CARPET CLEANERS WAREHOUSE · TRAINING

Truck-Mount Operator Course

HydraMaster & Sapphire Scientific · Australian configuration

Standards-sourced | Australianised | Assessment & sign-off included

Compiled July 2026 · Training material — not legal advice and not a substitute for the manufacturer's manual or a licensed practitioner.

How to use this pack — read first

This pack contains **Part A — the Manufacturer's Truck-Mount Safety Certificate** (Australian regulatory compliance) and **Part B — the six-unit Operator Course**.

Every safety-critical setpoint (water temperature, working pressure, RPM, service intervals, torque) is **model- and engine-specific**, and several compliance points are flagged ⚠ **CONFIRM**. **This is training reference, not fact for a specific machine, until Unit 3.6 "Gate A" is completed** against the actual unit + engine manual and the operator's State. No operator is signed off unproven, and no ⚠ item is taught as settled until verified.

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Gate A — Trainer pre-flight (complete BEFORE delivering the course)

Gate B — Operator competency assessment

Sign-off

Module 02 — Manufacturer's Truck-Mount Safety Certificate (Australia)

Part of: CCW Restoration Training Manual **Audience:** CCW as manufacturer/supplier of truck-mount systems; installers; and operators who need to understand the compliance basis of a mounted unit. **Status:** Framework + ready-to-complete certificate template.

> **Important.** There is **no accredited Australian "truck-mount certification scheme."** Compliance is assembled from the separate vehicle, gas, electrical, pressure and WHS regimes below. This certificate is therefore a **manufacturer's compliance declaration that references the underlying statutory sign-offs** — not a third-party accreditation. Three of those sign-offs (vehicle-modification signatory, licensed gasfitter, licensed electrician) **cannot be self-certified by the manufacturer** and must be completed by the licensed practitioner. Items marked ⚠ **CONFIRM** below must be verified against the named authority before a certificate is issued.

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1. The two questions that drive everything

Before any standard applies, resolve these two determinations for the specific unit and host vehicle. They decide which rules bind.

1a. GVM band — light vehicle or heavy vehicle?

Australian obligations split sharply on **Gross Vehicle Mass (GVM)**:

- **≤ 4.5 t GVM** (most vans/utes) → **light vehicle**. Modifications certified under the relevant **state light-vehicle scheme** against **VSB14 (National Code of Practice for Light Vehicle Construction and Modification, "NCOP")**.
- **> 4.5 t GVM** (trucks) → **heavy vehicle**. Modifications regulated by the **National Heavy Vehicle Regulator (NHVR)**, certified by an **Approved Vehicle Examiner (AVE)** against **VSB6 (National Code of Practice for Heavy Vehicle Modifications)**.

> **Terminology correction:** VSB6 is the **heavy**-vehicle code, and **VSB14** is the **light**-vehicle code. These are commonly confused — the certificate must cite whichever matches the host vehicle's GVM.

1b. Load or modification?

The single most important legal question for a slide-in unit:

- **Restrained cargo (genuinely slide-in / removable):** sits in the tray or van, held by rated tie-downs, not structurally bolted or hard-plumbed. Governed by the **Load Restraint Guide** — **no modification plate required**, but the unit's mass must fit within GVM and axle limits.
- **Permanent modification (bolted to chassis/body, hard-plumbed gas/water, fixed tanks):** affects mass and mass distribution → **requires engineering certification (modification plate) under the light- or heavy-vehicle scheme.**

An uncertified permanent install can render the vehicle **unregistered / unroadworthy and void insurance.** This determination must be stated explicitly on the certificate, and for a permanent install must be ruled on by the vehicle signatory before anything else.

The most common real-world failure point: full water tanks + fuel + occupants pushing the loaded vehicle over its **GVM or axle-group mass limits.** Always compute loaded mass per vehicle — never assume.

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2. Brands, models and heat-source architecture

CCW's truck-mount range is built around two primary manufacturer families — **HydraMaster** and **Sapphire Scientific**. Getting the certificate right starts with identifying the unit's **power and heat architecture**, because that decides which compliance domains

actually bite.

2a. Corporate note (state accurately)

- **Sapphire Scientific** and **Dri-Eaz** are **Legend Brands** companies — the same parent as the Dri-Eaz dehumidifier referenced in Module 01. (Confirmed: Legend Brands' portfolio includes Dri-Eaz, Sapphire Scientific, Prochem, Chemspec, ODORx, Unsmoke.)
- **HydraMaster** operates under **Universal Cleaning Concepts LLC** per its own current corporate/copyright statements. It shares deep industry lineage with the Legend Brands cleaning line but should **not** be described as a current Legend Brands company on a formal certificate. State the manufacturer entity as it appears on the unit.

2b. The compliance-critical distinction: how the unit makes heat and power

Verified across the current HydraMaster and Sapphire Scientific ranges, mainstream units fall into two architectures — **and neither is a gas-fired appliance**:

Architecture	Example models	Power	Heat	What this means for compliance
Direct-drive / engine-heat (host-vehicle powered)	HydraMaster **CDS xDrive** (Thermal Accumulation Heating System)	Runs off the **host vehicle engine** — no separate engine	Recovered from the **vehicle engine** (thermal exchange), no burner	Vehicle-modification and WHS dominate; **no gas appliance**; no separate fuel store beyond the vehicle's own tank
Onboard-engine slide-in	HydraMaster **Boxxer 318HP** (18 HP air-cooled), **Boxxer XL** (31 HP Briggs & Stratton), **TMTG4000** (23 HP Vanguard); Sapphire Scientific **370SS** (23 HP Kohler, 3000 RPM in the AU spec), **370EFI** (liquid-cooled Kubota 4-cyl)	Own **petrol** engine (EFI models are fuel-injected)	Recovered from the **engine exhaust** via a **stainless finned-tube heat exchanger**	Adds **petrol fuel storage** (flammable liquid) and **engine exhaust / CO in the enclosed van** as the salient hazards; heat exchanger assessed under pressure rules (AS 4343), **not** gas rules

Typical operating envelope for these units: solution pressure to ~**1,500 psi**, single- or multi-stage **finned-tube (stainless) heat exchanger**, high heat (93 °C+ / 200 °F+).

> **Key correction to the generic framework:** because standard HydraMaster and Sapphire Scientific units take heat from the **engine exhaust**, not a **fuel-gas burner**, the **gas domain (AS/NZS 5601 / 1596 / appliance certification) generally does NOT apply**. It applies **only** if a specific unit is fitted with a **gas-fired auxiliary heater** (uncommon in this range). For the mainstream engine-heat units the salient hazards are **petrol fuel handling, engine exhaust / CO extraction from an enclosed vehicle, the finned-tube heat exchanger (pressure), noise, and the vehicle modification.**

3. Regulatory map by domain

Each row: what governs a truck-mount, the issuing body, and an official source. Standard editions current as at the 2026 research pass; always work to the current published edition.

