



VEYRUM ROBOTICS STANDARD



VRS-SVC-001

Service & Public Sector Standard

Application Rating requirements for robots operating among untrained bystanders in retail, hospitality, and public spaces.

VEYRUM RESEARCH INSTITUTE

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Foreword. This is the sector standard for the **Service & Public (SVC)** application sector, instantiating the universal sector template (VRS-GEN-002 §6.4) with the **public-exposure module** (Annex A). The defining condition of this sector is the **untrained bystander**: unlike Industrial sites, the humans sharing space with the robot have no training, no briefing, and include children, crowds, and persons with reduced mobility. A Service & Public Application Rating expresses, as a letter C < B < A < AA < AAA (AAA best), how suitable and safe a robot model is for public-facing service — **above** the mandatory compliance floor: a robot may be fully compliant with the anchor standards of Clause 2 and still receive any letter. VRS does not replace those standards; it discriminates among compliant robots. Anchor regimes were verified against issuing-body pages on 2026-09-11 (Bibliography); numeric thresholds are not set here — they live inside the criterion rungs of VRS-SVC-201 and its data twin (VRS-SVC-501). A Service & Public AR is an opinion, not a certification, and no display implies a real robot holds a Veyrum rating (VRS-GEN-006 §10). Requirements use “shall”; recommendations use “should”.

1 1 Scope

This Standard defines the requirements for issuing a **Service & Public AR** for robots operating among untrained bystanders: retail and hospitality service, delivery in shared pedestrian space, reception and guidance, and cleaning of public venues. Its clauses follow the universal sector template (VRS-GEN-002 §6.4).

The scoring mathematics are excluded (VRS-GEN-005/006; the sector’s scoring content lives in VRS-SVC-201 with its data twin VRS-SVC-501). Boundary with adjacent sectors: domestic in-home use is rated under **VRS-DOM-001**; clinical and personal-care use under **VRS-MED-001**; structured industrial operation behind access control under **VRS-IND-001**; on-road transport under **VRS-TRN-001**. Robot form is not a sector (VRS-GEN-001 §3.4.3): any form — a wheeled base, a quadruped, a manipulator on a mobile base, or a delivery rover — is rated under SVC by this Standard when Clause 4 holds.

2 2 Normative references

The documents below constitute requirements of this Standard where cited. VRS documents are dated at the point of assessment unless stated otherwise.

- **VRS-GEN-001**, Vocabulary; **VRS-GEN-005**, IR Methodology; **VRS-GEN-006**, AR Scheme; **VRS-GEN-007**, Sector Classification; **VRS-GEN-009**, Passport & Registry Schema; **VRS-GEN-012**, Evidence & Data Requirements (evidence grades).
- **VRS-SVC-201**, Service & Public AR Assessment Protocol (scoring; dated at assessment); its data twin is **VRS-SVC-501**.
- **VRS-GEN-008**, Application of Ratings (issued-rating lifecycle). Cold-start parity and the company-wide fallback are defined in **VRS-GEN-005** §6; the letter bands in **VRS-GEN-006** §4.
- Anchor regimes (verified 2026-09-11) — anchors and evidence lanes, **not** conformity floors VRS re-certifies (VRS-GEN-001 §3.5.1, §3.6.3–3.6.4); the ISO 8373:2021 term basis is cross-referenced in Clause 3:

- **ISO 13482:2014** — Robots and robotic devices — Safety requirements for personal care robots. This edition is under revision as **ISO/FDIS 13482** ([iso.org](https://www.iso.org/project/83498) project 83498), renaming to *Safety requirements for service robots* and extending scope to personal AND professional/commercial service; the citation shall be re-dated when the revision publishes. Informative companions **ISO/TR 23482-1:2020** (safety-related test methods) and **ISO/TR 23482-2:2019** (application guidelines).
- **ANSI/CAN/UL 3300:2024** — Standard for Service, Communication, Information, Education and Entertainment (SCIEE) Robots — the US/Canada safety anchor for robots operating autonomously in commercial public spaces (added to UL's OSHA NRTL scope in 2024). Safety-floor anchor for **indoor-retail-hospitality** and reception/guidance service in North American markets.
- **ISO 3691-4:2023** — Industrial trucks — Safety requirements and verification — Part 4: Driverless industrial trucks and their systems (supersedes ISO 3691-4:2020) — quantitative safety anchor and evidence lane for delivery/AMR platforms sharing pedestrian space.
- **Machinery Regulation (EU) 2023/1230** (applicable from 20 January 2027, repealing Directive 2006/42/EC) — EU market safety-floor context for machinery placed on the EU market.
- **AI Act, Regulation (EU) 2024/1689** (in force 1 August 2024) — Article 5 restrictions on real-time remote biometric identification in publicly accessible spaces; evidence lane for H5 where the robot performs biometric processing.
- **GDPR, Regulation (EU) 2016/679** — data-protection regime; representative jurisdiction anchor for H5 public data capture. General product-safety and premises-liability regimes are jurisdiction-specific and shall be recorded per deployment; no harmonised global list is asserted here.

