CYCLONIC WIND REGION C (AREAS UP TO 50KM FROM THE COASTLINE) - IL4 BUILDINGS OR STRUCTURES - STRUCTURAL REQUIREMENTS

Contents

1 General requirements

1.1 Structural design

Structural engineering design of the building work is to comply with the relevant requirements of the current National Construction Code (NCC), the *NT Building Act 1993*, the *Work Health and Safety (National Uniform Legislation) Act 2011*, all current relevant Australian Standards and other statutory requirements.

1.2 Definition

For the purpose of this document, the word ‘shall’ indicates that a statement is mandatory.

1.3 Proprietary truss

Do not specify or use manufacturer prefabricated steel or timber trusses.

1.4 Timber products

Do not use timber material for any part of the structural work without approval.

1.5 Safety in design (SID)

Comply with the *Work Health and Safety (National Uniform Legislation) Act 2011.*

The design shall consider and incorporate design solutions that minimise the potential for danger during construction as well as during occupation and maintenance.

A SID report detailing the optimal solutions to minimise hazards and risk issues must be provided as part of the documentation work at the conclusion of the design project. Refer to s.22 of the Act, to Regulation 295, and to the NT Code of Practice *Safe design of structures.*

1.6 Maintainability

Any part of the building, or a building element where maintenance needs to be undertaken, shall be provided with suitable access to enable works to be safely undertaken and to meet the requirements of the *WHS (NUL) Act 2011* and the WHS Regulations.

1.7 Construction phase shop drawings and request for information (RFIs)

The Engineer engaged for the structural design is required to review Shop Drawings (precast concrete and/or steelwork) to ensure the intent of the design has been correctly interpreted. The review should include general arrangement, member sizes and connection details, but should not be regarded as a check of dimensions. In addition, the Design Engineer is also responsible for responding to any RFIs during construction.

2 Standards

The following standards shall be used as a minimum in the design of the building structure.

Table – Australian Standards	
Use Standards, and their amendments, current as at the date for the close of tenders except where different editions and/or amendments are required by statutory authorities, including, but not limited to, NATA and the National Construction Code including the Building Code of Australia.	
Designation	**Title**
AS 1170 (series)	Structural design actions
AS/NZS 1170.0	- General principles
AS/NZS 1170.1	- Permanent, imposed and other actions
AS/NZS 1170.2	- Wind Actions
AS 1170.4	- Earthquake actions in Australia
AS 1562 (series)	Design and installation of sheet roof and wall cladding
AS 1562.1	- Metal
AS 1657	Fixed platforms, stairways, walkways and ladders

Table – Australian Standards	
Use Standards, and their amendments, current as at the date for the close of tenders except where different editions and/or amendments are required by statutory authorities, including, but not limited to, NATA and the National Construction Code including the Building Code of Australia.	
Designation	**Title**
AS 2047	Windows and external glazed doors in buildings
AS 2159	Piling – Design and Installation
AS 2312 (series)	Guide to the protection of structural steel against atmospheric corrosion by use of protective coatings
AS 2312.1	- Paint coatings
AS/NZS 2312.2	- Hot-dip galvanising
AS 2870	Residential slabs and footings
AS 3600	Concrete structures
AS 3700	Masonry structures
AS 3798	Guidelines on earthworks for commercial and residential developments
AS 3850 (series)	Prefabricated concrete elements
AS 4100	Steel structures
AS 4600	Cold formed steel structures
AS 4678	Earth retaining structures
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 4792	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialised process
AS 5131	Structural steelwork - Fabrication and erection

The above are the minimum standards that should be considered. All other relevant standards and codes must be adopted as deemed necessary.

3 Design drawings

The drawings shall comply with the following principles/requirements.

The drawings shall comply with NTG Technical Drawings Part 1 and Part 3.

Ensure there is no conflict between the Structural drawings and other discipline drawings.

Depicting structural details on other discipline drawings is not acceptable.

Incomplete structural documentation is not acceptable.

Structural notes must not be excessive with only the notes that are relevant shall be shown. Notes that are not relevant shall not be included.