Domain A — Vehicle & road ("Main Roads")

Reference	Governs	Source
Australian Design Rules (ADRs) under the Road Vehicle Standards Act 2018	Base vehicle must stay ADR-compliant post-install (braking, mass, lighting, emissions, occupant protection)	infrastructure.gov.au — vehicle design regulation
VSB14 / NCOP (light ≤4.5 t)	Technical requirements for modifying a light vehicle: mass/loading, GVM, body/structural mounting	infrastructure.gov.au — NCOP bulletins
VSB6 (heavy >4.5 t)	Standard AVEs use to approve heavy-vehicle modifications	nhvr.gov.au — VSB6
NHVR + Approved Vehicle Examiners (AVEs)	Regulator and signatory for heavy-vehicle mods (issues heavy mod plate)	nhvr.gov.au — heavy vehicle modifications
Load Restraint Guide 2018 (heavy) / **Load Restraint Guide for Light Vehicles 2018** (NTC)	Restraint of a slide-in treated as cargo	nhvr.gov.au / ntc.gov.au
GVM/GCM & axle mass limits	Loaded unit + water + fuel + occupants must stay within limits	nhvr.gov.au — mass, dimension & loading

State modification sign-off (the "Main Roads" certificate):

State	Scheme	Signatory	Authority
QLD	Approved Person Scheme (QRVM codes)	Approved Person	Transport and Main Roads (TMR)
NSW	Vehicle Safety Compliance Certification Scheme (VSCCS)	Licensed Certifier	Transport for NSW
VIC	Vehicle Assessment Signatory Scheme (VASS)	VASS Signatory	Dept of Transport and Planning
SA / WA / TAS / NT / ACT	Equivalent state schemes (VASS certificates are commonly recognised for light vehicles) — ⚠ **CONFIRM per state**	Varies	State transport authority

⚠ **CONFIRM:** the **exact VSB14 / QRVM modification code(s)** applicable to a permanently mounted equipment module and its mass effect is a **signatory determination** — the certifying signatory nominates the applicable code(s). Do not pre-print a code.

Domain B — Gas (⚠ ONLY if a gas-fired auxiliary heater is fitted)

Applies only to gas-fired configurations. Mainstream HydraMaster / Sapphire Scientific units are **engine-heat** (see §2b) and this whole domain is **N/A** for them. Complete it only where a gas-fired auxiliary heater is actually installed.

Reference	Governs	Source
AS/NZS 5601.1 Gas installations — general	Design/install/commission of the fuel-gas system feeding the fired heat exchanger	store.standards.org.au
AS/NZS 5601.2 LP Gas in caravans/boats (non-propulsive) — ⚠ **CONFIRM applicability**	Possible boundary standard for in-vehicle LP Gas; a licensed gasfitter determines whether .1 or .2 governs	standards.org.au
AS/NZS 1596 Storage & handling of LP Gas	LPG **cylinder** mounting, location, impact/fire protection, ventilation	store.standards.org.au
Gas appliance certification (AS/NZS 5263 series; GTRC listing) — ⚠ **CONFIRM exact part**	The fired heat exchanger is a **gas appliance** — usually must be type-certified by a recognised Conformity Assessment Body and listed on the GTRC database before a gasfitter may connect it	gtrc.gov.au

Sign-off: a **licensed gasfitter** installs and certifies the gas installation; the appliance must hold current certification. **The manufacturer cannot self-certify the gas installation.**

Domain C — Electrical (⚠ only where a 230 V onboard generator/inverter is fitted)

> **Applies only to generator-equipped units.** Mainstream HydraMaster (Boxxer/TITAN/TMTG) and Sapphire (370/570/870) units are **petrol-engine slide-ins with 12 V DC controls — no 230 V mains installation** (see Course Unit 3.1). This domain and the licensed-electrician sign-off apply **only** to units with an onboard 230 V generator/inverter (e.g. the electric-drive CDS xDrive). For 12 V-only units, mark Section 5 of the certificate N/A.

Reference	Governs	Source
AS/NZS 3000 (Wiring Rules)	Fixed onboard 230/400 V installation fed by generator/inverter	store.standards.org.au
AS/NZS 3001 Electrical installations — transportable structures and vehicles — ⚠ **CONFIRM current designation**	Likely the most directly applicable *vehicle* installation standard; confirm with a licensed electrician	standards.org.au
AS/NZS 3760 In-service inspection & testing	Periodic test-and-tag of plug-in leads/tools (ongoing operator duty)	store.standards.org.au
RCD protection (within AS/NZS 3000)	30 mA RCD on socket-outlets/final subcircuits — critical in wet carpet-cleaning work	AS/NZS 3000

Sign-off: a **licensed electrician** installs and certifies the fixed electrical installation (Certificate of Electrical Safety / state equivalent). **Not self-certifiable by the manufacturer.**

Domain D — Pressure / mechanical

Reference	Governs	Source
AS 4343 Pressure equipment — hazard levels	Hazard-level (A–E) calculation for the heat exchanger from pressure × volume × fluid; drives whether design/item **registration** with the state WHS regulator is required	store.standards.org.au
AS 1210 Pressure vessels	Design/construction/testing if a component is a pressure vessel	standards.org.au
Model WHS Regs — plant registration	Ties hazard level to registration duty	safeworkaustralia.gov.au

Practical read: a fired heat-exchange coil is typically small-volume and usually computes to **Hazard Level D or E** (little/no registration) — but this **must be calculated per AS 4343 for the specific unit**, not assumed. Rotating plant (blower, pump, engine, belts) must be **guarded** per WHS plant duties.

Domain E — Work Health & Safety (the legal spine of the certificate)

Reference	Governs	Source
Model WHS Act — duties of designers / manufacturers / importers / suppliers / installers of plant (approx. s22–s26 — ⚠ **CONFIRM section numbers**)	Core manufacturer/supplier duty: ensure plant is without risk so far as reasonably practicable, test as necessary, provide safety information	safeworkaustralia.gov.au — model WHS laws
Model WHS Regulations — Chapter 5 (Plant and structures)	Guarding, controls, risk control, plant registration, information provision	safeworkaustralia.gov.au
AS/NZS 1269 series + Managing Noise Code of Practice	Blower/engine noise; exposure standard 85 dB(A) L_Aeq,8h / 140 dB(C) peak	safeworkaustralia.gov.au
Workplace Exposure Standards — carbon monoxide	**Exhaust/CO in an enclosed van** is a real design hazard: prevent CO accumulation in the operator/cabin space (exhaust routing, ventilation, CO alarm as a control)	safeworkaustralia.gov.au

Domain F — Fuel, dangerous goods & chemicals carried onboard

Reference	Governs	Source
Petrol / flammable-liquid fuel storage (onboard-engine models)	Onboard-engine HydraMaster/Sapphire units carry **petrol** — the fuel tank/lines must be safely mounted, vented and protected from ignition and impact; combined with the engine-exhaust/CO control in Domain E this is the dominant hazard on engine-heat units	AS 1940 (storage & handling of flammable & combustible liquids) — ⚠ **CONFIRM applicability of onboard quantities**; safeworkaustralia.gov.au
ADG Code (Edition 7.9)	If onboard cleaning chemicals are dangerous goods **above placard/exemption quantities**: packaging, segregation, marking, documentation. Most small onboard loads fall **under** DG thresholds (limited-quantity exemptions) — **assess against the actual products**	ntc.gov.au
SDS obligations (WHS Regs, GHS)	Current Safety Data Sheet held for every hazardous chemical; GHS labelling — applies regardless of DG transport threshold	safeworkaustralia.gov.au

Industry bodies (credibility layer, not statutory)

IICRC certifies operators/methods/firms (S100 carpet cleaning, S500 water damage) — a credibility layer, **not** a machine/vehicle safety authority. **RIA** is a US trade association with **no Australian statutory role**. No industry body certifies truck-mount vehicle/gas/electrical safety — that is why this certificate binds the statutory sign-offs.