3 Terms and definitions

For the purposes of this Standard, the terms in VRS-GEN-001 (aligned to ISO 8373:2021) apply, together with the following local terms:

- **bystander** — a person sharing the robot's operating space who has received no training or briefing, including children, crowds, and persons with reduced mobility.
- **public venue** — a space with uncontrolled public access during operation.
- **venue class** — the declared public-space category the model is assessed in; at minimum one of **indoor-retail-hospitality**, **shared-pedestrian-outdoor**, **queue-and-crowd**.
- **exposure envelope** — the declared operating limits for a venue class: maximum crowd density (persons per square metre, persons/m²), maximum operating speed (metres per second, m/s), and the hours-of-day / supervision conditions under which operation is claimed.
- **service exposure** — operating time accrued in a declared venue class, measured in **op-hours**, used as the exposure denominator for frequency-type quantities.
- **adversarial interaction** — deliberate obstruction, tampering, riding, or vandalism by members of the public, a failure mode trained industrial workers do not present.
- **public data capture** — sensor capture of bystanders (imagery, audio, biometrics) incidental to service, and any onward retention, transmission, or identification.

4 4 Sector applicability

4.1 SVC is an **intended-use sector** (VRS-GEN-007 §5.2): no capability gate applies. A model shall be treated as SVC-applicable when (a) the manufacturer declares a public-facing service use in its operating envelope, or (b) an assessor records evidence of material deployment in a public venue (override with rationale, VRS-GEN-006 §5.2). Default: not-applicable.

4.2 The minimum capability for applicability is safe operation in the presence of uninstructed persons — detection and response behaviour that does not assume cooperative humans.

4.3 The assessed envelope shall state the **venue classes** covered — at minimum one of **indoor-retail-hospitality**, **shared-pedestrian-outdoor**, **queue-and-crowd** — as protocol applicability fields (VRS-GEN-007 §4.2), each with its declared exposure envelope (maximum crowd density in persons/m², maximum speed in m/s, supervision conditions). The AR letter shall cover only the assessed venue classes; unassessed classes shall be displayed as not covered.

5 5 Sector hazard taxonomy

The Service & Public AR shall weigh, at minimum, the following hazard groups. Each maps to the IR categories (VRS-GEN-005 §5) it draws evidence from and to its dominant loss driver; the sector emphasis (weights) is defined in VRS-SVC-201, not here.

#	HAZARD GROUP	ARCHETYPE	PRIMARY IR CATEGORIES	LOSS DRIVER
H1	Bystander contact	collision with, or toppling onto, uninstructed persons; children and reduced-mobility persons as worst-case	safety_incidents	frequency, severity
H2	Crowd dynamics	movement in dense/queueing crowds; blocking egress routes	safety_incidents, reliability	frequency, severity
H3	Adversarial interaction	deliberate obstruction, tampering, riding, vandalism – the public interacts adversarially in ways trained workers do not	spec_integrity, safety_incidents	frequency, severity
H4	Venue service interruption	failure in-service degrading venue operation; stranded-robot hazards in walkways	reliability, serviceability	frequency, exposure
H5	Public data capture	sensor capture of bystanders (privacy exposure, biometrics); venue-network compromise	cyber_posture	severity, correlated/cyber-catastrophe
H6	Premises / operator liability	premises-liability exposure of the operator hosting the robot	manufacturer_support, safety_incidents	severity, recoverability

5.1 The hazard taxonomy shall be treated as the minimum coverage set: an assessment that omits a hazard group applicable to the declared venue classes shall record the omission and its reason.