All graphical details shall be drawn to the correct scales. The outlines and details of a representation must be proportional to the represented part.

Details shall be unambiguous and clear. For any feature of a drawing, there shall be only one interpretation. It must be easy for people who will read and use the drawings to understand the drawings. Details by description without actual graphical illustration is not acceptable.

Details of a specific nature and particular to an individual project need to be fully detailed in the drawings. It is important to ensure that the coverage is comprehensive. If a specific detail is required that is not similar to any other previously shown detail, it must be shown.

Details of specific nature based on standardise details are not acceptable. The details shall be purposely drawn to reflect and illustrate the detail envisaged.

Details shall be clearly cross-referenced to the appropriate design layout/elevation/section. Poor or erroneous cross-referencing is not acceptable. Omission of cross referencing is not acceptable.

Details not relevant or applicable to the project shall not be included as part of the detailing.

Areas of floor designed to support specific localised heavy loads (e.g. mechanical equipment or compactus storage) shall be noted and highlighted on the structural floor plans.

Amendments when required on drawings must be shown clouded and tagged with an appropriate mark in accordance with NTG Technical Drawings Part 1. Additionally, the amendment table within the title block of the drawing must be updated (with a brief description) to reflect the amendment.

4 Design deliverables

Drawing submittals for design review at each of the major phases shall meet the level of completion listed below.

Table – Design deliverables					
Deliverables (But not limited to)	**25% Conceptual design and drawings established**	**50% Major design elements completed and design analysis completed**	**75% Detailed drawings and technical specification developing**	**95% Deliverables substantially complete**	**100% Contract document ready**
General structural notes, site plan, drawing index	Preliminary design criteria and parameters established	Address comments from previous review Preliminary project specific structural notes presented	Address comments from previous reviews Project specific structural notes finalised	Address comments from previous reviews Amend as required	Complete
Ground slabs, column, wall, and footing layout plans, and related details	Preliminary layout plans and schedule showing slabs and footing information	Address comments from previous review Layout plans, legend, and schedule (showing type, size and reinforcement) confirmed and presented Preliminary details presented	Address comments from previous reviews Layout plans and related details complete	Address comments from previous reviews Amend as required	Complete

Table – Design deliverables					
Deliverables (But not limited to)	**25% Conceptual design and drawings established**	**50% Major design elements completed and design analysis completed**	**75% Detailed drawings and technical specification developing**	**95% Deliverables substantially complete**	**100% Contract document ready**
Wall elevations and related details	Preliminary elevations showing design intent and type of construction	Address comments from previous review Elevations with schedules showing steel member or reinforcement sizes Preliminary details presented	Address comments from previous reviews Elevations with schedules complete Details developing and at an advanced stage	Address comments from previous reviews Elevations and related details complete	Address comments from previous reviews Complete
Sections and related details	Preliminary sections showing design intent	Address comments from previous review Sections and related details developing and presented	Address comments from previous reviews Sections and related details progressing and at an advanced stage	Address comments from previous reviews Section and related details complete	Address comments from previous reviews Complete

Table – Design deliverables					
Deliverables (But not limited to)	**25% Conceptual design and drawings established**	**50% Major design elements completed and design analysis completed**	**75% Detailed drawings and technical specification developing**	**95% Deliverables substantially complete**	**100% Contract document ready**
Concrete beam, column, suspended slab layout, stairs, lift shaft plans, and related details if applicable	Preliminary layout plan showing design intent and approximate member sizes	Address comments from previous review Plans and schedules (showing type, size and reinforcement) confirmed, including positive and negative reinforcement plans	Address comments from previous reviews Plans and schedule complete Details progressing and at an advanced stage	Address comments from previous reviews All concrete elements and associated details complete	Address comments from previous reviews Complete
Steel/concrete column and roof framing layout plans and related details	Preliminary concept showing design intent, layout plans and approximate member sizes	Address comments from previous review Column layouts, roof framing layout plans, member schedules (with steel sizes) confirmed and presented Developing steel connection detail details	Address comments from previous reviews Framing layout plans, and member sizes complete Steel connection details progressing and at an advanced stage	Address comments from previous reviews All steelworks and associated details complete	Address comments from previous reviews Complete