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4. Why the certificate is structured as a compliance dossier

No single body certifies the whole unit, so a credible certificate **binds together the separate licensed sign-offs** into one dossier. Each section is signed by whoever is legally competent to sign it. The manufacturer signs the design/WHS/pressure/DG sections; the vehicle signatory, gasfitter and electrician sign theirs. This is honest, defensible, and matches how Australian law actually allocates the duties.

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5. Certificate template (complete one per unit)

> Copy this block into the issued certificate. Delete rows that do not apply (e.g. gas rows for a non-gas unit). Do not issue until every ⚠ **CONFIRM** item is resolved and every required licensed signatory has signed.

CERTIFIED MANUFACTURER'S TRUCK-MOUNT SAFETY CERTIFICATE

Issued by (manufacturer/supplier): Carpet Cleaners Warehouse **Certificate no.:** _____ **Date of issue:** _____

Section 1 — Unit & vehicle identification

- Truck-mount make / model / serial: _____ (e.g. HydraMaster Boxxer 318HP / CDS xDrive; Sapphire Scientific 370SS / 370EFI)
- Manufacturer entity as marked on unit: _____ (e.g. Universal Cleaning Concepts LLC for HydraMaster; Legend Brands for Sapphire Scientific)
- **Power/heat architecture:** □ Direct-drive / engine-heat (host vehicle) □ Onboard petrol engine + finned-tube exchanger □ Gas-fired auxiliary heat fitted
- Host vehicle make / model / VIN: _____
- Vehicle **GVM**: _____ t → **Band:** □ Light (≤4.5 t) □ Heavy (>4.5 t)
- Tare / kerb mass: _____ Loaded mass (unit + full water + fuel + occupants): _____
- **Within GVM & axle-group limits?** □ Yes □ No — computed value: _____

Section 2 — Load-vs-modification determination

- This installation is: □ Restrained cargo (Load Restraint Guide) □ Permanent modification (mod plate required)
- Basis for determination: _____
- *Manufacturer signature:* _____ *Vehicle signatory concurrence (if permanent):* _____

Section 3 — Vehicle modification / engineering certificate *(permanent installs)*

- Scheme: □ QLD Approved Person □ NSW VSCCS □ VIC VASS □ NHVR AVE (heavy) □ Other: ____
- Applicable VSB14 (light) / VSB6 (heavy) code(s), as nominated by the signatory: _____
- ADRs not degraded by the modification: □ Confirmed
- Modification plate no.: _____
- *Licensed vehicle signatory (name / licence no. / signature):* _____

Section 4 — Gas installation & appliance *(⚠ ONLY if gas-fired auxiliary heat fitted — N/A for standard engine-heat HydraMaster/Sapphire units)*

- □ N/A — unit is engine-heat, no gas appliance

- Gas installation to **AS/NZS 5601.1** (or .2 if determined): □ Confirmed
- Fired appliance certification / GTRC listing ref: _____
- LPG cylinder mounting to **AS/NZS 1596**: □ Confirmed
- *Licensed gasfitter (name / licence no. / signature):* _____

Section 5 — Electrical installation *(⚠ ONLY units with a 230 V onboard generator/inverter — N/A for standard 12 V DC petrol slide-ins)*

- □ N/A — unit is 12 V DC only, no 230 V installation
- Fixed installation to **AS/NZS 3000** (and **AS/NZS 3001** vehicle installation): □ Confirmed
- 30 mA RCD protection on socket-outlets: □ Confirmed
- Certificate of Electrical Safety no.: _____
- *Licensed electrician (name / licence no. / signature):* _____

Section 6 — Pressure equipment

- **AS 4343** hazard-level calculation for heat exchanger: Level ____ (A/B/C = register; D = design only; E = neither)
- **AS 1210** conformance if a pressure vessel: □ N/A □ Confirmed Registration status: _____
- *Signed (manufacturer / competent pressure engineer):* _____

Section 7 — WHS plant safety & design declaration

- Model WHS Act designer/manufacturer/supplier duty discharged (plant without risk SFARP; safety information provided): □ Confirmed
- Rotating plant (blower, pump, engine, belts) guarded: □ Confirmed
- Noise data (AS/NZS 1269) provided: _____ dB(A)
- **CO/exhaust control** in enclosed vehicle (exhaust routing / ventilation / CO alarm): □ Confirmed
- Operating & safety manual supplied to operator: □ Confirmed
- *Manufacturer signature:* _____

Section 8 — Fuel, dangerous goods & chemicals

- Petrol fuel tank/lines safely mounted, vented, impact/ignition protected (onboard-engine units): □ N/A □ Confirmed
- Onboard chemical DG threshold assessed (ADG 7.9): □ Under threshold □ ADG controls applied
- Current SDS register + GHS labelling: □ Confirmed
- *Signed (manufacturer / operator):* _____

Section 9 — Residual operator duties (ongoing, not discharged by this certificate)

- In-service test-and-tag (AS/NZS 3760), periodic gas/electrical re-inspection, load restraint on every trip, and mass compliance when loaded remain the **operator's** ongoing responsibility.
- *Acknowledged by operator:* _____

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6. Before issuing — confirmation checklist

Resolve every ⚠ **CONFIRM** item with the named primary authority or licensed practitioner first:

- [ ] Exact VSB14 / QRVM modification code(s) — nominated by the vehicle signatory
- [ ] AS/NZS 3001 vehicle-electrical current designation — confirmed with the electrician
- [ ] AS/NZS 5601.1 vs 5601.2 applicability — determined by the gasfitter (**only if a gas-fired heater is fitted**)
- [ ] AS 1940 flammable-liquid applicability to onboard petrol quantities — confirmed for engine-heat units
- [ ] Model WHS Act section numbers for manufacturer/supplier duties — confirmed against the model Act text
- [ ] Specific AS/NZS 5263 appliance-standard part + certification pathway — confirmed with a Conformity Assessment Body
- [ ] Per-state modification schemes beyond QLD/NSW/VIC — confirmed with each authority
- [ ] ADG threshold applicability for the specific onboard chemicals — assessed per load

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Sources: infrastructure.gov.au (ADRs/NCOP), nhvr.gov.au (VSB6/AVE/mass/load restraint), ntc.gov.au (Load Restraint Guide light / ADG Code), store.standards.org.au (AS/NZS 5601, 1596, 3000, 3001, 3760, 4343, 1210, 1269), gtrc.gov.au (gas appliance certification), safeworkaustralia.gov.au (model WHS Act & Regs, noise, WES), tmr.qld.gov.au / transport.nsw.gov.au / transport.vic.gov.au (state modification schemes), iicrc.org. Framework material — not legal advice. Confirm ⚠ items before issuing any certificate.