5.2 H1 (bystander contact) is the sector-defining loss driver and shall be evidenced against **uninstructed-person** scenarios; evidence gathered only with trained test subjects shall not be accepted as sufficient for H1 (Annex A.1), because the untrained-bystander behaviour is the risk being rated.

5.3 Severity in this sector shall account for the vulnerability of the worst-case bystander (child, reduced-mobility person) present within the declared venue class, not for an average adult, and the assessment shall record which worst-case population the exposure envelope admits.

6 Sector Application Rating

6.1 The Service & Public sector AR shall be determined per **VRS-SVC-201** from the pool defined there – the sector criteria SVC-1...SVC-10 together with the contributing intrinsic criteria – as a percentage of

the applicable pool; letters (C < B < A < AA < AAA, AAA best) follow **VRS-GEN-006 §4**. The machine-readable data twin is **VRS-SVC-501**.

6.2 The letter bands, the per-criterion tier ceilings, and the reserved-headroom AAA band (deliberately hard, anti-inflation) live in VRS-GEN-006 §4 and VRS-SVC-201 §7 and are not restated here.

6.3 Service-robot safety-regime conformity for the declared venue class (Clause 2 — ISO 13482:2014 or its published successor for personal/service applications, ANSI/CAN/UL 3300:2024 for SCIEE robots in North American commercial spaces, or ISO 3691-4:2023 for delivery/AMR platforms) is scored by VRS-SVC-201 §6.1 (criterion SVC-1) on a large point range; absence of evidenced conformity scores zero on that criterion and is **not a gate** — the rating rewards performance above the compliance floor without substituting for it.

6.4 Public data-capture handling (H5) — a data-protection assessment (GDPR-class) and, where the robot performs remote biometric identification in a publicly accessible space, an AI Act (EU 2024/1689) Article-5 admissibility record — is scored by VRS-SVC-201 §6.7 (criterion SVC-7); undocumented capture behaviour scores zero on that criterion and is not a gate (Annex A.3).

7 Evidence requirements

7.1 Evidence shall be graded per VRS-GEN-012. Sector-relevant sources include: venue incident logs, operator exposure records (in op-hours), public-interaction and uninstructed-person test evidence, tamper/abuse-robustness evidence, and public-data-handling documentation.

7.2 For each hazard group, an existing conformity artefact should be mapped to the VRS evidence lane so that adoption costs a manufacturer a mapping rather than new testing:

HAZARD	EXISTING ARTEFACT (EXAMPLE)	VRS EVIDENCE LANE
H1	ANSI/CAN/UL 3300:2024 evaluation report; ISO 13482:2014 risk assessment (ISO/TR 23482-1:2020 test methods); uninstructed-person trial report	safety_incidents
H2	ISO 3691-4:2023 verification report (AMR/delivery); crowd-navigation trial results (persons/m², m/s); egress-clearance test	safety_incidents, reliability
H3	tamper/abuse-robustness test report; adversarial-interaction trial (riding, obstruction) evidence	spec_integrity, safety_incidents
H4	reliability telemetry; ISO 14224:2016 maintenance records (active repair time; parts-delay in days); stranded-robot recovery procedure	reliability, serviceability
H5	data-protection impact assessment (GDPR-class); AI Act (EU 2024/1689) Art. 5 record for biometric ID; IEC 62443-4-2:2019 SL-C evaluation of the venue link	cyber_posture
H6	operator premises-liability documentation; incident-reporting procedure; manufacturer support declaration	manufacturer_support, safety_incidents

7.3 Evidence shall be assessed at one of three tiers — **Unverified, Verified, Certified** — each criterion stating the points reachable at each tier (VRS-SVC-201 §6, §8). Where a criterion’s evidence bar is not met the criterion shall score **0** (no evidence is zero points, not a discard from the pool); a model×venue-class with no admissible public-context evidence shall be displayed as *not covered* for that class (VRS-GEN-006 §6).