Table – Design deliverables					
Deliverables (But not limited to)	**25% Conceptual design and drawings established**	**50% Major design elements completed and design analysis completed**	**75% Detailed drawings and technical specification developing**	**95% Deliverables substantially complete**	**100% Contract document ready**
Miscellaneous structures/items and/or details (e.g. walkways, stringer stairs, screens, external ceiling, retaining walls, debris resistant glazing, seismic restraints, decking, etc.)	Preliminary information showing design intent	Address comments from previous review Elevations, sections, plans confirmed and presented Construction type shown confirmed and presented	Address comments from previous reviews Elevations, sections, layout plans and related details progressing and at an advanced stage	Address comments from previous reviews All details complete	Address comments from previous reviews Complete

5 Additional design requirements

Comply with the following additional specific requirements.

5.1 General design requirements

5.1.1 Design engineer

The structural engineer responsible for the design and certification shall be a NT Registered Building Practitioner (Structural) with extensive experience and proven track record in design and construction for buildings commensurate with the value, usage and complexity of the IL4 building or cyclone shelter works.

Provide an efficient structural design and high-quality documentation.

Review reports and address any comments of the independent third party review engineer.

Provide the required Section 40 engineering certificate and documentation to enable the Building Certifier to issue a Permit to Build.

Completion of a technical specification section relevant to this discipline.

5.1.2 Design life

The building design life for the primary structure (floor foundations, walls and structural framing and roof structure) is defined to be 50 years as per the requirements of the Building Code, AS 1170.0 and AS 3600.

5.1.3 Building importance level

The building and its ancillary structures are to be designed as Importance Level (IL) 4 with impact protection against windborne debris, and to remain operational after the disaster event.

Listed below are some examples of IL 4 building types:

- Buildings and facilities designated as essential facilities.
- Buildings and facilities with special post disaster functions.
- Medical emergency or surgery facilities.
- Emergency service facilities: fire, rescue, police station and emergency vehicle garages.
- Utilities required as backup for buildings and facilities of Importance Level 4.
- Designated emergency shelters (excluding cyclone shelters).
- Designated emergency centres and ancillary facilities.
- Buildings and facilities containing hazardous materials capable of causing hazardous conditions that extend beyond property boundaries.

5.1.4 Structural robustness

Comply with the requirements of AS 1170.0, NCC and ABCB Structural Robustness Handbook.

The structure and its fabric shall be designed and constructed so that they will not be damaged to an extent disproportionate to the original cause, by unforeseen events such as localised cladding failures, or opening failures, or due to the consequences of human error, during the disaster event.

Low-rise concrete panel buildings (which are prone to progressive collapse) shall be provided with more than one means of lateral stability so that there is an alternative load path. For example, a roof framing system relying on a single set of roof cross bracing (to transfer lateral loads) is not acceptable. A minimum of two sets of cross bracing to give an alternative load path is required.

A debris protected building designed with a low internal wind pressure is not acceptable.

5.1.5 Deflection limits

Generally, deflection limits shall be as per AS 1170.0.

Table – Deflection limits			
Item	**Description**	**Applied Load**	**Criteria Adopted**
Roof supporting elements	Mid-span deflection	$G + \Psi_l Q + W_s$ $G + W_s$	Span/300
Floors and floor supports	Mid-span deflection	$G + \Psi_l Q$	Span/350 or 30mm Span/500 (under blockwork walls / glazing)
Wall elements	Mid-height deflection	W_s	Height/250
Transfer structures	Mid-span deflection	$G + \Psi_l Q$	Span/500

5.1.6 Non-structural parts and components

Non-structural parts and components, including architectural, mechanical, and electrical components, and their fastenings, shall be designed for horizontal and vertical earthquake forces as per the **Design of parts and components** Section of AS 1170.4 for all non-domestic buildings. Refer to the respective discipline's Minimum Design Standard (MDS) for further instructions.

