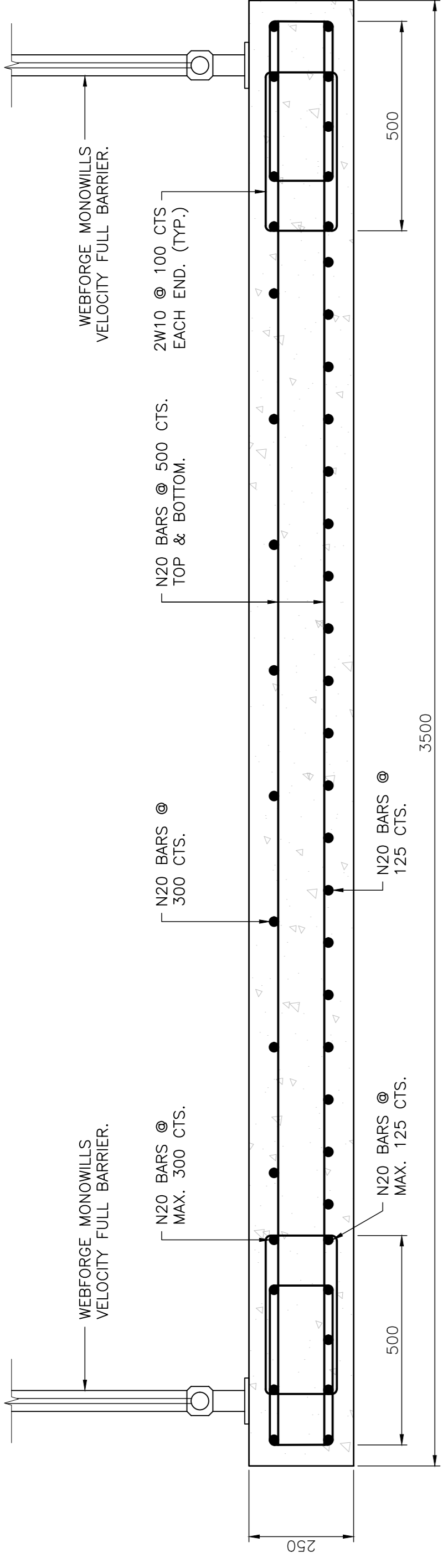
TITLE:
SITE PLAN SOUTH

CONTRACTORS MUST VERIFY ALL DIMENSIONS PRIOR TO ANY OFF SITE FABRICATION.	
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	REVISION: E



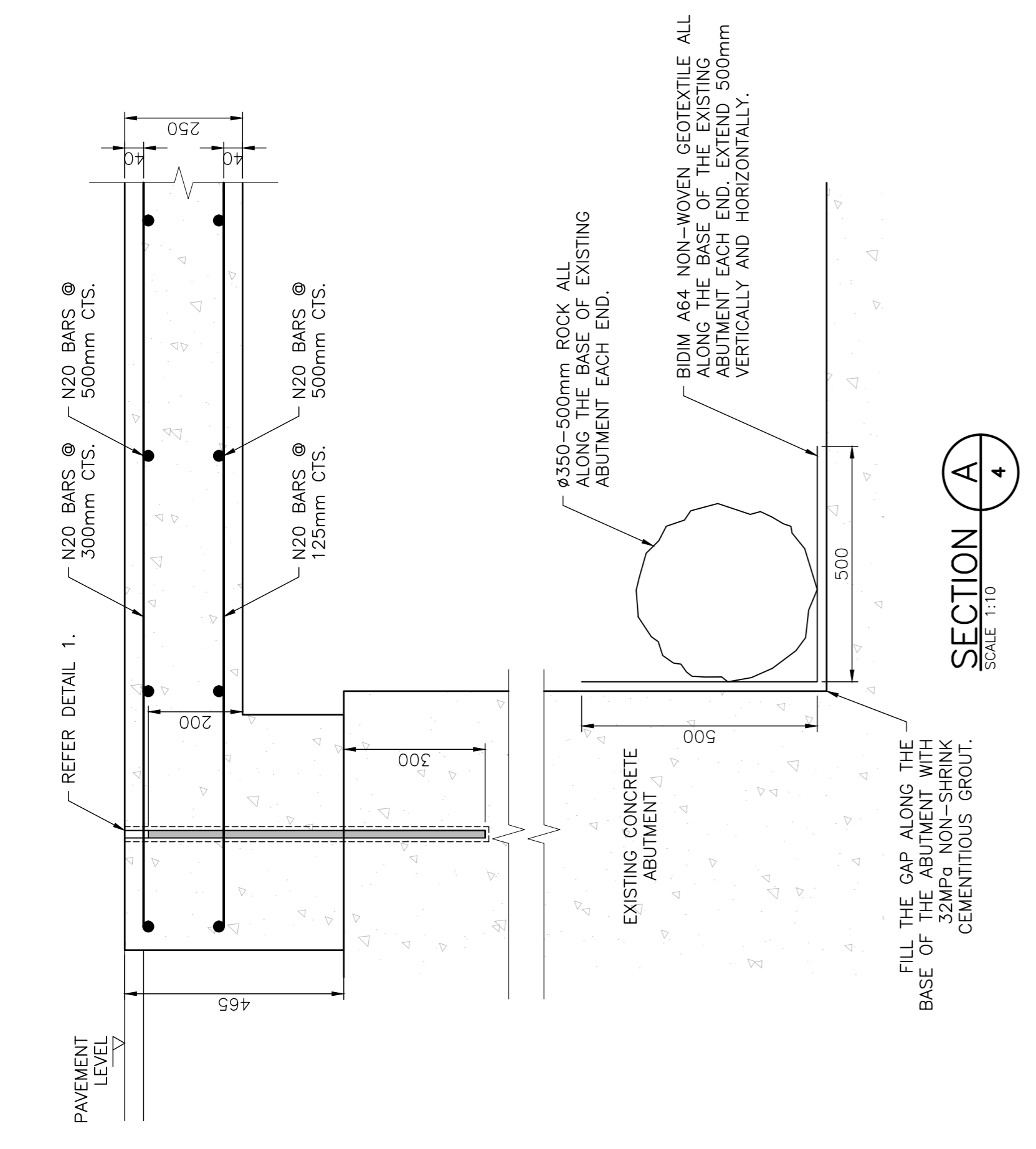
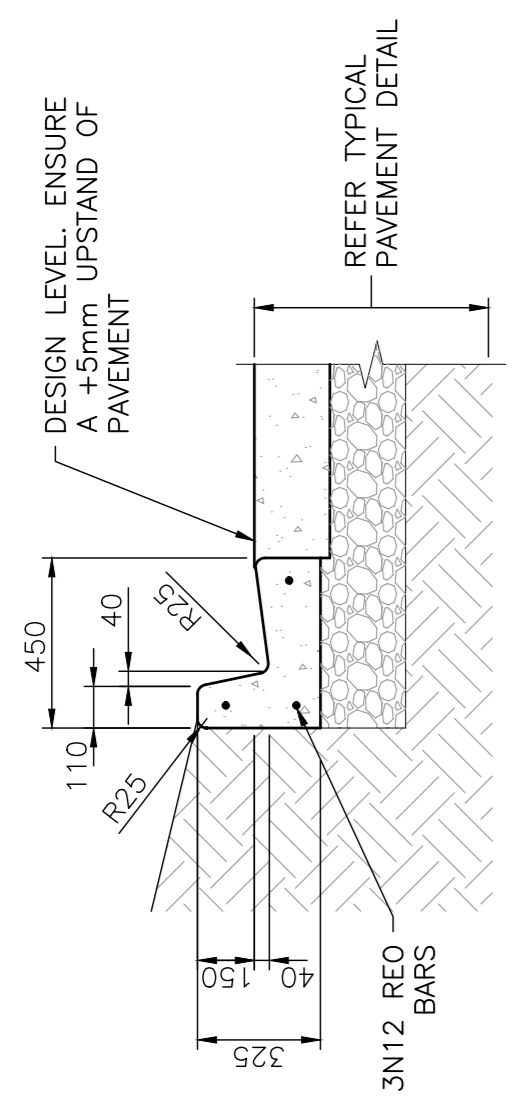
SITE PLAN - SOUTH
 SCALE: 1:50

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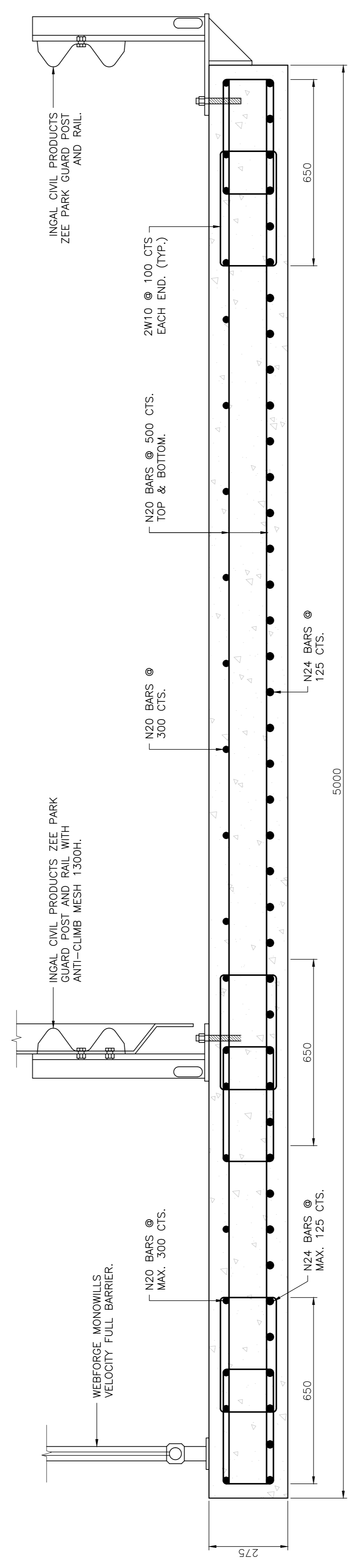


SECTION B
SCALE 1:10
4

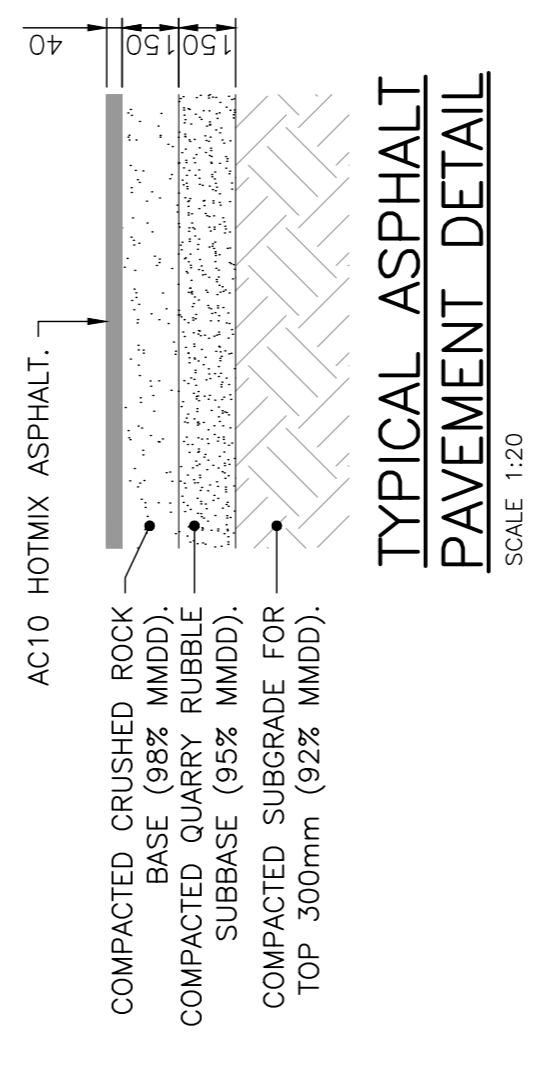
TYPICAL KERB/WATERTABLE DETAIL
SCALE 1:20
NOTE: SAW CUT KERB/WATERTABLE @ 6m CTS.



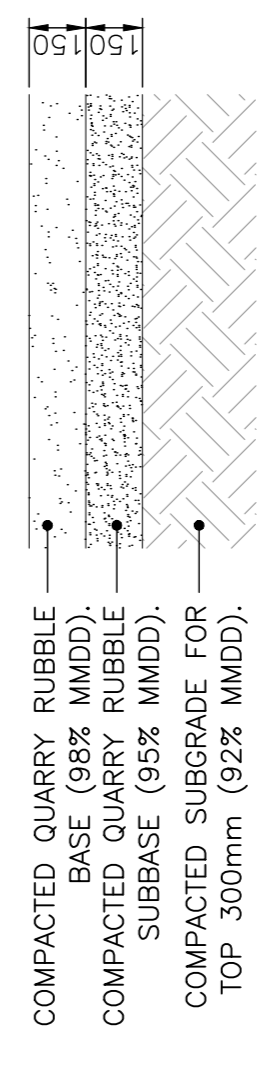
SECTION A
SCALE 1:10
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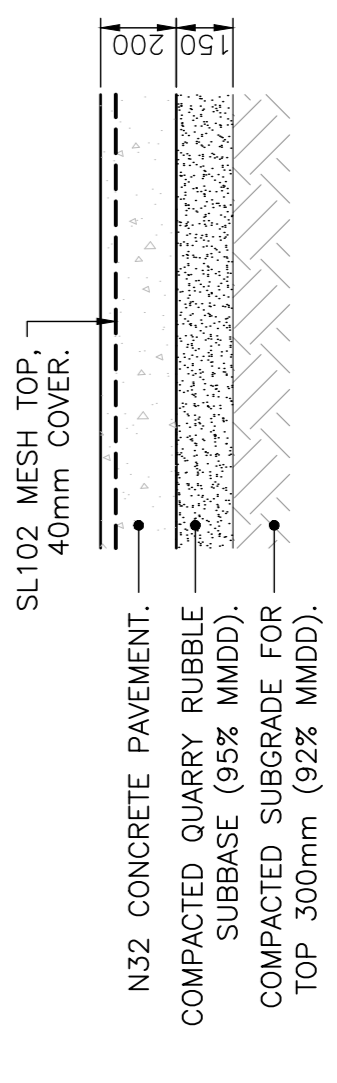
SECTION D
SCALE 1:10
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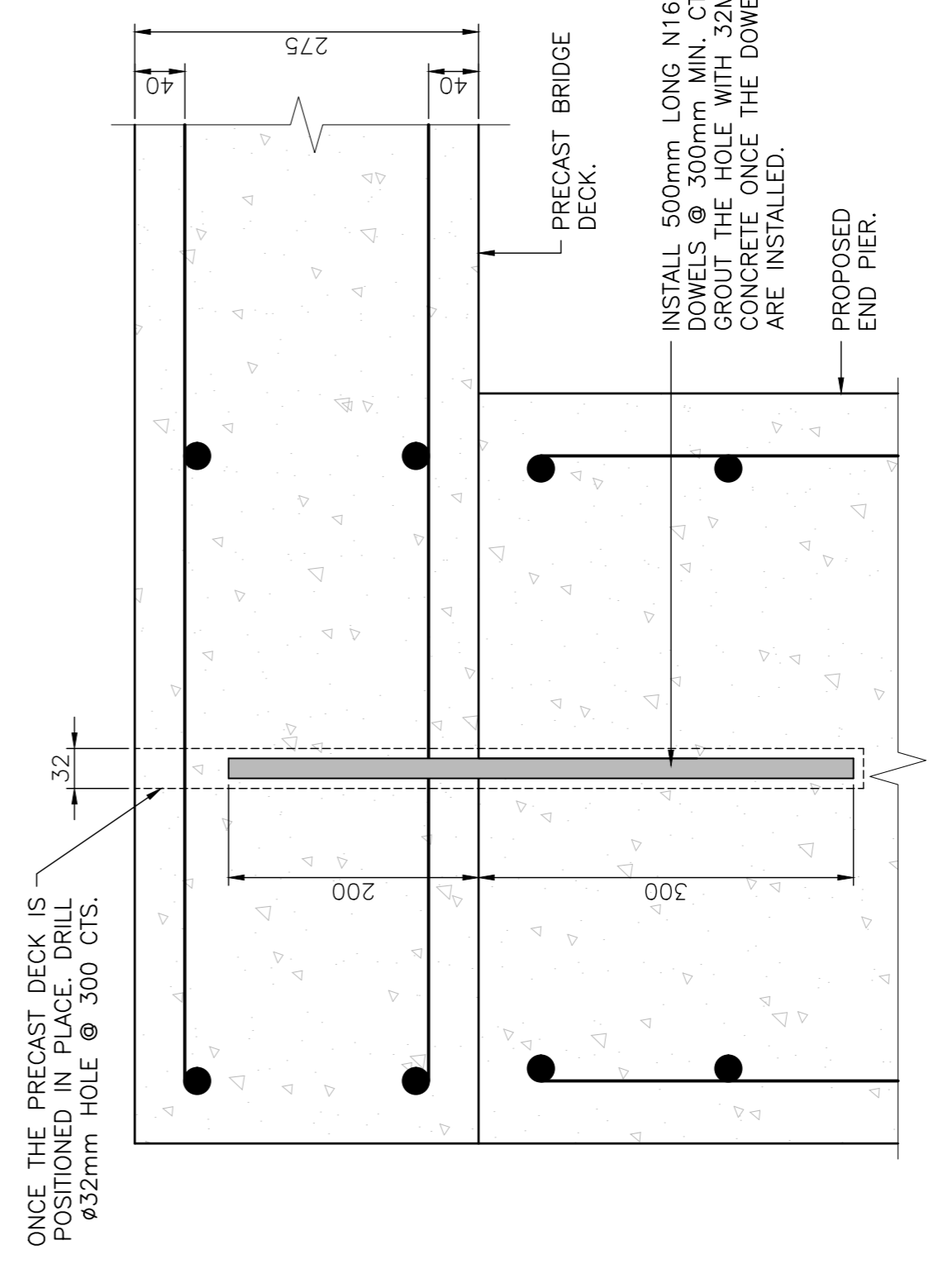
TYPICAL ASPHALT PAVEMENT DETAIL
SCALE 1:20



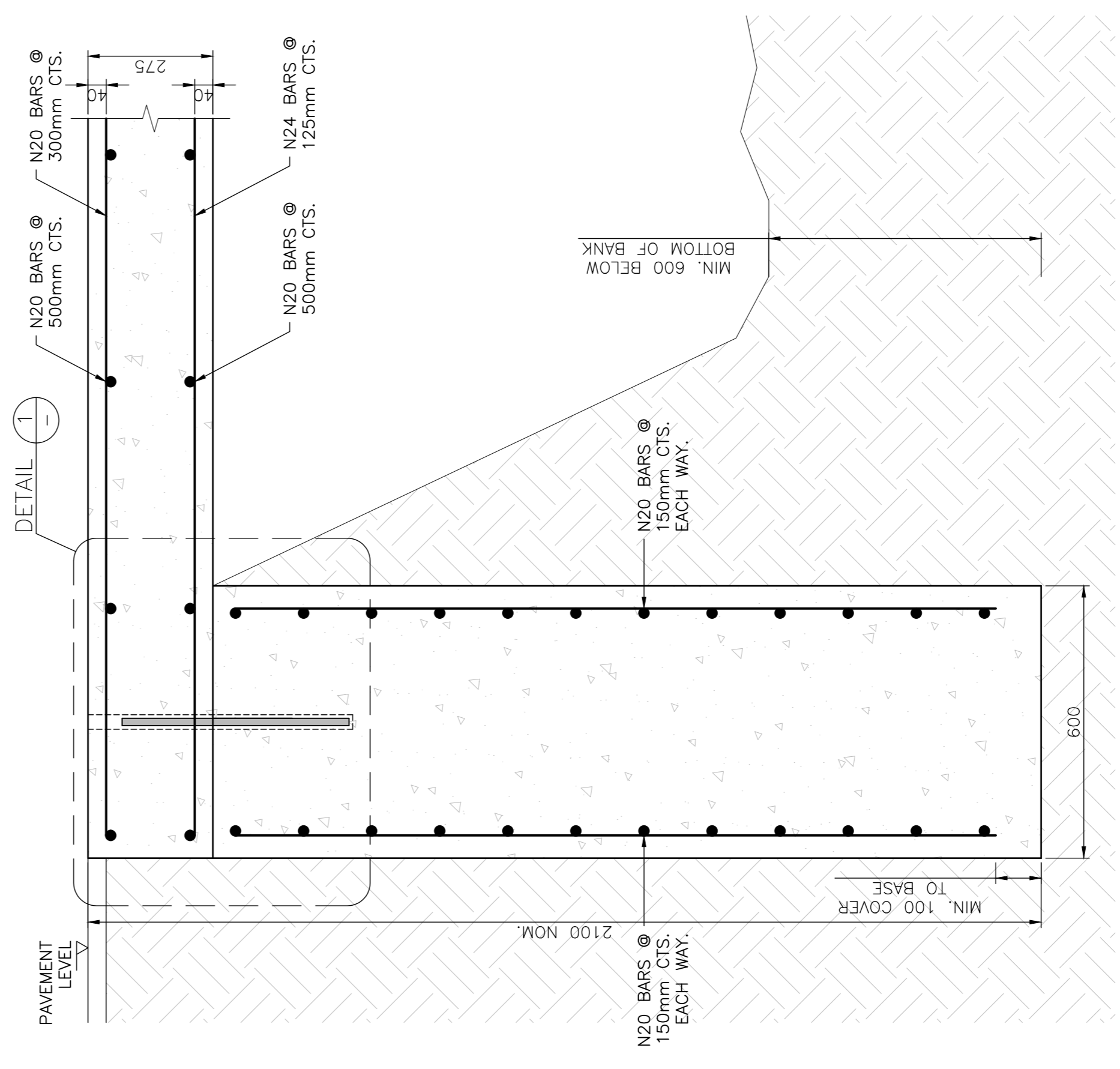
TYPICAL COMPACTED QUARRY RUBBLE PAVEMENT DETAIL
SCALE 1:20



TYPICAL CONCRETE PAVEMENT DETAIL
SCALE 1:20



DETAIL 1
SCALE 1:5



SECTION C
SCALE 1:10
5

E	AMENDMENTS	TH	29.04.22
D	AMENDMENTS	TH	20.04.22
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	ISSUE	INT./DATE	



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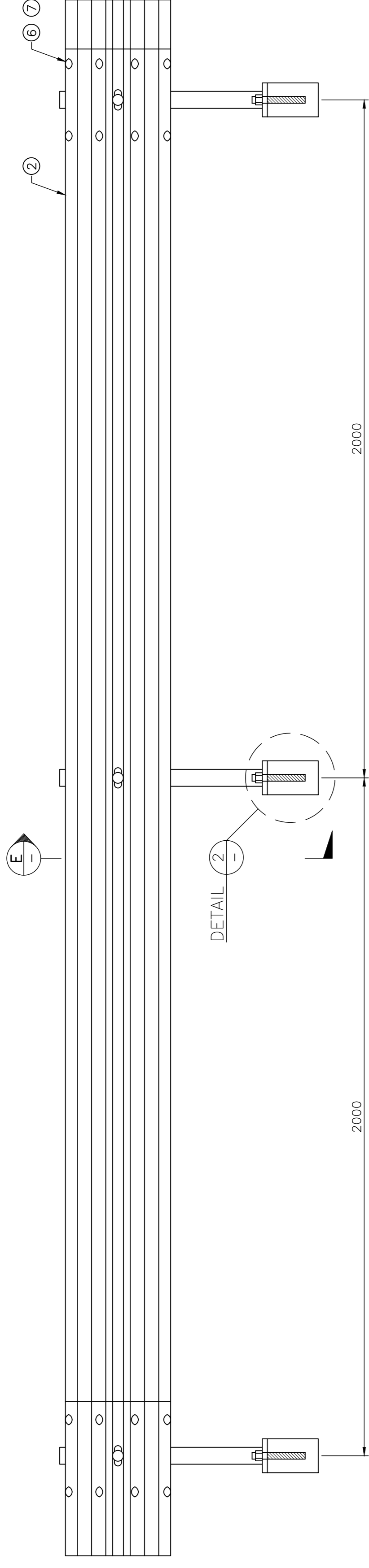
PROJECT ADDRESS:
CLARE VALLEY DISCOVERY PARK

