SENTREL
AUSTRALIA

Sentrel iRail

Aluminium Rail and Stainless Steel Infill System — Balustrade and Pool Fence

CERTIFIER INFORMATION PACK
Engineering & Compliance Information

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1. Product and system description

Sentrel iRail is a panelised barrier system comprising 75 × 40 × 3 mm extruded aluminium top and bottom rails (6005A T5) with vertical 12.7 × 1.2 mm 316 stainless steel infill tubes that lock into the rails, supported on 65 × 65 × 3.0 mm extruded aluminium posts (6063-T5) with welded 110 × 110 × 12 mm base plates. Each panel is held to the posts by cradle brackets and caps, as tested. An optional snap-on aluminium handrail (80 × 32 × 2.5 mm, 6063 T5) is available. iRail is a site-assembled system — the rails, stainless infill tubes, posts and brackets are assembled and fixed on site per the Sentrel installation instructions — and is used for both balustrade and pool fence applications; matching gate units are supplied for pool fence use. This pack presents the two applications separately because each is supported by its own NATA test report.

2. Scope of supply and limitations

Supply only — Sentrel does not install. Sentrel Australia supplies iRail as a kit. The rails, stainless infill tubes, posts and brackets are assembled and fixed in place on site by the customer or their builder, following the Sentrel installation instructions supplied with the system. Sentrel does not provide an installation service for this product and is not the installer of record. On advice received from NSW Fair Trading, the onsite fixing of the supplied system does not of itself require a contractor licence; parties should confirm licensing requirements applicable in their own jurisdiction and project context.

Compliance coverage — from the posts up. The evidence summarised in this pack covers the Sentrel system from the posts upward, including the post fixing in the configurations described below. Two tiers of fixing coverage apply, and they are kept distinct throughout this pack: (a) fixing to concrete is supported by independent NATA test evidence; (b) fixing to timber and other substrates is supported by Sentrel's engineering assessment, provided the connection develops the required design actions. See Section 2.1.

Site-specific matters remain with the certifier / project engineer. Wind region and site wind speed, bushfire attack level (BAL), barrier heights and non-climbable zones relative to finished ground and

surrounding structures, boundary-barrier situations, the adequacy of the supporting slab or structure, and any equipotential bonding or earthing required by AS/NZS 3000 (to be carried out by a licensed electrical contractor) are site-specific and are not certified by Sentrel. Sentrel can provide tested capacities, drawings and supporting documentation for these assessments on request.

2.1 Fixing coverage — concrete (tested) and timber / other (by assessment).

Concrete — test evidence. The Sentrel post and base plate have been load-tested fixed to a concrete substrate and this configuration is supported by the NATA test reports cited in the compliance summary. The adequacy of the concrete itself (thickness, strength, edge distance, reinforcement and condition) remains a site matter for the project engineer or certifier.

Timber and other substrates — Sentrel engineering assessment. Fixing the Sentrel post to timber (or to other substrates) is not covered by the NATA test reports, which relate only to the samples tested on concrete. It is instead supported by Sentrel's own engineering design basis, provided as an engineering assessment rather than as laboratory test evidence. On that basis, fixing to a timber substrate is supported provided the connection develops the required barrier design actions — a concentrated design action of P* = 1.65 kN and a distributed design action of w* = 1.125 kN/m (domestic barrier loads to AS 1170.1), resolved through the base plate at a 110 mm lever arm — with timber withdrawal capacities to AS 1720.1.

Specified timber fastener. The recommended timber fastener is the Bremick XTP 18g washer-head construction screw (T40 drive, TechnoGuard coated) — a structural screw that drives without coach-screw effort and whose large washer head bears across the 10 mm base-plate hole without an added washer. For coastal or pool environments the equivalent is the SPAX 8 mm washer-head screw in 316 stainless steel (drive without an impact driver). Capacity is taken from the XTP published pull-out data (mean ultimate 12.6 kN in F17/JD3 hardwood and 7.3 kN in F5/JD4 pine at 35 mm embedment), reduced by a 0.34 design knock-down and scaled linearly with penetration. Stocked lengths for timber-fixed posts are 150, 200 and 250 mm (18g) only. The loaded-row pattern is two screws in hardwood (JD3 and denser) and two or three screws in pine/LVL (JD4), per the table below; for the three-screw pattern the third screw goes in a workshop-drilled 10 mm hole midway along the loaded row (5 screws per post). Screw length is sized so the thread penetrates the structural bearer (not decking alone) by the depth in the table below; where the post sits over a decking or packer gap, that gap is added to the screw length. Sections 7–12 of this pack cover this same post system — the 65 × 65 mm aluminium post, now supplied on a 110 × 110 × 12 mm base plate (the 112 × 112 × 10 mm plate was load-tested on concrete in AZT0257.23; the production plate has not been separately tested). This is an engineering assessment by Sentrel, not an independent test result.