5.1.7 Modification to existing structure

A structural assessment of the existing structure by visual inspection and examination of the original/as-built drawings shall be undertaken to confirm the accuracy of the original drawings, assessment of the impacts on the overall structure and the effect on the localised area affected by the proposed modifications.

5.1.8 Ecological sustainable design (ESD)

The design shall consider and incorporate ESD requirements into the structure wherever possible. This includes, but is not limited to: consideration in the use of steel (structural steelwork or reinforcement) manufactured from high recycled steel content, and General Purpose Blend (GB) cement that contains manufactured by-product slag, or a concrete mix that contains fly ash.

5.2 Design loads

The design of the building structure (for stability, strength and serviceability) and external fabric, including windows and doors, shall be capable of resisting the loads listed below.

As a minimum the following information shall be noted in tabular form on the structural drawings approved for construction:

- Design superimposed dead loads
- Design live loads
- Special design live loads in localised areas such as compactus storage
- Design wind loads
- Design earthquake loads
- Design bearing pressures for foundation material
- Any other relevant loadings

All design loads and their parameters relevant to the project shall be fully stated on drawings.

5.2.1 Dead and live loads

The dead loads shall be calculated in accordance with the principles of AS 1170.0 and AS 1170.1 and utilise a gravity constant of 9.81m/s^2.

Superimposed Dead and Live Loads are to be calculated in accordance with the minimum loads described below (unless exceeded by the loads described in AS 1170 in which case the design must be for the higher load).

Table – Typical minimum loads for calculation Superimposed Dead Loads, and Live Loads

Area/Use	Load	Load (kPa)	Load (kN)	Comments
Roof	Live Load	0.25 4.0 for accessible roofs	- 1.8	-
Typical Suspended Floor Level	Dead Load	0.5	-	-
	Live Load	3.0	2.7	Offices for general use, hospital wards.
Basement Level Slab	Surcharge Load	Refer Geotechnical Report	-	-
	Live Load	2.5	13	Light traffic.
Stairs/Landings/Foyers	Dead Load	0.5	-	-
	Live Load	4.0	4.5	-
Plant Rooms	Dead Load	Plant Loads	-	-
	Live Load	5.0	4.5	-
Basement Walls	Surcharge Load	Varies	-	This will vary depending on the methodology chosen to deal with ground water.

Areas of floor designed to support specific localised heavy loads (e.g. from compactus storage or mechanical plant equipment or vehicles) shall be noted and shaded on the structural floor plans.

5.2.2 Wind loads

The wind forces applied to the building are determined in accordance with AS 1170.2 based on the criteria below.

Table – Wind forces determination criteria

Item	Description	Symbol	Value	Comment
Site and Building Data	Terrain category	-	To be determined	Design for worst case direction.
	Region	-	C	-
	Reference probability of exceedance	-	2,000	-
Wind Data	Regional wind speed (ultimate)	$V_{10,000}$	73 m/s	-
	Regional wind speed (serviceability)	V_{25}	47.0m/s	-
	Topographic factor	M_t	>1.0	Refer Contour Survey to determine.
	Site shielding factor	M_s	1.0	Applies for worst case direction
	Wind direction multiplier	M_d	1.0	Applies for worst case direction.
	Internal pressure coefficient (ultimate)	C_{pi}	+0.7, -0.65	The internal pressure is determined on the basis that localised failure of cladding element may occur due to a load larger than the design debris load or that use of the natural ventilation system may result in full internal pressure

5.2.3 Earthquake loads

The building is to be designed to resist earthquake loads for a building of Importance Level 4 as defined by the NCC and AS 1170.4.

5.2.4 Debris loads

The external building fabric (including, but not limited to, debris screens, walls, cladding, windows, doors, roller shutters, plant room louvres, mechanical dampers, and ventilation grills) shall be capable of resisting wind borne debris loads based on the criteria below.