TITLE:
SECTIONS & DETAILS

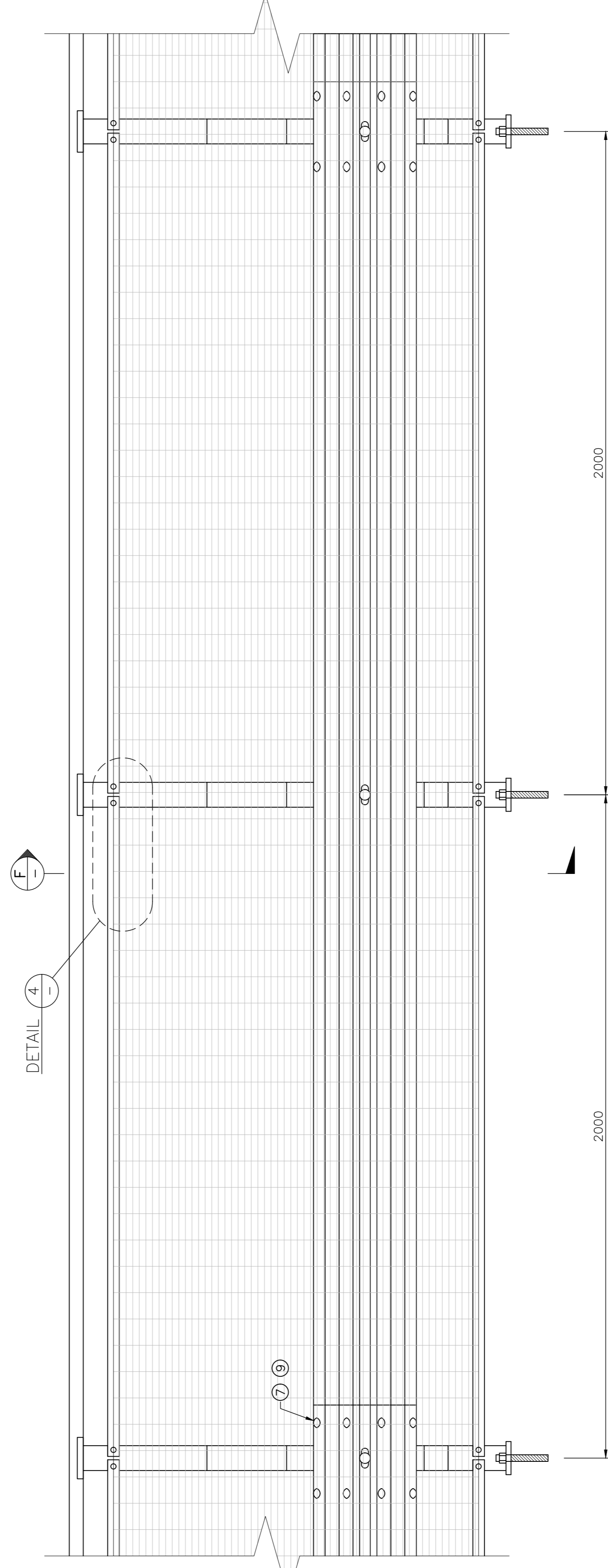
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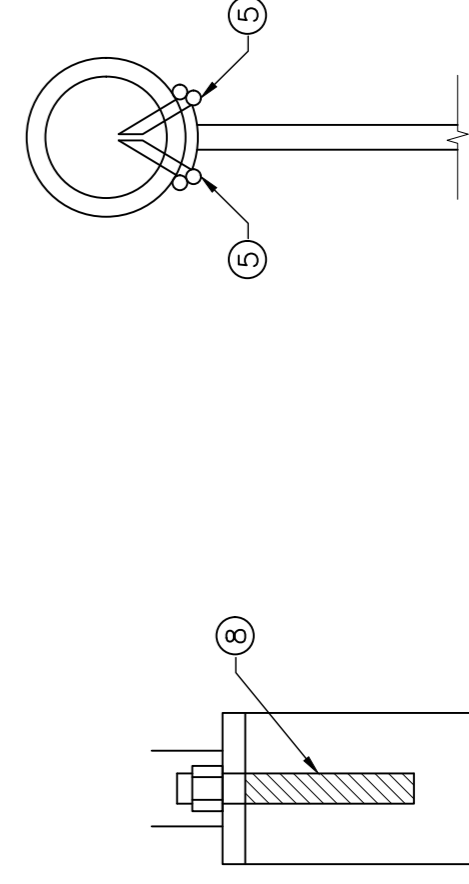
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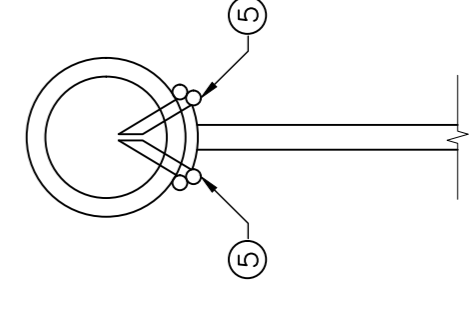
ELEVATION – TYPICAL ZEE PARK GUARD POST & RAIL
SCALE 1:10



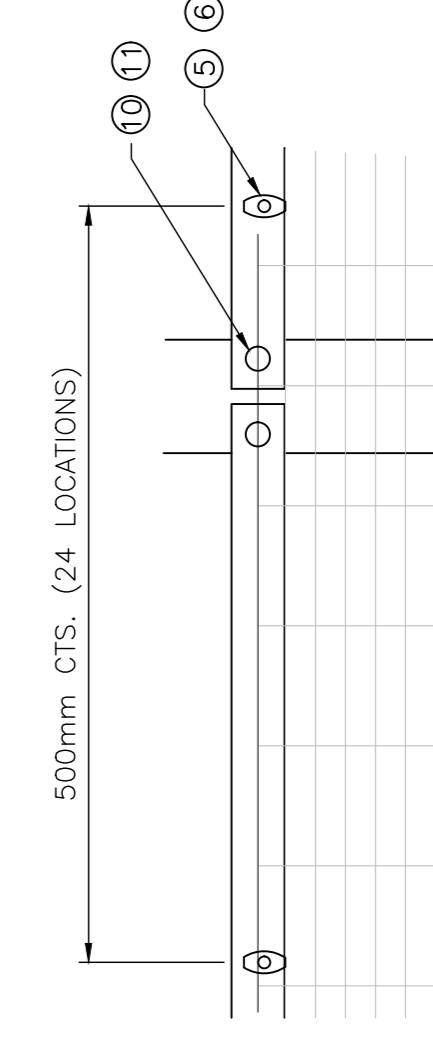
ELEVATION – TYPICAL ZEE PARK GUARD POST & HANDRAIL WITH 1300mm HIGH ANTI-CLIMB MESH
SCALE 1:10



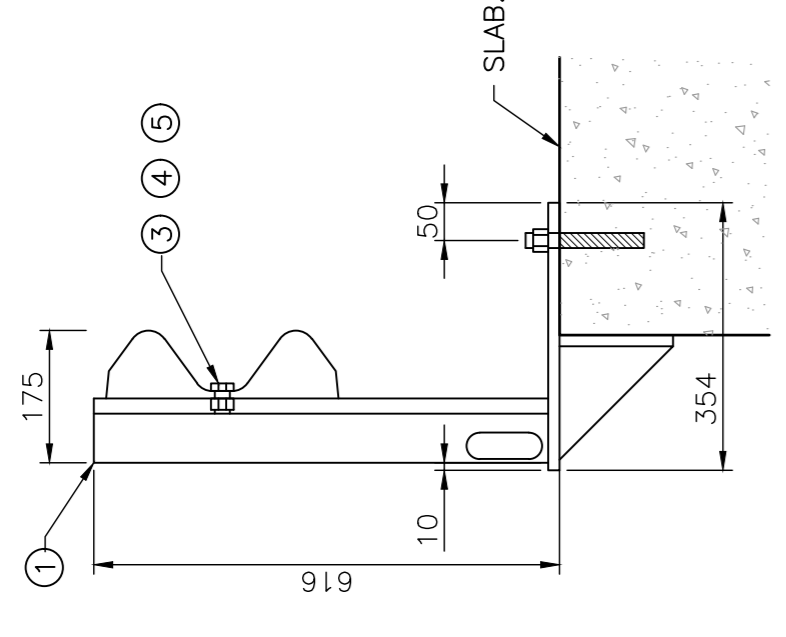
DETAIL 2
SCALE 1:5



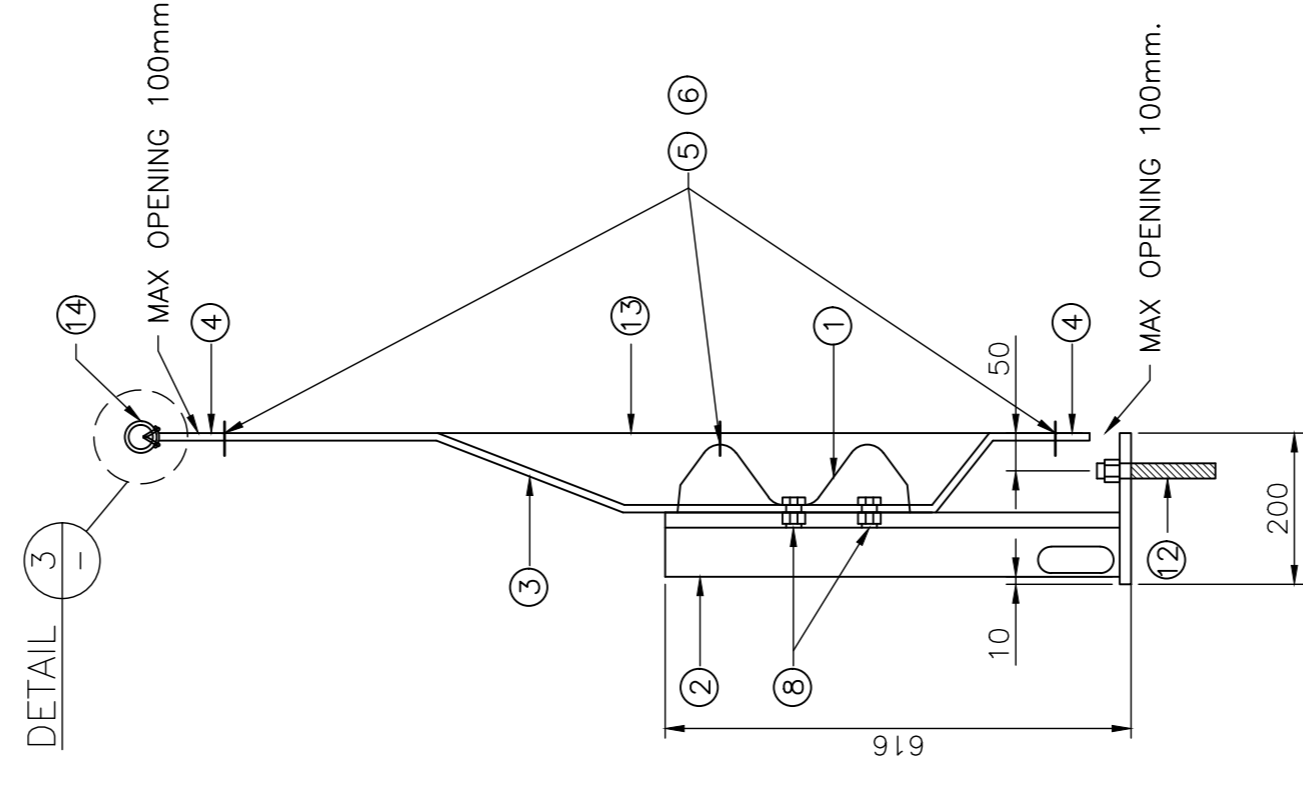
DETAIL 3
SCALE 1:2



DETAIL 4
SCALE 1:5



SECTION E
SCALE 1:10



SECTION F
SCALE 1:10

MEMBER SCHEDULE

ITEM NO.	PART NO.	DESCRIPTION	KIT QTY
1	10007950	DECK GUARD POST 616mm HEIGHT AGL.	2
2	10000977	W-BEAM GUARDRAIL 4.0M N.L.L.	1
3	10001347	M16 x 35 HEX HEAD BOLT.	2
4	10001242	M16 WASHER.	4
5	10001336	M16 HEX NUT GALV.	2
6	10001248	M16 x 32 SPLICE BOLT.	8
7	10001239	M16 OVERSIZE NUT.	8
8	10006675	M20 x 180mm STUD W/NUT & WASHER.	-

NOTE:
- ALL PROPRIETARY BARRIERS AND BOLLARDS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

MEMBER SCHEDULE

ITEM NO.	PART NO.	DESCRIPTION	KIT QTY
1	10000977	W-BEAM GUARDRAIL 4.0M N.L.L.	1
2	10007635	ZEE PARK POST 616mm OALL.	2
3	10001820	1300mm CRANKED HANDRAIL EXTENSION	2
4	10001741	ANGLE SUPPORT FOR MESH.	4
5	10001311	TEK SCREW 12-14 x 25.	32
6	10001742	M8 SECUREMAX SECURITY WASHER.	24
7	10001248	M16 x 32 SPLICE BOLT.	8
8	10001264	M16 x 45mm HEX BOLT/NUT/2W.	4
9	10001239	M16 OVERSIZE NUT.	8
10	10001310	M8 x 30mm CUP BOLT/NUT.	8
11	10001305	M8 FLAT WASHER.	8
12	10006675	M20 x 180mm STUD W/NUT & WASHER.	-
13	10001746	1100x2400mm ANTI-CLIMB MESH PANEL.	-
14	10001731	32NB HANDRAIL 6.5M.	-

ISSUE	AMENDMENTS	INT./DATE
E	NO CHANGES	TH 29.04.22
D	AMENDMENTS	TH 20.04.22
C	FOR CONSTRUCTION DRAWING	CT 18.02.22
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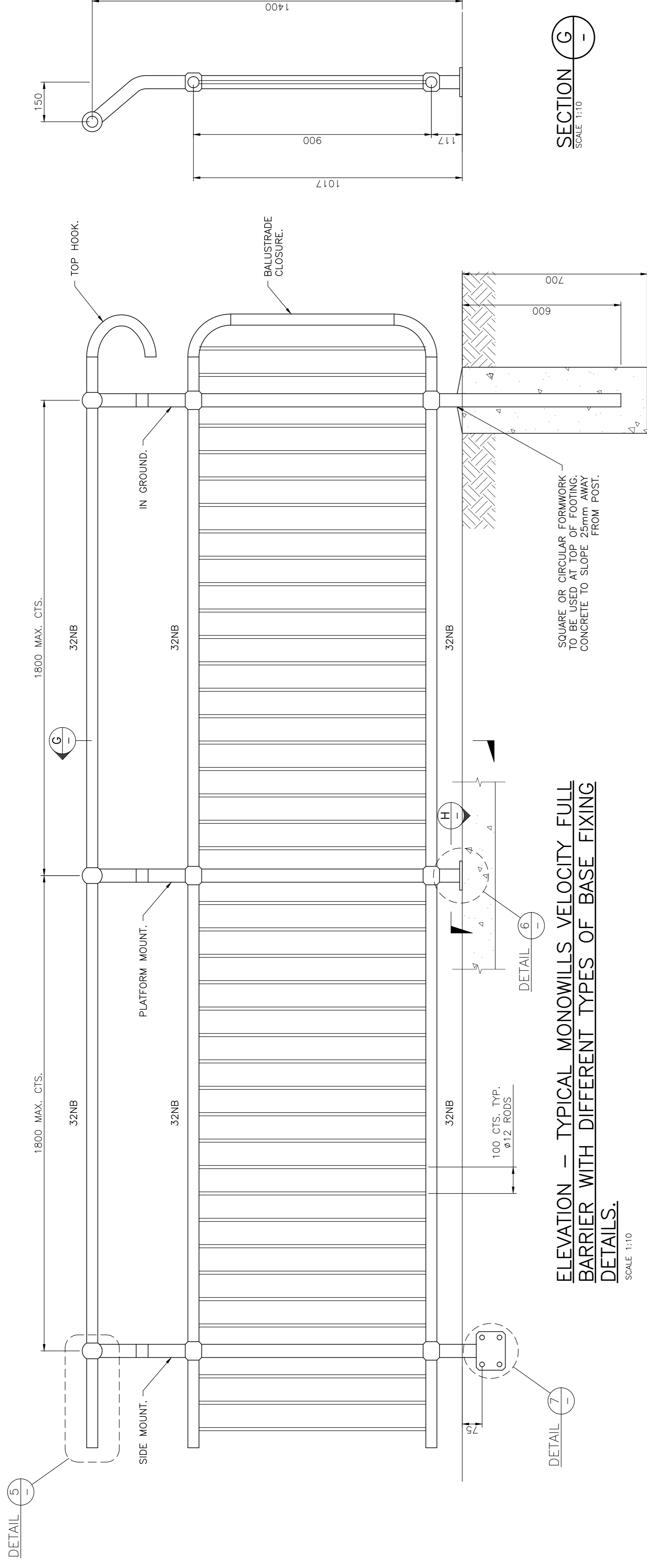
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PROJECT:
INFRASTRUCTURE PROJECTS

PROJECT ADDRESS:
CLARE VALLEY
DISCOVERY PARK

TITLE:
TYPICAL SECTIONS & DETAILS

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DESIGN: LW
SCALE: AS SHOWN
DATE: JAN. 2021
DRAWING NUMBER: 21414-7
SHEET SIZE: A1
REVISION: E



ELEVATION – TYPICAL MONOWILLS VELOCITY FULL BARRIER WITH DIFFERENT TYPES OF BASE FIXING DETAILS.