Timber / pattern	XTP 18g screw	Penetration	Max span	kN req.	kN ach.	Wind rating
JD3 hardwood & denser — 2 screws	150 mm	133 mm	3.0 m	30.7	32.6	**N3**
JD3 hardwood & denser — 2 screws	200 mm	183 mm	3.0 m	30.7	44.8	**N3**
JD3 hardwood & denser — 2 screws	250 mm	233 mm	3.0 m	30.7	57.0	**N3**
JD4 pine / LVL — 2 screws	150 mm	133 mm	1.8 m	18.4	18.9	**N4**
JD4 pine / LVL — 2 screws	200 mm	183 mm	2.5 m	25.6	26.0	**N3**
JD4 pine / LVL — 2 screws	250 mm	233 mm	3.0 m	30.7	33.0	**N3**
JD4 pine / LVL — 3 screws	150 mm	133 mm	2.7 m	27.6	28.3	**N3**
JD4 pine / LVL — 3 screws	200 mm	183 mm	3.0 m	30.7	38.9	**N3**
JD4 pine / LVL — 3 screws	250 mm	233 mm	3.0 m	30.7	49.6	**N3**

Table values are for the screw thread fixed directly into the structural bearer. For a decking or packer gap g, increase the screw length by g. kN required = 10.23 × span (design tension on the loaded row); kN achieved = number of screws × design withdrawal × penetration. Wind rating = the highest AS 4055 wind class the panel width (= span) stays within the tested post capacity for (N1–N3 ≤ 3,000 mm; N4 ≤ 2,160 mm; N5 ≤ 1,355 mm; N6 ≤ 910 mm — see the wind section); all spans are capped at the 3.0 m maximum panel length.

Steel and other substrates. The demand is unchanged — the loaded-row fixings must develop T* = 10.23 × span (kN), e.g. 30.7 kN total at 3.0 m spacing. The valid fixing (tapped 8.8 set screw or through-bolt in thick steel; rated self-drilling structural screws or weld studs in thinner steel; with galvanic isolation of the aluminium plate) is selected and verified by the project engineer against the per-fixing capacity table in Section 10 of this pack.

Wind loading — maximum panel width by wind rating. Each panel is supported by two structural posts (65 × 65 × 3 mm aluminium; fence height 1,206 mm FFL to top rail). The post assembly's was tested to a breaking load of 2,720 N·m (AZT0257.23, weld shear); on a limit-state basis this gives a welded-base design capacity of φRn ≈ 1.51 kN·m (from the tested ultimate via AS/NZS 1170.0 Appendix B; the 12 mm production base plate is thicker than the 10 mm tested plate, but 110 × 110 mm against the tested 112 × 112 mm (production plate not separately tested)). Wind load is calculated member-by-member with credit for the round 12.5 mm infill bars at 100 mm centres and low panel solidity. The table below gives the largest panel width that keeps the ULS wind moment within φRn for each site wind classification to AS 4055 — including the cyclonic classes — the N rating shown on most residential site classifications. Select the panel width (or standard panel size) at or below the figure for the site's confirmed rating.

Wind class (AS 4055)	Equivalent region	Maximum panel width	Largest opening
N1 – N3	Region A	**3,000 mm (cap)**	2,935 mm
N4	Region B	**2,160 mm**	2,095 mm
N5	Region C (non-cyc)	**1,355 mm**	1,290 mm
N6	Region C (non-cyc)	**910 mm**	845 mm
C1	Region C/D	**3,000 mm (cap)**	2,935 mm
C2	Region C/D	**2,160 mm**	2,095 mm
C3	Region C/D	**1,355 mm**	1,290 mm
C4	Region D	**910 mm**	845 mm

Widths are the structural post spacing, worked out for an intermediate post, which carries the wind on half of each neighbouring panel (two structural posts per panel; the 12.5 mm infill bars are non-structural), for the tested 1,206 mm fence height against the post limit-state design capacity φRn ≈ 1.51 kN·m (AZT0257.23, welded base). A 3,000 mm manufacturing cap applies. The cyclonic classes C1–C4 (Regions C/D) are included and are designed to the static ULS wind actions. For ground-mounted posts, the embedded footing option (Section 8A) may be used; an embedded 6063-T5 post gives slightly narrower widths (N4 1,980 mm, N5 1,230 mm, N6 820 mm). The certifier or engineer confirms the site classification per AS 4055 / AS/NZS 1170.2.

Optional aluminium handrail cap. An aluminium handrail cap (6063-T5) is available as an additional option that can improve the wind rating in some situations — for example where it ties the tops of in-ground 6082-T6 posts together, braces off existing structural posts, or where panels meet at right angles and brace one another. The benefit is situational and is assessed case by case; ask Sentrel for the applicable option.

What limits panel width. For a pool fence the limiter at these widths is the **post**, not the base fixing. A wider panel puts more wind moment on the post, and the post assembly reaches its design capacity (φRn ≈ 1.51 kN·m, ULS) before the timber fixing reaches its pull-out capacity — so the base screws are not the weak link, and adding screws does not allow a wider pool-fence panel. To exceed the widths above, the post itself, its footing or the panel must be upgraded and re-tested. (This is the opposite of the balustrade case, where the heavier people-load makes the base fixing the limiter, and the 3-screw pattern in the span table does extend the reach.)