7.4 Models without sufficient model-specific public-context evidence shall be scored at the tier the available evidence supports and, where offered, from manufacturer-wide records under the company-wide fallback and cold-start parity of **VRS-GEN-005 §6**; the lower tier caps the attainable letter through the per-criterion ceilings (VRS-SVC-201 §7). Where H1 or H3 evidence rests on manufacturer declaration alone, without test data or field incident records, the assessment shall hold the criterion at its Unverified rung and record the evidence gap. Field-return evidence from public venues shall be held at the Unverified tier unless corroborated by instrumented logs or incident records (public-venue recollection is unreliable; logs are not).

8 Loss-driver mapping (insurance and finance fitness)

8.1 Every quantity that feeds the SVC rating shall be traceable to a loss driver and to a Robot Risk Passport field (VRS-GEN-009), so that an underwriter or lender can compute it from obtainable evidence. The mapping is:

LOSS DRIVER	SVC SIGNAL	EXPOSURE DENOMINATOR	CONSUMES
Frequency	H1 contact events; H2 crowd incidents; H4 in-service failures	per 1,000 op-hours	safety_incidents, reliability
Severity	bystander-injury consequence, weighted to worst-case population	per event	safety_incidents
Exposure	service time in the declared venue class	op-hours	reliability
Recoverability	H4 in-venue recovery feasibility; stranded-robot clearance time	per event	serviceability
Residual value / obsolescence	end-of-support horizon (months); public-space wear	per model	economics_residual
Correlated / cyber-catastrophe	H5 shared venue-network / update-plane compromise across a fleet	per fleet	cyber_posture

8.2 An SVC signal that lacks an exposure denominator shall not be scored as a frequency; it shall be recorded as a descriptive attribute or elevated as a design question (VRS-GEN-202). No loss statistic shall be invented to fill a missing denominator.

8.3 The rating output shall be expressed so that it can feed an underwriting decision (rate relativity, deductible, exclusion, condition) or a credit decision (loan-to-value, residual curve, covenant), and shall be recorded in the Passport with its assessment tier and evidence-basis flags (VRS-GEN-006 §9.3, VRS-GEN-009).

8.4 Third-party bodily-injury exposure to bystanders is the loss driver unique to this sector: the population at risk is uninsured-by-the-operator, uninstructed, and includes vulnerable persons, so a single H1 event can generate a premises-liability claim far exceeding the robot's own value. The rating shall record the worst-case bystander population admitted by the exposure envelope (Cl. 5.3) as a separate passport attribute so that an underwriter can weight severity independently of frequency.

8.5 Correlated and cyber-catastrophe accumulation (H5) shall be surfaced as a passport-recorded attribute: where many units of a model share one venue-network or update plane, one compromise or one defective update can degrade or capture the fleet at once, so the risk does not diversify the way independent mechanical failures do. The attribute shall record whether that plane holds an IEC 62443-4-2:2019 SL-C evaluation. This attribute is descriptive, not scored, until a fleet-loss denominator exists (VRS-GEN-202 §8).

9 Protocol references

- **VRS-SVC-201** — Service & Public AR Assessment Protocol (scoring) — dated reference at assessment time; its data twin is **VRS-SVC-501**.
- Service Test Protocols (**VRS-SVC-1xx**) are reserved; the first candidates are a bystander-detection and response protocol and a crowd-navigation trial protocol, drawing on the anchor regimes' test methods (ISO/TR 23482-1:2020; ISO 3691-4:2023) rather than duplicating them.

10 Worked example (informative) — applicability walkthrough

The following illustrates how an assessor applies Clauses 4–8 to a **hypothetical** model; it is not a real assessment and does not imply any robot holds a Veyrum rating.

Input. A manufacturer declares a wheeled hospitality-service robot, model code **SVC-HR-01**, for two venue classes: **indoor-retail-hospitality** (max crowd density 1.5 persons/m², max speed 1.2 m/s, attended operating hours) and **queue-and-crowd**. The manufacturer holds an ANSI/CAN/UL 3300:2024 evaluation report, an ISO 13482:2014 risk assessment with ISO/TR 23482-1:2020 test evidence, a data-protection impact assessment for its onboard camera (no biometric identification claimed), an IEC 62443-4-2:2019 SL-2 evaluation of the venue link, and 8,000 op-hours of operator field data with 3 recorded minor bystander-contact events and 0 injuries.

Step 1 — applicability (Cl. 4). The manufacturer declaration satisfies 4.1(a); SVC is applicable. The envelope records classes **indoor-retail-hospitality** and **queue-and-crowd**, each with its exposure envelope (4.3).

