



VEYRUM ROBOTICS STANDARD



VRS-TRN-501

Transportation — AR Rubric Data Twin

Machine-readable criteria, tier ceilings, contributors and bands of VRS-TRN-201 (VRS 2026 (draft)); generated, never hand-edited.

VEYRUM RESEARCH INSTITUTE

DOCUMENT

VRS-TRN-501

VERSION

1.0.0

STATUS

Draft

DATE

16 September 2026

Foreword. Data Artifact: the machine-readable twin of **VRS-TRN-201** (VRS 2026 (draft)) — the sector criteria with their point ranges, rungs and tier ceilings, the contributing intrinsic criteria, the letter bands and the application classes — generated FROM the protocol's Clause 5–7 by `tools/vrs-twin-generate.py`. Consistency is by construction and re-verified on every build (conformance check 15). The JSON in Clause 4 is the normative payload; scorer tooling consumes it directly. A change to VRS-TRN-201 and to this twin is one change instrument.

1 Scope

This Data Artifact carries the rubric data of the Transportation (TRN) sector in machine-readable form: the 8 sector criteria of VRS-TRN-201 Clause 6 with points, rungs and Unverified / Verified / Certified ceilings; the contributing intrinsic criteria of Clause 5; the letter bands and application classes of Clause 7. It states no independent requirements. Where this artifact and VRS-TRN-201 could be read to differ, VRS-TRN-201 governs and this twin is regenerated to match.

2 Normative references

- **VRS-TRN-201**, *Transportation — AR Assessment Protocol* — source protocol twinned (Clauses 5–7).
- **VRS-TRN-001**, *Transportation — Sector Standard* — application classes and hazard groups.
- **VRS-GEN-005**, *IR Methodology* — point sum, tier ceilings, no-evidence rule.
- **VRS-GEN-006**, *AR Scheme* — pool mechanics, letter bands, tier caps by construction.
- **VRS-GEN-002**, *Designation and Drafting Rules* — criterion layout (§6.5) and versioning.

3 Terms and definitions

The terms of VRS-GEN-001 and VRS-TRN-201 apply. **data twin** — a machine-readable artifact regenerated one-to-one from a source protocol's normative clauses. **rung** — a named state of a criterion awarding a stated integer number of points (VRS-GEN-002 §3.9). **ceiling** — the maximum points a criterion awards at a stated tier (VRS-GEN-002 §3.10).

4 Payload

Sector criteria total **100** points; ceilings Unverified **70**, Verified **85**, Certified **100**.

```
{
  "_meta": {
    "description": "TRN sector AR rubric data twin – machine-readable form of VRS-TRN-201 Clause 5/6/7 (VRS 2026 (draft)). Generated by tools",
    "edition": "VRS 2026 (draft)",
    "source_protocol": "VRS-TRN-201 v1.0.0",
    "generated": "2026-09-16",
    "conforms_to": "VRS-GEN-005 §6 (point sum, tier ceilings); VRS-GEN-006 §6–§8 (pool, bands, tier caps by construction)"
  },
  "sector_code": "trn",
  "bands_percent": {
    "AAA": 90,
    "AA": 75,
    "A": 60,
    "B": 45,
    "C": 0
  },
  "application_classes": [
    "robotaxi",
    "autonomous truck",
    "low-speed shuttle",
    "sidewalk delivery"
  ],
  "contributing_ir_criteria": [
    {
      "id": "SF-2",
      "document": "VRS-GEN-101",
      "clause": "6.2"
    },
    {
      "id": "SF-4",
      "document": "VRS-GEN-101",
      "clause": "6.4"
    }
  ]
}
```

```

    "id": "SF-5",
    "document": "VRS-GEN-101",
    "clause": "6.5"
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    "id": "SF-7",
    "document": "VRS-GEN-101",
    "clause": "6.7"
  },
  {
    "id": "SF-8",
    "document": "VRS-GEN-101",
    "clause": "6.8"
  },
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    "id": "RL-3",
    "document": "VRS-GEN-102",
    "clause": "6.3"
  },
  {
    "id": "RL-7",
    "document": "VRS-GEN-102",
    "clause": "6.7"
  },
  {
    "id": "SV-6",
    "document": "VRS-GEN-103",
    "clause": "6.6"
  },
  {
    "id": "CY-3",
    "document": "VRS-GEN-105",
    "clause": "6.3"
  },
  {
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    "document": "VRS-GEN-105",
    "clause": "6.4"
  },
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    "document": "VRS-GEN-105",
    "clause": "6.5"
  },
  {
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    "document": "VRS-GEN-105",
    "clause": "6.7"
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    "document": "VRS-GEN-106",
    "clause": "6.1"
  },
  {
    "id": "MS-7",
    "document": "VRS-GEN-106",
    "clause": "6.7"
  },
  {
    "id": "SI-1",
    "document": "VRS-GEN-104",
    "clause": "6.1"
  },
  {
    "id": "SI-6",
    "document": "VRS-GEN-104",
    "clause": "6.5"
  }