Table – Criteria for design for wind-borne debris loads				
Item	**Trajectories**	**Description**	**Impact Speed (m/s)**	**Comment**
Wind Borne Debris	Horizontal	A spherical 8mm steel ball of 2g impacting at 0.4 x $V_{10,000}$, normal to wall surfaces, and roof surfaces greater than 35° pitch	29	-
		A 100mm x 50 mm piece of timber of 4 kg (of a density of at least 600kg/m3) impacting end-on at 0.4 x $V_{10,000}$, normal to wall surfaces, and roof surfaces greater than 15° pitch	29	
	Vertical	A spherical 8mm steel ball of 2g impacting at 0.3 x $V_{10,000}$, normal to roof surfaces less than, or equal to, 35° pitch	22	Roof cladding up to 15° pitch shall have a minimum of 18mm plywood protection against windborne debris irrespective of test results.
		A 100mm x 50 mm piece of timber of 4 kg (of a density of at least 600kg/m3) impacting end-on at 0.1 x $V_{10,000}$, normal to roof surfaces less than, or equal to, 15° pitch	7	

The building shall be located away from taller structures defined by a plane that is 1 vertical to 1 (minimum) horizontal. The horizontal distance between the building and the taller structure must be equal to the height of the taller structure or greater.

External walls shall be of reinforced blockwork or concrete.

Reinforced blockwork shall be concrete filled all cores for all external walls.

Roof with a slope 15° or less shall have debris protection lining of no less than 18mm structural plywood regardless of the test results of vertical trajectory test.

Roof with a slope greater than 15° shall be designed as a wall and must satisfy the horizontal trajectory debris impact loads.

Do not use stainless steel woven wire mesh as cyclone debris screen.

Test method for debris tests shall be in accordance with *'2006 Design Guidelines for Queensland Public Cyclone Shelter - Appendix I: Specifications and Guidelines – External fabric of Public Cyclone Shelters - Specification of test criteria and procedures, and Debris resistant screens for Public Cyclone Shelter Specifications'*.

Fabric materials compliance must be verified with a NATA test compliance report, certified by a Registered Professional Engineer, to the specified criteria, and approved by DIPL.

6 Geotechnical investigation

Prepare a written geotechnical investigation report of the site including any car parking areas.

The report shall provide information on subsurface conditions across the site, including but not limited to:

- Assessment of soil materials encountered across the site
- Site classification in accordance with AS 2870
- Recommendations on site preparation and earthworks requirements, including suitability of in-situ material for re-use as fill, placement of fill, compaction criteria and testing requirements
- Recommendations on suitable foundation systems
- Foundation design parameters, including allowable soil bearing pressures and estimated soil settlements
- Assessment of the site factor for earthquake design in accordance with AS 1170.4
- Assess pavement requirements and provide pavement subgrade design parameters, including CBR
- Comments on site drainage and groundwater
- Identify anticipated construction difficulties and provide possible solutions

The investigation shall be carried out by an experienced and qualified Geotechnical Engineer.

6.1 Foundation design

Foundation design shall be based on the recommendations of the Geotechnical Report prepared for the project. Fill material shall be select fill and compacting to 95% (min) MMDD. Depth of footings to be determined by Structural Engineer.

The project title, the name of the consultant / author, the report number, and the issue date of the Geotechnical Report shall be clearly noted on the drawings.

6.2 Earth pressure

Any designed structure, including retaining walls, shall be designed to resist earth pressures in accordance with the recommendations from the Geotechnical Investigation. Basement walls and floors must be protected via subsoil drains.

7 Building fabric and layout

7.1 Location of walls, columns and wall bracing

The design of the structure shall incorporate flexibility for future changes in internal layout or use. This requirement must be reflected in the design of the building structure. The use of internal walls as load bearing or structural walls is to be avoided where possible.

Careful consideration must be given to the location of columns within the building. Columns within the body of a functional space should be avoided wherever possible.

Walls required for bracing purposes should be carefully located so as not to impact severely on flexibility to rearrange the internal layout in the future.

7.2 Fire resistance

The structure and its component members shall be designed for the appropriate fire resistance in accordance with the relevant Australian Standards and the requirements of the NCC.

7.3 Strength

The structure and its component members shall be designed such that their design strength exceeds the appropriate design actions in accordance with the NCC and the relevant Australian Standards.