Bracket fixing to existing or site-supplied posts — minimum fastener requirement. Where iRail brackets are fixed to an existing or site-supplied post (not a Sentrel post), the minimum fastener specification is **2 screws per bracket, each rated to at least 506 N shear** — based on NATA test results (AZT0130.20), not a generic screw datasheet. In that test the toughest case — 750 N/m load across the 2.7 m panel — put 1,013 N on each bracket, 506 N per screw, into a 3 mm aluminium post wall with no failure. A generic datasheet shear rating does not apply because the screw is not the weak link: the thin aluminium around it is, so the only valid number is what was proven on the real post material. The structural adequacy of any existing or

site-supplied post (size, material, condition, wind capacity) remains the customer's / installer's responsibility — Sentrel does not certify posts it did not supply.

3A. Compliance summary — iRail as balustrade

Tested by Azuma Design Pty Ltd, NATA Accredited Laboratory No. 15147, Report AZT0130.20, tested 15/04/2020 (signed A. Horne).

Requirement	Standard / clause	Evidence document	Result
Concentrated load on top rail — serviceability 600 N, ultimate 1080 N, outwards and downwards	AS/NZS 1170.1:2002 Cl. 3.6 / Table 3.3; combination factor 1.5; AS 1657-2018 App. B method	Test Report AZT0130.20	Pass — max 20 mm deflection, ≤1 mm permanent, nil breakage
Uniformly distributed load on top rail — 750 N/m vertical and horizontal, serviceability and ultimate	AS/NZS 1170.1:2002 Table 3.3; AS 1657-2018 App. B method	Test Report AZT0130.20	Pass — max 43 mm under ultimate load, 11 mm permanent, nil breakage
Resulting occupancy classification	AS/NZS 1170.1:2002 Table 3.3	Test Report AZT0130.20, Section 6.1	Categories A, B/E and C3 only

What the occupancy categories mean here. AS/NZS 1170.1 Table 3.3 sets different barrier loads for different building uses. AZT0130.20 applied the loads required for the lighter-use categories and iRail passed them, so as a balustrade iRail is supported for Category A (domestic and residential), Categories B and E (offices, work and access areas, including walkways and stairs for access) and Category C3 (areas without obstacles for moving people, not susceptible to overcrowding — e.g. external balconies, edges of roofs).

Categories with the same or lower load requirements are also covered. The heavier crowd-load cases (1.5 kN/m and 3 kN/m) were not part of this test, so iRail as a balustrade is not supported for categories C1, C2, C5 or D, or any use requiring those higher loads — these are crowd and assembly areas such as grandstands, theatres and places of public assembly. If a project falls into one of those categories, it needs separate engineering. (This category range is specific to iRail; the Sentrel vertical cable balustrade is a different product with its own, broader evidence.)

3B. Compliance summary — iRail as pool fence

Tested by Azuma Design Pty Ltd, NATA Accredited Laboratory No. 15147, Report AZT0003.20, tested 20/01/2020 (signed A. Horne).

Requirement	Standard / clause	Evidence document	Result
Strength and rigidity of barrier openings (150 N minimum, test object)	AS 1926.1-2012, Appendix A	Test Report AZT0003.20	Pass — peak forces 191.4 N, 218.5 N, 234.4 N
Strength of posts and footings (330 N horizontal, 30 s)	AS 1926.1-2012, Appendix B	Test Report AZT0003.20	Pass — 0 mm permanent deformation, nil breakage or loosening
Strength of fencing components (330 N horizontal and vertical)	AS 1926.1-2012, Appendix C	Test Report AZT0003.20	Pass — permanent deformation 0 mm and 1 mm, within L/200 limits
Barrier geometry of tested sample	AS 1926.1-2012, Section 2	Test Report AZT0003.20, Section 2.2	85 mm vertical element gaps; 975 mm between horizontals; 1195 mm height; 90 mm ground gap

Gate units. No gate formed part of the AZT0003.20 iRail sample. However, iRail pool gates use the same gate frame as the Sentrel Aluminium Pool Fence (cable) system, which has been tested as a gate unit under AS 1926.1-2012 Sections 3.4 and 3.5 in Report AZT0098.14 (closing and latching under natural weight and after a 25 kg top-rail load; 330 N panel and corner loads; 250 N vertical at the latch stile — all pass), fitted with D&D Technologies "MagnaLatch" latch and "Tru Close" self-closing hinges. iRail gates are supplied with the same hardware. The certifier should confirm the installed gate matches this tested frame and hardware and that latch height, self-closing and self-latching perform from all positions on site. **Gate leaf height.** iRail pool gate leaf frames are 1135 mm high (no handrail or timber handrail) or 1150 mm high (aluminium handrail), with the same frame section and hardware as the tested gate. **Edition of AS 1926.1.** iRail pool fence testing was performed against AS 1926.1-2012; where a jurisdiction has adopted AS 1926.1:2024, the certifier should assess the tested configuration against that edition.

Barrier-opening (cone) test results. Tested at three locations per AS 1926.1-2012 Appendix A (105 mm cone, 150 N): recorded pull-through resistance 191.4 N, 218.5 N and 234.4 N — the cone did not pass through at any location; all results exceed the 150 N requirement (Clause 3.1, Report AZT0003.20). See the note below on where this test applies.