SCALE 1:10

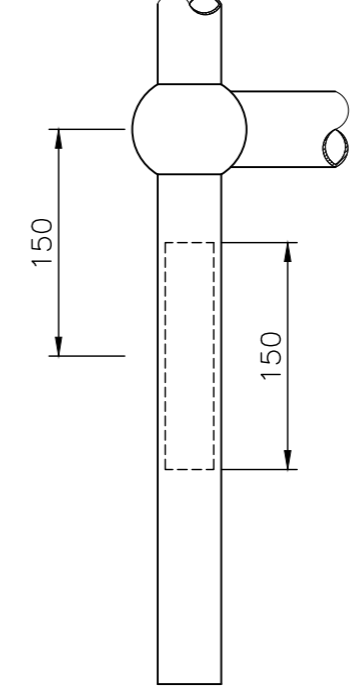
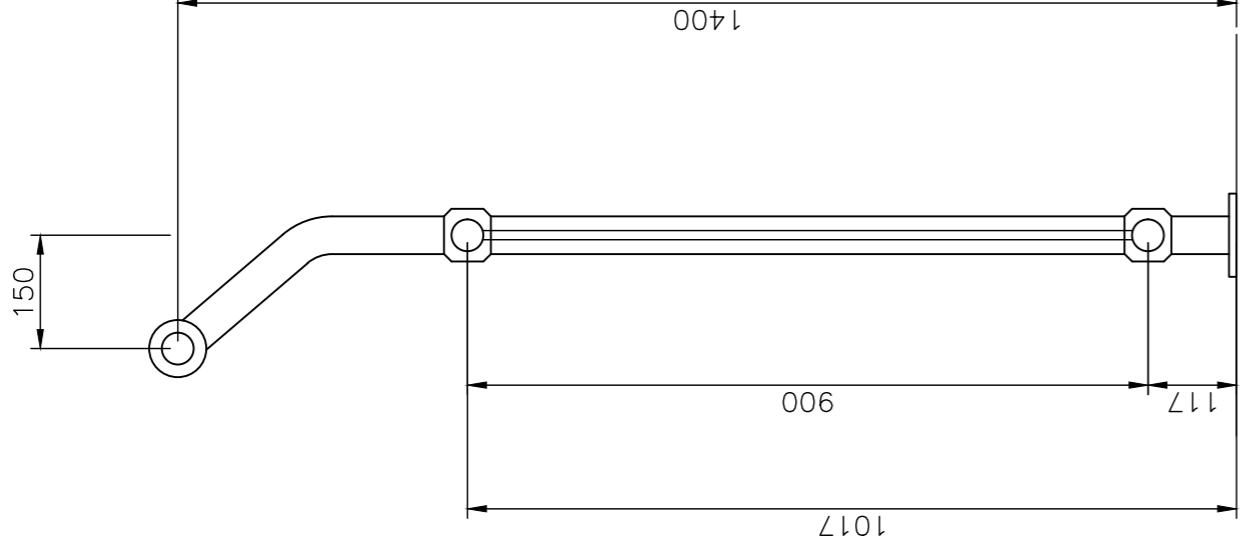
NOTES

1. BASE FIXING TO BE PLATFORM MOUNT ON CONCRETE SLAB, UNLESS OTHERWISE NOMINATED BY THE CLIENT.
2. ALL STEEL TO BE HOT DIPPED GALVANISED TO AS 2312.2. PAINT SYSTEMS TO BE IN ACCORDANCE WITH CLIENT REQUIREMENTS.
3. ALL POSTS TO BE 40NB (48.3 O.D., 3.2 THICK) GALVANISED STEEL TUBE BARRIER DESIGNED TO MEET RECOMMENDATIONS FOR SHARED PATH BARRIER AS OUTLINED IN AUSTRALIAN GUIDE TO ROAD DESIGN PART 6A – PATHS FOR WALKING AND CYCLING.
4. STANDARD MONOWILLS VELOCITY FULL BARRIER DESIGNED TO MEET BARRIER TYPE C3 AS NZS 1170.1:2002 (R2016).
5. BARRIER DESIGNED TO MEET NCC 2016 BARRIER REQUIREMENTS TO PREVENT FALLS.
6. ALL WELDS TO BE 4mm CFW (CONTINUOUS FILLET WELDS) TO AS/NZS 1594.1. PREFERRED COLD GALVANISING TREATMENT FOR IN-SITU WELDS, CUT ENDS OR OTHER BARE STEEL TO BE IN ACCORDANCE WITH AS/NZS 4660:2006 CLAUSE 8 & REPAIR PROCEDURE.
7. ALL CONCRETE TO BE GRADE N32.
8. POSTS INSTALLED IN EXISTING BRIDGE CONCRETE TO BE GROUTED INTO ø90mm HOLE WITH 1:3 CEMENT MORTAR BY VOLUME AFTER THEY HAVE BEEN CAREFULLY ALIGNED. THESE FENCES ARE INTENDED AS A PEDESTRIAN BARRIER AND ARE NOT TO BE USED IN SITUATIONS WHERE MOTOR VEHICLES REQUIRE RESTRAINT.
- 9.
- 10.
- 11.

NOTE:

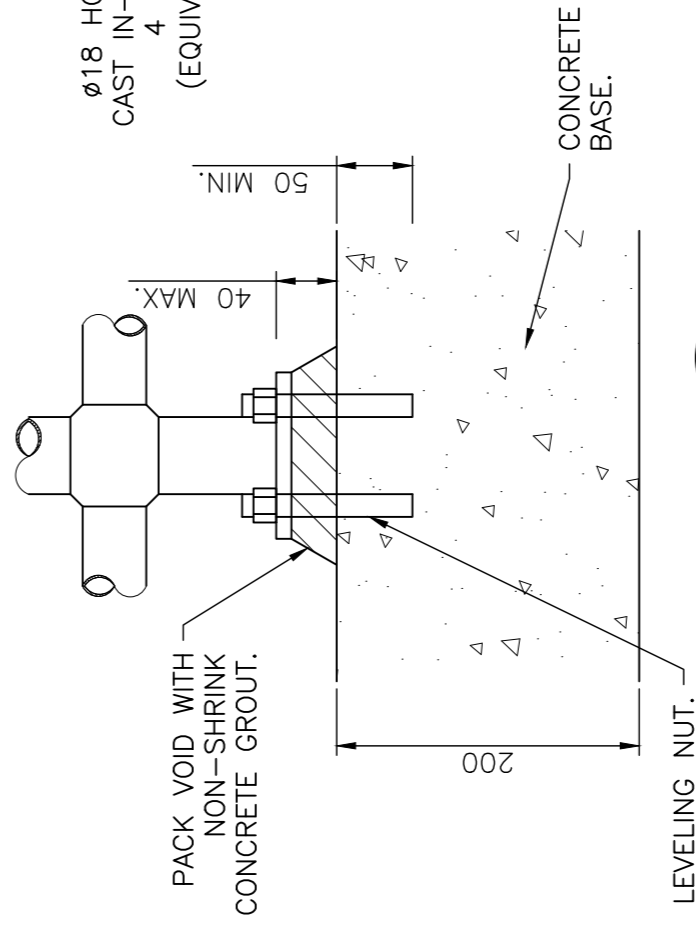
– ALL PROPRIETARY BARRIERS AND BOLLARDS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

SECTION G
SCALE 1:10

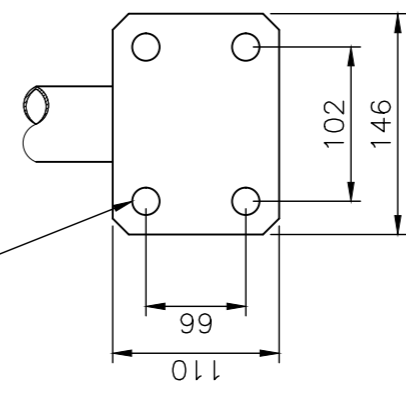


DETAIL 5
SCALE 1:5

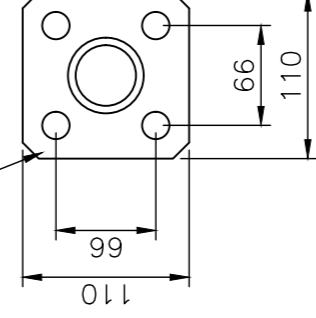
TYPICAL SLIP JOINT



DETAIL 6
SCALE 1:5



DETAIL 7
SCALE 1:5



DETAIL 8
SCALE 1:10

E	NO CHANGES	TH 29.04.22
D	AMENDMENTS	TH 20.04.22
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PROJECT:
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PROJECT ADDRESS:
CLARE VALLEY DISCOVERY PARK

TITLE:
TYPICAL SECTIONS & DETAILS

CONTRACTORS MUST VERIFY ALL DIMENSIONS PRIOR TO ANY OFF SITE FABRICATION.		
DESIGN: LW	SCALE: AS SHOWN	DATE: JAN. 2021
SHEET SIZE: A1	DRAWING NUMBER: 21414-8	REVISION: E

TECHNICAL SPECIFICATION

PROJECT: BRIDGE REPAIR

SITE LOCATION: CLARE DISCOVERY PARK, CLARE SA

PROJECT NO: 21414

<u>ISSUE:</u>	<u>ISSUE DATE</u>	<u>DESCRIPTION</u>
A	February 2022	Preliminary Issue
B	February 2022	Amendments to Schedule of Rates
C	April 2022	Issue for construction
D	May 2022	Issue for construction

TABLE OF CONTENTS:

- 01 GENERAL REQUIREMENTS
- 02 DEMOLITION
- 03 SITE PREPARATION
- 04 EARTHWORK
- 05 PAVEMENT BASE AND SUBBASE
- 06 ASPHALT
- 07 PAVEMENT ANCILLARIES
- 08 CONCRETE IN SITU
- 09 CONCRETE REINFORCEMENT
- 10 AUXILIARY CONCRETE WORKS
- 11 PRECAST CONCRETE
- 12 CONCRETE PAVEMENT

01 GENERAL REQUIREMENTS

1 GENERAL

1.1 PRECEDENCE

General

Work sections and referenced documents:

- The requirements of other work sections of the specification override conflicting requirements of this work section.
- The requirements of the work sections override conflicting requirements of their referenced documents.
- The requirements of the referenced documents are minimum requirements.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following work section(s):

- *Demolition*
- *Site Preparation*
- *Earthwork*
- *Pavement Base and Subbase*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Precast Concrete*
- *Concrete Pavement*

1.3 REFERENCED DOCUMENTS

Contractual relationships

General: Responsibilities and duties of the principal, contractor and contract administrator are not altered by requirements in the documents referenced in this specification.

Current editions

General: Use referenced documents which are the editions, with amendments, current at the closing date for tenders, except where other editions or amendments are required by statutory authorities.

1.4 INTERPRETATION

Abbreviations

General: For the purposes of this specification the following abbreviations apply:

- AS: Australian Standard.
- BCA: National Construction Code Series Volume One: Building Code of Australia Class 2 to 9 Buildings and Volume Two: Building Code of Australia Class 1 and Class 10 Buildings.
- NATA: National Association of Testing Authorities.
- NZS: New Zealand Standard.
- WHS: Work Health and Safety.

Definitions

General: For the purposes of this specification, the following definitions apply:

- Attendance: Attendance, provide attendance and similar expressions mean give assistance for examination and testing.
- Contract administrator: Contract administrator has the same meaning as architect or superintendent and is the person appointed by the owner or principal under the contract.

- Contractor: Contractor has the same meaning as builder and is the person or organisation bound to carry out and complete the work under the contract.
- Documented: Documented, as documented and similar terms mean contained in the contract documents.
- Geotechnical site investigation: The process of evaluating the geotechnical characteristics of the site in the context of existing or proposed construction.
- Give notice: Give notice, submit, advise, inform and similar expressions mean give notice (submit, advise, inform) in writing to the contract administrator.
- Local (government) authority: A body established for the purposes of local government by or under a law applying in a state or territory.
- Obtain: Obtain, seek and similar expressions mean obtain (seek) in writing from the contract administrator.
- Practical completion or Defects free completion: The requirements for these stages of completion are defined in the relevant building contract for the project.
- Principal: Principal has the same meaning as owner, client and proprietor and is the party to whom the contractor is legally bound to construct the works.
- Proprietary: Proprietary means identifiable by naming manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
- Provide: Provide and similar expressions mean supply and install and include development of the design beyond that documented.
- Record drawings: Record drawings has the same meaning as as-installed drawings, as-built drawings and work-as-executed drawings.
- Registered testing authority:
 - . An organisation registered by the National Association of Testing Authorities (NATA) to test in the relevant field; or
 - . An organisation recognised as being a Registered Testing Authority under legislation at the time the test was undertaken.
- Required: Required by the documents, the local council or statutory authorities.
- If required: A conditional specification term for work which may be shown in the documents or is a legislative requirement.
- Statutory authority: A public sector entity created by a specific law of the Commonwealth, State or Territory.
- Supply: Supply, furnish and similar expressions mean supply only.
- Tests - completion: Tests carried out on completed installations or systems and fully resolved before the date for practical completion, to demonstrate that the installation or system, including components, controls and equipment, operates correctly, safely and efficiently, and meets performance and other requirements. The contract administrator may direct that completion tests be carried out after the date for practical completion.
- Tests - pre-completion: Tests carried out before completion tests, including:
 - . Production: Tests carried out on a purchased item, before delivery to the site.
 - . Progressive: Tests carried out during installation to demonstrate performance in according with this specification.
 - . Site: Tests carried out on the site.
 - . Type: Tests carried out on an item identical with a production item, before delivery to the site.
- Tolerance: The permitted difference between the upper limit and the lower limit of dimension, value or quantity.
- Verification: Provision of evidence or proof that a performance requirement has been met or a default exists.

1.5 CONTRACT DOCUMENTS

Levels

General: Spot levels take precedence over contour lines and ground profile lines.

1.6 INSPECTION

Notice

Concealment: If notice of inspection is required in respect of parts of the works that are to be concealed, advise when the inspection can be made before concealment.

Tests: Give notice of the time and place of documented tests.

Minimum notice: 48hours prior to tests.

1.7 SUBMISSIONS

Tests

General: Submit an inspection and testing plan which is consistent with the construction program. Include particulars of test stages and procedures.

Test reports: Submit written reports on nominated tests.

2 EXECUTION

2.1 OFF-SITE DISPOSAL

Removal of material

General: Dispose of building waste material off site to the requirements of the relevant authorities.

2.2 VIBRATION SUPPRESSION

General

Requirement: Minimise the transmission of vibration from rotating or reciprocating equipment to structures both within the property and adjacent properties.

Standard

Rotating and reciprocating machinery noise and vibration: Vibration severity in Zone A to AS 2625.1 and AS 2625.4.

Speeds

General: If no maximum speed is prescribed do not exceed 1500 r/min for direct driven equipment.

Connections

General: Provide flexible connections to rotating machinery and assemblies containing rotating machinery. Isolate pipes by incorporating sufficient flexibility into the pipework or by use of proprietary flexible pipe connections installed so that no stress is placed on pipes due to end reaction.

02 DEMOLITION**1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Carry out demolition, as documented.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- *General Requirements*
- *Site Preparation*
- *Earthwork*
- *Pavement Base and Subbase*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Precast Concrete*
- *Concrete Pavement*

1.3 STANDARD**General**

Demolition: To AS 2601.

1.4 INTERPRETATION**Definitions**

General: For the purposes of this worksection, the following definitions apply:

- Demolition: The complete or partial dismantling of a structure, by pre-planned and controlled methods or procedures.
- Dilapidation record: The photographic or video and written record, before commencement of demolition work, of the condition of the portion of the existing building retained, adjacent buildings, and other relevant structures or facilities.
- Recover: The disconnection and removal of an item in a manner to allow re-installation.

1.5 SUBMISSIONS**Authority approvals**

Evidence of compliance: Before commencing demolition, submit evidence of the following:

- Requirements of authorities relating to the work under the contract have been obtained.
- A permit to demolish has been obtained from the appropriate authority.
- A scaffold permit has been obtained from the appropriate authority (if scaffolding is proposed to be used).
- Certification that each person having access to the construction site has completed a WHS induction training procedure which is site-specific.
- Precautions necessary for protection of persons and structure have been taken and suitable protective and safety devices have been provided to the approval of the relevant authority.
- Fees and other costs have been paid.

Hazardous materials

Audit: Prepare and submit a hazardous substances management plan to AS 2601 clause 1.6.1.

Include the following:

- Asbestos or material containing asbestos.
- Toxic, infective or contaminated materials.

Investigation and work plan

Work plan: Submit the work plan before demolition or stripping work. Include the check list items appropriate to the project from AS 2601 Appendix A, and the following information:

- The method of protection and support for adjacent structures.
- Locations and details of necessary service deviations and terminations.
- Confirmation of the sequence of work.
- Requirements of AS 2601 Section 2.
- If the demolition program results in components temporarily cantilevered, provide a certificate from a professional engineer.
- If implosion methods are proposed, provide a separate report of methods and safeguards.
- Wheel loads of tipping or loading vehicles.

Off-site disposal

Disposal location: Submit the locations and evidence of conformance with the relevant authorities for the disposal of material required to be removed from the site.

Records

Dilapidation record: Submit a copy of the dilapidation record for inspection before commencement of demolition.

Recycling

Delivery location: Submit the name and address of the proposed recycling facility.

Certification: Provide evidence of delivery to the nominated recycling facility.

Stockpiles

Location: Submit the locations for on-site stockpiles for demolished materials for recycling in the works. Coordinate with the locations of storage for other waste streams and prevent mixing or pollution.

1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Site after removal of demolished materials.

2 EXECUTION

2.1 SUPPORT

Temporary support

General: If temporary support is required, certification for its design and installation is required from a professional engineer engaged by the contractor.

Existing structures: Until permanent support is provided, provide temporary support for sections of existing structures which are to be altered and which normally rely for support on work to be demolished.

Adjacent structures: Provide supports to adjacent structures where necessary, sufficient to prevent damage resulting from the works.

- Lateral supports: Provide lateral support equal to that given by the structure to be demolished.
- Vertical supports: Provide vertical support equal to that given by the structure to be demolished.

Permanent supports

General: If permanent supports for adjacent structures are necessary and are not documented, give notice and obtain instructions.

2.2 PROTECTION

Security

General: Provide security against unauthorised entry to the construction site.

Existing services

Location: Before commencing demolition, locate and mark existing underground services in the areas which will be affected by the demolition operations.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not excavate by machine within 1 m of existing underground services.

2.3 DEMOLITION – BUILDING WORKS

Dilapidation record

Purpose: Use the dilapidation record to assess the damage and rectification work arising from the demolition work.

Availability: Keep the records of the investigations on site and available for inspection until the date of practical completion of the contract.

Concrete slabs

General: Using a diamond saw, neatly cut back or trim to new alignment with a clean true face existing concrete slabs to be partially demolished or penetrated. Do not overcut at corners.

Recycling: If concrete crushing is proposed on site, submit details of plant and environmental controls.

Remaining voids: Stabilise and provide barriers.

Explosives

General: Do not use explosives.

2.4 DEMOLITION – BUILDING SERVICES

General

Requirement: Decommission, isolate, demolish and remove from the site all existing redundant equipment including associated components that become redundant as a result of the demolition.

Breaking down: Disassemble or cut up equipment where necessary to allow removal.

Components for re-use

General: Clean components to be re-used and test for compliance with current Australian Standards before returning to service. Provide results of compliance tests.

2.5 HAZARDOUS MATERIALS

Identify hazardous material

General: Identify all hazardous materials present on site and prepare a hazardous materials register where required.

Hazardous materials removal

Standard: To AS 2601 clause 1.6.2.

2.6 COMPLETION

Notice of completion

General: Give at least 7 working days' notice of completion of demolition so that adjacent structures may be inspected following completion of demolition.

Rectification: Repair any damage arising out of demolition work. Obtain written acceptance from the owner of each adjoining property of the completeness and standard of the rectification work.

Temporary support

General: Clear away at completion of demolition.

03 SITE PREPARATION

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide site preparation, as documented.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following work section(s):

- *General Requirements*
- *Demolition*
- *Earthwork*
- *Pavement Base and Subbase*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Precast Concrete*
- *Concrete Pavement*

1.3 INTERPRETATION

Definitions

General: For the purposes of this work section the following definitions apply:

- **Authorities:** Any authority or agency covering statutory requirements relating to the project, including clearances for work in that particular area.
- **Clearances:** A formal certificate, approval or condition issued by an authority to allow work to be carried out in a particular area.
- **Network utility operator:** The entity undertaking the piped distribution of drinking water or natural gas for supply or is the operator of a sewerage system or a stormwater system.

2 EXECUTION

2.1 EXISTING SERVICES

General

Requirement: Before commencing earthworks, locate and mark existing underground services in the areas which will be affected by the earthworks operations including clearing, excavating and trenching.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not machine excavate within 1 m of existing underground services.

Existing service lines: If required, divert services detected during excavation to new routes, clear of the works, and reconnect to the network utility operator's requirements.

2.2 SITE CLEARING

Extent

Requirement: Clear only areas shown on Drawings 21414-1 to 21414-5 to allow for final levels to be completed.

Contractor's site areas: If not included within the areas documented above, clear generally only to the extent necessary for the performance of the works.

Clearing and grubbing

Clearing: Remove everything on or above the site surface, including rubbish, scrap, grass, vegetable matter and organic debris, scrub, trees, timber, stumps, boulders and rubble.

Grubbing: Grub out stumps and roots over 75 mm diameter to a minimum depth of 300 mm below finished surface levels. Backfill holes remaining after grubbing with sand material to prevent ponding of water. Compact the material to the relative density of the existing adjacent ground material.

Surplus material

Topsoil and excavated material: Continually remove unwanted stripped soil and other material from the site as the work proceeds, including any material dropped on footpaths or roadways.

2.3 STORMWATER AND SEDIMENT CONTROL

General

Erosion and sediment control measures: An erosion and sediment control design should be undertaken and approved by the Superintendent prior to works commencing. The measures outlined in the design should be undertaken during the period of the works.

Waterways and drains

Waterways: Temporarily divert, as necessary, ditches, field drains and other waterways affected by excavation and reinstate on completion.

Stormwater drains: Divert drains detected during excavation, as necessary, to new routes, clear of buildings, and reconnect to the network utility operator's requirements.

2.4 TREE PROTECTION

General

Protection: Ensure trees are protected during the works.

2.5 COMPLETION

Clean up

Progressive cleaning: Keep the work included in the contract clean and tidy as it proceeds and regularly remove from the site waste and surplus material arising from execution of the work, including any work performed during the defects liability period or the plant establishment period.

Removal of plant: Within 10 working days of the date of practical completion, remove temporary works, construction plant, buildings, workshops and equipment which does not form part of the works, except what is required for work during the defects liability period or the plant establishment period.

Remove these on completion.

04 EARTHWORK**1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide earthworks to the dimensions and tolerances, as documented.

Design

Levels: To match existing level as per the level survey on drawings 21414-2 to 21414-5.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following work section(s):

- *General Requirements*
- *Demolition*
- *Site Preparation*
- *Pavement Base and Subbase*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Precast Concrete*
- *Concrete Pavement*

1.3 STANDARDS**General**

Earthworks: Conform to the recommendations of those parts of AS 3798 which are referenced in this work section.

1.4 INTERPRETATION**Abbreviations**

General: For the purposes of this work section the following abbreviations apply:

- GITA: Geotechnical inspection and testing authority.
- GTA: Geotechnical testing authority.

Definitions

General: For the purposes of this work section the definitions given in AS 1348, AS 3798 and the following apply:

- Description and classification of soils: To AS 1726.
- Site classification: To BCA 3.2.4.
- Bad ground: Ground unsuitable for the purposes of the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground which is or becomes soft, wet or unstable.
- Discrepancy: A difference between contract information about the site and conditions encountered on the site, including but not limited to discrepancies concerning the following:
 - . The nature or quantity of the material to be excavated or placed.
 - . Existing site levels.
 - . Services or other obstructions beneath the site surface.
- Rock: Monolithic material with volume greater than 0.5 m³ which cannot be removed until broken up by rippers or percussion tools.