```

```

    }
  ],
  "sector_criteria": [
    {
      "clause": "6.1",
      "id": "TRN-1",
      "name": "Lawful-operation status and safety case",
      "points_max": 16,
      "what_is_measured": ".",
      "rungs": [
        {
          "points": 16,
          "state": "permits/type approval public + published safety case assessed by a third party (UL 4600 / notified body)"
        },
        {
          "points": 14,
          "state": "pack-evidenced (documents), not demonstrated"
        },
        {
          "points": 12,
          "state": "permits public + safety case published"
        },
        {
          "points": 8,
          "state": "permits only"
        },
        {
          "points": 0,
          "state": "not established"
        }
      ],
      "ceiling": {
        "unverified": 12,
        "verified": 14,
        "certified": 16
      },
      "company_wide": null,
      "evidence_bar": "Operating jurisdictions declared.",
      "applicability": "robotaxi · autonomous truck · low-speed shuttle · sidewalk delivery. All criteria apply to all classes.",
      "not_applicable_by_class": false
    },
    {
      "clause": "6.2",
      "id": "TRN-2",
      "name": "ODD discipline and minimal-risk manoeuvre",
      "points_max": 14,
      "what_is_measured": "Operation refused outside the declared ODD; MRM quality (pull-over, stop-in-lane behaviour) on fault or ODD exit.",
      "rungs": [
        {
          "points": 14,
          "state": "witnessed on closed course"
        },
        {
          "points": 11,
          "state": "pack-evidenced (documents), not demonstrated"
        },
        {
          "points": 10,
          "state": "validated + independently observed"
        },
        {
          "points": 7,
          "state": "publicly evidenced only (no pack, no demonstration)"
        },
        {
          "points": 6,
          "state": "documented"
        }
      ],

```

```

    {
      "points": 0,
      "state": "not established"
    }
  ],
  "ceiling": {
    "unverified": 7,
    "verified": 11,
    "certified": 14
  },
  "company_wide": null,
  "evidence_bar": "ODD declared.",
  "applicability": "robotaxi · autonomous truck · low-speed shuttle · sidewalk delivery. All criteria apply to all classes.",
  "not_applicable_by_class": false
},
{
  "clause": "6.3",
  "id": "TRN-3",
  "name": "Vulnerable-road-user detection and response",
  "points_max": 14,
  "what_is_measured": "Detection/response to pedestrian/cyclist targets at declared speeds incl. night/rain within ODD.",
  "rungs": [
    {
      "points": 14,
      "state": "witnessed on closed course"
    },
    {
      "points": 11,
      "state": "pack-evidenced (documents), not demonstrated"
    },
    {
      "points": 10,
      "state": "validated + independent tests"
    },
    {
      "points": 8,
      "state": "certified/tested ((public))"
    },
    {
      "points": 5,
      "state": "documented"
    },
    {
      "points": 0,
      "state": "not established"
    }
  ]
},
  "ceiling": {
    "unverified": 8,
    "verified": 11,
    "certified": 14
  },
  "company_wide": null,
  "evidence_bar": "Speeds and conditions declared.",
  "applicability": "robotaxi · autonomous truck · low-speed shuttle · sidewalk delivery. All criteria apply to all classes.",
  "not_applicable_by_class": false
},
{
  "clause": "6.4",
  "id": "TRN-4",
  "name": "Handover and remote-assistance quality",
  "points_max": 12,
  "what_is_measured": "Takeover requests, remote-assistance latency and authority limits; failure of remote link → MRM.",
  "rungs": [
    {
      "points": 12,
      "state": "witnessed"
    }
  ]
},