> **Note for certifiers — the cone (barrier-opening) test is a laboratory test, not a field test**
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> The 105 mm cone / barrier-opening strength-and-rigidity test (AS 1926.1, Appendix A, demonstrating Clause 3.1) is a normative manufacturer's certification test. The 2012 edition states the method is to be used by manufacturers to gain certification for their barrier and is not designed for in-field testing.
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> The test only works on a bench: it requires the panel clamped into a jig in the vertical position, the mild-steel test object suspended horizontally at two points on a low-friction rig, and force applied through a calibrated force-measuring device (2% accuracy) and a force-activating device, recorded at three locations across the panel. None of that apparatus exists on an installed barrier.
>
> Sentrel holds this laboratory evidence (recorded pull-through forces are listed above, all above the 150 N requirement). An on-site attempt to push a cone through an installed panel by hand is not the Appendix A test and is not a recognised compliance check under the standard; failing to push a cone through by hand is not a pass or a fail under AS 1926.1. What a certifier verifies on site is geometry (gap sizes, heights, non-climbable zones) and that the installed product matches the tested configuration.

4. Key tested details

Balustrade test sample (AZT0130.20)	Panel 2700 × 880 mm in overall sample 2830 × 1010 mm; rails 75 × 40 × 3 mm 6005A T5; infill 12.7 × 1.2 mm 316 stainless round tube; posts 65 × 65 × 3 mm 6063 T5 at 2732 mm centres; 90 mm ground gap
Panel-to-post fixing (tested)	Each panel held to the end posts by cradle brackets and caps, as tested in AZT0130.20; posts have welded base plates with full edge welds
Balustrade post fixing (tested)	4 × M6 hex head bolts per post into concrete — tested at 75 mm (AZT0130.20); supplied at M6 × 100 mm
Pool fence test sample (AZT0003.20)	Barrier 3250 mm W × 1195 mm H; two horizontal extrusions with 316 stainless infill tubes between; posts 65 × 65 × 3 mm aluminium at 3190 mm centres; 85 mm vertical gaps; 90 mm ground gap
Pool fence post fixing (tested)	4 × 6 mm × 50 mm concrete screws per post into concrete (AZT0003.20)
Posts supplied (current production)	The iRail posts now supplied (6063-T5) are the same 65 × 65 × 3 mm aluminium post section as that independently load-tested on concrete in Report AZT0257.23 (07/07/2023): 600 N — 9.29 mm deflection, 0.83 mm permanent (pass); 1200 N — 4.17 mm permanent, nil damage (pass); peak 2720 N at weld shear. Sentrel's specified concrete fixing is 4 × M6 × 100 mm screw bolts per post — longer than the tested 75 mm, giving greater embedment. Production posts use a 110 × 110 × 12 mm plate with holes at 88 mm centres, not the tested 112 × 112 × 10 mm plate at 94 mm (production plate not separately tested). Base plate as tested: 112 × 112 × 10 mm aluminium, 4 × M6 × 75 mm screw bolts at 94 mm centres. Production: 110 × 110 × 12 mm, holes at 88 mm centres (production plate not separately tested)

Optional handrail	80 × 32 × 2.5 mm 6063 T5 aluminium, snap-on to top rail, held in end brackets (included in balustrade test sample)

4A. Gate latch post (1400 mm)

For self-closing gates, AS 1926.1 requires the latch release to sit at least 1500 mm above finished ground level — this is a national requirement, adopted in all Australian states and territories. Where the latch is top-mounted on the outside face of the gate, a standard fence post may not reach that height, so Sentrel supplies a taller 1400 mm gate latch post (refer Sentrel drawing "1400 mm Pool Post for Gate Latch — WA / QLD") at the latching side of the gate. (An inside-mounted latch reached over the top of the gate can sometimes achieve the effective 1500 mm on a standard post — the taller post is specifically for the top-mounted external-latch arrangement.) It is the same post, base plate and fixing as the standard post, simply extended in height to raise the latch mounting; the gate leaf, hinges and latch hardware are otherwise as described for the tested gate.

Purpose	Raises the latch mounting so a top-mounted external latch release sits ≥ 1500 mm above finished ground (AS 1926.1 latch-height requirement, national — all states and territories).
Post and fixing	Same 65 × 65 × 3 mm extruded aluminium section, welded aluminium base plate and 4 × M6 base fixing as the standard post (tested at M6 × 75 mm, AZT0257.23; supplied at M6 × 100 mm), extended to 1400 mm overall height.
Latch / hinge hardware	D&D Technologies "MagnaLatch" latch and "Tru Close" self-closing hinges, as fitted to the tested gate unit (AZT0098.14). Confirm self-close and self-latch from all positions on site.
Site wind	Footing / embedment to suit the site wind classification per AS/NZS 1170.2, assessed by the project engineer as for any pool fence post.

The latch height itself is set on site by how the gate and post are installed; Sentrel supplies the taller post to make the ≥ 1500 mm release achievable, but the installer / certifier confirms the as-installed latch release height and gate performance. Under AS 1926.1:2024, an external latch must also sit at least 1400 mm above any lower horizontal member or foothold — confirm both dimensions where that edition applies.