7.4 Stability

The structure as a whole and its parts shall be designed to prevent instability due to overturning, uplift and sliding in accordance with the NCC and the relevant Australian Standards.

7.5 Serviceability

The structure and its component members shall be designed for serviceability by controlling or limiting deflection, lateral drift, cracking, and vibration in accordance with the relevant Australian Standards.

Unreinforced blockwork is not permitted.

7.6 Waterproofing and weatherproofing

The exterior building fabric shall be resistant to water penetration. The fabric shall not permit penetration of uncontrolled water when tested in accordance with AS 2047 under a water penetration resistance test pressure of 630 Pa.

Floors, walls and lift pits shall be fully tanked where below grade or subject to hydrostatic pressure.

7.7 Windows, doors, louvres, dampers, debris screens and roller shutters

External doors, windows, louvres, mechanical dampers and roller shutters shall comply with the requirements of wind and debris loads. Evidence of debris testing for compliance is required.

Details of debris screens, louvres, glazing, windows frames, door frames, door locks and associated fixings between frame members and walls shall be fully documented and structurally certified with Section 40 Structural Design Certificate. It is envisaged the design engineer will need to collaborate with the aluminium and glazing manufacturers suppliers (such as Capral and Glasshape) to complete the design of windows to satisfy the requirements.

Purposely made doors or proprietary doors (such as Sealeck doors) that have been tested, and satisfied the debris loads and test criteria are acceptable to be specified for this project.

Roller shutters thickness shall be 1mm BMT minimum. Fixing of roller shutters channel guide to wall must be fully detailed and certified as part of structural design documentation.

Do not refer to manufacturer’s details or specifications for fixings. Fixing details shall be detailed as part of structural drawings.

Only the products that have been tested and meet the debris testing compliance should be specified.

Drawings shall specify design wind pressures (incorporating local pressure factors) and water penetration resistance pressure for glazing. Water penetration resistance test pressure shall be 630 Pa (minimum).

8 Concrete and masonry

8.1 Concrete durability

All concrete elements of the structure shall be designed for durability in accordance with Table 4.3 of AS 3600, the exposure classification of particular concrete surfaces shall be detailed below.

Table – Concrete durability			
Item	**Description**	**Value**	**Comment**
Concrete Durability	Design life	50 years	-
	Concrete exposure classification	A2	Surfaces in interior environments / surfaces in contact with ground protected by damp proof membrane
		B1	Near coastal / surfaces in above-ground exterior environments (1km to 50km from coast or tidal estuaries)
	Concrete strength	32MPa (f'c) minimum	Vehicle pavements in any location

8.2 Crack control

Reinforcement for crack control shall be provided at, or better than, the ratios stipulated in AS 3600. This requirement does not replace any requirement for reinforcement specified for structural integrity.

8.3 Post tensioned or precast concrete slab

The adoption of post tensioned or precast concrete system for slab or beam is not allowed without the approval of DIPL.

If post tensioned slabs are installed, the location of all tendons must be marked on the underside of the slab to ensure that any future core holes cut in the slab do not intersect any stressing cables.

8.4 Ground slab moisture barrier and bedding sand

All floor slabs on ground shall be placed on moisture barrier equivalent to 300 micron thick 'Fortecon' polythene membrane, turned up at the perimeter and with all joints and penetrations sealed.

Do not use or specify 200 or 300 µm termite barrier polymer sheet (e.g. HomeGuard or similar product) as moisture barrier or damp proof membrane is prohibited.

Bedding sand shall be a naturally occurring material that has a high clay/fine silt content to ensure the material can hold its shape when used under concrete slabs. Do not use or specify manufactured quarry sand as bedding sand. This must be clearly noted on the drawings.

8.5 External slab

External slabs associated with buildings are to be documented as part of structural documentation. This includes slabs for under cover walkways, verandahs, carports, and path slabs linking between buildings.

Do not document external slabs of buildings as part of civil design documentation.

8.6 Slab joints

Slab joints whether for contraction, expansion, or construction must be considered and documented as part of structural documentation. All joint locations to be clearly shown on the slab plans.