Module 03 — Truck-Mount Operator Course (Specialised)

Part of: CCW Restoration Training Manual **Audience:** Operators and technicians running HydraMaster / Sapphire Scientific truck-mount systems in Australia. **Format:** Specialised operator course — this index plus five linked units.

> Real-data, Australianised course. Product specs, procedures, service intervals and compliance points are **sourced** (manufacturer manuals + primary Australian government and standards bodies); anything not tied to a manufacturer manual or primary authority is flagged ⚠ **CONFIRM**. Safety-critical setpoints (temperatures, pressures, torque, service intervals) must always be verified against the specific unit's manual before use. Training material — not a substitute for the manufacturer's manual or a licensed practitioner.

Course map

Unit	Title	Covers
3.1	Australian Configurations & Specifications	The "not-mains-powered" reality (petrol + 12 V DC), live AU model line-up, CCW AUD pricing, per-model specs, distributors, US-vs-AU differences
3.2	Safe Operating Procedures	Pre-start walk-around, startup/shutdown sequences, safe operation, hazard controls (CO first), emergencies
3.3	Storage, Transport & Road Safety	Load restraint (GVM/axle), fuel & chemical carriage, driving, the rego/insurance modification trap, storage, trade-waste disposal
3.4	Maintenance & Servicing	Daily→annual run-hour schedule, hard-water descaling (AU thresholds), fault diagnostics, service network, consumables
3.5	Image Catalogue	Verified real image source URLs by topic, with copyright/licensing notes
3.6	Assessment & Operator Competency Sign-Off	Trainer pre-flight gate (verify ⚠ CONFIRM items against the unit before delivery) + operator competency assessment and sign-off sheet

> **Delivery gate:** this course is Australianised and sourced, but is **training reference, not fact for a specific machine, until Unit 3.6 Gate A is completed** for the actual unit and the operator's State. Safety-critical setpoints are model-specific — no operator is signed off unproven.

How the course was built

Each unit is synthesised from a dedicated research pass against **primary sources**: manufacturer service/owner manuals (Sapphire 370 SS #49-038, 454 SS, HydraMaster Boxxer 423S & Titan 875), live Australian distributor pages (ccwonline.com.au and others), Australian government/standards bodies (NHVR, NTC, Safe Work Australia, state transport and water authorities), and a WA/NIOSH CO-fatality investigation. Full source lists are at the foot of each unit.

The three things that make this course *Australian* (and correct)

1. **Power:** these machines are **petrol-engine slide-ins with 12 V DC controls — not 240 V mains.** Only portable extractors use AU mains. (Unit 3.1.)
2. **Carbon monoxide is the killer hazard.** Petrol exhaust in/near an enclosed space kills in minutes — park outdoors, route exhaust away, fit CO alarms (35 ppm trip). AU exposure standard 30 ppm (→20 ppm in 2026). (Unit 3.2.)

3. **Compliance is assembled, not bought.** Load restraint (NHVR/NTC), the load-vs-modification rego/insurance trap, hard-water descaling as a warranty condition, and trade-waste disposal are the AU-specific duties. (Units 3.3–3.4, and Module 02 for the safety certificate.)

Related: Module 02 — Manufacturer's Truck-Mount Safety Certificate.

Unit 3.1 — Australian Configurations & Specifications

Course: Truck-Mount Operator Course (Module 03) · **Machines:** HydraMaster & Sapphire Scientific **Sourced 2026-07-08.** Every spec carries a source. US-only figures are labelled **US-SPEC**; anything not on a manufacturer/distributor page is ⚠ **confirm with distributor**. Imperial converted to metric.

Learning outcome

Identify the truck-mount models CCW supplies in Australia, how they are powered, and their key operating specifications — and correctly explain why these machines are **not** mains-powered.

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1. The power myth — teach this first

These machines do not plug into 240 V mains. The HydraMaster Boxxer/TITAN/TMTG and Sapphire Scientific 370/570/870 ranges are **self-contained petrol-engine slide-in units**: an onboard petrol engine (Briggs & Stratton, Kohler, Kawasaki or Kubota) drives the pump and blower and generates the heat. Onboard electrics are **12 V DC** (battery for ignition, control console, electric pump clutch).

- No mains connection, and **no US-120 V → AU-240 V conversion** exists on the machine. The AU-vs-US difference is **distributor, warranty and fuel — not voltage.**
- **240 V/50 Hz** applies only to *portable electric extractors* — a different product class, not in this course.
- The **HydraMaster CDS xDrive** uses an electric drive motor, but powered by an **onboard generator off the vehicle**, still not mains. (AU availability unconfirmed.)

> **Teaching point:** the electrical module for these machines is **fuel + 12 V DC**, not mains voltage. Correct any "what plug does it use" question up front.

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2. Australian model line-up (CCW list prices, AUD, 2026-07-08)

HydraMaster — ccwonline.com.au/collections/hydramaster-truckmounts

Model	AUD (listed)
Boxxer 318HP 1500psi	$45,889.22
TITAN 375	$52,644.49
TITAN 425	$54,830.61
TMTG4000 Truckmount to Go	$66,137.09
TITAN 575HP (incl. 2000psi pressure-wash)	$81,180.90
TITAN 625	enquire
Boxxer 423S (WACER Perth)	enquire

Sapphire Scientific — ccwonline.com.au/collections/sapphire-scientific-truckmounts

Model	AUD (listed)
Sapphire 370EFI Package	$58,058.88
Sapphire Apex 570	$74,704.08
Sapphire Everest 870 HP	$92,912.16
Sapphire 370SS	enquire

Live range vs legacy: the **Boxxer 421/427** are legacy/used-market only — the **TITAN series** is their current replacement. Teach **Boxxer 318HP + TITAN + TMTG4000** (HydraMaster) and **370SS/370EFI, Apex 570, Everest 870** (Sapphire) as the live AU range.

AU distributors / service channel: Carpet Cleaners Warehouse (national — NSW Seven Hills, QLD Boondall, VIC Bayswater North), WACER (Perth), Tasmanian Cleaner's Specialist, Restoration Warehouse, Advanced Specialized Equipment, PowerVac (Perth), Charles Service, Whyte Specialised Equipment (Melbourne). **CCW is the AU master distributor and warranty/service channel for this equipment class.**

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3. Key specifications (sourced)

HydraMaster Boxxer 318HP — tcspec.com.au

- Engine: Briggs & Stratton Vanguard 18 HP twin petrol · Pump: 0–1500 psi (**103 bar**), 3.5 GPM (**13.2 L/min**), HydraClutch
- Heat: up to **100 °C** · Vacuum: Tuthill 3006, max **315 CFM**, to 90 m vac hose · Hoses: 30 m vac + 30 m solution · Weight: ⚠ confirm

HydraMaster Boxxer 423S — wacer.com.au

- Engine: B&S Vanguard V-Twin 23 HP petrol · Pump: 4.0 GPM (**15.1 L/min**), 1000 psi (**69 bar**)
- Heat: ≈**113 °C** · Vacuum: Dominator 4005 Tri-Lobe, **300+ CFM** · Weight: **255 kg** · Recovery tank: **265 L** · Fuel: ~4.2 L/h

HydraMaster TMTG4000 — AU price ccwonline.com.au; specs **US-SPEC** hydramaster.com

- Engine: B&S Vanguard 23 HP @3000 rpm · Pump: Comet 3.5 GPM (**13.2 L/min**), 1000 psi (**69 bar**)
- Heat: up to ≈**116 °C**; holds >93 °C at 1.5 GPM · Vacuum: Tuthill Dominator 4005, **350+ CFM**

HydraMaster TITAN 375 / 425 / 575HP / 625 — AU prices only; engine/heat/CFM per model ⚠ **confirm with distributor** (575HP includes a 2000 psi / **138 bar** pressure-wash).