- Site topsoil: Soil excavated from the site which contains organic matter, supports plant life, conforms generally to the fine to medium texture classification to AS 4419 (loam, silt, clay loam) and is free from:
 - . Stones more than 25 mm diameter.
 - . Clay lumps more than 75 mm diameter.
 - . Weeds and tree roots.
 - . Sticks and rubbish.
 - . Material toxic to plants.
- Fill: Layer(s) of material below the subgrade level to allow for the correct design levels to be met.
- Subgrade: Top 300mm of material below the sub-base.

1.5 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Areas to be cleared and/or stripped of topsoil.
- Areas stripped of topsoil.
- Excavation completed to contract levels or founding material.
- Proof roll subgrade before placing fill.
- Filling completed to contract levels.

1.6 TOLERANCES

General

Finish: Finish the surface to the required level, grade and shape within the following tolerances:

- Ground surface: ± 50 mm, provided the area remains free draining and matches adjacent construction where required. Provide smoothness as normally produced by a scraper blade.

1.7 SUBMISSIONS

Execution details

Report: Submit a time based schedule noting the methods and equipment proposed for the earthworks, including the following:

- Dewatering and groundwater control and disposal of surface water.
- Excavation methods, stages and clearances.
- Stockpiles.
- Placing and compaction methods and stages.

Disposal location: Submit the locations and evidence of compliance with the relevant authorities for the disposal of material required to be removed from site.

Proof rolling: Submit method and equipment for proof rolling.

Construction records: Submit the following to AS 3798 clause 3.4 and Appendix B:

- Geotechnical site visit record; and
- Earthworks summary report or daily geotechnical reports.

Materials

Imported fill: Submit certification or test results by a GTA registered laboratory which establish the compliance of imported fill with the contract including the source.

Tests

Compaction: Submit certification to Level 1 supervision in conformance with AS 3798.

2 PRODUCTS

2.1 FILL MATERIALS

General

Suitable material: To AS 3798 clause 4.4 including inorganic, non-perishable material suitably graded and capable of compaction to the documented density. Material used in the top 150mm under the sub

grade shall be free of particles larger than 75mm. Material used in the top 500mm below sub grade shall be free of particles larger than 200mm.

Unsuitable materials: Do not use unsuitable material for fill in conformance with AS 3798 clause 4.3.

Re-use of excavated material: Only re-use suitable material in conformance with AS 3798 clause 4.4.

Stockpiles: Segregate the earth and rock material and stockpile, for re-use in backfilling operations.

Locations: Do not stockpile excavated material against tree trunks, buildings, fences or obstruct the free flow of water along gutters where stockpiling is permitted along the line of the trench excavation.

Disposal: If stockpiling is not permitted under the contract, dispose of excavated material off-site to AS 3798 clause 6.1.8.

2.2 SUB GRADE MATERIALS

General

Suitable material: To AS 3798 clause 4.4 including inorganic, non-perishable material suitably graded and capable of compaction to the documented density. Material used in the sub grade shall be free of particles larger than 50mm.

Unsuitable materials: Do not use unsuitable material for fill in conformance with AS 3798 clause 4.3.

2.3 IMPORTED FILL

Imported material: Only when no suitable excavated material is available.

Suitable material: To AS 3798 clause 4.4, Environment Protection Regulations 2009 and the following:

All Queensland Department of Environment and Science (which is to take precedence over the following) and

'Standard for the production and use of waste derived fill':

http://www.epa.sa.gov.au/xstd_files/Waste/Guideline/standard_wdf.pdf

Table 3 'Summary of requirements for waste soil being used as WDF' of the Standard spells out the procedure.

A risk-based approach with consideration to both the chemicals present within the waste derived fill (WDF) and the source of the waste shall be in accordance with the EPA testing, submission and approval requirements for WDF. Default chemical criteria for reuse of these wastes as WDF are provided below. The two levels of chemical criteria are:

- Waste derived fill (WDF) that does not exceed the chemical criteria for Waste Fill, as specified in clause 3(1) of the *Environment Protection Regulations 2009*. This WDF is indicative of a low-risk material for use as fill. Waste soil must be demonstrated as suitable in accordance with this standard prior to transport and reuse at the receiving site
- WDF that exceeds this low-risk criteria, but does not exceed an upper level criteria (ie Intermediate Waste Soil criteria). For this WDF, the standard provides a mechanism for a site-specific risk-based approach for the proponent to employ to assess the potential to allow the use waste as a fill product. An auditor would be required to certify this material.

To demonstrate that the soil is fit for reuse, an assessment of the waste soil needs to be conducted including a risk assessment of the chemical substances likely to be present (where appropriate) and the risks posed to the proposed destination. In addition to the waste fill criteria, any other substances reasonably expected to be present based on knowledge of activities undertaken on the source site shall be tested for. This can be through a broad analysis or a more limited suite of analytes may be determined following a full assessment of the source site in accordance with the *Site Contamination NEPM*. Refer to Appendix 3 of the Standard.

The source of the waste soil, particularly if it is from a site where a potentially contaminating activity (PCA) has occurred, shall be one of the main factors for determining the assessment requirements for its use as WDF. Potentially contaminating activities are prescribed in the Environment Protection Regulations 2009.

3 EXECUTION

3.1 GEOTECHNICAL

As found site conditions

General: If the following are encountered, give notice immediately and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Discrepancies.
- Rock.
- Springs, seepages.

Inspection and testing

Inspection and testing: Conform to the following:

- Level 1 GITA required to AS 3798 clause 8.2.

3.2 RECORDS OF MEASUREMENT

Excavation and backfilling

Agreed quantities: If provisional quantities are specified, or there are variations to the contract levels or dimensions of excavations, do not commence backfilling or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations related to the datum.
- Final plan dimensions of excavations.
- Quantities of excavations in rock.

Method of measurement: By registered surveyor unless otherwise agreed.

3.3 REMOVAL OF TOPSOIL

General

Extent: Areas of cut or fill as shown on drawings 21414-2 to 21414-5.

3.4 EXCAVATION

General

Do not use explosives.

Extent

Site surface: Excavate over the site to give correct levels and profiles. Make allowance for compaction, settlement or heaving. Where existing fill exists, excavate existing fill down to firm natural soil.

Proof rolling

Extent: Proof roll excavations to determine the presence of any bad ground.

Proof rolling method and equipment: To AS 3798 clause 5.5.

Outcome: If excessive settlement, rebound or heaving is encountered, provide test pits or trenching to determine the extent of bad ground.

Disposal of excess excavated material

General: Remove excess excavated material from site not required or unsuitable for fill.

- Standard: To AS 3798 clause 6.1.8.

3.5 SUBGRADES AFFECTED BY MOISTURE

General

General: If the subgrade is unable to support construction equipment, or it is not possible to compact the overlying pavement only because of a high moisture content, perform one or more of the following:

- Allow the subgrade to dry until it will support equipment and allow compaction.
- Scarify the subgrade to a depth of 150 mm, work as necessary to accelerate drying, and recompact when the moisture content is satisfactory.
- Excavate the wet material and remove to spoil, and backfill excavated areas.

Where settlement of the filling of the site is on-going, preparation of the subgrade should be placed on hold until such time as the fill has settled.

3.6 REINSTATEMENT OF EXCAVATION

General

Cut subgrades: Where the over excavation is less than 100 mm, do not backfill. Rectify by increasing the thickness of the layer above.

3.7 PREPARATION FOR FILLING

Preparation

Stripping: Prepare the ground surface before placing fill to AS 3798 clause 6.1.5. Remove materials which will inhibit or prevent satisfactory placement of fill layers, loose material, debris and organic matter.

Compaction: Compact the ground exposed after stripping or excavation to the minimum relative compaction in AS 3798 Section 5 and the **Minimum relative compaction table**.

Scarify method: Loosen exposed excavation by scarifying to a minimum of 150 mm, moisture condition and compact to AS 3798 Section 5 and the **Minimum relative compaction table**.

Impact roller compaction: Use an approved impact roller or impact completion.

3.8 PLACING FILL AND SUB GRADE

General

Layers: Place fill in near-horizontal layers of uniform thickness, deposited systematically across the fill area. Layers shall not exceed 250mm (loose state) nor 200mm (fully compacted state).

Extent: Place and compact fill to the designated dimensions, levels, grades, and cross sections so that the surface is always self-draining.

Edges: At junctions of fill and existing surfaces, do not feather the edges.

Mix: Place fill in a uniform mixture.

Previous fill: Before placing subsequent fill layers, make sure that previously accepted layers still conform to requirements, including moisture content.

Protection: Protect adjoining structures from damage due to compaction operations. Commence compacting each layer at the structures and proceed away from it.

3.9 FILL MOISTURE CONTROL

General

Moisture content: Adjust the moisture content of fill during compaction within the range of 85 – 115% of the optimum moisture content determined by AS 1289.5.1.1 or AS 1289.5.2.1 as appropriate to achieve the required density.

3.10 COMPACTION REQUIREMENTS FOR FILL AND SUBGRADE

Density

General: Other than rolled fill, to AS 2870 clause 6.4.2(b). Compact the subgrade and each layer of fill to the required depth and density, as a systematic construction operation and to conform to the **Minimum relative compaction table**. Shape surfaces to provide drainage and prevent ponding.

Minimum relative compaction table

Location	Cohesive soils. Minimum dry density ratio (modified compaction) to AS 1289.5.4.1
Fill > 150mm below subgrade	92%
Fill < 150mm below subgrade	92%
Subgrade	92%

Excavated and stripped ground surface: After excavation and/or stripping, compact these surfaces in conformance with the **Minimum relative compaction table** to a minimum depth of 150 mm.

Compaction control tests

Compaction control tests: To AS 1289.5.4.1 or AS 1289.5.7.1.

Compaction control test frequency

Standard: To AS 3798 Table 8.1 (Type 1).

3.11 COMPLETION

Grading

External areas: Grade to give falls as per drawings 21414-2 to 21414-5.

05 PAVEMENT BASE AND SUBBASE

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide base and subbase courses as documented.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following worksection(s):

- *General Requirements*
- *Demolition*
- *Site Preparation*
- *Earthwork*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Precast Concrete*
- *Concrete Pavement*

1.3 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given in AS 1348 and the following apply:

- Absolute level tolerance: Maximum deviation from design levels.
- Base: Layer(s) of material forming the uppermost structural element of a pavement and on which the surfacing may be placed.
- Flexible pavement: A pavement which obtains its load-spreading properties from intergranular pressure, mechanical interlock and cohesion between the particles of the pavement material.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Subbase: Material laid on the subgrade (or selected material), below the base, either for the purpose of making up additional pavement thickness, to prevent intrusion of the subgrade into the base, or to provide a working platform.

1.4 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Prepared subgrade.
- Proof rolling of subbase before spreading of base.
- Proof rolling of base before sealing.

1.5 SUBMISSIONS

Materials

Source of material: Submit the supplier name, material type (crushed rock, natural gravel, recycled concrete aggregate) and source quarry or recycling site.

Compliance of material: Provide certification and test results from a NATA registered laboratory confirming that the material conforms to the documented requirements.

2 PRODUCTS

2.1 BASE AND SUBBASE MATERIAL

Granular material

Requirement: Provide unbound granular materials, including blends of two or more different materials, which when compacted develop structural stability and are uniform in grading and physical characteristics.

Crushed rock and recycled material class

Requirement: Provide crushed rock and recycled material as documented, from the following classes:

- Class 1: Pavement base material (with a minimum plasticity index) for unbound pavements requiring a very high standard of surface preparation for a sprayed sealed or thin asphalt surfacing.
- Class 2: Pavement base material (with no minimum plasticity index) for unbound pavements which may not require a very high standard of surface preparation.
- Class 3: Not applicable.
- Class 4: Subbase material for unbound flexible pavements.

3 EXECUTION

3.1 SUBGRADE PREPARATION

General

Requirement: Prepare the subgrade in conformance with the *Earthwork* worksection.

3.2 PLACING BASE AND SUBBASE

General

Weak surfaces: Do not place material on a surface that is weakened by moisture and is unable to support, without damage, the construction plant required to perform the works.

Spreading: Spread material in uniform layers without segregation.

Moisture content: Maintain wet mixed materials at the required moisture content before and during spreading. Add water to dry mixed materials through fine sprays to the entire surface of the layer after spreading, to bring the material to the required moisture content.

Compacted layer thickness: 200 mm maximum and 100 mm minimum. Provide layers of equal thickness in multilayer courses.

Joints

General: Plan spreading and delivery to minimise the number of joints. Offset joints in successive layers by a minimum of 300 mm.

Start of shift: Remix last 2 m of previous days' work for continuity of compaction.

Final trimming

General: Trim and grade the base course to produce a tight even surface with no loose stones or slurry of fines.

3.3 TOLERANCES

Surface level

General: Provide a finished surface which is free draining and evenly graded between level points.

Base abutting gutters: ± 5 mm from the level of the lip of the gutter, minus the design thickness of the wearing course.

Tolerances: Conform to the **Surface level tolerances table**. The tolerances apply to the finished level of each layer, unless overridden by the requirements (including tolerances) for the finished level and thickness of the wearing course.

Surface level tolerances table

Item	Level tolerance	
	Absolute	Relative
Subbase surface	+ 10 mm, - 25 mm	10 mm
Base surface	+ 10 mm, - 5 mm	5 mm

3.4 SUBBASE AND BASE COMPACTION

General

Construction operation: Compact each layer of fill to the required depth and density, as a systematic construction operation and to conform to the **Minimum relative compaction table**.

Minimum relative compaction table

Item description	Minimum dry density ratio (modified compaction) to AS 1289.5.2.1
Subbase	95%
Base	98%

Unstable areas: If unstable areas develop during rolling or are identified by proof rolling, open up, dry back and recompact, to the requirements of this worksection. If dry back is not possible, remove for the full depth of layer, dispose of and replace with fresh material.

Compaction requirements

General: Apply uniform compactive effort, over the whole area to be compacted, until the required density is achieved or until failure is acknowledged. If failure acknowledged, the subclause

Rectification applies.

Equipment: Use rollers appropriate to the materials and compaction requirements documented.

Moisture content

General: During spreading and compaction, maintain material moisture content within the range of -2% to +1% from the optimum moisture content (modified compaction).

Spraying: Use water spraying equipment to distribute water uniformly in controlled quantities over uniform lane widths.

Dry back: Allow material to dry back to 60% to 80% of the optimum moisture content before applying the seal or wearing course.

Rectification

General: If a section of pavement material fails to meet the required density or moisture content after compaction, remove the non-conforming material, dispose of off-site or rectify for re-use, replace with fresh material, and recompact.

Level corrections

General: Rectify incorrect levels as follows:

- High areas: Grade off.
- Low areas: Remove layers to a minimum depth of 75 mm, lightly tyne and replace with new material and recompact.

3.5 TESTING

Compaction control tests

Standard: To AS 1289.5.4.1 and AS 1289.5.4.2.

Frequency of compaction control tests

Shall be in accordance with AS 3798.

06 ASPHALT**1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide asphalt surfacing as documented in drawings 21414-2 to 21414-5.

Design

Authority requirements: All workmanship and materials shall comply with the relevant Department for Infrastructure and Transport and Clare and Gilbert Valleys Council Standard Specifications.

Performance

Requirements: Provide asphalt surfacing conforming to the following:

- Free draining and evenly graded between level points.
- Even and smooth riding.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- *General Requirements*
- *Demolition*
- *Site Preparation*
- *Earthwork*
- *Pavement Base and Subbase*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Precast Concrete*
- *Concrete Pavement*

1.3 STANDARDS**General**

Hot mix asphalt: To the recommendations of AS 2150.

1.4 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given below apply:

- Absolute level tolerance: Maximum deviation from design levels.
- Lot: A lot consists of any part of the works which has been constructed/manufactured under a continuous operation of uniform conditions and is essentially homogeneous with respect to material and general appearance. The whole of the work included in a lot is of a uniform quality without obvious changes in attribute values.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Relative compaction: The ratio between the field bulk density and the bulk density of the job mix when compacted in the laboratory.

1.5 TOLERANCES**Surface level**

General: Provide a finished surface which is free draining and evenly graded between level points.

Tolerances table

Item	Level tolerance	
Level (Longitudinal)	± 10 mm Absolute	5 mm Relative
Level (Transverse)	± 10 mm Absolute	10 mm Relative
Compacted layer thickness (Any one sample)	+ 10 mm, - 5 mm.	
Edges abutting gutters	± 5 mm from the level of the lip of the gutter.	
Shape	Conform to AS 2150 Table 15.	
Roughness	Conform to AS 2150 Table 16.	
The tolerances apply to the finished level of each layer, unless overridden by the requirements (including tolerances) for the finished level and thickness of the surface course.		

1.6 SUBMISSIONS**Execution details**

General: Submit proposals for work methods and equipment including the following:

- Survey control.
- Staging of the work, access and traffic control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.
- Methods and equipment for each operation.
- Material stockpiles.

Trial: Submit trial paving using the proposed job mix and all equipment as proposed. Trial may be incorporated into the final works, if satisfactory.

Trial length: 10m

Products and materials

Certificate of compliance: As an alternative to testing a product, submit the manufacturer's certificate together with the results of recent tests undertaken by the manufacturer, showing conformance with test criteria.

Proposals: Submit the following details before commencing production:

- Combined aggregate particle size distribution.
- Binder content expressed as a percentage of the total mix.
- The filler content expressed as a percentage by mass of the combined aggregates.
- The asphalt mix properties.
- The proposed mixing temperature.
- Sources of materials.
- Reclaimed asphalt pavement stockpile and proportion.

Samples

Requirement: Submit samples to AS 1141.3.1 at least one month before use.

- Granular materials: Submit samples of each proposed type and size of asphalt and cover aggregate.

Identification: Attach a tag to each sample showing relevant information including description, source and nominal size of material.

1.7 INSPECTION**Notice**

Inspection: Give notice so that inspection may be made of the following:

- Surface prepared for priming, sealing or asphalt surfacing.
- Commencement of asphalt surfacing.
- Completion of asphalt surfacing.

2 PRODUCTS

2.1 AGGREGATE

Properties

General: Clean, sound, hard, angular, of uniform quality, free from deleterious matter.

Standard: To AS 2758.5.

Mineral filler: To AS 2150 clause 4.2.

Combined aggregate grading: To AS 2150 clause 5.2.

Crushed slag: Air-cooled blast furnace slag of uniform quality, free from vesicular, glassy or other brittle pieces.

Fine aggregate: Clean, sound, hard, durable particles of natural sand or particles derived from crushed stone, gravel or slag, free from injurious coating or particles of clay, silt, loam or other deleterious matter.

Aggregate properties table

Property	Test method	Value
Particle shape	AS 1141.14	≤ 25 for wearing course ≤ 30 for binder course and corrective course
Wet strength	AS 1141.22	≥ 100 kN
Wet/dry strength variation	AS 1141.22	≤ 35%

2.2 TACK COATING

Properties

Bitumen emulsion: Rapid setting to AS 1160.

2.3 ASPHALT

General

Hot mix asphalt: To AS 2150.

Medium cut back bitumen: To AS 2157.

Bitumen emulsion: To AS 1160.

- Designation: Grade ASS/50

Bitumen binder: Class 170.

Mix design

Design: To AS/NZS 2891.5, AS 2150 clause 6 and the Marshall method:

- Marshall stability: Greater than 4.5 kN.
- Marshall flow: 2 mm to 4 mm.
- Voids in total mix (maximum theoretical density based on apparent specific gravity of aggregates):
 - . Wearing courses: 3% to 5%.
 - . Binder courses and 7 mm mixes: 4% to 6%.
- Voids in aggregate filled with bitumen:
 - . Wearing courses: 75% to 85%.
 - . Binder courses and 7 mm mixes: 70% to 80%.

Reclaimed asphalt pavement (RAP): To AS 2150 clause 4.6.

Warm mix asphalt additive

General: If required, include warm mix asphalt additive to asphalt to reduce the asphalt manufacturing temperature and/or to improve workability during the paving and compaction operations.

Product tests

General: Take samples from trucks at the mixing plant and test for mix properties using one of the following methods as appropriate:

Standard: To AS 2150 Table 9 and AS/NZS 2891.5.

- Marshall stability of compacted mix: Compactive effort:
 - . 35 blows for light traffic,
 - . 50 blows for general conditions
 - . 75 blows for heavy traffic or deep lifts.

Variations in mix properties

General: Make sure the maximum variation between the mix property of each sample and the job mix value conforms to the **Mix property table**.

Mix property table

Mix property	Maximum variation from job mix value
Aggregate passing 4.75 mm sieve or larger	± 7% by mass
Aggregate passing 2.36 mm to 300 µm sieves	± 5% by mass
Aggregate passing 150 µm sieve	± 2.5% by mass
Aggregate passing 75 µm sieve	± 1.5% by mass
Bitumen content	± 0.3% by mass
Added filler content	± 0.3% by mass
Mixing temperature	± 10 °C

2.4 OTHER MATERIALS

Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1.

3 EXECUTION

3.1 PREPARATION

Cleaning

Requirement: Immediately before priming or tack coating remove loose stones, dust and foreign material from the base surface using a power broom or blower. Keep traffic off the cleaned surface.

Priming

Requirement: Prime the base surface as soon as possible after compaction and finishing.

Potholes

Patching: Trim to a regular shape and a uniform depth of at least 75 mm, tack coat the edges and patch with asphaltic concrete.

Level anomalies

Requirement: Prepare adjacent asphaltic areas in conformance with **Potholes** to achieve uniform or tapered depth to match final levels.

Pre-treatment: Regulate to AS 2150 clause 14.3.2.

Tack coating

Application rate: Apply tack coat 30 to 120 minutes before asphalt surfacing is placed. Cover the surface uniformly at an application rate of 0.10 to 0.30 L/m² of residual binder.

3.2 SURFACING

Spreading

Conditions: Place asphalt surfacing in dry weather on dry pavement surface, at minimum pavement temperature of 10°C.

