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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 mm extruded aluminium posts (6063 T5) with welded 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 factory-fabricated barrier systems — cable pool fence and balustrade panels are supplied pre-assembled, while iRail is assembled on site — which are then fixed in place onsite 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. The loaded-row pattern is two screws in hardwood (JD3 and denser) and three screws in pine/LVL (JD4). 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. The substrate document covers this same post system — the 65 × 65 mm aluminium post on its 112 × 112 mm aluminium base plate, independently load-tested on concrete in AZT0257.23 — and is available on request. 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	100 mm	83 mm	1.9 m	19.4	20.3	**N4**

Timber / pattern	XTP 18g screw	Penetration	Max span	kN req.	kN ach.	Wind rating
JD3 hardwood & denser — 2 screws	125 mm	108 mm	2.5 m	25.6	26.4	**N4**
JD3 hardwood & denser — 2 screws	150 mm	133 mm	3.0 m	30.7	32.6	**N3**
JD3 hardwood — 3 screws	100 mm	83 mm	2.9 m	29.7	30.4	**N3**
JD3 hardwood — 3 screws	125 mm	108 mm	3.0 m	30.7	39.5	**N3**
JD4 pine / LVL — 3 screws	100 mm	83 mm	1.7 m	17.4	17.7	**N6**
JD4 pine / LVL — 3 screws	125 mm	108 mm	2.2 m	22.5	23.0	**N4**
JD4 pine / LVL — 3 screws	150 mm	133 mm	2.7 m	27.6	28.3	**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 ≤ 3,030 mm; N4 ≤ 2,590 mm; N5–N6 ≤ 1,830 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 the Substrate Requirements & Limitations document.

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 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 below gives the largest panel width that stays within the safe working limit for each site wind classification to AS 4055 — 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	Standard panel
N1 – N3	Region A	**3,030 mm — no restriction**	P44
N4	Region B	**2,590 mm**	P38
N5 – N6	Region C	**1,830 mm**	P26

Widths are the structural post spacing (two structural posts per panel; the 25.4 mm dividers are non-structural), for the tested 1,206 mm fence height against the post safe-working limit of 1,200 N·m (AZT0257.23). AS 4055 wind classes map to AS/NZS 1170.2 regions as shown. For a full-size panel in a higher class, use a mid-panel fixing or a stronger post/footing (which requires re-test). Region D (severe cyclone — a short remote WA stretch) is excluded as outside the target market. The certifier or engineer confirms the site classification per AS 4055 / AS/NZS 1170.2.

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 tested capacity (1,200 N·m safe working) 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. **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

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.

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 certified, 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 × 75 mm hex head bolts per post into concrete (AZT0130.20)
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 are the same 65 × 65 × 3 mm aluminium post and welded base plate 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. Base plate 112 × 112 mm aluminium (tested 10 mm; production 12 mm), 4 × M6 × 75 mm screw bolts at 94 mm centres
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 × 75 mm base fixing as the standard post (AZT0257.23), 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 certified product	Confirm the installed product (post, panel, infill spacing, gate) matches the tested, certified 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.

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 mm extruded aluminium (6063 T5); welded aluminium base plate 112 × 112 mm with 10 mm holes at 94 mm corner spacing — current production 12 mm thick, tested at 10 mm per AZT0257.23 (production equals or exceeds 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. 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.

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. The loaded-row pattern is two screws in hardwood (JD3 and denser) and three screws in pine/LVL (JD4). 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. The substrate document covers this same post system — the 65 × 65 mm aluminium post on its 112 × 112 mm aluminium base plate, independently load-tested on concrete in AZT0257.23 — and is available on request. 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	100 mm	83 mm	1.9 m	19.4	20.3	**N4**
JD3 hardwood & denser — 2 screws	125 mm	108 mm	2.5 m	25.6	26.4	**N4**
JD3 hardwood & denser — 2 screws	150 mm	133 mm	3.0 m	30.7	32.6	**N3**
JD3 hardwood — 3 screws	100 mm	83 mm	2.9 m	29.7	30.4	**N3**
JD3 hardwood — 3 screws	125 mm	108 mm	3.0 m	30.7	39.5	**N3**
JD4 pine / LVL — 3 screws	100 mm	83 mm	1.7 m	17.4	17.7	**N6**
JD4 pine / LVL — 3 screws	125 mm	108 mm	2.2 m	22.5	23.0	**N4**
JD4 pine / LVL — 3 screws	150 mm	133 mm	2.7 m	27.6	28.3	**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 ≤ 3,030 mm; N4 ≤ 2,590 mm; N5–N6 ≤ 1,830 mm — see wind section); all spans are capped at the 3.0 m maximum panel length.

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
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	Standard panel
N1 – N3	Region A	**3,030 mm — no restriction**	P44
N4	Region B	**2,590 mm**	P38
N5 – N6	Region C	**1,830 mm**	P26

Widths are the structural post spacing (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). Region D (severe cyclone — a short remote WA stretch) is excluded as outside the target market. 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 1,200 N·m safe working limit — a base tension of 10.9 kN on the loaded row, about a third of 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+); three in pine/LVL (JD4). 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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