Step 2 — hazard coverage (Cl. 5). H1–H6 all apply to the declared classes. H1 evidence includes an uninstructed-person trial, satisfying 5.2. The **queue-and-crowd** envelope admits children, so 5.3 records child as the worst-case bystander population.

Step 3 — evidence and reuse (Cl. 7.2). Each hazard maps to an existing artefact via §7.2: H1→UL 3300:2024 evaluation report + ISO 13482:2014 risk assessment (ISO/TR 23482-1:2020 test methods); H4→ISO 14224:2016 records; H5→data-protection impact assessment + IEC 62443-4-2:2019 evaluation of the venue link. Adoption is a mapping, not new testing.

Step 4 — criteria and evidence tier (Cl. 6, 7.3–7.4). The UL 3300:2024 evaluation and ISO 13482:2014 risk assessment are scored by SVC-1 (§6.3), not treated as a gate; the data-protection assessment is scored by SVC-7 (§6.4), and because no biometric identification is performed the AI Act Art. 5 record is recorded as not-applicable. The manufacturer evidence pack (evaluation report, risk assessment, trial evidence, data-protection assessment, 8,000 op-hours of operator field data) supports the **Verified** tier; no behaviour is witnessed, so each criterion is held at its Verified ceiling (VRS-SVC-201 §7) and the Certified tier is not reached.

Step 5 — loss-driver read (Cl. 8). Bystander-contact frequency is expressed as 3 events per 8,000 op-hours = 0.38 per 1,000 op-hours (H1). Severity is weighted to the child worst-case (8.4). The fleet shares an update plane with an SL-2 (not SL-C) evaluation, so 8.5 records the accumulation attribute below the target level. End-of-support horizon (months) is recorded for the residual-value driver.

Output. The rating is computed by VRS-SVC-201 (not in this document). The displayed sector letter is the lowest issued venue-class letter (Cl. 4.3). The Passport record carries the per-class letters, the venue classes and exposure envelopes, the assessment tier, the H1 evidence notes, the worst-case-population attribute, and the accumulation attribute. The numeric score and band boundary come from the criterion rungs and bands of VRS-SVC-201 and are not asserted here.

11 Annex A (normative) — Public-exposure module

A.1 Evidence for H1–H3 shall include uninstructed-person scenarios (children, crowds, reduced-mobility persons), not only trained test subjects.

A.2 The assessed envelope shall state the maximum crowd-density conditions (persons/m²) and maximum operating speed (m/s); operation beyond the declared envelope is outside the rating.

A.3 Public data-capture behaviour (retention, faces, minors, biometric identification) shall be documented and consistent with the deployment jurisdiction’s data-protection regime; where remote biometric identification in a publicly accessible space is performed, its admissibility under AI Act (EU 2024/1689) Article 5 shall be recorded. Undocumented capture behaviour scores zero on criterion SVC-7 (Cl. 6.4).

12 Bibliography

- ISO 8373:2021, Robotics — Vocabulary ([iso.org/standard/75539.html](https://www.iso.org/standard/75539.html)) — robot-term basis.
- ISO 13482:2014, Robots and robotic devices — Safety requirements for personal care robots ([iso.org/standard/53820.html](https://www.iso.org/standard/53820.html)); under revision as ISO/FDIS 13482 ([iso.org/standard/83498.html](https://www.iso.org/standard/83498.html), “Safety requirements for service robots”), replacement + rename confirmed 2026-09-11.
- ISO/TR 23482-1:2020 (safety-related test methods) and ISO/TR 23482-2:2019 (application guidelines) ([iso.org](https://www.iso.org)) — informative companions to ISO 13482.
- ANSI/CAN/UL 3300:2024, Standard for Service, Communication, Information, Education and Entertainment (SCIEE) Robots (webstore.ansi.org; ULSE 2024; OSHA NRTL scope addition 2024) — SVC safety anchor (US/CA).
- ISO 3691-4:2023, Industrial trucks — Safety requirements and verification — Part 4: Driverless industrial trucks and their systems ([iso.org/standard/83545.html](https://www.iso.org/standard/83545.html)) — delivery/AMR evidence lane.
- Machinery Regulation (EU) 2023/1230 (adopted 14 June 2023; applicable 20 January 2027; repeals Directive 2006/42/EC) (eur-lex.europa.eu/eli/reg/2023/1230) — EU market safety-floor context.
- AI Act, Regulation (EU) 2024/1689 (in force 1 August 2024; Art. 5 public-space biometric restrictions) (eur-lex.europa.eu/eli/reg/2024/1689) — H5 biometric/data-capture lane.
- GDPR, Regulation (EU) 2016/679 — data-protection regime; representative H5 jurisdiction anchor.
- IEC 62443-4-2:2019, technical security requirements for IACS components (SL-C; FR1–FR7) — H5 venue-link cyber lane.
- ISO 14224:2016, collection and exchange of reliability and maintenance data for equipment — H4 serviceability lane.
- VRS framework research Phase 5 (internal) — SVC regime scan.