```

```

    {
      "points": 10,
      "state": "pack-evidenced (documents), not demonstrated"
    },
    {
      "points": 9,
      "state": "documented in detail + validated"
    },
    {
      "points": 7,
      "state": "publicly evidenced only (no pack, no demonstration)"
    },
    {
      "points": 5,
      "state": "documented"
    },
    {
      "points": 0,
      "state": "not established"
    }
  ],
  "ceiling": {
    "unverified": 7,
    "verified": 10,
    "certified": 12
  },
  "company_wide": null,
  "evidence_bar": "Remote-operation model declared.",
  "applicability": "robotaxi · autonomous truck · low-speed shuttle · sidewalk delivery. All criteria apply to all classes.",
  "not_applicable_by_class": false
},
{
  "clause": "6.5",
  "id": "TRN-5",
  "name": "Fleet cyber and software-update governance (R155/R156)",
  "points_max": 12,
  "what_is_measured": "Certified cyber-management and software-update systems; V2X spoof resistance; location-data controls.",
  "rungs": [
    {
      "points": 12,
      "state": "shown + certificates"
    },
    {
      "points": 10,
      "state": "certificates public"
    },
    {
      "points": 9,
      "state": "publicly evidenced only (no pack, no demonstration)"
    },
    {
      "points": 6,
      "state": "documented"
    },
    {
      "points": 0,
      "state": "not established"
    }
  ],
  "ceiling": {
    "unverified": 9,
    "verified": 10,
    "certified": 12
  },
  "company_wide": null,
  "evidence_bar": "None.",
  "applicability": "robotaxi · autonomous truck · low-speed shuttle · sidewalk delivery. All criteria apply to all classes.",
  "not_applicable_by_class": false
}

```

```

    },
    {
      "clause": "6.6",
      "id": "TRN-6",
      "name": "Service availability and stranded-vehicle recovery",
      "points_max": 10,
      "what_is_measured": "Recovery response times, depot logistics, traffic-blocking mitigation.",
      "rungs": [
        {
          "points": 10,
          "state": "commitments + record + witnessed procedure"
        },
        {
          "points": 8,
          "state": "commitments + record"
        },
        {
          "points": 7,
          "state": "publicly evidenced or company-wide record"
        },
        {
          "points": 4,
          "state": "documented"
        },
        {
          "points": 0,
          "state": "not established"
        }
      ],
      "ceiling": {
        "unverified": 7,
        "verified": 8,
        "certified": 10
      },
      "company_wide": {
        "text": "Record company-wide → 7",
        "ceiling": 7
      },
      "evidence_bar": "None.",
      "applicability": "robotaxi · autonomous truck · low-speed shuttle · sidewalk delivery. All criteria apply to all classes.",
      "not_applicable_by_class": false
    },
    {
      "clause": "6.7",
      "id": "TRN-7",
      "name": "Data-recorder completeness and reporting compliance",
      "points_max": 10,
      "what_is_measured": "Event data recorder scope, retention, regulator reporting compliance history.",
      "rungs": [
        {
          "points": 10,
          "state": "shown + compliant record"
        },
        {
          "points": 9,
          "state": "pack-evidenced (documents), not demonstrated"
        },
        {
          "points": 8,
          "state": "documented in detail + compliant record public"
        },
        {
          "points": 5,
          "state": "documented"
        },
        {
          "points": 0,
          "state": "not established"
        }
      ]
    }
  ]
}