5. Site compliance — installer / certifier checklist

The items below are site-dependent and are the responsibility of the installer and certifier under AS 1926.1-2012 — they are not controlled by the supplied product and are not certified by Sentrel. A product that is compliant as supplied and as tested can still fail certification if these are not met on site. Clause references are to AS 1926.1-2012 (assess against AS 1926.1:2024 where adopted).

Barrier height	≥ 1200 mm perpendicular to finished ground, maintained along the whole barrier (Cl. 2.1). The tested panel height is ~1195 mm, so confirm ground build-up does not reduce effective height below 1200 mm.
Bottom gap	≤ 100 mm between the bottom of the barrier and finished ground at every point, including over pavers, turf, mowing strips and slopes (Cl. 2.1). A 100 N vertical lift must not open the gap beyond 100 mm.
Non-climbable zones (NCZ)	Required on all barriers under 1800 mm (Cl. 2.2). NCZ 1 (900 mm vertical plane, outside face), NCZ 2 (900 mm radius quadrant down from top of NCZ 1) and — because this product has 10–100 mm vertical openings — NCZ 4 (900 × 300 mm on the inside) must be kept clear of any handhold, foothold, object or plant.
Objects / level changes near barrier	Steps, retaining walls, garden beds, taps, pumps, pots, BBQs and furniture must not sit within the NCZ, and level changes that reduce effective height must be ≥ 500 mm from the barrier (Cl. 2.3.1).
Stepped / sloping ground	Over steps or slopes, maintain perpendicular height and the ≤ 100 mm ground gap along the run (see the AS 1926.1:2024 barriers-over-stepped-ground provisions).
Junctions with other barriers / walls	Where the barrier meets a wall, boundary fence or another barrier, no gap > 100 mm and no climbable step may be created; where a lower

	barrier meets one ≥ 1800 mm at > 90°, extend NCZ 1 and 2 by 900 mm past the intersection (Cl. 2.2.5).
Boundary-barrier junction (1800 mm)	Where the pool barrier is also a boundary fence, it must be at least 1800 mm high on the inside, with a non-climbable zone (NCZ 5) formed as a 900 mm-radius quadrant down from the top of the inside face (Cl. 2.2.4); the outside face may be climbable. An internal pool fence may join the 1800 mm boundary barrier without being raised to 1800 mm at the junction only if its top rail is no more than 50 mm wide at any point within NCZ 5 and it meets the boundary at 45–135°. A top rail wider than 50 mm within NCZ 5 requires the lower barrier to extend to 1800 mm and run at least 900 mm from the intersection. The Sentrel top rail profile is ≤ 50 mm wide, so it satisfies the narrow-top-rail junction allowance — confirm the intersection angle and NCZ 5 on site.
Equipotential bonding / earthing (pool)	Metallic pool barriers and fixings within the pool's equipotential-bonding zone may require bonding to the pool's common bonding network under AS/NZS 3000 (Wiring Rules), Section 5. This is a licensed electrical contractor's responsibility, determined on site — it is not certified by Sentrel. The system must not be modified in a way that interrupts electrical continuity along the barrier; Sentrel's AS/NZS 3000 continuity letter is available to support the electrician's assessment.
Gate installation	Gate must open away from the pool, self-close and self-latch from any position, with the latch release ≥ 1500 mm above ground (or shielded), and no gap > 100 mm at the hinge or latch side. Hardware is as tested; hanging direction and latch height are install matters.
Match the tested product	Confirm the installed product (post, panel, infill spacing, gate) matches the tested configuration in this pack. Cone / opening strength is a manufacturer laboratory test (see note in Section 3) — it is not re-tested on site; the certifier verifies geometry instead.

6. Conditions and exclusions

The test results relate to the samples tested in the configurations described in the reports. Panels and posts must be assembled in accordance with Sentrel installation instructions without modification or substitution of components.

For balustrade use, application is limited to occupancy categories A, B/E and C3 (and classifications with equal or lower loads), as explained in Section 3A.

For pool fence use, the gate frame and hardware match the tested Sentrel cable pool-fence gate (AZT0098.14); the certifier should confirm the installed gate matches that tested unit and performs on site, and verify the Section 5 site items.

Barrier heights, ground clearances, non-climbable zones and boundary configurations as installed are site matters for the certifier. Fixing to substrates other than concrete is supported by Sentrel engineering assessment (Sections 7–12), not by the test reports.

6A. Bushfire attack level (BAL) — material position

Aluminium with stainless cables — the structural materials are non-combustible to AS 1530.1 — suiting AS 3959 sites to BAL-40. At BAL-FZ, Clause 9.7 requires balustrades within 125 mm of glazing or a combustible wall to be non-combustible only (no AS 1530.8.2 test). Any plastic content is limited to minor packers and fixings — the class of minor ancillary components the NCC (C1.9 / C2D10) permits within non-combustible construction. FZ acceptance is the certifier’s decision.