Operations: Spread the mix in layers covering the full width of the pavement, or in the case of carriageways and wide pavements, in lanes of 3 m wide minimum. Place layers in adjoining lanes to the same compacted thickness.

Self-propelled paving machine spreading: To AS 2150 clause 12.2.

Hand spreading: To AS 2150 clause 12.3.

Average thickness tolerance:

- Thickness > 50 mm: ± 10% of total thickness to a maximum of ± 15 mm.

Frequently check thickness: Measure uncompacted and compacted layer in conformance with AS 2150.

Protection

Adjacent surfaces: Protect adjacent surfaces during spraying.

Freshly spray surfaces: Protect from contamination.

Joints

Standard: To AS 2150 clause 12.6.

Requirement: Provide joints that are well bonded and sealed, with a smooth riding surface across the joint. Minimise the number of joints.

Transverse joints: Provide if the operation is stopped for more than 20 minutes or if pavement temperature falls below 90°C. Provide a straight vertical face for the full layer depth and offset in adjoining spreader runs and layer to layer by 1 m minimum.

Longitudinal joints: Offset joints from layer to layer by 150 mm minimum. Longitudinal joint locations in the wearing course to coincide with the lane line.

Edges: Form exposed edges of each spreader run while hot to a straight line with a dense face inclined between vertical and 45°.

Cold joints: Tack coat the surface of cold longitudinal and transverse joint before placing the adjoining asphalt.

Abutting structures

Level: Place asphalt surfacing to match the level of abutting surfaces such as kerbs, gutters, edge strips, access chamber covers, or adjoining pavement as for longitudinal and transverse joints.

Fill: Fill spaces left unfilled between the spreader run, abutting edges with sufficient surfacing material to the required height.

Matched junctions

Requirement: Where asphalt is to match an existing pavement, or other fixture, place the surfacing material to provide a smooth riding surface across the junction as follows:

- Remove existing pavement or taper the thickness of layers.
- Terminate layers at a 20 mm deep and 400 mm wide chase cut into the existing pavement.
- Coarse particles: Remove from a layer of tapering thickness using hand raking.

Tack coat: Where the thickness of the layer tapers to less than twice the nominal size of the mix, tack coat the surfacing area at a uniform application rate.

Existing sealed pavement: Trim the seal to a neat edge.

Compaction

Trimming: Before compaction, correct any irregularities in line or level. Trim lane edges to a straight line.

Rolling: Compact asphalt surfacing uniformly as soon as it will support rollers without undue displacement, and complete rolling while the mix temperature is above 90°C.

Density tests: Perform a field bulk density test for each test site from one of the following:

- On a core sample taken from the asphalt surfacing layer.
- If the nominal layer thickness is 50 mm or greater, measured in situ using a nuclear gauge.

Sample preparation: To AS/NZS 2891.2.1 and AS/NZS 2891.2.2, as appropriate.

Number of test per lot: To AS 2150, 6 tests per lot for simple/small works.

Nuclear gauge tests: To AS/NZS 2891.14.2.

Density criteria: Not less than 97% if the "Marshall" maximum density.

3.3 TESTING

General

Tests: Perform tests of the type and frequency necessary to control the materials and processes used in the construction of the works and as documented.

Process control tests

Records: Show the results of process control tests using control charts or graphs displayed on site in a readily accessible location and updated daily.

Methods: Use wet preparation methods where applicable.

Sampling: Timing and location to AS/NZS 2891.1.1.

Compliance assessment tests

Timing: Obtain material samples at the time of delivery to the site.

Location: Obtain sample from selected sites within designated test lots, consisting of surfacing areas placed, and/or compacted in one day. Test lots to be uniform in material properties and density.

3.4 COMPLETION

Non-conforming asphalt

Requirement: Remove asphalt surfacing, including defective joints and finish, to the full depth of the layer, and replace with conforming pavement.

Joints: Treat edges of remedial work as documented for cold joints.

Reinstating adjacent surfaces

Requirement: Reinstate surfaces next to new pavements and associated elements. Where an existing flexible road pavement has been disturbed, trim it back to a straight edge 250 to 300 mm from and parallel to the new concrete for the full depth of the slab. Backfill with asphalt rammed solid, using suitable rammers.

Removal: Dispose of any residual or non-conforming material to a location off site.

Finished pavement properties

Tolerances: Make sure finished pavement levels, thickness and shape conforms to **TOLERANCES**.

Non-conforming surfaces: Where tolerances are exceeded, remove and replace surface.

Cleaning

Spraying equipment: Flushing, if required, is to be contained. Return waste in a container to the depot for disposal.

Excess material: Sweep any excess material away from traffic lanes and remove.

Excavated material: Remove from site.

07 PAVEMENT ANCILLARIES**1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide pavement, kerbs and vehicle barriers, as documented.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following worksection(s):

- *General Requirements*
- *Demolition*
- *Site Preparation*
- *Earthwork*
- *Pavement Base and Subbase*
- *Asphalt*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Precast Concrete*
- *Concrete Pavement*

1.3 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given in AS 1348 and the following apply:

- Absolute level tolerance: Maximum deviation from design levels.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface

1.4 TOLERANCES**Vehicle barriers**

Plan position deviation: 50 mm.

Length: ± 20 mm.

2 PRODUCTS**2.1 VEHICLE BARRIERS**

In accordance with Drawings 21414-2 to 21414-8.

08 CONCRETE IN SITU

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide concrete in situ, as documented.

Performance

Requirements:

- Conforming to the design details and performance criteria.
- Satisfying the quality and inspection requirements.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *General Requirements*
- *Demolition*
- *Site Preparation*
- *Earthwork*
- *Pavement Base and Subbase*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Precast Concrete*
- *Concrete Pavement*

1.3 STANDARDS

General

Reinforced concrete construction: To AS 3600.

Specification and supply of concrete: AS 1379.

1.4 INTERPRETATION

General: For the purposes of this worksection the following definitions apply:

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Average ambient temperature: Average value of the daily maximum and minimum ambient temperatures over the relevant period at a site.
- Batch: A quantity of concrete containing a fixed quantity of ingredients and produced in a discrete operation.
- Concrete class:
 - . Normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise conforming to with AS 1379 clause 1.5.3.
- Early age strength: A mean compressive strength at 7 days exceeding the values shown in AS 1379 Table 1.2.
- Green concrete: Concrete which has set but not appreciably hardened.
- Production assessment: An assessment procedure for concrete specified by strength grade, carried out by the supplier on concrete produced by a specific supplying plant and based on the statistical assessment of standard compressive strength tests on concrete.
- Project assessment: An assessment procedure for concrete specified by strength grade, specified at the customer's option, which provides additional test data for the statistical assessment of concrete supplied to a specific project.

- Sample: A physical example that illustrates workmanship, materials or equipment, and establishes standards by which the work will be judged. It includes samples, prototypes and sample panels.
- Specimen: A portion of a sample which is submitted for testing.
- Weather:
 - . Cold: Ambient shade temperature less than 10 °C.
 - . Hot: Ambient shade temperature greater than 30 °C.

1.5 SUBMISSIONS

Design

Loading: Submit details of proposed construction systems, loads and procedures, including propping and re-shoring.

Execution details

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Changes to the concrete mix.
- Curing and protection methods.
- Curing period for low-pressure steam curing.
- Cutting or displacing reinforcement, or cutting or coring hardened concrete.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Placing under water.
- Sequence and times for concrete placement, and construction joint locations and relocations.
- Site storage, mixing and transport methods and equipment, if applicable.
- Temperature control methods.
- Sequence of concrete placement: Submit details of any proposed sequential placement of slab segments.
- Sawn joints: Submit details of proposed methods, timing and sequence of sawing joints.

Pre-mixed supply delivery dockets: For each batch, submit a docket listing the information required by AS 1379, and the following:

- Method of placement and climate conditions during pour.
- Name of concrete delivery supervisor.
- Project assessment carried out each day.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.
- The total amount of water added at the plant and the maximum amount permitted to be added at the site.

Products and materials

Product conformity: Submit evidence of conformity, as appropriate, as follows:

- Certification by a JAS-ANZ accredited third party.
- Report by a registered testing authority describing tests and giving results which demonstrate that the product conforms.

Concrete mixes: Submit details, for each grade and type of concrete including any proposed use of special-purpose cement types.

Curing compounds: Submit details of any proposed liquid membrane-forming curing compound, including the following:

- Certified test results for water retention to AS 3799 Appendix B.
- Evidence of compatibility with concrete, and with applied finishes including toppings and render, if any, including methods of obtaining the required adhesion.
- For visually important surfaces, evidence that an acceptable final surface colour will be obtained.

Admixtures: Submit details of any proposed admixtures, including the following:

- Brand name.
- Place of manufacture.
- Basic chemical composition.

Samples

Coloured concrete: Submit sample blocks of coloured concrete produced using the proposed mix and method before casting final concrete as follows:

- Number: 4.
- Size (nominal): 300 x 300 x 50 mm.

Shop drawings

Cores, fixings and embedded items: Submit the proposed locations, clearances and cover and show any proposed repositioning of reinforcement.

Subcontractors

Pre-mixed supply: Submit names and contact details of proposed pre-mixed concrete suppliers and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

Tests

Requirement: Submit test results, as follows:

- Concrete compressive strength test results to AS 1012.9.
- Other concrete properties. Test results as documented in the **Tests schedule**.

1.6 INSPECTION**Notice**

Inspection: Give notice so that inspection may be made of the following:

- Base or subgrade before covering.
- Completed formwork and reinforcement, tendons, cores, fixings and embedded items fixed in place.
- Concealed surfaces or elements before covering.
- Commencement of concrete placing.

2 PRODUCTS**2.1 MATERIALS****General**

Stockpile: If uniform, consistent colour is documented, stockpile sand, cement and aggregates.

Aggregates

Standard: To AS 2758.1.

Cement

Standard: To AS 3972.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

Water

Standard: To AS 1379 clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/l of chloride ions.

Polymeric film underlay

Vapour barriers and damp-proofing membranes: To AS 2870 clause 5.3.3.

Chemical admixtures

Standard: To AS 1478.1.

Curing compounds

Standard: To AS 3799.

2.2 CONCRETE**Properties**

Concrete mix and supply: Conform to the following:

- Normal-class: To AS 1379 clause 1.5.3.
 - . Properties: As documented in the **Concrete properties schedule - performance**.

2.3 TESTING

General

Test authority: Concrete supplier or a registered testing authority.

Reports and records of test results: To the relevant parts of the AS 1012 series. Keep results on site.

Assessment process of test results

Standard: To AS 1379.

Method of assessment: Project assessment.

Sampling

Method of sampling: AS 1012.1.

Sampling locations: To AS 1012.1 and the following:

- Slump tests: On site, at the point of discharge from the agitator.
- Compressive strength tests: Spread the site sampling evenly throughout the pour.

Frequency of sampling: To AS 1379 Sections 5 and 6 and the following:

- Slump tests: Take at least one sample from each batch.
- Compressive strength tests: To the **Project assessment strength grade sampling table**.

Project assessment strength grade sampling table

Number of batches for each type and grade of concrete per day	Minimum number of samples: Columns and load bearing wall elements/batch	Minimum number of samples: Other elements/day
1	1	1
2-5	1	2
6-10	1	3
11-20	1	4
each additional 10	1	1 additional

Making and curing of specimens

General: To AS 1012.8.1 and AS 1012.8.2.

Specimen size:

- Aggregate size \leq 20 mm: Nominally 200 x 100 mm diameter.
- Aggregate size $>$ 20 mm: Nominally 300 x 150 mm diameter.

Test methods

General: To the relevant parts of the AS 1012 series.

Acceptance criteria:

- General: As documented in the **Concrete properties schedule – performance**.
- Early age compressive strength: As documented in the **Control tests schedule**.

Slump tests: Assess slump for every batch. Perform slump test on each strength sample.

Drying shrinkage at 56 days: To AS 1012.8.4 and AS 1012.13.

Other concrete properties tests: As documented in the **Tests schedule**.

3 EXECUTION

3.1 CONCRETE

General

Performance properties: As documented in the **Concrete properties schedule – performance**.

Elapsed delivery time

General: Make sure that the elapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10 °C or above 30 °C unless approved heating or cooling measures are taken to deliver concrete within the range 5 °C to 35 °C.

Elapsed delivery time table

Concrete temperature at time of discharge (°C)	Maximum elapsed time (minutes)
10 – 24	120
24 – 27	90
27 – 30	60
30 – 32	45

Pre-mixed supply

Addition of water: To AS 1379 clause 4.2.3.

Transport method: Select to prevent segregation, loss of material and contamination of the environment, and not to adversely affect placing or compaction.

Site mixed supply

Emergencies: If mixing by hand, provide details.

Plant: Mix concrete in plant located on the construction site.

3.2 CORES, FIXINGS AND EMBEDDED ITEMS**Adjoining elements**

Fixings: Provide fixings for adjoining elements. If required, provide temporary support to the adjoining elements during concreting, to prevent movement.

Protection

General: Grease threads. Protect embedded items against damage.

Compatibility: Provide inserts, fixings and embedded items that are compatible with each other, with the reinforcement and with the documented concrete mix and the documented surface finish.

Corrosion: In external or exposed locations, galvanize anchor bolts and embedded fixings or submit proposed alternate materials.

Structural integrity

Position: Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, displace but do not cut reinforcement, and maintain cover to reinforcement.

Isolation: Isolate embedded items to prevent water tracking to concrete providing minimum cover to reinforcement.

Tolerances

General: Maximum deviation from correct positions:

- Cores and embedded items generally: 10 mm.

3.3 PLACING AND COMPACTION**Placing**

Horizontal transport: Use suitable conveyors, clean chutes, troughs, hoppers or pipes.

Methods: Avoid segregation and loss of concrete, and minimise plastic settlement. Maintain a nominally vertical and plastic concrete edge during placement.

Horizontal elements: Place concrete in layers not more than 300 mm thick. Compact the following layer into previous layer before previous layer has taken initial set.

Compaction

Methods: Use immersion and screed vibrators accompanied by hand methods as appropriate to remove entrapped air and to fully compact the mix.

Vibrators: Do not allow vibrators to contact set concrete, reinforcement or items including pipes and conduits embedded in concrete. Do not use vibrators to move concrete along the formwork. Avoid causing segregation by over-vibration.

Placing records

Log book: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.

- The portion of work.
- Volume placed.

Rain

Protection: During placement and before setting, protect the surface from damage.

Vertical elements

Placement: Limit the free fall of concrete to maximum of 2000 mm. Place concrete in layers not more than 300 mm high.

Placing in cold weather

Cement: Do not use high alumina cement.

Temperature limits: Maintain the following temperature limits:

- Freshly mixed concrete: $\geq 5^{\circ}\text{C}$.
- Formwork and reinforcement before and during placing: $\geq 5^{\circ}\text{C}$.
- Water: Maximum 60°C when placed in the mixer.

Severe weather: If severe weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is within the documented limits.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any formwork, materials, and equipment coming in contact with the concrete.

Freezing: Prevent concrete from freezing.

Placing in hot weather

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses.

Temperature limits: Maintain freshly mixed concrete at the following temperature limits:

- Normal concrete in footings, beams, columns, walls and slabs: $\leq 35^{\circ}\text{C}$.
- For concrete strength grade less than 40 MPa with section thickness ≥ 1 m in all dimensions: $\leq 27^{\circ}\text{C}$.
- For concrete strength grade 40 MPa or greater with section thickness ≥ 600 mm in all dimensions: $\leq 27^{\circ}\text{C}$.
- Formwork and reinforcement before and during placing: $\leq 35^{\circ}\text{C}$.

Evaporation control barriers: Erect barriers to protect freshly placed concrete from drying winds.

Temperature control: Select one or more of the following methods of maintaining the temperature of the placed concrete at 35°C or less:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover horizontal transport containers.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water.

Placing under water

General: Do not place under water unless conditions prevent dewatering.

Minimum cement content for the mix: Increase by 25%.

3.4 CURING**General**

Requirements: Taking into account the average ambient temperature at site over the relevant period affecting the curing, adopt procedures to make sure of the following:

- Curing: Cure continuously from completion of finishing until the total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above 10°C , conforms to the following, unless accelerated curing is adopted:
 - . Fully enclosed internal surfaces/Early age concrete: 3 days.
 - . Other concrete surfaces: 7 days.
- End of curing period: Prevent rapid drying out at the end of the curing period.

- Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

Curing compounds

Application: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken at least for the required curing period after application.

Substrates: Do not use wax-based or chlorinated rubber-based curing compounds on surfaces forming substrates to applied finishes, concrete toppings and cement-based render.

Self levelling toppings: If used also as curing compounds, conform to AS 3799.

Cold weather curing

Temperature: Maintain concrete surface temperatures above 5 °C for the duration of the curing period.

Hot weather curing

Curing compounds: If curing compounds are proposed, provide details.

Protection: Select a protection method from the following:

- If the concrete temperature is more than 25 °C or if not protected against drying winds, protect the concrete using a fog spray application of aliphatic alcohol evaporation retardant.
- If ambient shade temperature is more than 35 °C, protect from wind and sun using an evaporative retarder until curing is commenced.
- Immediately after finishing, either cover exposed surfaces using an impervious membrane or hessian kept wet until curing begins, or apply a curing compound.

Water curing

Method: Select a method of ponding or continuously sprinkling to prevent damage to the concrete surface during the required curing period.

3.5 COMPLETION

Protection

General: Protect the concrete from damage due to construction load, physical and thermal shocks, and excessive vibrations, particularly during the curing period.

Surface protection: Protect finished concrete surfaces and applied finishes from damage.

4 SELECTIONS

4.1 SCHEDULES

Concrete properties schedule – performance

Property	A
Normal and special class	Normal
Air entrainment – air volume (%)	5% Maximum
Maximum aggregate size (mm)	20mm
Assessment process	Slump (ASTM C 143)
Strength grade/characteristic compressive strength f_c (MPa)	32

Tests schedule

Property	Test method
Bleeding	To AS 1012.6
Density of hardened concrete	To AS 1012.12.1 or AS 1012.12.2
Density of plastic concrete	To AS 1012.5
Indirect tensile strength	To AS 1012.10

Property	Test method
Modulus of rupture (flexural strength)	To AS 1012.11

Control tests schedule

Concrete element	28 day strength	Early strength (MPa)	Days after pouring
Normal	32	20	7 days

Material tests schedule

Material	Test method
Admixtures (each type used)	To AS 1478.1
Coarse aggregate, dense and lightweight: LA value	To AS 1141.23
Coarse aggregate, dense and lightweight: Particle density and water absorption	To AS 1141.6.1
Coarse aggregate, dense and lightweight: Particle size analysis	To AS 1141.11.1 and AS 1141.12
Coarse aggregate, dense and lightweight: Soundness	To AS 1141.24
Fine aggregate: Friable particles	To AS 1141.32
Fine aggregate: Light particles	To AS 1141.31
Fine aggregate: Organic impurities	To AS 1141.34
Fine aggregate: Particle size analysis	To AS 1141.11.1 and AS 1141.12
Fine aggregate: Particle density and water absorption	To AS 1141.5
Fine aggregate: Soundness	To AS 1141.24
Fine aggregate: Sugar	To AS 1141.35
Fly ash	To AS 3582.1
Ground slag	To AS 3582.2
General purpose and blended cement (each type used)	To AS 3972

09 CONCRETE REINFORCEMENT

1 GENERAL**1.1 RESPONSIBILITIES****General**

Requirement: Provide concrete reinforcement, as documented.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- *General Requirements*
- *Demolition*
- *Site Preparation*
- *Earthwork*
- *Pavement Base and Subbase*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Auxiliary Concrete Works*
- *Precast Concrete*
- *Concrete Pavement*

1.3 STANDARDS**General**

Reinforced concrete construction: To AS 3600.

1.4 TOLERANCES**General**

Fabrication and fixing: To AS 3600 clause 17.2.

Reinforcement position: To AS 3600 clause 17.5.3.

1.5 SUBMISSIONS**Execution details**

Reinforcement: Submit the following:

- General: Details of any proposed changes to documented reinforcement.
- Damaged galvanizing: Details of proposed repair to AS/NZS 4680 Section 8.
- Mechanical bar splices: Details and test certificates for each size and type of bar to be spliced.
- Provision for concrete placement: Details of spacing or cover to reinforcement that does not conform to AS 3600.
- Splicing: Details of any proposed changes to documented requirements.

Products and materials

Reinforcement strength and ductility: Submit type-test reports as evidence of conformance to AS 3600 Table 3.2.1 for each reinforcement type.

1.6 INSPECTION**Notice**

Inspection: Give notice so that inspection may be made of the following:

- Cores and embedments fixed in place.
- Reinforcement fixed in place, with formwork completed.

2 PRODUCTS

2.1 MATERIALS

Steel reinforcement

Standard: To AS/NZS 4671

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which would reduce the bond between the reinforcement and concrete.

Protective coating

Standard: To AS 3600 clause 17.2.1.2.

General: For concrete elements containing protective coated reinforcement, provide the same coating type to all that element's reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules, and protect other embedded metals with a suitable coating.

Epoxy coating: Provide a high build, high solids, chemically resistant coating.

- Thickness: 200 µm minimum.

Galvanizing: To AS/NZS 4680, as follows:

- Sequence: If fabricating after galvanizing, repair damaged galvanizing and coat cut ends.
- Zinc-coating (minimum): 600 g/m².

Tie wire

General: Annealed steel 1.25 mm diameter (minimum).

External and corrosive applications: Galvanized.

3 EXECUTION

3.1 CONSTRUCTION

Dowels

Fixing: If a dowel has an unpainted half, embed in the concrete placed first.

Tolerances:

- Alignment: 1:150.
- Location: ± half the diameter of the dowel.

Grade: 500 N.

Cover

Concrete cover generally: 40mm.

Supports

Proprietary concrete, metal or plastic supports: To AS/NZS 2425 and as follows:

- Able to withstand construction and traffic loads.
- With a protective coating if they are ferrous metal, located within the concrete cover zone, or are used with galvanized or zinc-coated reinforcement.
- Spacing:
 - . Bars: ≤ 60 diameters.
 - . Mesh: ≤ 800 mm.

Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.

Tying

General: Secure the reinforcement against displacement at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of formwork or unformed faces to prevent the ties projecting into the concrete cover.

Columns: Secure longitudinal column reinforcement to all ties at every intersection.

Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections.

10 AUXILIARY CONCRETE WORKS

1 GENERAL**1.1 RESPONSIBILITIES****General**

Requirement: Provide cast and pre-cast concrete, as documented.

1.2 CROSS REFERENCES**General**

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- *General Requirements*
- *Demolition*
- *Site Preparation*
- *Earthwork*
- *Pavement Base and Subbase*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Precast Concrete*
- *Concrete Pavement*

1.3 STANDARDS**General**

Specification and supply of concrete: To AS 1379.

Concrete materials, design and construction: To AS 3600.

Concrete structures for retaining liquids: To AS 3735.

1.4 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given in AS 1379, AS 3600 and the following apply:

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Early age strength: A mean compressive strength at 7 days exceeding the values shown in AS 1379 Table 1.2.
- Expansion joint: A closing control joint with the joint surfaces separated by a compressible filler to allow axial movement due to thermal expansion or contraction with changes in temperature or creep. It may include unbound dowels to assist vertical deflection control.
- Sprayed concrete: Concrete pneumatically applied at high velocity on to a surface. Application may be either a wet or dry process, to produce a sound homogeneous product with a surface finish reasonably uniform in texture and free from blemishes.
- Weather:
 - . Cold: Ambient shade temperature < 10 °C.
 - . Hot: Ambient shade temperature > 30 °C.

1.5 SUBMISSIONS**Certification**

Design: Submit certification verifying conformance of the formwork design for precast concrete bridge deck and southern bridge end piers.

Completed formwork: Submit certification verifying conformance of completed formwork, including the suitability of the formwork for the documented surface finish class.

Execution details

Modifications: Submit details of any proposed on-site modifications to the documented reinforcement.

Welding: Submit details of any proposed welding of steel reinforcement.

Splicing: Submit details of any proposed mechanical splicing of steel reinforcement.

Galvanizing repair: Submit proposals for any repair to damaged galvanizing of steel reinforcement.

Coring: Submit details of any proposed cutting or coring required in hardened concrete.

Elapsed delivery time: Submit details of any proposed methods for cooling or heating wet concrete before placement.

Measurement of materials: Submit proposal to measure materials by volume for on-site mixing for minor concrete works.

Placing: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Changes to the concrete mix.
- Curing and protection methods.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Site storage, mixing and transport methods and equipment, if applicable.
- Temperature control methods.
- Details of any proposed sequential placement of slabs.

Placing under water: Submit detailed method statement for proposed placement of concrete under water.

Construction joints: Submit details of any emergency construction joints included in the works.

Repair of defects: Submit details of the proposed method of defect repair.

Surface repairs: Submit details of the proposed method of surface repair.

Method statement: Submit method statement for all sprayed concrete works.

Products and materials

Curing compounds: Submit details of any proposed liquid membrane forming curing compound, including evidence of conformance to the documented requirements.

Machine mixing: Submit details of proposed concrete mix when on-site machine mixing is proposed.

Shop drawings

Submit shop drawings to a scale that best describes the detail, showing the following:

- Location: The location of any cores, fixings or embedded items, including any requirement to displace reinforcement.

Subcontractors

Pre-mixed subcontractors: Submit details of proposed pre-mixed concrete suppliers.

Tests

Quality: Submit results of testing to **ANNEXURE – MAXIMUM LOT SIZE AND MINIMUM TEST FREQUENCIES**.

Cores and test acceptance: Submit proposed locations of test cores.

Other tests: Submit results, as follows:

- Loading: If applying superimposed loads to a future load bearing concrete structure, within 21 days of placing concrete, complete tests to demonstrate that 95% of the concrete design strength has been achieved.

1.6 INSPECTIONS

Notice

General: Give notice so that inspection may be made of the following:

- Base preparation: Completed and prepared base before laying underlay or placing concrete.
- Completed formwork: Completed formwork following certification by professional engineer.
- Steel reinforcement placement: Completed steel reinforcement placement before placing concrete.
- Galvanizing repair: Any repaired galvanizing of steel reinforcement before placing concrete.
- Emergency hand mixing: Emergency hand mixing of concrete due to mechanical failure.

- Sprayed concrete sample panels: Concrete spraying of sample panels.

2 MATERIALS

2.1 GENERAL

Consistency

Stockpile: If uniform, consistent colour is documented, stockpile sand, cement and aggregates at the beginning of the project to minimise colour variations.

Aggregates

Standard: To AS 2758.1.

Coarse aggregate:

- Wear (Loss of weight): < 30%.
- Crushing value: < 25%.
- Sulphate soundness: < 12% (loss of mass).
- Particle shape: < 35% (misshapen 2:1 ratio).

Cement

Standard: To AS 3972.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

Water

Standard: To AS 1379 clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/l of chloride ions.

2.2 CONCRETE

Properties

Concrete mix and supply: Conform to the following:

- Normal-class: To AS 1379 clause 1.5.3.

2.3 FORMWORK

General

Form linings, facings and release agents: Compatible with any finishes applied to concrete.

Lost formwork: Free of timber or chlorides, and not to impair the structural performance of the concrete members.

Plywood formwork

Material: To AS 6669.

Grade: To suit the documented design dimensions, loading and surface quality.

Joints: Seal the joints consistent with the surface finish class.

2.4 REINFORCEMENT

Steel reinforcement

Standard: To AS/NZS 4671.

Fabrication tolerances: To AS 3600 clause 17.2.2.

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which would reduce the bond between the reinforcement and concrete.

Storage: Store reinforcement above the surface of the ground and protect from damage and from deterioration by exposure.

Protective coating

Standard: To AS 3600 clause 17.2.1.2.

Requirement: For concrete elements containing protective-coated reinforcement, provide the same coating type to all that element's reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules, and protect other embedded metals with a suitable coating.

Epoxy coating: High build, high solids chemically resistant coating.

- Thickness: 200 µm minimum.

Galvanizing: To AS/NZS 4680:

- Sequence: If fabricating after galvanizing, repair damaged galvanizing and coat cut ends.
- Zinc-coating (minimum): 600 g/m².

Tie wire

General: Galvanized annealed steel 1.25 mm diameter (minimum).

2.5 PRECAST UNITS

General

Requirement: Provide proprietary precast units as documented in drawings 21414-0 to 21414-8.

Marking

Identification: Identify all units with easily visible markings that will be hidden once the unit is installed, including the following:

- Date of manufacture.
- Manufacturer's name or registered mark and location of manufacture.
- Maximum mass of unit in kg.
- Batch number.
- Correct orientation of unit.

2.6 MISCELLANEOUS

Surface hardeners, sealants and protectors

Supply: If documented, provide proprietary products to the manufacturer's recommendations.

Chemical admixtures

Standard: To AS 1478.1.

Curing compounds

Standard: To AS 3799.

2.7 TESTING

Quality

Requirement: Test for all characteristics in conformance with **ANNEXURE – MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

Quality verification: If material/product quality verification can be obtained from the supplier, documented tests need not be repeated.

3 EXECUTION

3.1 GROUND PREPARATION

Rock foundations

Minimum depth: Excavate a minimum depth of 200 mm into the rock for end piers supporting southern bridge.

Base preparation

Requirement: Prepare base, as follows:

- Graded prepared subgrade: Blind with sand to create a smooth surface free from hard projections. Wet the sand just before laying the underlay, where documented.
- Concrete blinding: Remove projections above the plane surface, and any loose material.

3.2 FORMWORK

General

Standard: To AS 3610 and AS 3610.1.

Robustness: Provide formwork of adequate strength to carry all applied loads, including the pressure of fresh concrete, vibration loads, weight of workers and equipment, without loss of shape.

Stripping: Provide forms that can be removed without causing damage to the completed structure.

Side forms: In earth excavations, provide side forms to prevent contact between concrete and the in situ earth.

Corners above ground: Provide 25 mm bevelled fillet at re-entrant angles, and chamfer at corners.

Steel linings: Clean off any rust and apply rust inhibiting agent before use.

Design

General: The design of formwork is the contractor's responsibility.

Certification: Obtain certification by a professional structural engineer, experienced in formwork design, verifying conformance of the design.

Fittings and embedments

Requirement: Make provision for the accurate location and firm support of fittings, bolts, anchorages and formers of holes and recesses, as documented.

Temporary fittings for the support of the formwork: Arrange to allow removal without damage to the concrete.

Embedments: Fix through formwork to prevent movement, or loss of slurry or concrete, during concrete placement.

Openings

Inspection: In vertical forms, provide form openings or removable panels for inspection and cleaning at the base of columns, walls and deep beams.

Access: For thin walls provide access hatches for placing concrete so that concrete does not fall a distance greater than 2 m.

Release agents

Application: Before placing reinforcement, apply a release agent to form linings and facings.

Staining: If commercial quality form oil or grease is used, make sure that surfaces to be exposed will not become stained or discoloured.

Application: Spread the coating uniformly in a thin film and remove any surplus before placing concrete.

Unlined timber forms: Wet the timber thoroughly before oiling.

Completed formwork

Certification: Obtain certification by a professional engineer, experienced in formwork design and construction, verifying conformance of the completed formwork, including the suitability of the formwork for the documented surface finish class.

3.3 STEEL REINFORCEMENT PLACEMENT

General

Fixing: To AS 3600 clause 17.2.5 and as documented.

Modifications

Requirement: Record any on-site modifications to the documented reinforcement, including position, splice location, spacing or cover, to accommodate concrete placement or the requirements of AS 3600.

Dowels

Fixing: If a dowel has an unpainted half, embed this in the concrete placed first.

Grade: 500 N.

Cover

Concrete cover generally: 40mm unless note otherwise on drawings 21414-0 to 21414-8.

Supports

Proprietary concrete, metal or plastic supports: To AS/NZS 2425 and as follows:

- Able to withstand construction and traffic loads.

Spacing:

- Bars: ≤ 60 bar diameters.
- Mesh: ≤ 800 mm.

Tying

General: Secure the reinforcement against displacement at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of forms so that the ties do not project into the concrete cover.

Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections

Welding

General: If welding of reinforcement is proposed, conform to AS/NZS 1554.3.

Bending

Restriction: Use only bars with bends as documented. If required to bend or straighten bars do not use heat and use only methods that will not damage the steel.

Splicing

Standard: To AS 3600 clause 13.2.

Lapped splices: Provide laps in reinforcing bars as documented and securely tie together in a minimum of two places.

Lapping of reinforcing mesh: Overlap each sheet of reinforcing mesh a minimum length of the spacing of the wires running perpendicular to the edge of the sheet, plus 25 mm.

Staggering: Stagger splices as documented.

Galvanizing repair

Damaged galvanizing: If galvanizing is damaged, propose repairs to AS/NZS 4680 Section 8.

3.4 CORES, FIXINGS AND EMBEDDED ITEMS

Location

Requirement: Produce shop drawings showing the proposed locations, clearances and cover of any cores, fixings or embedded items, indicating any proposed repositioning or displacement of reinforcement.

Coring

Requirement: If cutting or coring of hardened concrete is proposed, prepare details.

Adjoining elements

Fixings: Provide fixings -for adjoining elements. If required, provide for temporary support to the adjoining elements during concreting, to prevent movement.

Protection

General: Grease threads. Protect embedded items against damage.

Compatibility: Provide inserts, fixings and embedded items that are compatible with each other, with the reinforcement and with the documented concrete mix and the documented surface finish.

Corrosion: In external or exposed locations, galvanize anchor bolts and embedded fixings.

Structural integrity

Position: Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, displace but do not cut reinforcement, and maintain cover to reinforcement.

Isolation: Isolate embedded items so that water cannot track to concrete providing minimum cover to reinforcement.

Tolerances

Requirement: Maximum deviation from correct positions:

- Cores and embedded items generally: 10 mm.

3.5 PRE-MIXED -CONCRETE SUPPLY

General

Addition of water: To AS 1379 clause 4.2.3.

Transport and production equipment: Use equipment which:

- Prevents segregation or loss of materials.
- Supplies a homogenous product suitable for placing and compaction.

Delivery information: For each batch, obtain a delivery docket and keep a record of the information required by AS 1379, and the following:

- Method of placement and climate conditions during pour.
- Name of concrete delivery supervisor.
- Project assessment carried out each day.
- The amount of water, if any, added at the site.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.

- The total amount of water added at the plant and the maximum amount permitted to be added at the site.

Pre-mixed concrete subcontractors

Requirement: Compile a list of names and contact details of proposed pre-mixed concrete suppliers, and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

Elapsed delivery time

General: Make sure that the e-lapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10 °C or above 30 °C unless approved heating or cooling measures are taken to deliver concrete within the range 5 °C to 35 °C.

Elapsed delivery time table

Concrete temperature at time of discharge (°C)	Maximum elapsed time (minutes)
10 – 24	120
24 – 27	90
27 – 30	60
30 – 32	45

3.6 ON-SITE MIXING

Machine mixing

Requirement: Mix all materials by machine, conforming to the following:

- Mixer requirements: Use a mixer which will uniformly distribute the materials throughout the batch.
- Mixer capacity: Use a mixer with capacity for one or more whole bags of cement to be used per batch of concrete. Do not exceed the manufacturer’s rated capacity of the mixer with the volume of the mixed material.
- Mixing time: Allow a mixing time for each batch of not less than 1.5 minutes after all ingredients are assembled in the mixer, and before any portion of the batch is removed.
- Total mix discharge: Discharge the entire contents of a batch from the mixer before placing any new materials in the mixer for the next batch.

Emergency hand mixing

Restrictions: Hand mixing is only permitted if there is a breakdown of mechanical mixing equipment. Provide notice if hand mixing is required and conform to the following:

- Hand mix in small quantities no greater than 0.25 m³ per batch, to complete a section of the work or reach a suitable construction joint. Do not start a new section of work.
- Hand mix on a water-tight platform of sufficient size to allow the mixing of at least two batches simultaneously. Use an amount of cement 10% more than required for machine mixed concrete.

Procedure: Conform to the following:

- First mix the fine aggregate and cement until a uniform colour is obtained, and then spread on the mixing platform in a thin layer.
- Spread the coarse aggregate, previously drenched with water, over the fine aggregate and cement in a uniform layer, and turn the whole mass over as further water is added with a rose sprinkler.
- After the water is added, turn the mass at least three times, not including shovelling into barrows or forms, until the mixture is uniform in colour and appearance.

Measurement of materials

General: Measure all materials by weight, except if necessary:

- Water: Measure by volume with an approved adjustable water-measuring and discharging device.
- Cement: Measure by bags as packed by the manufacturer. Proportion batches on the basis of one or more unbroken bags of cement, assumed to weigh 40 kg per bag.

Bulk cement: Weigh in an individual hopper and keep separate from the aggregates until the components of the batch are discharged from the batching hopper.

Measurement by volume for minor works: Not permitted, without approval.

Measuring by volume: Minor concrete works only

Mixing by volume on site: If measurement by volume is approved, proportion the materials to produce a mix free of voids and having the documented strength at 28 days.

Volume batching: Use the nominal proportions documented in the **Volume batching table**.

Volume batch table

MPa	Parts by volume		
	Cement	Fine aggregate	Coarse aggregate
32	1	2.5	4

Fine aggregate bulking: If the fine aggregate contains sufficient moisture to produce 'bulking' in excess of 10%, increase the volume of fine aggregate by a corresponding amount.

Batch measurement: Measure the volumes of fine and coarse aggregates for each batch in boxes or bins, as follows:

- Measure the aggregates loose (i.e. without compaction) in the boxes and strike off level.
- Do not undertake measurements by shovels or like methods.
- Arrange batch proportions for each batch to contain 1 bag of cement. Assume one 40 kg bag of cement to have a volume of 27.5 litres.

3.7 PLACING AND COMPACTION**Preparation**

Cleaning: Before placing concrete, remove free water, dust, debris and stains from the area, the forms and the formed space.

Water: Moisten the area before placing concrete: Remove any ponding water.

Placing

Method: Avoid segregation and loss of concrete, and minimise plastic settlement. Maintain a nominally vertical and plastic concrete edge during placement.

Horizontal elements: Place concrete in layers not more than 300 mm thick. Compact the following layer into previous layer before previous layer has taken initial set.

Vertical elements: Limit the free fall of concrete to a maximum of 2 m. Place concrete in layers not more than 300 mm high.

Compaction

Methods: Use immersion and screed vibrators accompanied by hand methods as appropriate to remove entrapped air and to fully compact the mix.

Vibrators: Do not allow vibrators to contact set concrete, reinforcement or items including pipes and conduits embedded in concrete. Do not use vibrators to move concrete along the formwork. Avoid causing segregation by over-vibration.

Placing records

Log book: -Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.
- The portion of work.
- Volume placed.

Rain

Protection: During placement and before setting, protect the surface from damage.

Placing in cold weather

Cement: Do not use high alumina cement.

Temperature limits: Maintain the following temperature limits:

- Freshly mixed concrete: ≥ 5 °C.
- Formwork and reinforcement before and during placing: ≥ 5 °C.
- Water: Maximum 60 °C when placed in the mixer.

Severe weather: If severe weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is within the documented limits.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any formwork, materials, and equipment coming in contact with the concrete.

Freezing: Prevent concrete from freezing.

Placing in hot weather

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses.

Temperature limits: Maintain freshly mixed concrete at the following temperature limits:

- Normal concrete in footings, walls, slabs, culverts and drainage structures: $\leq 35\text{ }^{\circ}\text{C}$.
- For concrete strength grade less than 40 MPa, with section thickness $\geq 1\text{ m}$ in all dimensions: $\leq 27\text{ }^{\circ}\text{C}$.
- For concrete strength grade 40 MPa or greater, with section thickness $\geq 600\text{ mm}$ in all dimensions: $\leq 27\text{ }^{\circ}\text{C}$.
- Formwork and reinforcement before and during placing: $\leq 35\text{ }^{\circ}\text{C}$.

Evaporation control barriers: Erect barriers to protect freshly placed concrete from drying winds.

Temperature control: Select one or more of the following methods of maintaining the temperature of the placed concrete at $35\text{ }^{\circ}\text{C}$ or less:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover horizontal transport containers.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water.

Placing under water

General: Do not place under water unless conditions prevent dewatering.

Minimum cement content for the mix: Increase by 25%.

Method: Prepare a detailed method statement if proposing to place concrete under water.

Extruded concrete

Surface slurry: Where the extrusion machine is equipped with a slurry receptacle place small quantities of cement-sand slurry, comprising two parts plasterer's sand and one part cement (by volume), together with sufficient water to bring it to a semi-fluid condition, and feed onto the surface of the concrete at a rate sufficient to produce a smooth and uniform finish.

3.8 CURING

General

Requirements: Taking into account the average ambient temperature at site over the relevant period affecting the curing, adopt procedures to make sure of the following:

- Curing: Cure continuously from completion of finishing until the total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above $10\text{ }^{\circ}\text{C}$, conforms to the following, unless accelerated curing is adopted:
 - . Early age concrete: 3 days.
 - . Other concrete: 7 days.
- End of curing period: Prevent rapid drying out at the end of the curing period.
- Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

Curing compounds

Application: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken at least for the required curing period after application.

Substrates: Do not use wax-based or chlorinated rubber-based curing compounds on surfaces forming substrates to applied finishes, concrete toppings and cement-based render.

Self-levelling toppings: If used also as curing compounds, conform to AS 3799.

Cold weather curing

Temperature: Maintain concrete surface temperatures above 5 °C for the duration of the curing period.

Hot weather curing

Protection: Select a protection method as applicable.

- If the concrete temperature is more than 25 °C or if not protected against drying winds, protect the concrete using a fog spray application of aliphatic alcohol evaporation retardant.
- If ambient shade temperature is more than 35 °C, protect from wind and sun using an evaporative retarder until curing is started.
- Immediately after finishing, either cover exposed surfaces using an impervious membrane or hessian kept wet until curing begins, or apply a curing compound.

Water curing

Method: Select a method of ponding or continuously sprinkling to prevent damage to the concrete surface during the required curing period.

repairs.

3.9 UNFORMED SURFACES

General

Surface finish: To be compatible with any documented applied finish, as documented.

Finished levels: Strike off, screed and level slab surfaces to the documented finished levels and tolerances.

Finishing methods – surfaces other than wearing surfaces

General: Compact and tamp, screed off and finally dress with a wooden float to an even surface, also:

- Drain or otherwise promptly remove any water which comes to the surface.
- Roughen all future contact surfaces, so that the coarse aggregate at the surface is firmly embedded but not forced below the surface.

Finishing methods – wearing surfaces

General: Compact then screed off the surface with a vibrating screed, or hand screed if the distance between forms perpendicular to the direction of screed is no greater than 2 m.

Correction: Immediately following compaction and screeding test and correct for high or low spots.

Final finish: Finish the surface true and uniform and free of any glazed or trowelling finish and finally dress with a wooden template or float.

Surface to receive asphalt: After compacting, screeding and correcting, dress with a wooden float and finally broom to produce a rough surface.

Textured patterned surface: Finish coloured, textured or patterned surfaces, as documented.

Tolerances

Finished surface: Conform to the following maximum deviations from documented values:

- Concrete structures not adjacent to road pavements:
 - . Absolute level: ± 25 mm.
 - . Alignment: 25 mm.
- Concrete structures adjacent to road pavements (e.g. drainage pits):
 - . Absolute level: ± 10 mm.
 - . Alignment: 10 mm.
- Longitudinal surfaces greater than 10 m in length: 5 mm from a 3 m straightedge, subject to any necessary allowances for vertical and horizontal curves.

Surface repairs

Method: If surface repairs are required, obtain approval of the proposed method before commencing repairs.

3.10 PRECAST UNITS

Lifting and handling

General: Conform to the handling and installation requirements of the ASCC National code.

Requirement: Lift and support units only at designated points. Use handling methods which do not overstress, warp or damage the units.

Site conditions: Only lift units when the wind and temperature conditions allow handling and fixing consistent with the structural capability and geometry of the unit.