Sapphire Scientific 370SS — tcspec.com.au · powervac.com.au · charlesserviceco.com.au

- Engine: 23 HP V-Twin @3000 rpm — **make varies by year: Kohler or Kawasaki (confirm on the unit)** · Pump: General HTXS1813S, 1500 psi (**103 bar**), 3.4–3.57 GPM (**12.9–13.5 L/min**)
- Heat: **121 °C** thermostatic · Vacuum: Tri-Lobe, **317 CFM** · Waste tank: **340 L** marine aluminium · Weight: **296 kg** · Warranty: 2-year (AU)

Sapphire 370EFI — AU price only ($58,058.88); EFI variant of the 370 platform; per-model figures ⚠ **confirm with distributor**.

Sapphire Apex 570 — AU price/availability ccwonline.com.au; specs **US-SPEC** legendbrands.com

- Engine: Kubota WG972 31 HP liquid-cooled petrol @3000 rpm · Pump: General HTS2016S, 1500 psi (**103 bar**), 5 GPM (**18.9 L/min**)
- Vacuum: Gardner Denver HeliFlow HF408, **455 CFM** · Waste tank: **341 L** (opt. 454 L) · Heat/weight: ⚠ confirm

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4. Australia-specific differences vs US units

1. **Electrical:** none on the machine — identical petrol/12 V DC platform to US. No voltage conversion.
2. **Fuel:** Australian unleaded (91/95). No diesel variant among the named models.
3. **Freeze/winterising:** US material stresses antifreeze; across most populated Australia hard freezes are rare, so full winterising is a **cold-region-only** concern (alpine NSW/VIC, Tasmania, inland winter nights). See Unit 3.3.
4. **Warranty/service:** via the **AU distributor** (CCW network), not the US factory. Parts/service route through the reseller who sold the unit.
5. **Availability:** Boxxer 421/427 are used-market only; CDS xDrive AU availability unconfirmed.

Assessment checks

- State how these machines are powered and why they don't use 240 V mains.
- Name the live AU HydraMaster and Sapphire ranges and CCW's role in service/warranty.
- Read a spec plate and locate pump pressure (bar), max heat (°C), and vacuum (CFM) for the unit in front of you.

Sources: ccwonline.com.au, tcspec.com.au, wacer.com.au, powervac.com.au, charlesserviceco.com.au, hydramaster.com, legendbrands.com, extractionzone.com, carpetcleaningequipment.com.au. Confirm ⚠ items and any US-SPEC figure against the specific unit before teaching as AU spec.

Unit 3.2 — Safe Operating Procedures

Course: Truck-Mount Operator Course (Module 03) · **Machine class:** petrol-engine truck-mount (HydraMaster / Sapphire Scientific) Procedures below are drawn from the **Sapphire Scientific 370 SS Service & Operation Manual (Part #49-038)** as the representative unit. **Every psi / rpm / in-Hg / temperature figure is model-specific — verify against the manual for the machine in front of you.** Figures that vary are marked ⚠ **confirm against unit manual**.

> **The first rule, taught to every operator:** *"Read the operator's manual before starting this unit. Failure to adhere to instructions could result in severe personal injury or could be fatal."* (370 SS, Warning #1.)

Learning outcome

Safely pre-check, start, operate, and shut down a petrol truck-mount, and respond correctly to the hazards that can kill or maim — carbon monoxide first among them.

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1. Pre-start / daily checks (fixed walk-around)

Check	What to do
Engine oil	Level daily, fill to mark, **never overfill**. API SG/SH/SJ+; SAE30 above ~25 °C, 10W-30 for 0–25 °C. Capacity ≈ 1.7 L.
Pump oil (HP pump)	Check crankcase level daily; a drop = find and fix the leak before running.
Blower oil	Check daily, **do not overfill** (overfill overheats the blower); the 370 has **two** sights — check both.
Petrol	Enough for the job **and** to drive home (~3.8 L/hr). Fresh unleaded, ≥87 octane, **≤10% ethanol** (E20/E85 damages engine, voids warranty).
Water supply & inlet hose	Flush tap and inlet hose of debris **before** connecting. Never use a waste/out hose as a fresh-water inlet.
HP solution hose	Inspect for wear/damage. Must be rated **≥3,000 psi and ≥121 °C** — plain thermoplastic hose must never be used (burst = severe burns).
Vacuum hoses & inlet filter	Inspect; clean strainer basket; never run with the filter removed/damaged (protects the blower).
Belts & guards	Inspect belts; **never operate without belt and safety guards fitted**.
Chemical	Container full enough; inlet/prime tubes clean.
CO & exhaust	CO monitor(s) fitted and working; exhaust routing intact (see §5).

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2. Startup sequence — order matters

Water on first, then engine, then pressure. Running the pump/heat exchanger dry damages the pump and overheats components.

1. **Position the vehicle for exhaust safety FIRST** — park **outdoors**, exhaust aimed **away** from every door, window, vent and air intake (see §5). A start-of-job decision.

2. **Connect and open the water supply**; let the water box fill. *"DO NOT operate this unit without the water supply on… the low-pressure shutdown switch should NOT be bypassed."* (Warning #19).
3. **Connect the HP solution hose** and cleaning tool — before starting.
4. **Connect the vacuum hose(s).**
5. **Start the engine:** throttle in, choke out, pump switch to override, key to start; push choke in once it fires.
6. **Throttle up** for warm-up; **do not run below 50% throttle** in operation.
7. **Water pump switch ON.** If pressure doesn't build in ~5 s, **stop and check the water supply** — do not persist (dry-run risk).
8. **Prime the chemical pump:** submerge inlet + prime tubes, valve to **PRIME** until flow shows **no air bubbles**, then **PRIME → METER** and set the metering valve.
9. **Warm up** a few minutes so solution reaches cleaning temperature before starting (essential for low-flow/upholstery tools).
0. **Set pressure & temperature:** adjust the regulator and thermostatic control for the tool/fibre. Keep floor-tool jets **≤ #4**.

370 SS setpoints (⚠ confirm against unit manual): pump **1,500 psi max**; flow **3.4 GPM max**; vacuum relief **14 in Hg**; engine **3,000 rpm high / 1,400 rpm idle**.