Slabs with architectural significance or visible surfaces must be carefully designed to minimise cracking.

Do not document joint locations and details of building slabs as part of architectural or civil documentation.

8.7 Masonry

Drawings to specify clean out inspection holes at base course of all reinforced and core fill cores. Clean out progressively as the work proceeds all cores which are to be filled.

Drawings are required to show full elevations of all external and internal shear blockwork walls.

Window sills are required to be fixed to bond beam with galvanised N12 shear pins at 600mm centres and at each window mullion.

All external blockwork, wet area blockwork, blockwork below ground level and for the first 3 base courses above finished floor level shall be constructed using mortar with a damp-proof admixture such as “Cementaid Calblack” or similar. This must be clearly noted on the drawings.

All external blockwork walls shall be concrete filled all cores.

The use of unreinforced blockwork or brick masonry walls is prohibited.

Blockwork control joints shall be provided in walls to minimise the effects of linear shrinkage, temperature variations, creep, and subgrade movement. All joint locations to be clearly marked on slab plans and wall elevations.

9 Steel and metal

9.1 Protective coatings on steel

Durability

The steel protection system shall satisfy the requirement of very long term durability of 25 years to first major maintenance and be warranted for a minimum of 20 years. Name the Principal as the warrantee.

Coating damage caused by welding or flame cutting, or during handling, transport, or erection shall be reinstated in accordance with the provisions of AS/NZS 4680, **Repair after galvanizing** section.

Bases of all external structural steel columns must be coated with “Epireze 215”, coated 100mm below slab level or top of base plate, and extend to 100mm above finished concrete slab or above concrete collar surface level at the steel.

External steel columns / stumps surrounded by natural ground shall be encased with a reinforced concrete collar. The collars must extend horizontally a minimum of 100mm from the steel. The collars must be sloped down away from the column and finish not less than 100mm above natural ground level at the highest ground level point adjacent to the concrete collar.

Guide Notes

The steel protective coating/s for the project is/are to be selected from the following Table with options of inorganic zinc silicate (IZS), hot dip galvanised (HDG), or polyurethane system. Following the identification of the building location and the finish required, select and specify the appropriate coating/s from the Table. The selection of coating is to be read in conjunction with the associated NOTES below the table.

Do not use other protective coatings without approval.

Coating required is HDG, IZS, or polyurethane system (subject to the building location and finish required by the design architect), for all structural steelwork.

Table – Steel protective coating selection

Building location	Coating	Comment
Inland tropical (areas more than 0.5km from coast or estuary)	Hot dip galvanised (HDG) - As per Table 1 of AS/NZS 4680	Steelwork to be galvanised shall be prepared and pre-treated to the requirements of AS 1627.4 and hot dip galvanized in accordance with AS/NZS 2312.2, AS 4650, AS/NZS 4680, and with the Standard Specification for Hot Dip Galvanizing, published by the Galvanizers Association of Australia, accessible via https://gaa.com.au/standard-specification-for-hot-dip-galvanizing/ .
	Inorganic zinc silicate (IZS) - 75 µm DFT (min)	All non-galvanised steelwork is to be blast cleaned to a class 2½ finish and primed with 75 microns inorganic zinc silicate. Top or finish coat to be as per architectural specification.
Marine (areas 0.5km from coast or less)	Polyurethane System, total DFT 325 µm - Consists of 75 µm IZS primer, 200 µm high build epoxy (2 pack) intermediate coat, and 50 µm polyurethane (2 pack) topcoat	Prepared and primed as above. Colour to be as per architectural specification.

NOTES:

1. For this Guide, durability is defined as the time elapsed before the first major maintenance (recoating) of a coating system becomes necessary, to arrest corrosion.

2. The objective is to achieve maximum durability compatible with the 50 years design life of the structural steelwork, or equal to the expected service life of the structure as defined in the Brief or NCC.

3. The design of the structure influences the choice of a protective coating. As a general rule, important, difficult to access, and complicated structures should be given long-life systems to reduce the amount of costly maintenance. More durable coating at the beginning is more sustainable and this will lead to cost saving in the long run with less or no recoating required (lower lifecycle cost).

