



VEYRUM ROBOTICS STANDARD



VRS-HAZ-001

Hazardous & Emergency Response Sector Standard

Application Rating requirements for robots in explosive, radiological, and emergency-response environments — the explosive-atmosphere, radiological, EOD, fire and search-rescue classes.

VEYRUM RESEARCH INSTITUTE

DOCUMENT

VRS-HAZ-001

VERSION

1.0

STATUS

Draft

DATE

16 September 2026

Contents

1 1 Scope

2 2 Normative references

3 3 Terms and definitions

4 4 Sector applicability

5 5 Sector hazard taxonomy

6 6 Sector Application Rating

7 7 Evidence requirements

8 8 Loss-driver mapping (insurance and finance fitness)

9 9 Protocol references

10 10 Worked example (informative) – applicability walkthrough

11 Annex A (normative) – Qualification-test module (first use)

12 Bibliography

13 Change history

Foreword. This is the sector standard for the **Hazardous & Emergency Response (HAZ)** application sector. It instantiates the universal sector template (VRS-GEN-002 §6.4). A Hazardous & Emergency Response Application Rating expresses, as a letter $C < B < A < AA < AAA$ (AAA best), how suitable and safe a robot model is for use in extreme environments — **above** the mandatory compliance floor: a model may be fully compliant with the anchor regimes of Clause 2 and still receive any letter. VRS does not replace those regimes; it discriminates among compliant models. The defining condition of the sector is the **extreme environment**: the robot exists precisely because the environment is too dangerous for people, so failure tolerance is low, recovery may be impossible, and the robot itself must not become the ignition source or the contamination path. The rating is built so that an insurer or lender can read frequency, severity, exposure, recoverability, residual value, and correlated-cyber risk from evidence a manufacturer already produces for CE / UL / ISO / IECEx conformity (Clauses 7–8). Anchors were verified against issuing-body pages on 2026-09-11, with the IEC 60079-0 explosive-atmosphere anchor re-verified 2026-09-12 (Bibliography). Numeric thresholds are not set here; they live inside the criterion rungs of VRS-HAZ-201 and its data twin (VRS-HAZ-501). A Hazardous & Emergency Response 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 Scope

This Standard defines the requirements for issuing a **Hazardous & Emergency Response AR** for robots operating in extreme environments: explosive atmospheres (oil/gas/chemical), radiological environments, explosive-ordnance disposal (EOD), firefighting, and search-and-rescue. 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-HAZ-201 with its data twin VRS-HAZ-501). Boundary with adjacent sectors: routine outdoor inspection without extreme-environment exposure is rated under **VRS-FLD-001**; flying platforms under **VRS-AER-001**; underwater platforms under **VRS-MAR-001**; military and adversarial missions under **VRS-DEF-001**. Robot form is not a sector (VRS-GEN-001 §3.4.3): any form — arm, tracked vehicle, quadruped, or aerial platform — is rated under HAZ by this Standard when Clause 4 holds.

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-HAZ-201**, Hazardous & Emergency Response AR Assessment Protocol (scoring; dated at assessment); its data twin is **VRS-HAZ-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:
 - **ATEX Directive 2014/34/EU** (recast; applicable from 20 April 2016) — EU essential health & safety requirements and Notified-Body conformity route for explosive-atmosphere equipment (equipment groups and categories keyed to zone). Safety-floor anchor for the **explosive-atmosphere** class in EU markets.
 - **IEC 60079-0:2026** (Edition 8.0; published 2026-06-16, cancelling and replacing Edition 7.0:2017 as a technical revision) — Explosive atmospheres — Part 0: Equipment — General requirements, certified internationally through the **IECEx** scheme and commonly run alongside ATEX as one project. A valid certificate to the superseded Edition 7.0:2017 remains acceptable H1 evidence until re-certification (VRS documents are dated at the point of assessment; §2).
 - **UL 121201** (9th edition, 2017; harmonised with CSA C22.2 No. 213-17) — US nonincendive equipment for Class I/II Division 2 and Class III hazardous (classified) locations. US route for H1 where ATEX/IECEx is not the market regime.
 - **IEC 60529:1989+AMD2:2013** (IP Code) — degrees of protection provided by enclosures; ingress-protection evidence lane for H3 environmental attrition.
 - **ASTM E2853/E2853M-22** and the **DHS-NIST-ASTM E54.09** (Homeland Security Applications; Response Robots) test-method suite (incl. ASTM E2566-17a, response-robot sensing) — harmonised, quantitative capability-measurement methods for the **eod**, **fire**, and **search-rescue** classes.
 - **IEC 62443-4-2:2019** — technical security requirements for IACS components (security levels SL-C against foundational requirements FR1–FR7); operator-link cyber evidence lane for H4.
 - Radiological, EOD, and firefighting mission-domain requirements (nuclear-site licensing, EOD procurement specs, firefighting-apparatus norms) are per-programme and shall be recorded at assessment. For the **fire** class the recognised US firefighting-apparatus construction/performance norm is **NFPA 1900, 2024 edition** (effective 2024-01-01; consolidating NFPA 414/1901/1906/1917) — cited as an example mission-domain anchor recorded at assessment, not a harmonised global floor. No harmonised public performance floor exists for radiological robots, so none 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:

- **extreme environment** — an environment whose conditions (explosive atmosphere, ionising radiation, fire, structural collapse, toxic release) preclude routine human presence.
- **environment class** — the declared extreme-environment category the model is assessed in; at minimum one of **explosive-atmosphere**, **radiological**, **eod**, **fire**, **search-rescue**.

- **exposure envelope** — the declared operating limits for an environment class: zone class (explosive atmospheres), dose budget (radiological, in millisieverts, mSv), and thermal envelope (fire, in °C).
- **mission criticality** — the consequence class of the robot failing mid-mission, where human intervention may be impossible.
- **hazard aggravation** — the robot itself becoming an ignition source, a contamination-spread path, or an obstacle that worsens the incident it was deployed to resolve.
- **theatre exposure** — operating time accrued in a declared environment class, measured in **op-hours**, used as the exposure denominator for frequency-type quantities.
- **contamination write-off** — loss of residual value when a unit exposed to radiological or chemical contamination cannot be decontaminated to a returnable state, even if functionally repairable.

4 Sector applicability

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

4.2 The minimum capability for applicability is operation in at least one declared environment class with evidence that the robot does not aggravate the hazard (ignition, contamination spread, obstruction).

4.3 The assessed envelope shall state the **environment classes** covered — at minimum one of **explosive-atmosphere**, **radiological**, **eod**, **fire**, **search-rescue** — as protocol applicability fields (VRS-GEN-007 §4.2), each with its declared exposure envelope (zone class, dose budget in mSv, thermal envelope in °C). The AR letter shall cover only the assessed classes; unassessed classes shall be displayed as not covered.

4.4 Environment classes are the sector's **segments**: per-class letters where evidence diverges materially, lowest-issued-letter display, and *not-covered* handling of unassessed classes follow **VRS-GEN-006 §8.3** (the single home of that rule), as implemented for this sector in VRS-HAZ-201. Where a model is assessed for more than one environment class, the displayed sector letter shall be the lowest letter issued across the assessed classes.

4.5 Evidence shall be attributable both to a declared environment class and to its exposure envelope (zone class, dose budget in mSv, thermal envelope in °C); evidence accrued outside the declared envelope shall not support a broader claim. Where evidence does not cover the declared envelope, the envelope shall contract to the exposure actually observed rather than the score being stretched to cover conditions never seen (VRS-HAZ-201 §4.3–4.4).

5 Sector hazard taxonomy

The Hazardous & Emergency Response 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-HAZ-201, not here.