> **Water temperature:** the 370 SS manual states only *"adjust the thermostatic control to the desired temperature"* — it publishes **no fixed °C**. This class commonly delivers ~90 °C+ at the wand, but **confirm the exact safe temperature against the specific unit manual** — do not assume a number.

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3. Operating safely

- **Hot-water / high-pressure burns — the primary injury hazard.** *"Water under high pressure at high temperature can cause burns, severe personal injury, or fatality."* Never point the hand-valve at yourself or others. **Before removing any cap, valve, plug, fitting or filter: shut down, cool, and relieve ALL pressure** (Warning #11).
- **Wand/hose discipline.** Test the fan ~30 cm above the surface (even fan = clear nozzle). Chemical on the push, extract on the pull, **final stroke a dry pull**.
- **Never run the pump dry;** don't bypass the low-pressure shutdown (Warning #19).
- **Monitor gauges continuously** — pressure, vacuum, **temperature**. Falling temperature, a stuck-open relief valve, or low RPM are early fault signs; investigate, don't push on.
- **Waste-water:** a float switch auto-shuts the unit when the tank is full — empty it. **Never** discharge to a storm drain, waterway or ground — dispose per Australian trade-waste rules (Unit 3.3).
- **Don't service a running machine.** *"NEVER service this unit while it is running… may result in injury or severed limbs."* (Warning #8).

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4. Shutdown sequence — order matters

1. **Flush the chemical system** with fresh water.
2. **Clear moisture from the vacuum hoses**, then disconnect the vacuum hose.
3. **Throttle to idle; thermostat to lowest.**
4. **Cool-down run ≥5 minutes with the bypass valve open** (removes moisture from the vacuum pump, cools the unit).
5. **End-of-day blower lube:** plug the vacuum inlet, throttle high, spray blower lube into the lube cup **5 s**, run **2 min**, unplug, idle **3–5 min**.
6. **Ignition OFF.**
7. **Water off:** tap off, loosen the supply hose at the tap to bleed pressure, disconnect, stow.
8. **Relieve residual pressure:** trigger every tool hand-valve before disconnecting tools/hoses.
9. **Drain the waste tank** at a proper disposal point; clean strainer and inlet filter.

0. **Hot-surface hold-off:** *"DO NOT touch any part of the exhaust system while running or for 20 minutes after shut-off."* (Warning #10).

Freeze protection (alpine/cold-region jobs): water left in the unit can freeze and crack the heat exchanger. Park heated, or winterise with glycol antifreeze through the water box and chemical system per the manual — recover and recycle antifreeze, never to ground or drains.

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5. Hazard controls

5.1 Carbon monoxide — the critical, life-threatening hazard

Petrol engines produce **CO — odourless, colourless, deadly**. A truck-mount exhaust was measured at **37,500 ppm CO** in a fatal incident; a van-mount killed a worker in an enclosed warehouse (WA L&I FACE 06WA021). CO reaches lethal levels in **minutes**.

Controls (engineering first, PPE last):

- **Park outdoors — no exceptions.** *"Opening windows and doors may not provide adequate ventilation to make a work-safe indoor environment."* (FACE 06WA021).
- **Aim exhaust away** from every door, window, vent, air-con and air intake. *"Do not run this unit in an enclosed area."* (Warning #2). Carports, overhangs, alleys, docks and shrubs can trap CO.
- **Operate with vehicle doors open** (Warning #4) — but this is **not** a substitute for outdoor parking.
- **Never remain in the van** while the unit runs.
- **Route exhaust out** with a leak-proof clamp-on flexible exhaust hose that carries gas clear of the van/workspace.
- **Fit CO monitors (audible + visual)** — personal on the operator and fixed near the source; **alarm at 35 ppm → evacuate, shut the engine down, notify supervisor.**
- **Australian workplace exposure standard: 30 ppm CO (8-hr TWA), reducing to 20 ppm effective 2026** (Safe Work Australia).
- **CO lethality reference:** 200 ppm headache/nausea; 400 ppm life-threatening ~3 h; 1,500 ppm death within 1 h; 3,000 ppm death within 30 min; 6,000 ppm within 10–15 min.
- **Do a site risk assessment for CO; work in pairs** on new/remote jobs. **Never enter to rescue a downed worker without first ventilating/monitoring.**

5.2 Noise

Engine + blower are loud. **Australian standard: LAeq,8h 85 dB(A), or LC,peak 140 dB(C)** (Safe Work Australia noise COP). "1-metre rule": if you must raise your voice at 1 m, it's too loud — wear rated hearing protection; provide audiometric testing for frequent users.

5.3 Hot surfaces

Engine, exhaust, muffler, heat exchanger stay extremely hot. **No exhaust contact for 20 minutes after shutdown** (Warning #10).

5.4 Slips & manual handling

Wet floors and long heavy hoses (25–50 ft) — slip/trip and manual-handling load. Use correct technique, tidy runs, stow tools securely.

5.5 Electrical / battery / fuel

Battery vents explosive hydrogen and holds acid — charge ventilated, no sparks, disconnect **negative first** (Warning #13). **Petrol is extremely flammable** — approved containers only, never inside the vehicle, no smoking, don't start the ignition after a spill until cleaned up (Warnings #3, #5, #14).

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6. Emergency procedures

Emergency	Immediate actions
CO alarm / suspected exposure	Evacuate to fresh air, **shut the engine down**, notify supervisor. Symptoms (headache, dizziness, nausea, confusion, collapse) → fresh air, call **000**; do NOT re-enter unventilated to rescue. Don't resume until the source is fixed.
Over-temp / loss of heat	Stuck-open temperature-relief valve, low RPM, missing balance orifice, or frost-cracked heat exchanger. Stop, diagnose, clean/test the relief valve — don't clean with an abnormal temperature.
Engine stops	Out of petrol, waste tank full (float shut-off), tripped breaker, or **low-oil-pressure shutdown — do NOT restart until the cause is fixed**.
Loss of pump pressure	Stop — check water supply, low-pressure switch, prime. Never bypass the low-pressure shutdown; dry-running destroys the pump.
HP hose burst/leak	Release the hand-valve, **shut down, cool, relieve ALL pressure** before touching fittings. Replace worn hose; fit only ≥3,000 psi / ≥121 °C hose.
Petrol spill / fire	Don't switch ignition on after a spill; clean up first. Fire: shut down if safe, evacuate, appropriate extinguisher, call **000**.
Heat-exchanger leak (cold weather)	Distinguish from condensation; remove and pressure-test (**370 SS max test 1,200 psi**). Winterise to prevent recurrence.

Assessment checks

- Perform the full pre-start walk-around and the startup and shutdown sequences in correct order.
- State the CO controls in hierarchy order and the alarm/evacuation trigger (35 ppm) and the AU exposure standard (30 → 20 ppm).
- Demonstrate correct pressure-relief before opening any fitting.

Sources: Sapphire Scientific 370 SS Manual (#49-038); HydraMaster manuals library; WA L&I/NIOSH FACE 06WA021 (CO fatality); Safe Work Australia CO exposure standard and Managing Noise COP; SafeWork NSW/SA CO fact sheets. Replace US "Local/State/Federal" wording with Australian WHS + trade-waste rules. Confirm every model-specific figure against the unit manual.