4. Any components of the structure which are not accessible after assembly should be provided with a corrosion protection system that will remain effective for the service life of the structure. If this cannot be achieved by means of a protective coating system, other measures, such as manufacturing from corrosion-resistant material, designing for replacement, or specification of a corrosion allowance, should be taken.

5. IZS and HDG have been chosen as the preferred steel protective coating systems due to their proven performance, superior durability and less maintenance (lower frequency of recoating required) than other products. Both have been shown to have a very long life to first maintenance in most environments and often no maintenance will be required during the entire life of the project.

6. As a guide, colour or architectural paint coated finish steel shall have a protective coating of IZS. Buildings located within the tropical, arid and more than 0.5km from the coast or tidal estuaries shall be coated with IZS or HDG. Steel surfaces vulnerable to corrosion in the coastal fringe would require a polyurethane coating system. Coastal fringe includes areas up to 0.5km from the coast or tidal estuaries.

7. The coating systems apply to all structural steelworks of the project, including internal and external (exposed) located steel members. This standardised approach minimises confusion and errors in design and fabrication, easier for quality control in verification and inspection, and provides consistency among all DIPL projects.

8. Specifiers to nominate the coating systems suitable for the project based on the coating options and criteria from the Table as well as other criteria stated in this Guide.

9. For works associated with refurbishment of existing steelwork, minor and temporary structures, or if only a shorter working life is required, a cheaper, less durable system may be sufficient. However, this will need to be assessed on a case by case basis, and be subject to approval by DIPL.

10. For this Guide, the atmospheric corrosivity category has been assessed as C5 for the areas of Coastal fringes, Tropical Inland or C4 for the areas north of Tennant Creek and up to the Top End C5 region, and C3 for the arid areas south of Tennant Creek to Central Australia.

11. In the regional centres such as Tenant Creek and Alice Spring Springs where HDG facility is unavailable, specifiers are reminded to also consider local industry capacity to undertake the coating work, and the logistics of having to have the coating undertaking elsewhere if HDG is specified for the project in the area.

12. Due to potential surface exposure to micro-climatic circumstances of damp and mild humidity, condensation, acidic or alkaline (fallout) mist generated from the air-conditioning cooling tower, extreme hot or cold weather, and windborne abrasives (e.g. sand or soil), which can contribute to coating degradation, the areas south of Tennant Creek to Central Australia within the NT has been assessed as C3 in atmospheric corrosivity category.

9.2 Dissimilar metals

Contact between dissimilar metals shall be avoided to prevent galvanic corrosion. Special attention is required to reliably achieve isolation between dissimilar metal surfaces using marine-grade stainless steel inert spacers or washers.

9.3 Steel stud wall frame

Do not specify steel stud frames for external or structural walls.

Non-structural internal stud frames of light gauge “C” sections shall be no less than 1.6mm BMT and must be fully detailed. Drawing details shall include, but not be limited to, full elevation of every wall frame, member section sizes, welding connection, galvanised hold-down bolt information, and specification of Alcor flashing between base of bottom plate and concrete.

Fixing of bottom plates to concrete slab must be by galvanised cast-in bolts. Do not use other mechanical fixings, nor chemical anchors, for the fixing without approval.

Do not specify manufacturer proprietary systems.

Do not specify manufacturer to design, manufacture, and certify for structural stud wall frames.

9.4 Metal capping and flashing

All exposed parts of flashing and capping are to be screw fixed with No. 14 class 4 HH screws with EPDM seal. Fixing distances to be fully detailed and in accordance with AS 1562.1:2018 for cyclonic regions. This must be noted on the drawings.

9.5 Metal roof and wall sheeting

All metal sheeting to be Colorbond steel.

Sheeting thickness to be 0.48mm BMT minimum with Class 4 finish fixing screws.

Ceiling sheeting thickness can be 0.42mm BMT.

9.6 Hold-down anchor

All vertical hold-down anchors are to be cast-in system.

Do not use other mechanical, nor chemical anchors as column or stub column hold-downs without approval.