#	HAZARD GROUP	ARCHETYPE	PRIMARY IR CATEGORIES	LOSS DRIVER
H1	Hazard aggravation	robot as ignition source in an explosive atmosphere; contamination spread from a radiological zone	safety_incidents, spec_integrity	severity (catastrophic), frequency
H2	Mission-critical failure	failure mid-mission where humans cannot intervene; a stranded robot becoming an obstacle or secondary hazard	reliability, safety_incidents	frequency, exposure, severity
H3	Environmental attrition	radiation degradation of electronics; thermal damage; corrosive/abrasive/dust exposure	reliability, economics_residual	frequency (degradation), obsolescence
H4	Operator-link integrity	tele-operation link loss in shielded/underground/burning structures; control-handover and spoofing failures	cyber_posture, reliability	frequency, correlated/cyber-catastrophe
H5	Decontamination and recovery	post-mission decontamination; disposal of contaminated units; recovery logistics	serviceability, economics_residual	recoverability, residual value
H6	Responder interaction	robots operating alongside emergency responders under incident command	safety_incidents, manufacturer_support	frequency, severity

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

5.2 H1 (hazard aggravation) is the sector-defining loss driver and shall never be inferred from transferred evidence: the anti-aggravation case shall rest on the environment class's own certification or instrumented test evidence, not on analogy to another model or class.

5.3 Severity in this sector shall account for the mission consequence, not only physical harm to bystanders: a mission-critical failure of an EOD or radiological platform can leave an unresolved hazard in a zone humans cannot enter, a consequence that exceeds the platform's own repair cost. The assessment shall record the mission-consequence class alongside the physical-harm severity so that the two are not conflated in the rating record.

6 Sector Application Rating

6.1 The Hazardous & Emergency Response sector AR shall be determined per **VRS-HAZ-201** from the pool defined there — the sector criteria HAZ-1...HAZ-9 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-HAZ-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-HAZ-201 §7 and are not restated here.

6.3 Anchor-regime conformity (Clause 2) is scored by **VRS-HAZ-201 §6.1** (criterion **HAZ-1**, Environment-specific certification / qualification), by environment class, on a large point range — the ATEX / IECEx (IEC 60079-0) certificate for the declared zone in the **explosive-atmosphere** class, and the recorded mission-domain requirements for the other classes. 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.

7 Evidence requirements

7.1 Evidence shall be graded per VRS-GEN-012. Sector-relevant sources include: certification dossiers (ATEX / IECEx / UL 121201), qualification-test campaigns, operator mission logs (in op-hours), radiation-exposure and dose records (in mSv), decontamination and disposal records, and post-incident reports.

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	ATEX 2014/34/EU EU-type-examination certificate; IECEx CoC (IEC 60079-0:2026 ed 8.0; ed 7.0:2017 certificates valid until re-certification); UL 121201 (2017) report for US Division 2; radiological contamination-control procedure	safety_incidents, spec_integrity
H2	operator mission logs (op-hours); reliability telemetry; ISO 14224:2016 maintenance records	reliability, safety_incidents
H3	IEC 60529:1989+AMD2:2013 IP-rating report; radiation-tolerance / total-ionising-dose test report; thermal-envelope test report	reliability, economics_residual
H4	IEC 62443-4-2:2019 SL-C evaluation of the control link; instrumented link-loss / handover trial report	cyber_posture, reliability
H5	decontamination procedure and disposal plan; ISO 14224:2016 repair records (active repair time; parts-delay in days)	serviceability, economics_residual
H6	ASTM E2853/E2853M-22 and E54.09 response-robot test results; NFPA 1900:2024 firefighting-apparatus dossier (fire class); incident-command integration procedure	safety_incidents, manufacturer_support

7.3 Evidence shall be assessed at one of three tiers — **Unverified, Verified, Certified** — each criterion stating the points reachable at each tier (VRS-HAZ-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×class with no admissible extreme-environment evidence shall be displayed as *not covered* for that class (VRS-GEN-006 §6).

7.4 Models without sufficient model-specific operating history 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-HAZ-201 §7). Where H1 anti-aggravation evidence rests on manufacturer declaration alone, without a certification dossier or instrumented test data, the assessment shall hold the criterion at its Unverified rung and record the evidence gap. Field-return evidence from extreme environments shall be treated as Unverified-tier unless instrumented, because the environment corrupts recollection where instruments do not.