7. Post fixing — substrate requirements (engineering assessment)

This section is Sentrel's engineering design basis for fixing the post to timber, steel and other substrates. It is a Sentrel engineering assessment — not independent laboratory test evidence — provided to support the certifier and project engineer. Fixing to concrete is the exception: it is backed by NATA test evidence (AZT0257.23), summarised below.

Two load cases. Case 1 — balustrade (fall protection): the AS 1170.1 barrier load w* = 1.125 kN/m governs and drives the span table. Case 2 — pool fence: a much lighter post load (AS 1926.1 330 N proof), with the installed fixing normally governed by site wind. Where a pool fence also protects a fall (Case 1 + 2), the heavier balustrade case governs — fix it as a balustrade. Use the case that applies; do not interchange them.

Post and base plate. 65 × 65 × 3.0 mm extruded aluminium (6063-T5); welded aluminium base plate 110 × 110 × 12 mm (standard production post) with 10 mm holes (16 mm counterbore) 11 mm from each edge, at 88 mm centres. The tested sample (AZT0257.23) had a 112 × 112 × 10 mm plate with holes at 94 mm; the production plate is thicker but 2 mm narrower, with holes 6 mm closer together. The test result, and the lever arm and fixing values below, are for the tested plate; the production plate has not been separately tested. Lever arm to the loaded row 110 mm; minimum substrate width 150 mm in the load direction.

8. Concrete substrate (NATA test evidence)

Fixing to concrete is the one substrate backed by independent NATA test evidence. In AZT0257.23 the post and 112 × 112 mm aluminium base plate were fixed to concrete with 4 × M6 × 75 mm screw bolts at 94 mm corner spacing and load-tested: 600 N serviceability (9.29 mm deflection, 0.83 mm permanent — pass), 1200 N ultimate (4.17 mm permanent, nil damage — pass), peak 2720 N at weld shear. Sentrel's specified concrete fixing is 4 × M6 × 100 mm screw bolts per post — longer than the tested 75 mm, giving greater embedment. Concrete adequacy (thickness, strength, edge distance, reinforcement, condition) and minimum embedment per the screw-bolt manufacturer's data remain a site matter for the project engineer / certifier.

8A. Embedded footing option (ground-mounted posts)

Where posts are set directly into concrete footings rather than surface-mounted on the base plate, the welded base connection is removed from the load path and the governing element becomes the 65 × 65 × 3 mm post at ground line (6063-T5 standard post or 6060-T5 custom post; both taken at Fty ≈ 110 MPa, so the same capacity applies) — design capacity φMn = 1.40 kN·m (φ0.9; Z ≈ 14,150 mm³; local buckling to AS/NZS 1664). This suits ground-mounted installations, including cyclonic sites where a cast-in detail is preferred. The footing below is designed to the post's full capacity (M* = 1.40 kN·m, V* = 2.16 kN at 0.65 m), so it bounds every wind classification; read the embedment against the site design lateral bearing kd (ULS, factored) confirmed by the geotechnical / project engineer. Where in-ground (embedded) post spacing becomes restricted at high-wind or cyclonic sites, an upgraded 65 × 65 × 3 mm 6082-T6 post is available — design capacity φMn ≈ 3.25 kN·m (6082-T6 structural alloy; design strengths per AS/NZS 1664; calculated by Sentrel Australia, not tested). On that calculation an embedded 6082-T6 post keeps a 3.0 m post spacing up to N5 / C3, and about 2,370 mm at N6 / C4 (calculated by Sentrel Australia, not tested).

Soil description	Design lateral bearing kd (kPa/m)	Embedment D — Ø300 pier	Embedment D — Ø450 pier
Very soft clay / loose sand / fill	20	1.30 m	0.97 m
Firm clay / medium dense sand	30	0.97 m	0.73 m
Stiff clay / dense sand	50	0.68 m	0.53 m
Very stiff clay / dense sand & gravel	80	0.50 m	0.39 m

Non-constrained cantilever pier (factored ULS actions vs design soil resistance). Concrete min 25 MPa; post continuous into footing, min 75 mm cover to base; assumes level ground, no surcharge/slope within 1.5 m, water table below footing. Site actions, soil kd (with φg) and certification remain with the project engineer.

9. Timber fixing — screw selection (Case 1, balustrade)

Specified timber fastener. The recommended timber fastener is the Bremick XTP 18g washer-head construction screw (T40 drive, TechnoGuard coated) — a structural screw that drives without coach-screw effort and whose large washer head bears across the 10 mm base-plate hole without an added washer. For coastal or pool environments the equivalent is the SPAX 8 mm washer-head screw in 316 stainless steel

(drive without an impact driver). Capacity is taken from the XTP published pull-out data (mean ultimate 12.6 kN in F17/JD3 hardwood and 7.3 kN in F5/JD4 pine at 35 mm embedment), reduced by a 0.34 design knock-down and scaled linearly with penetration. Stocked lengths for timber-fixed posts are 150, 200 and 250 mm (18g) only. The loaded-row pattern is two screws in hardwood (JD3 and denser) and two or three screws in pine/LVL (JD4), per the table below; for the three-screw pattern the third screw goes in a workshop-drilled 10 mm hole midway along the loaded row (5 screws per post). Screw length is sized so the thread penetrates the structural bearer (not decking alone) by the depth in the table below; where the post sits over a decking or packer gap, that gap is added to the screw length. Sections 7–12 of this pack cover this same post system — the 65 × 65 mm aluminium post, now supplied on a 110 × 110 × 12 mm base plate (the 112 × 112 × 10 mm plate was load-tested on concrete in AZT0257.23; the production plate has not been separately tested). This is an engineering assessment by Sentrel, not an independent test result.