Unit 3.3 — Storage, Transport & Road Safety (Australia)

Course: Truck-Mount Operator Course (Module 03) Compliance claims cite a source (primary **.gov.au** preferred). Anything not pinned to a primary source is ⚠ **CONFIRM**. Metric throughout.

> **Jurisdiction:** load-restraint and trade-waste law is administered per State/water authority. Figures are national defaults — confirm against the operator's own State road authority and local water authority. A vehicle **≤4.5 t GVM = light vehicle**; **>4.5 t = heavy vehicle** (NHVR).

Learning outcome

Transport a van-mounted truck-mount legally and safely, store it without damage, and dispose of waste water lawfully.

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1. Securing the unit and tanks for transport

Which guide applies. ≤4.5 t GVM → **NTC *Load Restraint Guide for Light Vehicles* (2018)** (QLD, NSW, VIC, TAS, SA, ACT refer to it and require compliance with the performance standards on p.19). >4.5 t GVM → **NHVR *Load Restraint Guide* (2025, Ed.4)**.

Performance standard the restraint must meet — the load (machine + tanks) must stay put under heavy braking, cornering and minor collision and must not affect stability, resisting at minimum:

- **0.8 g forward** (confirmed, NHVR guide), **0.5 g sideways/rearward**, **0.2 g vertical (upward)**. *(0.5 g/0.2 g is the standard LRG set — ⚠ **CONFIRM** exact light-vehicle wording on p.19.)*

Anchoring.

- A permanent truck-mount should be **through-bolted to an engineer-rated mounting frame** — any structure relied on for restraint must be "certified to restrain a certain mass by a suitably qualified engineer." Do **not** rely on light cargo-tie hooks.
- Lashings: **minimum 35° from horizontal**; number/rating read from the guide's tie-down tables for the load mass. A **cargo barrier** is required/advised on vans to stop the load entering the cabin.

Water-slosh. A part-full tank is a **moving load** — liquid surges under braking. Run tanks **full or empty** where practical, and prefer **baffled** tanks. Size the restraint frame for the **full** tank mass plus surge.

GVM & axle limits. Water ≈ **1 kg/L** — a 200 L fresh tank plus part-full recovery can add **250–350 kg** on top of machine, hoses, chemicals and crew (most on the rear axle). Weigh the **fully loaded, full-water, full-fuel** rig against the compliance-plate GVM and axle limits before first use. Overloading is an offence and voids the load-restraint defence.

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2. Fuel & chemical carriage

- **Dangerous-goods reality — you are almost certainly UNDER threshold.** The engine's own petrol plus small chemical containers are **well below** placard-load quantities; DG carried in limited quantities as **tools of trade** is treated as exempt from the heavy DG-transport regime (NSW EPA). Commonly cited limit for petrol in approved containers ≈ **250 L** — ⚠ **CONFIRM** the exact figure/container class for your State.
- **An SDS is NOT a substitute for an Emergency Information Panel** (ADG Code) — but a carpet-cleaning rig doesn't reach placard quantities, so full DG placarding isn't required. Keep fuel quantity modest and documented.
- **Petrol storage (AS 1940:2017 standard of care):** spare petrol only in **AS 2906-approved jerricans**; store **upright, capped, vented, away from ignition and the cabin/impact zones**; never carry loose fuel in the passenger compartment; segregate from chemicals.
- **Chemicals:** carry a **current SDS for every hazardous chemical in the vehicle** (WHS requirement); original labelled closed containers, secured against tipping/leaking.

- **Spill kit** sized to the largest container; petrol/chemical spills must not reach stormwater (see §5).

3. Road safety / driving

- **Braking & handling:** a rear slide-in plus full water raises rear-axle load and centre of gravity — longer braking, reduced stability, worse roll. Brake earlier, corner slower.
- **Load shift:** re-check strap tension after the first few km and after rough sections; stow loose gear (hoses, wands) — they're projectiles in a crash and count as load.
- **Daily pre-trip check:** tyres (pressure/condition, rated for the **loaded** axle mass), wheel nuts, brakes, lights, mirrors, restraint bolts, tank caps and fittings, fuel cap, no leaks, extinguisher present. *(For heavy vehicles a formal daily check is an NHVR duty; for light vehicles it's best-practice duty of care — ⚠ **CONFIRM**.)*
- **The rego/insurance trap — load vs modification.** Bolting a permanent frame can be a **vehicle modification / second-stage manufacture**, not just "a load." Complex mods must meet **VSB14 (light NCOP)**; GVM upgrades need an **authorised engineer**. An **uncertified permanent modification can render the vehicle non-compliant (affecting registration), and you must declare any modification to your insurer** — non-disclosure can void a claim or cancel the policy. Get the install engineer-certified and notify the insurer in writing. *(Ties directly to Module 02 — the certificate.)*

4. Storage of the unit

*(Equipment best-practice; ⚠ **CONFIRM** specifics against the machine manual.)*

- **Tank hygiene / biofilm:** standing water grows biofilm and odour — empty, flush, periodically sanitise; store tanks **drained and open to air** to dry.
- **Drain fully** — fresh tank, recovery tank, pump, lines and heater — before extended storage.
- **Winterising / anti-freeze:** most of Australia rarely freezes, but **alpine/high-country and inland cold regions do**. There, drain completely **or** circulate **non-toxic RV/marine propylene-glycol antifreeze** through pump and lines — **never automotive ethylene-glycol** in a system touching cleaning water. ⚠ **CONFIRM** product/method against the manufacturer's cold-weather procedure.
- **Pump:** relieve pressure, drain, and for long storage circulate a pump preservative/antifreeze so seals don't dry or corrode.
- **Engine/fuel:** add **fuel stabiliser** for storage >~1 month (run it through) or drain the fuel system to prevent gumming.
- **Battery:** disconnect or maintenance-charge; store charged.
- **Premises:** petrol + chemicals make a parked rig a fire/theft risk — store **ventilated, secured, away from ignition and public access** (AS 1940 standard of care).

5. End of day — waste-water disposal

- **Recovery water is commercial trade waste, not domestic greywater** (NSW Health; VIC Building & Plumbing Commission). It falls under **trade-waste rules**.
- **Dispose to sewer under a trade-waste permit — never to stormwater.** "Before you discharge you need a trade waste permit" (Water Corporation WA). Discharge only to an **approved sewer/dump point**, **never a street/stormwater drain, gutter or waterway** (stormwater flows untreated to creeks). Confirm the accepted point and permit with the **local water authority** (Sydney Water, Melbourne retailers, SA Water, Water Corp, Urban Utilities, etc.).
- **Tank flush:** empty recovery to the approved sewer point, then flush fresh water through recovery tank, filters and vacuum lines; clean lint/hair filters; rinse the fresh tank periodically.

Assessment checks

- Identify which Load Restraint Guide applies to the operator's vehicle and state the 0.8 g forward standard.
- Explain the load-vs-modification rego/insurance risk and the fix (engineer certification + insurer disclosure).
- State where recovery water may and may not be discharged, and the permit needed.