```

```

    }
  ],
  "ceiling": {
    "unverified": 8,
    "verified": 9,
    "certified": 10
  },
  "company_wide": null,
  "evidence_bar": "None.",
  "applicability": "robotaxi · autonomous truck · low-speed shuttle · sidewalk delivery. All criteria apply to all classes.",
  "not_applicable_by_class": false
},
{
  "clause": "6.8",
  "id": "TRN-8",
  "name": "Collision, disengagement and incident record",
  "points_max": 12,
  "what_is_measured": "Regulator-reported collisions/disengagements normalised by disclosed miles.",
  "rungs": [
    {
      "points": 12,
      "state": "low rate, all investigated"
    },
    {
      "points": 10,
      "state": "company-wide record in place of model-specific data"
    },
    {
      "points": 8,
      "state": "moderate"
    },
    {
      "points": 5,
      "state": "elevated with corrective action"
    },
    {
      "points": 0,
      "state": "not established. · 0. Regime-full at Unverified"
    }
  ],
  "ceiling": {
    "unverified": 12,
    "verified": 12,
    "certified": 12
  },
  "company_wide": {
    "text": "Company-wide → 10",
    "ceiling": 10
  },
  "evidence_bar": "Exposure public or declared.",
  "applicability": "robotaxi · autonomous truck · low-speed shuttle · sidewalk delivery. All criteria apply to all classes.",
  "not_applicable_by_class": false
}
],
"pool": {
  "sector_only": {
    "points": 100,
    "ceiling_unverified": 70,
    "ceiling_verified": 85,
    "ceiling_certified": 100,
    "best_letter": {
      "unverified": "A",
      "verified": "AA",
      "certified": "AAA"
    }
  },
  "with_contributors": "contributor ceilings are those of the cited IR standards; the combined pool sums are verified by the conformance ga
},

```

```
"rules": {
  "no_evidence": "0 points (VRS-GEN-005 §6, R3.3); the criterion stays in the pool at full range",
  "not_applicable": "criterion removed from numerator and denominator for that class (VRS-GEN-006 §6)",
  "tier_rule": "AR tier ≤ IR tier (VRS-GEN-006 §7)"
}
```

5 Field dictionary

FIELD	MEANING
<code>sector_criteria[].clause</code>	VRS-TRN-201 subclause (6.k) — the “Required by” reference used in derived packs and protocols
<code>sector_criteria[].points_max</code>	Upper end of the criterion's integer range
<code>sector_criteria[].rungs[]</code>	Every verifiable state and its points, highest first; the 0 state is implicit where not listed
<code>sector_criteria[].ceiling</code>	Maximum points at each tier; always equal to a rung value (VRS-GEN-002 §7.5.1)
<code>sector_criteria[].company_wide</code>	Field-record criteria only: the reduced ceiling when company-wide data substitutes for model data
<code>sector_criteria[].applicability / not_applicable_by_class</code>	Application classes the criterion applies to; excluded criteria leave the pool for that class
<code>contributing_ir_criteria[]</code>	Intrinsic criteria counted in the sector pool, with the standard and clause that score them
<code>pool.sector_only</code>	Sums over the sector criteria and the best attainable letter at each tier (A / AA / AAA by construction)
<code>bands_percent</code>	Letter thresholds as a percentage of the applicable pool (VRS-GEN-006 §4)

6 Verification

Regenerate with `python3 tools/vrs-twin-generate.py --sector trn --check`; a non-zero exit means the committed twin no longer matches VRS-TRN-201 and shall be regenerated before publication.

7 Bibliography

- VRS-TRN-201, *Transportation / On-road Autonomous — AR Assessment Protocol*, v1.0.0, 2026 — the source of every number in Clause 4.
- VRS-TRN-001, *TRN Sector Standard*, 2026 — sector scope, hazard taxonomy and application classes.
- VRS-GEN-005, *Intrinsic Rating — Methodology*, 2026 — point aggregation and tier ceilings for the contributing IR criteria.
- VRS-GEN-006, *Application Rating Scheme*, 2026 — letter bands and pool mechanics reproduced in `bands_percent` and `pool`.
- VRS-GEN-002, *Designation and Drafting Rules*, 2026 — §6.5 criterion layout and §7.5.1 (ceilings equal rungs) that this twin verifies.
- VRS-GEN-004, *Change, Edition and Review Policy*, 2026 — how a twin regeneration is designated.
- VRS-GEN-009, *Robot Risk Passport and Registry — Data Schema*, 2026 — consumer of the payload.
- ISO/IEC 21778:2017, *Information technology — The JSON data interchange syntax*.

8 Change history

VERSION	DATE	CHANGE
1.0.0 (draft)	2026-09-16	VRS 2026 (draft) rewrite: regenerated from VRS-TRN-201 Clause 5–7 (criteria, rungs, tier ceilings, contributors, bands, classes). Weights, modifiers, confidence and stage- prior fields removed.

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