Per-mm design withdrawal (mean ultimate × 0.34, over the 35 mm test depth): JD3 = 122 N/mm, JD4 = 71 N/mm. Denser hardwoods (JD1, JD2) exceed JD3, so the JD3 row is conservative for them. T* required = 10.23 × span (kN).

Timber / pattern	XTP 18g screw	Penetration	Max span	kN req.	kN ach.	Wind rating
JD3 hardwood & denser — 2 screws	150 mm	133 mm	3.0 m	30.7	32.6	**N3**
JD3 hardwood & denser — 2 screws	200 mm	183 mm	3.0 m	30.7	44.8	**N3**
JD3 hardwood & denser — 2 screws	250 mm	233 mm	3.0 m	30.7	57.0	**N3**
JD4 pine / LVL — 2 screws	150 mm	133 mm	1.8 m	18.4	18.9	**N4**
JD4 pine / LVL — 2 screws	200 mm	183 mm	2.5 m	25.6	26.0	**N3**
JD4 pine / LVL — 2 screws	250 mm	233 mm	3.0 m	30.7	33.0	**N3**
JD4 pine / LVL — 3 screws	150 mm	133 mm	2.7 m	27.6	28.3	**N3**
JD4 pine / LVL — 3 screws	200 mm	183 mm	3.0 m	30.7	38.9	**N3**
JD4 pine / LVL — 3 screws	250 mm	233 mm	3.0 m	30.7	49.6	**N3**

Balustrade case (w* = 1.125 kN/m, panel height 1,020 mm). Direct to the structural bearer (gap = 0); for a decking/packer gap g add g to the screw length. Screw length = 12 mm plate + gap + penetration + 5 mm tip, rounded to the next stocked length. kN required = 10.23 × span; kN achieved = screws × design withdrawal × penetration. Wind rating = highest AS 4055 class the panel width (= span) stays within the tested post capacity for (N1–N3 ≤ 3,000 mm; N4 ≤ 2,160 mm; N5 ≤ 1,355 mm; N6 ≤ 910 mm — see wind section); all spans are capped at the 3.0 m maximum panel length.

Site-calculated penetration. Penetration lp = L − 12 mm plate − g − 5 mm tip, counting only threaded shank within the structural bearer — decking, packers and sheet flooring count nothing, and where the tip passes through the bearer lp is limited to the bearer depth. Confirm the thread length of the selected XTP length. Penetration needed for the 3.0 m maximum span: 125 mm (JD3 and denser, 2 screws), 144 mm (JD4, 3 screws), 216 mm (JD4, 2 screws). With no gap the bearer must be at least 138 / 188 / 238 mm deep to contain the 150 / 200 / 250 mm screw. For any other condition, maximum span (m) = n × q × lp ÷ 10,230 (q = 122 N/mm JD3 and denser, 71 N/mm JD4), not exceeding the wind-rated width or 3.0 m; per-screw withdrawal must not exceed the screw's rated tensile capacity (Bremick data). Example: JD4 bearer, 40 mm decking gap, three 200 mm screws — lp = 200 − 12 − 40 − 5 = 143 mm; maximum span = 3 × 71 × 143 ÷ 10,230 = 2.97 → 2.9 m.

10. Steel and other substrates — required fixing capacity

The demand does not change with substrate — the loaded-row fixings must develop T* = 10.23 × S (kN). For steel Sentrel specifies the required per-fixing capacity rather than a single product, because the valid method depends on steel thickness, grade and access; the project engineer selects a fixing whose design tensile capacity φNf meets or exceeds the demand and verifies the steel on site.

Post spacing (span)	T* total on loaded row	2 fixings	3 fixings	4 fixings
1.8 m	18.4 kN	9.2 kN	6.1 kN	4.6 kN

Post spacing (span)	T* total on loaded row	2 fixings	3 fixings	4 fixings
2.4 m	24.6 kN	12.3 kN	8.2 kN	6.1 kN
2.7 m	27.6 kN	13.8 kN	9.2 kN	6.9 kN
3.0 m	30.7 kN	15.3 kN	10.2 kN	7.7 kN

Per-fixing tension = T* / number of loaded-row fixings. Valid methods: thick steel (≥6 mm) — tapped Grade 8.8 M10 set screw or through-bolt; thinner steel (3–6 mm) — rated self-drilling structural screws or weld studs; hollow sections — blind/cavity fixings or weld-on. Galvanic isolation of the aluminium plate from steel is mandatory (isolation washers/coating or stainless fixings), especially in coastal/pool environments. Other substrates (masonry/FRP/composite) follow the same per-fixing demand, verified by the engineer.