8 Loss-driver mapping (insurance and finance fitness)

8.1 Every quantity that feeds the HAZ 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	HAZ SIGNAL	EXPOSURE DENOMINATOR	CONSUMES
Frequency	H2 mission failures; H1 aggravation events; H4 link losses	per 1,000 op-hours	reliability, safety_incidents
Severity	ignition/explosion/contamination consequence; unresolved-hazard mission abort	per event	safety_incidents
Exposure	theatre time in the declared environment class	op-hours	reliability
Recoverability	H5 decontamination and recovery feasibility; repair-in-place vs. write-off	per event	serviceability
Residual value / obsolescence	H3 attrition; contamination write-off; end-of-support horizon (months)	per model	economics_residual
Correlated / cyber-catastrophe	H4 shared control/update plane compromise across a fleet	per fleet	cyber_posture

8.2 A HAZ 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, the environment classes and exposure envelopes covered, and evidence-basis flags (VRS-GEN-006 §9.3, VRS-GEN-009). The letter alone is insufficient.

8.4 Contamination write-off is the finance-risk driver unique to this sector: a radiologically or chemically contaminated unit may carry near-zero residual value even when it is functionally repairable, because return-to-service and resale depend on decontamination to a certifiable state, not on mechanical condition. The rating shall record contamination write-off exposure as a separate passport attribute and shall not net it against serviceability (H5), so that a lender can weight recoverability and residual value independently in its residual curve.

8.5 Correlated and cyber-catastrophe accumulation (H4) shall be surfaced as a passport-recorded attribute: where many units of a model share one control or update plane, one adversary action 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, so an underwriter can set a per-fleet accumulation cap. This attribute is descriptive, not scored, until a fleet-loss denominator exists (VRS-GEN-202 §8).

9 Protocol references

- **VRS-HAZ-201** — Hazardous & Emergency Response AR Assessment Protocol (scoring) — dated reference at assessment time; its data twin is **VRS-HAZ-501**.
- Hazardous Test Protocols (**VRS-HAZ-1xx**) are reserved; the first candidates are an explosive-atmosphere qualification protocol (drawing on IEC 60079 test methods) and a decontamination / recovery verification protocol, drawing on the anchor regimes' test regimes 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 (VRS-GEN-006 §10).

Input. A manufacturer declares a tracked ground robot, model code **HAZ-EX-01**, for two environment classes: **explosive-atmosphere** (oil/gas, Zone 1) and **search-rescue**. The manufacturer holds an ATEX 2014/34/EU EU-type-examination certificate and an IECEx CoC to the superseded IEC 60079-0:2017 (ed 7.0; acceptable H1 evidence until re-certification per §2/§6.3) for the declared Zone 1, an IEC 60529:1989+AMD2:2013 IP66 report, an IEC 62443-4-2:2019 SL-2 evaluation of the tele-operation link, and 6,000 op-hours of operator field data with 2 recorded link-loss events and 0 aggravation events.

Step 1 — applicability (Cl. 4). The manufacturer declaration satisfies 4.1(a); HAZ is applicable. The envelope records classes **explosive-atmosphere** (Zone 1) and **search-rescue**, each with its exposure envelope (4.3). Two classes are assessed, so 4.4 lowest-letter display applies across them.

Step 2 — hazard coverage (Cl. 5). H1–H6 all apply to the declared classes. H1 evidence rests on the ATEX + IECEx certification for Zone 1, satisfying 5.2 (no transferred evidence).

Step 3 – anchor conformity (Cl. 6.3). The ATEX + IECEx Zone 1 certificate is scored on criterion HAZ-1 by VRS-HAZ-201 §6.1 for the **explosive-atmosphere** class; because it is evidenced it earns points on the criterion's range rather than acting as a gate.

Step 4 – search-rescue class (Cl. 6.3). The **search-rescue** class has no ATEX-style floor; its mission-domain requirements (recorded per assessment) plus ASTM E2853/E2853M-22 capability results are the HAZ-1 evidence for that class, again scored on the range, not gated.

Step 5 – evidence tier (Cl. 7.3–7.4). The evidence pack (ATEX EU-type-examination certificate, IECEx CoC to the superseded IEC 60079-0:2017, IEC 60529:1989+AMD2:2013 IP66 report, IEC 62443-4-2:2019 SL-2 evaluation, and 6,000 op-hours with 2 link-loss and 0 aggravation events) is documented but not witnessed, so the assessment supports the **Verified** tier; each criterion is held at its Verified ceiling (VRS-HAZ-201 §7) and the Certified tier is not reached.