13 Change history

DATE	VERSION	STATUS	CHANGE	AUTHORITY
2026-09-05	0.1	Draft	Initial draft — template replication #1; public-exposure module first use; ISO 13482 replacement/rename caught in-house	CEO goal 2026-09-05
2026-09-11	0.2	Draft	DEEPEN: brought to publishable depth. Added dated anchors (ISO 8373:2021, ISO 13482:2014→ISO/FDIS 13482, ISO/TR 23482-1:2020 / -2:2019, ANSI/CAN/UL 3300:2024, ISO 3691-4:2023, EU 2023/1230, EU 2024/1689, GDPR 2016/679, IEC 62443-4-2:2019, ISO 14224:2016) verified 2026-09-11; UL 3300:2024 is the new on-point commercial-space safety anchor. Added evidence-reuse mapping (Cl. 7.2), loss-driver mapping incl. bystander bodily-injury and cyber-accumulation (Cl. 8), worked applicability example (Cl. 10), expanded terms/units (persons/m ² , m/s, op-hours, days, months, per 1,000). Rebuilt anchor-compliance caps (Cl. 6.2/6.3) on UL 3300 / ISO 13482 / ISO 3691-4 and GDPR/AI-Act. Retired all bare pending markers → GEN-202 stage labels. Net +≈2,500 words; shall 7→~31. No requirements deleted.	Curator Run #37; charter DEEPEN
2026-09-12	0.3	Draft	REFACTOR (HAZ/SVC pair): shared boilerplate replaced by cross-references to its single home (universal sector template GEN-002 §6.4; anchor/scale/form definitions in GEN-001; ISO 8373 delegated to Clause 3). No shall, dated anchor, or bibliography entry removed. Net –8 words.	Run #62 REFACTOR
2026-09-14	0.3ε1	Draft	COHERENCE: corrected 5 stale references describing VRS-SVC-501 as “planned”/“pending” (Foreword, §1, §2, §6.1, §9) → present tense — the data twin VRS-SVC-501 (v0.2.0) already exists as content and in library-map.json; matches the SPC-001/SPC-201 precedent (Run #95) and every sibling sector standard. Editorial only — no constant, threshold, requirement, or cross-reference target changed. Net +0 words.	Curator Run #135; charter COHERENCE
2026-09-16	1.0	Draft	VRS 2026 rewrite: recast Clause 6 — deleted the two anchor-compliance ≤ B caps (§6.2 safety floor, §6.3 data capture) and the grade-band pointer; service-robot safety-regime conformity is now scored by VRS-SVC-201 §6.1 (SVC-1) and public data-capture handling by §6.7 (SVC-7), each on a large range with	VRS 2026 rewrite Stage 4

DATE	VERSION	STATUS	CHANGE	AUTHORITY
			no gate, and bands live in VRS-GEN-006 §4 / VRS-SVC-201 §7. Evidence recast to the Unverified/Verified/Certified tiers (§7.3–7.4). Deleted Annex A (cold-start qualification) and renumbered Annex B→A. Dropped GEN-201/GEN-202 cold-start references (cold-start parity → GEN-005 §6). Retired confidence-band, provisional-flag, assessed-unrated, hard-cap and stage- prior wording; data-twin reference → VRS-SVC-501. Worked example re-run at the Verified tier with arithmetic shown. No numeric threshold, weight or constant set or changed; twin regenerated by the dispatcher. See GEN-005 §6.	

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