11. Wind loading & maximum panel width

Each panel is held by two structural posts (fence height 1,206 mm FFL to top rail). The post assembly's tested capacity is a safe working limit of 1,200 N·m and a breaking load of 2,720 N·m (AZT0257.23). The table gives the maximum panel width for each site wind classification, with the AS 4055 wind class mapped to the equivalent AS/NZS 1170.2 region:

Wind class (AS 4055)	Equivalent region	Maximum panel width	Largest opening
N1 – N3	Region A	**3,000 mm (cap)**	2,935 mm
N4	Region B	**2,160 mm**	2,095 mm
N5	Region C (non-cyc)	**1,355 mm**	1,290 mm
N6	Region C (non-cyc)	**910 mm**	845 mm
C1	Region C/D	**3,000 mm (cap)**	2,935 mm
C2	Region C/D	**2,160 mm**	2,095 mm
C3	Region C/D	**1,355 mm**	1,290 mm
C4	Region D	**910 mm**	845 mm

Widths are the structural post spacing, worked out for an intermediate post, which carries the wind on half of each neighbouring panel (two structural posts per panel) at the tested 1,206 mm height. For a full-size panel in a higher class, use a mid-panel fixing or a stronger post/footing (requires re-test). A 3,000 mm manufacturing cap applies; the cyclonic classes C1–C4 (Regions C/D) are included in the wind table, designed to static ULS actions. For ground-mounted posts see the embedded footing option (Section 8A). The certifier or engineer confirms the site classification per AS 4055 / AS/NZS 1170.2.

At the maximum panel width the wind moment equals the welded-base design capacity φRn ≈ 1.51 kN·m — a base tension of about 13.7 kN on the loaded row, under half the balustrade demand. Every span-table fixing develops well over this, so selecting a row for the balustrade span automatically satisfies the pool-fence wind case, provided the panel width is capped per the table above.

12. Installation & site setout requirements

Penetrate the structural bearer. Stated penetration must be into the structural bearer/joist, not decking alone. Where the bearer is not directly beneath the base plate, install solid blocking ≥ 150 × 90 mm at every post.

Minimum substrate width 150 mm in the load direction (38 mm edge distance + 110 mm lever arm). Edge distance ≥ 38 mm (5 × the ~7.5 mm 18g screw diameter) to the loaded free edge and any other free edge; end distance ≥ 70 mm from any bearer end.

Pattern. Two screws on the loaded row in hardwood (JD3+); two or three in pine/LVL (JD4) per the table — the third screw in a workshop-drilled hole midway along the loaded (fall) side, 5 screws per post; mark the loaded side. XTP 18g in 150, 200 or 250 mm only. Lever arm 110 mm — do not reduce; reducing it raises the load.

Pre-drilling. Pine/LVL: generally none. Mixed hardwood (JD3): pre-drill recommended. Dense hardwood (JD1/JD2, Merbau/ironbark): pilot drill required, wax thread.

Corrosion. Treated pine (H2/H3, CCA/ACQ) and coastal/pool environments: use the SPAX 8 mm 316 stainless option; zinc-plated fixings are not suitable in treated or marine conditions.

Timber condition. Sound timber, no splits in the fixing zone; JD4 seasoned (MC ≤ 19%). Confirm species / joint group on site; where unknown assume JD4 (most conservative). Merbau/Kwila = JD2 per AS 2082 regardless of F-grade.

Standards: AS 1170.0/1 (barrier design actions), AS 1720.1 (timber withdrawal, φ = 0.85), AS 2082 (species/joint groups), AS 4055 / AS/NZS 1170.2 (wind), Bremick XTP published pull-out data. This fixing content is a Sentrel engineering assessment for domestic barrier loading only and is not a substitute for site-specific structural engineering; the installer / certifier verifies species, substrate dimensions and condition, edge distances, and that the thread engages the structural bearer. Sentrel supplies a kit for onsite assembly and is not the installer.

13. Supporting documents (available in full on request)

Test reports are issued under NATA accreditation conditions and shall not be reproduced except in full; complete copies of the documents below are provided on request rather than excerpted here.

AZT0130.20	Test Report — Balustrade, Product: I-Rail (2700), Azuma Design Pty Ltd, NATA Lab 15147, tested 15/04/2020, to AS/NZS 1170.1:2002 Table 3.3 loads via AS 1657-2018 Appendices B and C
AZT0003.20	Test Report — Pool Fence, Product: Sentrel I-Rail, Azuma Design Pty Ltd, NATA Lab 15147, tested 20/01/2020, to AS 1926.1-2012 Section 3
AZT0257.23	Test Report — Physical Edge Protection, Aluminium Post fixed to concrete, Azuma Design Pty Ltd, NATA Lab 15147, tested 07/07/2023 (covers the currently supplied post)
AZT0098.14	Pool Fence Test Report — Sentrel Pool Fence (Aluminium), Azuma Design Pty Ltd, NATA Lab 15147, tested 2014 — gate unit testing relied upon for the shared iRail gate frame
Warranty	Sentrel Aluminium Products Warranty Certificate, 15 years (V.22.1)

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