Cranes: To AS 2550.1.

Attachments

Requirement: Remove temporary attachments after erection. Seal and rectify residual recesses.

Installation

Bedding: Place precast units on a fresh mass concrete bedding layer while it is still in a plastic state.

Fixing: Fix the units securely and accurately in their final positions.

Ancillaries: Provide components and materials, including fasteners, braces, shims, jointing strips, sealant, flashings, grout and mortar, necessary for the installation of the units.

Storage

Support points: When storing elements support units only at designated support points.

Protection: Adequately store and protect units to prevent warping, twisting, crushing, cracking, discolouration, staining and any other damage, until they are installed in their final location.

3.11 TESTING

Quality

Requirement: Test for all characteristics in conformance with **ANNEXURE – MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

Concrete tests

Slump: Test each batch at the point of discharge from the agitator before placing concrete from that batch in the work.

Test sample location: Spread the site sampling evenly throughout the concrete placement.

Sampling frequency: To the **Project assessment strength grade sampling table**.

Project assessment strength grade sampling table

Number of batches for each type and grade of concrete per day	Minimum number of samples (for 7 day and 28 day testing)
1	1
2-5	2
6-10	3
11-20	4
each additional 10	1 additional

Cores and test acceptance

General: If test specimens fail to achieve the documented 28 day strength, arrange for cores to be taken from the corresponding concrete and nominate proposed core locations.

Acceptance: For acceptance, demonstrate conformance of the average strength of cores with the documented 28 day strength requirements, adjusted using the relevant factor from the **Concrete age conversion factors table**.

Concrete age conversion factors table

*Age of test specimen in days of date of testing	Factor
28	1.00
35	1.02
42	1.04
49	1.06
56	1.08
70	1.10
84	1.12
112	1.14
140	1.16
168	1.18
196	1.20
224	1.22

*Age of test specimen in days of date of testing	Factor
308	1.24
365 and greater	1.25

*For intermediate ages the factor shall be determined by interpolation.

Failure of cores

Deduction: If cores taken fail to satisfy the strength requirements, apply the deduction provisions in **ANNEXURE – DEDUCTIONS**.

Completion tests

Liquid retaining structures: Liquid tightness to AS 3735.

3.12 COMPLETION

Loading

Prohibition: Do not apply any superimposed load to any part of what will become a load bearing structure within 21 days of placing concrete, unless it can be demonstrated that 95% of the design strength of the concrete has been achieved.

Protection

Protection: Protect the concrete from damage due to construction load overstresses, physical and thermal shocks, and excessive vibrations, particularly during the curing period.

Surface protection: Protect finished concrete surfaces and applied finishes from damage.

4 ANNEXURES

4.1 ANNEXURE - SUMMARY OF HOLD AND WITNESS POINTS

Clause and description	Type*	Submission/Inspection details	Submission/Notice times	Process held
SUBMISSIONS, Certification Design	H	Certification of formwork design conformance	3 days before erecting formwork	Erection of formwork
SUBMISSIONS, Certification Completed formwork	H	Certification of completed formwork conformance	1 day before placing concrete	Placement of concrete
SUBMISSIONS, Tests Loading	H	Results to show that concrete has achieved 95% of its design strength	1 day before applying superimposed load	Application of super-imposed load
SUBMISSIONS, Execution details Coring	H	Details of any proposed cutting or coring required in hardened concrete	3 days before coring concrete	Concrete coring
SUBMISSIONS, Products and materials Machine mixing	H	Details of proposed concrete mix for on-site machine mixing of concrete	7 days before on-site concrete mixing	On-site concrete mixing
SUBMISSIONS, Execution details Measurement of materials	H	Proposal to measure materials by volume for on-site mixing for minor concrete works	7 days before on-site concrete mixing	On-site concrete mixing
SUBMISSIONS, Execution details Repair of defects	H	Details of the proposed method of defect repair	3 days before repairing defect	Repair of defect
SUBMISSIONS,	H	Details of the	3 days before	Repair of surface

Clause and description	Type*	Submission/Inspection details	Submission/Notice times	Process held
Execution details Surface repairs		proposed method of surface repair	repairing surface	
SUBMISSIONS, Execution details Method statement	H	Detailed method statement for sprayed concrete works	14 days before spraying concrete	Sprayed concrete works
SUBMISSIONS, Samples Sprayed concrete	H	3 sample panels for each proposed mix	10 days before spraying concrete for works	Sprayed concrete works
INSPECTIONS, Notice Base preparation	W	Completed and prepared base	1 day before laying underlay or placing concrete	-
INSPECTIONS, Notice Completed formwork	W	Completed formwork	1 day before placing concrete	-
INSPECTIONS, Notice Steel reinforcement placement	W	Completed installed steel reinforcement, including cores fixings and embedded items fixed in place	1 day before placing concrete	-
INSPECTIONS, Notice Galvanizing repair	W	Repairs to damaged galvanizing of steel reinforcement	1 day before placing concrete	-
INSPECTIONS, Notice Emergency hand mixing	W	Emergency hand mixing of concrete due to mechanical failure	Immediately after mechanical failure	-
INSPECTIONS, Notice Sprayed concrete sample panels	W	Concrete spraying of sample panels	3 days before spraying sample panels	-

*H = Hold Point, W = Witness Point

4.2 ANNEXURE – MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Concrete constituent materials	Material quality – Supplier's documentary evidence and certification of:			
	Cement	1 mth's prod'n	1 per week	AS 3972
	Fly ash	1 mth's prod'n	1 per month	AS 3582.1
	Water	1 contract	1 per contract	AS 3583.13, AS 1289.4.2.1
	Admixtures	1 mth's prod'n	1 per month	AS 1478.1
	Steel reinforcement	1 delivery	1 per production batch	AS/NZS 4671
	Fine aggregates			
	Grading	1 wk's prod'n	1 per 200 m ³ concrete*	AS 1141.11.1
	Moisture content	N/A	1 per day	

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method	
	Sulphate soundness	1 contract	1 per contract	AS 1141.24	
	Bulk density	1 contract	1 per contract	AS 2758.1	
	Unit mass (Particle density)	1 contract	1 per contract	AS 2758.1	
	Water absorption	1 contract	1 per contract	AS 2758.1	
	Material finer 2 m	1 contract	1 per contract	AS 2758.1	
	Deleterious material (impurities/reactive)	1 contract	1 per contract	AS 2758.1	
	Coarse aggregates				
	Grading	1 wk's prod'n	1 per 200 m ³ concrete*		AS 1141.11.1
	Moisture content	N/A	1 per day		
	Wet strength	1 contract	1 per contract		AS 1141.22
	Wet/dry strength variation	1 contract	1 per contract		AS 1141.22
	Wear	1 contract	1 per contract		AS 1141.23
	Crushing value	1 contract	1 per contract		AS 1141.21
	Sulphate soundness	1 contract	1 per contract		AS 1141.24
	Particle shape	1 contract	1 per contract		AS 1141.14
	Fractured faces	1 contract	1 per contract		AS 1141.18
	Bulk density	1 contract	1 per contract		AS 2758.1
	Unit mass (Particle density)	1 contract	1 per contract		AS 2758.1
	Water absorption	1 contract	1 per contract		AS 2758.1
	Material finer 75 m	1 contract	1 per contract		AS 2758.1
	Weak particles	1 contract	1 per contract		AS 2758.1
	Light particles	1 contract	1 per contract		AS 2758.1
	Deleterious materials (impurities/reactive)	1 contract	1 per contract		AS 2758.1
	Iron unsoundness	1 contract	1 per contract		AS 2758.1
	Falling/dusting unsoundness	1 contract	1 per contract		AS 2758.1
	Mix design	Compressive strength	1 contract mix	1 per mix per contract	AS 1012.9
Aggregate moisture content		1 contract mix	1 per mix per contract		
Consistency – slump		1 contract mix	1 per mix per contract	AS 1012.3.1	
Air content		1 contract mix	1 per mix per contract	AS 1012.4.2 Method 2	
Shrinkage		1 contract mix	1 per mix per contract	AS 1012.8.4AS 1012.13	
Concrete	Consistency – slump	15 m ³	1 per batch	AS 1012.3.1	

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	Compressive strength (7 and 28 day)	15 m ³	As per the Project assessment strength grade sampling table	AS 1012.1 AS 1012.8.1 AS 1012.9
Concrete placement	Finished levels	15 m ³	1 per element or 1 per 15 m length	Survey and 3 m straightedge
	Surface dimensions	Single fabrication	As required to confirm design dimensions	Measure
Sprayed concrete	Test panels and cores	1 contract	4 cores from 1 test panel of each mix design	AS 1012.9 AS 1012.14
	Compressive strength cores	15 m ³	2 per 15 m ³	AS 1012.9 AS 1012.14
* Note: or part thereof, per lot.				

4.3 ANNEXURE - PAY ITEMS

Pay items	Unit of measurement	Schedule rate scope
0319.2 32 MPa Concrete works	m ³ of concrete supplied and placed	Include all operations involved in ground preparation, formwork, concrete supply, placement, compaction, joints, finishing, curing and testing. Where documented, include the supply and placement of reinforcing steel.
Precast units	'Each' precast unit, as documented	All costs associated with the supply and installation of the precast unit.

4.4 ANNEXURE - DEDUCTIONS

General

Deductions: Conform to the following:

- Concrete payment rates: At the scheduled rates provided the concrete meets the documented strength requirements.
- Reduction in payment rates: Where any concrete does not reach the documented strength, at the scheduled rate of payment reduced by 2% for each 1%, or fraction thereof, by which the strength of the specimen fails to reach the documented strength, up to a maximum deficiency of 10%.
- Rejection: If the deficiency in strength exceeds 10%, the concrete represented by the specimens may be rejected, in which case no payment will be made for the work nor for any remedial work to rectify the deficiency.

4.5 ANNEXURE - REFERENCED DOCUMENTS

11 PRECAST CONCRETE

1 GENERAL**1.1 RESPONSIBILITIES****General**

Responsibility: Provide precast concrete elements, as documented.

Performance

Requirement: Conform to the following:

- Fabricated in conformance with the shop drawings.
- Designed and certified by a professional engineer.
- Designed for handling, transport and installation by a professional engineer.
- Undamaged by handling and installation.
- Certified by a professional engineer after installation.

Design

Structural design: To AS 3600 and BCA B1.1.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- *General Requirements*
- *Demolition*
- *Site Preparation*
- *Earthwork*
- *Pavement Base and Subbase*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Concrete Pavement*

1.3 STANDARDS**General**

Precast elements: Conform to the recommendations of NP PCH (Precast concrete handbook).

Materials, components and equipment for manufacture: To AS 3850.1.

Planning, design, construction, casting, transportation, erection and installation: To AS 3850.2.

Design, installation and testing of post-installed and cast-in fastenings: To SA TS 101.

1.4 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given in AS 3850.1 clause 1.4 and the following apply:

- Precast concrete: Concrete building elements, cast in moulds and cured away from the final structural position, and then transported, lifted and fixed into position.

1.5 TOLERANCES**General**

Position of reinforcement: To AS 3600 clause 17.5.3.

Manufacturing, installation, fixings and embedded items tolerance for precast elements: To AS 3610.1 Table 3.3.3 and AS 3850.2 clause 2.11.

1.6 SUBMISSIONS

Certification

Design: Provide independent certification by a professional engineer of conformance of the design to project criteria.

Design documentation

Calculations: Submit structural performance calculations.

Execution details

Panel casting: Submit panel casting checklist.

Manufacturer's details: Submit name, contact details and credentials of proposed manufacturer of precast elements.

Safe work method statement: Prepare a safe work method statement specific to the project for the precast erection and submit on request.

Erection documentation: Submit lifting device locations and specification including marking plans and shop drawings.

Early lifting: If it is proposed to lift the precast elements by their designated lifting points before 28 day strength has been achieved, submit evidence to demonstrate that the element has adequate strength to carry its own weight without damage or residual cracking or deflection on removal of the lifting device.

Lifting and handling equipment: Submit details of proposed equipment along with qualifications and training of the operating personnel in the form of a qualification register.

Products and materials

Protective coating details: Submit proposals for protective coatings to exposed metallic components to AS/NZS 2312.1 or AS/NZS 2312.2 with regard to site-specific corrosivity zoning.

Proprietary inserts: Submit proprietary documentation for any lifting, bracing or fixing inserts. Include make, type and working load limit.

Non-proprietary inserts: Submit certificate from a professional engineer certifying the working load limit.

Concrete mix: Submit concrete mix details including the proportions and source of the constituents, admixtures, release agents and curing compounds.

Prototypes

Manufacture: Cast the prototype elements using the formwork, concrete, compaction equipment, form release agents, curing and formwork removal methods which are to be used in the final work.

Prototype storage: Maintain prototypes on site, undamaged and protected from discolouration for comparison with manufactured precast elements.

Prototype use: Use prototypes in the works if they conform with the structural drawings.

Shop drawings

Precast concrete drawings: Submit shop drawings of structural precast concrete elements showing the proposed details for their design, manufacture, assembly, transport and installation, including the following:

- Project title and manufacturer's name.
- Marking plans and elevations referenced to the building grids and floors to locate each precast element.
- Shape or profile drawings (submit these before fabrication of moulds and tooling).
- Locations, sizes, details, materials, ductility and stress grades of reinforcement.
- Locations, sizes, details, materials, corrosion protection and grades anchors and lifting devices.
- Site fitments.
- Details of all joints caulking, baffles and waterproofing.
- Surface finish class and surface treatment, if applicable.
- Curing and protection methods.
- Weight of precast elements.
- Calculated maximum loading on lifting and bracing inserts and attachments.
- Equipment and methods for handling, transport and installation, including lifting inserts and pick-up points.
- Evidence of load capacity of lifting and bracing inserts and attachments in the form of test reports or calculations.

Tests

Lifting inserts and attachments for precast elements: Submit test results.

Structural performance: Submit test results of prior testing for static load tests.

1.7 INSPECTION**Notice**

Inspection: Give notice so that inspection may be made of the following:

- Formwork dimensions and stability.
- Panel edge details and penetrations.
- Connection materials and inserts in place.
- Reinforcement in place.
- Concreting.
- First precast element of each type at the earliest possible time before and immediately after stripping.
- Stripping and storage.
- Site erection including fixings and any in situ topping.
- Installed temporary bracing.
- Final structure before removal of temporary bracing.

2 PRODUCTS

2.1 MATERIALS**General**

Standard: To AS 3850.1.

Stockpile: If uniform, consistent colour is documented, stockpile sand, cement and aggregates.

Aggregates

Standard: To AS 2758.1.

Cement

Standard: To AS 3972.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

Type: Do not use high alumina cement.

Water

Standard: To AS 1379 clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/l of chloride ions.

Other

Chemical admixtures: To AS 1478.1, used to manufacturer's recommendations.

Reinforcement

Standard: To AS/NZS 4671.

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which would reduce the bond between the reinforcement and concrete.

Structural welding: To AS/NZS 1554.3.

Corrosion: Protect from corrosion in conformance with AS 3600 clause 17.2.1.2.

2.2 PRECAST CONCRETE**General**

Concrete: To AS 3600 and AS 1379.

Testing: To the AS 1012 series.

Durability

Concrete cover: To AS 3600 clause 4.10.

2.3 CAST-IN ITEMS

Fixings and embedded items

Compatibility: Provide inserts, fixings and embedded items that are compatible with each other, with the reinforcement and with the documented concrete finish.

Corrosion: In external or exposed locations, galvanize anchor bolts and embedded fixings.

3 EXECUTION

3.1 PRECAST ELEMENTS

Marking

Precast element identification: Include the following:

- Plank thickness (mm).
- Concrete cover (mm).
- Remain legible until after the element has been fixed in place.
- Not visible in the completed structure.
- Date of casting.
- Orientation of the element.
- On precast elements other than those manufactured as a standard product, indicate their location within the structure, in conformance with the marking plan.
- Weight of the element.

Attachments for structural fixings

Grout tube: Provide grout tubes as documented, made from thin wall galvanized duct or similar cast into either in situ concrete or the precast element into which a dowel bar will be grouted.

Welding of connections: To AS/NZS 1554.1.

Requirement: Cast in all lifting, bracing and fixing inserts.

Curing

Curing compounds: To AS 3799.

Release agent: Provide a release agent that is compatible with the curing compound.

Rejection

Assessment: Set aside for inspection any element having damage such as cracking, deformation or spalling, or exhibiting lack of adequate concrete cover. Repair or recast, as instructed.

Lifting points

Standard: To AS 3850.2.

General: Provide proprietary lifting devices with published load data designed specifically for lifting concrete elements. Use face and edge lifters as required.

Cast in inserts: Provide hot-dipped galvanized finish with a minimum coating mass of 600 g/m² to all cast-in lifting and bracing devices.

Bracing inserts or strongbacks: Provide bracing inserts or strongbacks designed by a professional engineer.

Proprietary systems: Use in conformance with manufacturer's specifications and recommendations.

Lifting loops: Do not use deformed bars or stressing tendons as lifting loops.

Sealing: Recess lifting attachments such as bracing ferrules, or other types of cast-in fixings, and provide plugs for sealing.

Location: Do not place lifting attachments, holes and other temporary fixings for handling purposes on faces visible upon completion.

Marking: Clearly mark all lifting points and the positions for temporary bearing for storage and transport.

Welding: Do not site weld lifting, bracing or fixing inserts.

Requirement: Only lift or support members at specified points.

Lifting devices: Do not use the fixing devices for lifting or hoisting unless they have been designed to do so and confirmed by a professional engineer.

Precautions: Use handling methods which do not overstress, warp or damage the elements.

Completion: Remove, seal and rectify temporary attachments after erection.

Storage

Support points: Support elements at designated support points during storage.

Prevent damage: Store precast elements and protect to prevent warping, twisting, crushing, cracking, staining, discolouration and other damage until they are installed in their final location.

3.2 INSTALLATION

Lifting and handling

Requirement: Conform to the ASCC National code and AS 3850.2.

Site conditions: Make sure the wind and temperature conditions allow handling and fixing, and are consistent with the structural capability and geometry of the element.

Site Cranes: To AS 2550.1.

Temporary bracing and propping: To AS 3850.2 Section 5.

Fixing

Fixing: Fix the precast elements securely and accurately in their final position.

Ancillaries: Provide components and materials, including fasteners, braces, shims, jointing strips, sealant, flashings, grout and mortar, bearing pads or strips, ties and dowels, clips and fixings necessary for the installation of the elements.

Surfaces bonded to in situ concrete

Requirement: Fully scabble and roughen all surfaces required to bond with in situ concrete to achieve a shear plane surface coefficient in conformance with AS 3600 Table 8.4.3.

3.3 COMPLETION

Compliance

Tolerances: Check element compliance in conformance with AS 3610.1 Section 5.

Rejection: Reject any precast elements not conforming to the documented tolerances.

12 CONCRETE PAVEMENT

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide concrete pavement as documented.

Design

Coordination: Determine the local authority requirements initially as they may affect grades, transition, zones for the works. Considerations include:

- Drainage.
- Trees (due to settlement).

Performance

Requirement: Provide finished surfaces conforming to the following:

- Free draining and evenly graded between level points.
- Even and smooth riding.

Conformance: Conform to the local authority requirements for levels, grades and the minimum details of thickness, reinforcement and concrete strength for pavements.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *General Requirements*
- *Demolition*
- *Site Preparation*
- *Earthwork*
- *Pavement Base and Subbase*
- *Asphalt*
- *Pavement Ancillaries*
- *Concrete In Situ*
- *Concrete Reinforcement*
- *Auxiliary Concrete Works*
- *Precast Concrete*

1.3 STANDARDS

Concrete

Specification and supply: To AS 1379.

Materials and construction: To AS 3600.

Slip resistance

Classification: To AS 4586.

1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection the following definitions apply.

- Absolute level tolerance: Maximum deviation from design levels.
- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Average ambient temperature: Average value of the daily maximum and minimum ambient temperatures over the relevant period at a site.
- Concrete class – normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise in conformance with AS 1379 clause 1.5.3.

- Concrete class – special: Concrete which is specified to have certain properties or characteristics different from, or additional to, those of normal-class concrete and otherwise in conformance with AS 1379 clause 1.5.4.
- Green concrete: Concrete which has set but not appreciably hardened.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Weather – cold: Ambient shade temperature less than 10 °C.
- Weather – hot: Ambient shade temperature greater than 30 °C.

1.5 TOLERANCES

General

Edges abutting gutters: Within ± 5 mm of the level of the actual gutter edge.

Rigid pavement surface:

- Absolute tolerance: + 10 mm, - 0 mm.
- Relative tolerance: ± 5 mm.

Joint locations in plan (rigid pavement): ± 15 mm.

1.6 SUBMISSIONS

Certification

Compliance certificate: As an alternative to testing a product, submit the manufacturer's certificate together with the results of recent tests undertaken by the manufacturer, showing compliance with test criteria.

Test certificates and records: Submit test certificates, and also retain results on site.

Execution details

Safe Work Method Statement: Submit proposals for the methods and equipment to be used for the pavement works, including the following:

- Staging of the work, access and traffic control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.
- Methods and equipment for each operation.
- Sources of materials.
- Material stockpiles.
- Methods of concrete manufacture.
- Temperature control, curing and protection methods for concrete.

Mix design variation: If a variation is proposed, submit a further mix design report.

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Addition of water at the site.
- Changes to the plastic concrete mix.
- Curing and protection methods.
- Cutting or displacing reinforcement, or cutting hardened concrete.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Sequence and times for concrete pours, and construction joint locations and relocations.

Cores, fixings and embedded items: If required, submit shop drawings showing the proposed locations, clearances and cover, and indicate any proposed repositioning of reinforcement.

Cutting or coring: If cutting or coring of hardened concrete is proposed, provide details.

Sawn joints: Submit proposed methods, timing and sequence of sawing joints.

Damaged galvanizing: If repair is required, submit proposals to AS/NZS 4680 Section 8.

Splicing: If splicing not documented is proposed, submit details.