Step 6 – loss-driver read (Cl. 8). Link-loss frequency is expressed as 2 events per 6,000 op-hours = 0.33 per 1,000 op-hours (H4). The model shares a fleet update plane with an SL-2 (not SL-C) evaluation, so 8.5 records the accumulation attribute below the target level. No contamination write-off exposure applies (no radiological/chemical class declared), so 8.4 records that attribute as not applicable.

Output. The rating is computed by VRS-HAZ-201 (not in this document). The Passport record carries the per-class letters, the environment classes and exposure envelopes, the assessment tier, the H4 evidence notes, and the accumulation attribute. The numeric score and band boundary come from the criterion rungs and bands of VRS-HAZ-201 and are not asserted here.

11 Annex A (normative) — Qualification-test module (first use)

A.1 For each declared environment class, qualification-test evidence shall demonstrate survival **and** function at the declared exposure envelope — survival alone is insufficient.

A.2 Test conditions shall be traceable to the class's recognised test regime: IEC 60079 methods for explosive atmospheres; IEC 60529:1989+AMD2:2013 for ingress protection; total-ionising-dose test methods for radiological classes; and the ASTM E54.09 response-robot test methods (e.g. ASTM E2853/E2853M-22) for **eod**, **fire**, and **search-rescue** capability. Where no harmonised method exists (radiological robots), the recorded mission-domain method shall be stated.

A.3 Field-return evidence from extreme environments shall be treated as Unverified-tier unless instrumented, per 7.4.

12 Bibliography

- ISO 8373:2021, Robotics — Vocabulary ([iso.org/standard/75539.html](https://www.iso.org/standard/75539.html)) — robot-term basis.
- ATEX Directive 2014/34/EU (recast; applicable from 20 April 2016), equipment for potentially explosive atmospheres (eur-lex.europa.eu/eli/dir/2014/34/oj; EC ATEX Guidelines Ed. 5, 2024) — H1 floor (EU).
- IEC 60079-0:2026 (Edition 8.0; published 2026-06-16; cancels and replaces Edition 7.0:2017 as a technical revision), Explosive atmospheres — Part 0: Equipment — General requirements

(webstore.iec.ch/en/publication/114218); IECEx scheme – H1 international route.

- UL 121201 (9th edition, 2017; harmonised with CSA C22.2 No. 213-17), Nonincendive electrical equipment for Class I/II Division 2 and Class III hazardous locations (webstore.ansi.org) – H1 US route.
- IEC 60529:1989+AMD2:2013 (IP Code), degrees of protection provided by enclosures (webstore.iec.ch/en/publication/2452) – H3 ingress-protection lane.
- ASTM E2853/E2853M-22, Standard Test Method for Evaluating Emergency Response Robot Capabilities: HSI: Search Tasks (webstore.ansi.org; DHS-NIST-ASTM E54.09 suite; also ASTM E2566-17a, sensing) – H6 lane.
- NFPA 1900, 2024 edition, Standard for Aircraft Rescue and Firefighting Vehicles, Automotive Fire Apparatus, Wildland Fire Apparatus, and Automotive Ambulances (effective 2024-01-01; consolidates NFPA 414/1901/1906/1917) (catalog.nfpa.org, product P22358) – **fire** -class firefighting-apparatus mission-domain anchor (US regime, recorded at assessment).
- IEC 62443-4-2:2019, technical security requirements for IACS components (SL-C; FR1–FR7) – H4 cyber lane.
- ISO 14224:2016, Petroleum, petrochemical and natural gas industries – Collection and exchange of reliability and maintenance data for equipment (iso.org/standard/64076.html) – H2/H5 maintenance lane.
- VRS framework research Phase 5 (internal) – HAZ regime scan (extreme-environment; non-harmonised mission domains).