Welding: If welding of reinforcement is proposed, provide details and give notice before welding reinforcement.

Joint sealants: Submit proposals for installation methods and sealant performance.

Concrete placing: Submit proposals for size of the area to be placed and the spacing of planned construction joints before placement commences.

Crack assessment: If unplanned cracks occur in the finished pavement, submit proposals for investigation.

Surface repair method: If required, submit details of the proposed method before commencing repairs.

Trial section: Submit trial pavement.

Products

Aggregates: Nominate the source for all aggregates proposed.

Reinforcement: Submit the manufacturer's certificate of compliance with AS/NZS 4671, or submit test certificates from an independent testing authority.

Liquid curing compounds: Submit certified test results, including the application rate and the efficiency index to AS 3799 Appendix B.

Curing by covering: Submit details of the proposed covering material.

Repair materials: Submit proposals for epoxy resin/grout and elastomeric sealant.

Concrete: Submit the concrete supply delivery docket.

Subcontractors: Submit names and contact details of proposed pre-mixed concrete suppliers, and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

Trial mix design report: Six weeks before commencing production, submit a report for each mix design containing the information required in AS 1012.2, the individual and combined aggregate particle size distribution, and the records and reports for the tests.

Tests

Site tests: Submit results, as follows:

- Slip resistance test of completed installations.

1.7 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Concrete formwork, reinforcement and dowels in position.

2 PRODUCTS

2.1 REINFORCEMENT

Steel reinforcement

Standard: To AS/NZS 4671.

Identification: Supply reinforcement with readily identifiable grade and origin.

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which may reduce the bond between the reinforcement and concrete.

Protective coatings

Protective coating: Coatings to reinforcement must not reduce the performance of the reinforcement. Do not galvanize reinforcement steel. For pavements containing protective coated reinforcement, provide the same coating type to all reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules.

Epoxy coating: Provide high build, high solids chemically resistant coating.

- Thickness: 200 µm minimum.

Accessories

Bar chairs: Use plastic tipped wire bar chairs to AS/NZS 2425.

Tie wire: Galvanized annealed steel 1.25 mm diameter minimum.

Dowels

General: Provide each dowel in one piece, straight, cut accurately to length with ends square and free from burrs.

Standard: To AS/NZS 4671.

Grade: 500N steel bars 450 mm long.

Tie bars

Type: Deformed bar, 12 mm diameter, grade 500N, 1 m long.

2.2 AGGREGATE

Characteristics

Standards: AS 2758.1.

Quality: Provide at least 40% by mass of the total aggregates in the concrete mix of quartz sand aggregate having a nominal size of less than 5 mm and containing at least 70% quartz by mass.

Durability: All constituent, fraction of constituent or aggregates to conform to AS 1141.22 and the following:

- Wet strength not less than 80 kN.
- 10% Fines Wet/Dry Variation not to exceed 35%.

Recycled concrete aggregate (RCA): Use coarse aggregates from demolition concrete or RCA.

Blending: If blending coarse RCA with natural aggregates, make sure substitution rates are below 30%.

2.3 CEMENT

General

Standard: To AS 3972.

Transport: Cement in watertight packaging and protect from moisture until used. Do not use caked or lumpy cement.

- Age: Less than 6 months old.
- Storage: Store cement bags under cover and above ground.

2.4 FLY ASH

General

Standard: To AS 3582.1.

2.5 WATER

General

Standard: Chloride ion to AS 3583.13 and sulphate ion to AS 1289.4.2.1.

Quality: Water used in the production of concrete to be potable, free from materials harmful to concrete or reinforcement, and be neither salty nor brackish.

Limits: Not containing more than:

- 600 parts per million of chloride ion, determined to AS 3583.13.
- 400 parts per million of sulphate ion, determined to AS 1289.4.2.1.

2.6 ADMIXTURES

General

Standard: Chemical admixtures to AS 1478.1.

Quality: Provide admixtures free from calcium chloride, calcium formate, or triethanolamine or any other accelerator. Do not use admixtures or combinations of admixtures without prior written approval.

Dosage: Vary the dosage of chemical admixture to account for air temperature and setting time in conformance with the manufacturer's recommendations.

Types of admixtures

Air entraining agent: Adjust mix for workability allowing up to 5% air entrainment.

Warm season retarder: During the warm season, (October to March inclusive), use a lignin or lignin-based (ligpol) set-retarding admixture (Type Re or Type WRRe) as approved to control slump within the limits stated in Concrete mix, properties.

Cool season retarder: During the cool season, (April to September inclusive), use only a lignin or lignin based set-retarding admixture containing not more than 6% reducing sugars (Type WRRe complying with AS 1478.1).

2.7 CURING COMPOUNDS

General

Curing compounds: To AS 3799 and AS 1160, Type 2, white pigmented or containing aluminium reflective pigments.

Sheet material covering: To ASTM C171, white opaque or clear polyethylene film, or white burlap-polyethylene sheet, or equivalent material.

2.8 OTHER MATERIALS

Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1.

3 EXECUTION

3.1 GENERAL

Traffic control

Traffic restriction: Do not allow traffic or construction equipment other than those associated with testing, sawcutting, cleaning or joint sealing on pavement for minimum 10 days after placing, or when the concrete has reached compressive strength of at least 20 Mpa, and joints have been completely sealed.

3.2 SUBGRADE

Preparation

Conformance: Prepare subgrade in conformance with the *Earthwork* worksection.

Extent: Prepare a uniform subgrade for the full pavement formation, extending at least to the back of kerbs.

Reinstatement: Make sure of uniformity for backfilling of any utility trenches.

3.3 SUBBASE

Thickness

Refer drawings 21414-0 to 21414-8

Width

Subbase width: Extend the subbase at its full depth to at least the back of kerbs or other edge stops before their installation.

No integral kerbs: Extend granular unbound subbase at least 300 mm beyond each side of the carriageway.

Tolerance and friction reduction

Tolerance: Subbase finished surface level, + 0 mm to - 10 mm.

Friction reduction: Provide 200 µm thick polyethylene sheeting with 200 mm taped minimum laps and/or a 20 mm thick layer of sand (silt and clay material less than 5%) directly beneath the concrete pavement.

3.4 CONCRETE MIX

Standard

Concrete mix and supply: To AS 3600 Section 17 and AS 1379.

Properties

Workability: Slump values to conform to the following:

- Fixed form paving with manual operated vibration: 50 to 60 mm.
- Drying shrinkage: Maximum 450 µε after 21 days of air drying.

Elapsed time delivery

General: Make sure that the elapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10 °C or above 32 °C.

Elapsed delivery time table

Concrete temperature at time of discharge (°C)	Maximum elapsed time (hours)
10 – 24	2.00
24 – 27	1.50

Concrete temperature at time of discharge (°C)	Maximum elapsed time (hours)
27 – 30	1.00
30 – 32	0.75

Site mixed supply

Emergencies: If mixing by hand is carried out, provide details.

Plant: Mix concrete in a plant located on the construction site.

Pre-mixed supply

Addition of water: Do not add water.

Transport: Make sure the mode of transport prevents segregation, loss of material and contamination of the environment, and does not adversely affect placing or compaction.

Concrete delivery docket: For each batch, submit a docket listing the information required by AS 1379 clause 1.7.3, and the following information:

- Any binders or additives.
- Method of placement and climate conditions during pour.
- Name of concrete delivery supervisor.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.

3.5 TESTING**Standards**

Sampling, identification, testing and recording: To the AS 1012 series.

Specimens: Sample the concrete on-site, at the point of discharge from the agitator.

Type and frequency: To AS 1379.

Testing authority: Concrete supplier or NATA registered laboratory.

Concrete testing methods

Slump: Test at least one sample from each batch before placing concrete from that batch in the work.

- Standard: To AS 1012.3.1.
- Maximum slump variation: ± 10 mm.

Compressive strength: Test to AS 1012.8.1.

Drying shrinkage: Test to AS 1012.8.4 and AS 1012.13.

Flexural strength: To AS 1012.8.2 and AS 1012.11.

Acceptance criterion: The average strength of any set of 3 consecutive project samples must be equal to or greater than the specified minimum value.

Project assessment sampling frequency table

Number of batches for each type and grade of concrete per day	Minimum number of samples
1	1
2-5	2
6-10	3
11-20	4
each additional 10	1 additional

3.6 INSTALLATION**Fixed formwork**

Description:

- Steel forms.
- Seasoned, dressed timber planks, free of warps, bends or kinks, with the full width of their top edges covered with steel angle sections finishing flush with the form face.

Depth: Equal to the edge thickness of the slab and in one piece.

Tolerances on position:

- Absolute level tolerance: ± 5 mm.
- Relative level tolerance: ± 5 mm.
- Horizontal tolerance: ± 10 mm (maximum departure of face from a plane surface).
- Verticality: 3 mm departure from vertical.

Staking: Stake forms in position using at least 3 steel stakes per form, not more than 1.5 m apart. Lock joints between form sections to prevent movement.

Release agent: Before placing reinforcement, apply a release agent compatible with the contact surfaces, to the interior of the formwork, except where the concrete is to receive an applied finish for which there is no compatible release agent. Clean the reinforcement to remove all traces of release agent.

Re-use: Clean and recoat the forms each time before placing concrete.

Keyways: Form the keyways of keyed construction joints using steel form strips accurately located at the mid-depth of the slab and securely fastened flush against the formwork face.

Reinforcement

Tolerances in fabrication and fixing: To AS 3600.

Locate reinforcement: Place reinforcement in the top half of the pavement.

Minimum cover to reinforcement: 30 mm.

Splicing mesh: Overlap a minimum of 2 crosswires.

Supports: Provide proprietary concrete, metal or plastic supports to AS/NZS 2425 and as follows:

- To withstand construction and traffic loads and maintain the concrete cover, as documented.
- With a protective coating if they are ferrous metal extending to the surface of the concrete, or are used with galvanized or zinc-coated reinforcement.
- Minimum spacing:
 - . Bars: ≤ 60 diameters.
 - . Fabric: ≤ 800 mm.
- Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.
- Projecting reinforcement: If starter or other bars project beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is incorporated into subsequent work.
- Tying: Secure the reinforcement against displacement by tying at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of forms so that the ties do not project into the concrete cover.
- Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections.

Cores, fixings and embedded items

Position: Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, reposition but do not cut reinforcement, and maintain cover to reinforcement.

Isolation: Isolate embedded items so that water cannot track to concrete providing minimum cover to reinforcement.

3.7 CONCRETE PLACING AND COMPACTION

Concrete placing

General: Place concrete uniformly over the width of the slab or lane and so that the face is generally vertical and normal to the direction of placing. Hand spread concrete using shovels, not rakes.

Remove: Any water ponding on the ground.

Placing sequence: Commence from one corner (usually the lowest point) and proceed continuously out from that point.

Weather: Do not place concrete in temperatures above 30 °C or below 10 °C without adequate precautions.

Compaction

Thickness 100 mm or less: Compact by placing screeding and finishing processes. If required use a hand-held vibrating screed at the surface. Do not use immersion vibrators.

Thickness more than 100 mm and downturns: Use an immersion vibrator.

Placing records

General: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date of concrete placement.
- Delivery dockets noting the specified grade and source of concrete.
- Slump measurements to AS 1012.3.1.
- The portion of work.
- Volume placed.

Rain

General: During placement and before setting, do not expose concrete to rain.

Protection: Protect surface from damage by covering until hardened.

Concrete placing in cold weather

Cement: Do not use high alumina cement.

Placing concrete: Maintain the temperature of the freshly mixed concrete at 5 °C.

Formwork and reinforcement: Before and during placing maintain temperature at 5 °C.

Severe weather: If severe weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary to ensure that the temperature of the placed concrete is within the limits specified.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any forms, materials, and equipment coming in contact with the concrete.

Maximum temperature of water: 60 °C when it is placed in the mixer.

Plastic concrete: Prevent plastic concrete from freezing, without using salts or chemicals.

Concrete placing in hot weather

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses.

Hot weather placing: Maintain freshly mixed concrete at the following temperature limits:

- Normal concrete in footings, beams, columns, wall and slabs: ≤ 35 °C.
- Concrete section: ≥ 1 m in all dimensions: ≤ 27 °C, except where concrete strength is 40 Mpa or greater.
- Section thickness > 600 mm: ≤ 27 °C.

Formwork and reinforcement: Before and during placing maintain temperature at 35 °C.

Severe weather: If ambient shade temperature more than 38 °C, do not mix concrete.

Temperature control: Select one or more of the following methods of maintaining the specified temperature of the placed concrete:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover the container in which the concrete is transported to the forms.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water.

Evaporation control barriers: Erect barriers to protect freshly placed concrete from drying winds.

3.8 CONCRETE PRIMARY FINISH

General

Finishing: Do not commence finishing until all bleed water has evaporated from the surface.

Commence: Immediately after placement and spreading and compaction of the plastic concrete, start finishing operations to achieve the documented finish.

Formed surfaces

Damage: Do not damage concrete works through premature removal of formwork.

Curing: If forms are stripped when concrete is at an age less than the minimum curing period, commence curing exposed faces as soon as the stripping is completed.

Surface repairs

Method: If surface repairs are required, submit proposals.

3.9 CONCRETE CURING**General**

Curing: Commence curing as soon as possible after finishing and extend for a minimum period of 3 days.

End of curing period: Prevent rapid drying out at the end of the curing period.

Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

Cold weather curing

General: Maintain concrete temperature between 10 °C and 20 °C for curing period.

Hot weather curing

Curing compounds: If it is proposed to use curing compounds, provide details.

Protection: Select a protection method as applicable.

- If the concrete temperature exceeds 25 °C or if not protected against drying winds, protect the concrete using a fog spray application of aliphatic alcohol evaporation retardant.
- If ambient shade temperature is more than 35 °C, protect from wind and sun using an evaporative retarder until curing is commenced.
- Immediately after finishing, either cover exposed surfaces using an impervious membrane or hessian kept wet until curing begins, or apply a curing compound.

Curing methods

Covering sheet method: Immediately after finishing operations, cover concrete using damp hessian or cotton mats overlapped at least 150 mm and anchored against displacement by wind or other interference. Keep the mats continuously damp until covered by the covering sheet material. Repair tears immediately.

Moist curing method: Immediately after finishing operations and when the concrete has set sufficiently not to be damaged by the curing process, keep the concrete surface continuously damp by ponding or spraying constantly with water, fog, or mist, using suitable spraying equipment. Continue wetting for the curing period.

Self-levelling toppings: To AS 3799, if also used for curing.

Coloured concrete: Do not cure with plastic sheeting, damp sand or wet hessian. Use only chemical curing compounds compatible with the sealer or a sealer to the manufacturer's recommendations.

Curing compound

Application: Provide a uniform continuous flexible coating to AS 3799, without visible breaks or pinholes. Make sure coating remains unbroken at least for the required curing period after application. Respray defective areas within 30 minutes. Respray within 3 hours after heavy rain.

3.10 JOINTS**General**

Requirement Construct expansion, contraction and construction joints straight and plumb. Make transverse joints normal to longitudinal joints. Extend transverse expansion and contraction joints continuously from edge to edge of the pavement through interconnected slabs.

Joint layout: Install joints as documented.

Contraction joints

Installation: Construct transverse and longitudinal contraction joints by early power sawing or by placing an insert in the fresh concrete.

Expansion joints

Requirement: Provide formed full depth joints around structures and features which project through, into or against the pavement, and elsewhere as required.

Dowelled expansion joints: Cap dowels at one end with a compressible material.

Sawn joints

Weakened plane joint: Saw the hardened concrete to depth at least $\frac{1}{4}$ to $\frac{1}{3}$ of the pavement thickness and to a uniform width in the range of 3 to 5 mm as follows:

- Timing: Commence sawing, regardless of time or weather conditions, as soon as the concrete has hardened sufficiently to permit cutting with only minor raveling of the edges of the saw cut. Complete sawing no later than 24 hours after concrete placement.
- Sequence: If possible, saw every third transverse joint initially, then saw the intermediate joints. Start where concrete placement has commenced.
- Cracking: If the concrete has already cracked near the location chosen for a joint, do not saw a joint in that location. If a crack develops ahead of the saw cut, discontinue sawing and submit proposals for extra sawn joints. If uncontrolled cracking occurs, suspend concrete placing.
- Stand-by machines: Provide one stand-by sawing machine for each machine planned to be used.
- Cleaning and protection: Immediately after each joint is sawn, flush the saw cut and adjacent concrete surface using water, until the waste from sawing is removed from the joint. Temporarily caulk the joint using plastic or rubber tubing, or a suitable Tee shaped extrusion. Leave the caulking in place until grooving and sealing.

Rebated groove joints: Saw straight, parallel sided grooves for joint seals on top of and centred on the sawn weakened plane joints.

- Timing: Commence sawing after the curing period has ended, immediately before joint sealing. Saw during daylight hours.

Protection: Where there is a time elapse after sawing and before joint sealing, install a thin-splined rubber strip with a free width slightly larger than the saw cut at the bottom of the saw cut after washing slurry from sawn groove to temporarily prevent ingress of solid material.

Preparing joints

Stripping time: At least 12 hours.

Clean: Immediately before installation of the sealer, make sure the joint space is dry, clean and free from loose material. Remove laitance, curing compound and protrusions of hardened concrete from the sides and upper edges of the joint.

Joint sealing

Sealant type: Provide silicone sealant in conformance with the manufacturer's recommendations.

Backing rod: Compressible closed cell polyethylene foam with a bond breaking surface.

3.11 COMPLETION

Completion tests

Slip resistance of completed installation: To AS 4663.

Protection

General: Keep traffic, including construction plant, off the pavement entirely during curing. Permit access only to necessary construction plant vehicles which conform to the predetermined load limits appropriate to the use of the concrete.

Rectification

Reinstating adjacent surfaces: Reinstate surfaces next to new pavements and associated elements. If an existing road pavement has been disturbed, trim back to a straight and undisturbed edge, 250 to 300 mm from and parallel to the new concrete for the full depth of the slab.

Concrete pavement: If pavement does not conform to the tolerances, submit rectification proposal.

Unplanned cracking:

- 0.3 mm wide crack is acceptable.
- > 1 mm must be assessed, submit a proposal for possible cause and rectification processes.

Cleaning

Excavated material: Remove from site.

Appendix 2

Schedule of Rates Clare Caravan Park Bridges

TENDER

<p style="text-align: center;">DESCRIPTION OF PROJECT CLARE & GILBERT VALLEYS COUNCIL JULY 2022</p>
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I/We the undersigned, do hereby tender to perform the abovementioned work in accordance with the Tender Documents.

TOTAL OF SCHEDULE OF RATES	\$
GOODS & SERVICES TAX (GST)	\$
TOTAL CONTRACT SUM (INCLUDING (GST)	\$

Tenderer's Trade Name
(BLOCK LETTERS)

Address

Telephone No. Fax No.

Signature of Tenderer Witness

Dated the day of20

DESCRIPTION OF PROJECT
CLARE AND GILBERT VALLEY COUNCIL

SCHEDULE OF RATES

NORTHERN BRIDGE					
ITEM	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
1.	Establishment including location of services and traffic and pedestrian management	Item	1		
2.	Licensed surveyor set out and certification of precast units and barrier locations	Item	1		
3.	Careful removal of existing handrail and transport to Cleanaway Inkerman Solid Waste Services (80km lead)	Item	1		
4.	Demolition of existing bridge structure and disposal at Cleanaway Inkerman Solid Waste Services (80km lead)	Item	1		
5.	Surface preparation of existing abutment	Item	2		
6.	Truck and crane hire, lift and place precast units to accurate position on base abutment (include grouting and sealing)	No.	1		
7.	Drill and install dowel bars to connect the precast unit and the end abutments	No.	24		
8.	Supply and installation of Webforge Monowills Velocity Full Barrier	M	15.3		
9.	Supply and installation of Safety Xpress 90mm diameter in ground removable bollard, powder coated yellow with class 1 red reflective tape	No.	2		
10.	Upgrade approach to the new bridge (AC10 asphalt paving)	M2	14		

NORTHERN BRIDGE (CONTINUE)

ITEM	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
11.	Upgrade approach to the new bridge (rubble paving)	M2	19		
12.	Supply and installation of Bidim A64 non-woven geotextile fabric	M2	7		
13.	Supply and installation of 350-500mm diameter rocks	M3	1.8		
14.	Quality assurance documentation to be handed over to principle at the completion of the contract including ITP's, Survey As-builts	Item	1		
				TOTAL	

DESCRIPTION OF PROJECT
CLARE AND GILBERT VALLEY COUNCIL

SCHEDULE OF RATES

SOUTHERN BRIDGE					
ITEM	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
1.	Establishment including location of services and traffic and pedestrian management	Item	1		
2.	Licensed surveyor set out and certification of pavement slab precast units and barrier locations	Item	1		
3.	Careful removal of existing guard rail and transport to Cleanaway Inkerman Solid Waste Services (80km lead)	Item	1		
4.	Demolition of existing bridge structure and disposal at Cleanaway Inkerman Solid Waste Services (80km lead)	Item	1		
5.	Excavation for in situ pavement slab and concrete edge piers. Foundation preparation, supply and place reinforcement, formwork & concrete	M3	14		
6.	Truck and crane hire, lift and place precast units to accurate position on base slab (include grouting and sealing)	No.	1		
7.	Drill and install dowel bars to connect the precast unit and the end piers	No.	34		
8.	Supply and installation of Webforge Monowillls Velocity Full Barrier	M	12.5		
9.	Supply and installation of Zee Park Post with handrail & anti-climb mesh (1300H)	M	13.6		

SOUTHERN BRIDGE (CONTINUE)

ITEM	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
10.	Supply and installation of Zee Park Guards Post & Rail	M	12.5		
11.	Upgrade approach to the new bridge (AC10 asphalt paving).	M2	12.8		
12.	Upgrade approach to the new bridge (rubble paving).	M2	12.3		
13.	Supply and installation of kerb and water table at northern end	M	6		
14.	Quality assurance documentation to be handed over to principle at the completion of the contract including ITP's, Survey As-builts	Item	1		
TOTAL					