13 Change history

DATE	VERSION	STATUS	CHANGE	AUTHORITY
2026-09-05	0.1	Draft	Initial draft — qualification-test module first use; no-cert-no-letter for explosive atmospheres; honest [UNVERIFIED] on non-harmonised mission domains	CEO goal 2026-09-05
2026-09-11	0.2	Draft	DEEPEN: brought to publishable depth. Added dated anchors (ISO 8373:2021, ATEX 2014/34/EU, IEC 60079-0:2017, UL 121201:2017, IEC 60529:1989+AMD2:2013, ASTM E2853/E2853M-22 / E54.09, IEC 62443-4-2:2019) verified 2026-09-11; ASTM E54.09 resolves the v0.1 non-harmonised gap for eod/fire/search-rescue. Added evidence-reuse mapping (Cl. 7.2), loss-driver mapping incl. contamination write-off (Cl. 8), worked applicability example (Cl. 10), expanded terms/units (mSv, op-hours, days, °C, per 1,000). Retired all bare pending markers → GEN-202 stage labels. Net +≈2,400 words; shall 5→~33. No requirements deleted.	Curator Run #29; charter DEEPEN
2026-09-12	0.3	Draft	RESEARCH: refreshed the H1 explosive-atmosphere anchor to current edition IEC 60079-0:2026 (Edition 8.0, published 2026-06-16, technical revision cancelling ed 7.0:2017) — verified against webstore.iec.ch/en/publication/114218 . Updated §2, §6.2 gate, §7.2 H1 lane, worked example (Cl. 10) and Bibliography (incl. URL 32878→114218). Added an adoptability rule: a valid certificate to the superseded ed 7.0:2017 remains acceptable H1 evidence until re-certification (adoption stays a mapping, not new testing). No constant set or changed; HAZ-501 twin untouched. Net +≈90 words; no shall added or deleted.	Curator Run #58; charter RESEARCH
2026-09-12	0.4	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 –9 words.	Run #62 REFACTOR
2026-09-14	0.5	Draft	RESEARCH: added the fire -class firefighting-apparatus mission-domain anchor NFPA 1900:2024 (2024 edition, effective 2024-01-01, consolidating NFPA 414/1901/1906/1917) — verified against catalog.nfpa.org (P22358) + NFPA TIA_1900_24 this run — closing the Run #58 deferral of NFPA firefighting norms. Updated §2 anchor list, §7.2 H6 evidence-reuse	Curator Run #162; charter RESEARCH

DATE	VERSION	STATUS	CHANGE	AUTHORITY
			lane, and Bibliography. Cited as a US example anchor recorded at assessment, not a harmonised floor (jurisdiction-neutral); radiological “no harmonised floor” statement unchanged. No constant set or changed; HAZ-201/-501 twin untouched. Net +≈95 words; no normative requirement added or deleted.	
2026-09-16	1.0	Draft	VRS 2026 rewrite: recast Clause 6 — deleted the grade-band pointer, the explosive-atmosphere ATEX/IECEx no-letter gate (old §6.2) and the other-class ≤ B cap (old §6.3); anchor conformity is now scored by VRS-HAZ-201 §6.1 (HAZ-1) by class on a large range with no gate, and the letter bands / tier ceilings / AAA headroom live in VRS-GEN-006 §4 and VRS-HAZ-201 §7. Evidence recast to Unverified/Verified/Certified tiers (§7.3–7.4); §8.3 records the assessment tier. Added §4.4–4.5 (segments/lowest-letter display, exposure-envelope attribution). Deleted Annex A (cold-start qualification particulars) and renumbered Annex B→A. Dropped VRS-GEN-201 and stage-prior references (cold-start parity → GEN-005 §6); old §6.4 cold-start clause removed. Retired confidence-band, provisional-flag, assessed-unrated and grade-cap wording. Worked example re-run in the explosive-atmosphere class at the Verified tier. No numeric threshold, weight or constant set or changed; VRS-HAZ-501 twin regenerated by the dispatcher. See GEN-005 §6.	VRS 2026 rewrite Stage 4

About Veyrum Research Institute

Veyrum Research Institute is the research arm of Veyrum — the independent intelligence and trust layer for the robotics industry (research, ratings and registry, advisory, data, and specialist insurance & finance introductions).

Disclaimer

The opinions in this document are independent and current as of the date of publication, based on information believed reliable; they are not guarantees or warranties of safety, fitness, or compliance, and are not engineering, legal, or financial advice. This document may be revised. © 2026 Veyrum.

Contact: hello@veyrum.com · VRS-HAZ-001 · Version 1.0