Sources (all live 2026-07-08): NHVR Load Restraint Guide 2025 & light-vehicle NTC guide; NSW EPA dangerous-goods tools-of-trade; WorkSafe VIC jerricans; ADG Code (infrastructure.gov.au); Safe Work Australia / SafeWork NSW hazardous chemicals; Dept of Infrastructure second-stage-manufacture; NHVR/Transport VIC/TMR QLD modification guides; Water Corporation WA, NSW Health, VIC B&PC trade-waste. Confirm ⚠ items with the relevant primary authority.

Unit 3.4 — Maintenance & Servicing

Course: Truck-Mount Operator Course (Module 03) · **Class:** petrol slide-in truck-mount (HydraMaster Boxxer/TITAN, Sapphire 370/454/570/870) Intervals are **run-hours** (hour-meter), not calendar. Every interval/spec carries a source tag `[S#]`. **Intervals differ by engine and model — the operator's own machine + engine manual is the final authority.** Unsourced values are flagged **confirm against unit service manual**.

Learning outcome

Run the daily-to-annual maintenance program, keep the heat exchanger descaled in Australian hard water, and diagnose the common faults.

1. Scheduled maintenance table

Task	Interval (run-hours)	Spec / part	Src
Check engine oil	Daily	top to full, never overfill	[S1] [S3]
Check HP pump oil	Daily	add if low; leak = fix first	[S1] [S3]
Check blower oil	Daily	do **not** overfill	[S1] [S3]
Lubricate blower (lube port)	Daily	HydraMaster lube P/N 000-087-006; Sapphire WD-40/equiv ~5 s	[S1] [S3]
Clean recovery-tank filters/basket	Daily	—	[S1] [S3]
Clean inlet screen/waste strainer	Daily	—	[S1] [S3]
Inspect leaks / loose fittings & wiring	Daily	—	[S1]
Engine oil + filter change	first **5 h**, then **50 h** (25 h in heat/heavy use) — Boxxer; **100 h** — Sapphire 454; **150 h/120 d** — PSI GM	Boxxer filter 00-049-014, **5W30 synthetic**	[S1] [S2] [S3]
Re-tension drive belts	first **25 h**, then **100 h**	Sapphire: EPDM only; factory belts warranted 500 h	[S3]
Inspect belts for wear	Monthly	pump belt (Boxxer) 000-010-125	[S1] [S3]
Clean/inspect air cleaner	Monthly or **200 h** (100 h dusty)	—	[S2] [S3]
Replace air filter	**400 h** (200 h dusty) PSI; **1,000 h** Sapphire	Boxxer 000-049-053 / 000-049-012	[S1] [S2] [S3]
HP pump oil change	first **50 h**, then **500 h**	Boxxer **GP Series 100**; Sapphire **CAT Crankcase 13-000**	[S1] [S3]
Blower oil change	first **100 h** (Boxxer); flush/replace **1,000 h** (Sapphire)	Boxxer **Pneulube 000-087-034**; Sapphire **AEON PD-XD**	[S1] [S3]
Check/adjust vacuum relief valve	100 h	set **14 in Hg (≈47 kPa)**	[S2] [S3]
Lube O-rings / quick-connects	100 h	Sapphire lube 13-003	[S3]
Check/replace spark plugs	check 200 h, replace 1,000 h	Boxxer gap **0.76 mm**	[S1] [S3]
Valve clearance	per engine schedule	Boxxer **0.10–0.15 mm**	[S1]

Task	Interval (run-hours)	Spec / part	Src
Replace fuel filter	**500 h or 6 months** (Sapphire)	—	[S2] [S3]
Flush water & chemical systems	periodic / after hard-water jobs	—	[S1]
Chemical pump: diaphragm + check valves	500 h	—	[S3]
Clean radiator core (liquid-cooled)	100 h / 60 d	—	[S2]
Change coolant (liquid-cooled)	per PSI schedule	**DexCool only**	[S2]
De-scale heat exchanger	by water hardness (see §2)	TM DeScaler + recirc kit **078-058**	[S2]
Pressure-test heat exchanger	on suspected leak	max test **1,200 psi (≈83 bar)** — Sapphire	[S3]

Working-pressure note: HydraMaster TITAN warranty recommends **max working pressure 1,000 psi (≈69 bar)** — over-pressurising voids the heating-system warranty [S2]. If a unit runs nearer 1,500 psi, **confirm the rating against that unit's manual** before setting the regulator.

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2. Descaling the heat exchanger — critical in Australian hard water

Why: exhaust heat transfers to the water in the **finned-tube heat exchanger** [S2]. Hard-water scale plating the inside causes "noticeable loss in heating performance" and, unchecked, "reduced heat exchanger effectiveness, component failure and possible machine overheating" [S2]. Both makers make **softening + descaling a warranty condition** [S2][S3].

Manufacturer hard-water thresholds:

- HydraMaster: **never operate at ≥3.0 grains/gal (≈60 mg/L)** — test all water, soften if needed [S2].
- Sapphire: fit a softener above **3.5 grains**; softener must flow **≥19 L/min** unrestricted [S3].

Australian context (why this is not optional): ~60 mg/L (3.0 gpg) is exceeded across much of urban Australia — **Adelaide ~100–130 mg/L**, **Perth ~96 mg/L** (to 228 in suburbs), **Brisbane 53–115 mg/L**; **bore/tank water is always treated as hard** [S2][S7]. On most metro and virtually all rural/bore supplies, **a softener plus a regular descale cycle is mandatory** [S2].

Process (HydraMaster factory, TM DeScaler + recirc kit P/N 078-058) [S2]:

1. Empty water box; fill ~⅓ with **TM DeScaler** at label dilution.
2. Fit the recirc fitting to the garden-hose quick-connect; loop a solution-hose section back to it (add hose inline to descale hoses too).
3. **Run 3–5 minutes** — do not leave descaler standing.
4. **Flush thoroughly with clean water.**
5. **Clean all screens/strainers** afterward (dislodged scale migrates to screens).

Chemistry safety — do not improvise acids. *"Never use concentrated acids or solvents (including d-limonene) in the truck-mount water or chemical system"* — they destroy fittings, pumps and the heat exchanger and void warranty [S2]. Use only the **manufacturer's descaler**; do not substitute an unspecified acid or invent a dilution.

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3. Water-system hygiene

- **Recovery tank:** pressure-wash at interval; inspect filters/screens for tears; daily empty and rinse the strainer basket. A neglected tank feeds debris to the blower — a primary blower-failure cause [S1][S2][S3].
- **Filters/screens (daily):** recovery inlet, garden-hose inlet, chemical feed-line filter, check-valve strainer — clog starves the pump or destabilises chemical flow [S1][S3].
- **Biofilm:** flush water and chemical systems on schedule and before storage; only run chemistry with rust/corrosion inhibitors + softening agents [S2].
- **Freeze layup:** run Freeze Guard (drain box; circulate ~7.5 L of 50/50 antifreeze; clear vacuum lines) and flush before next clean [S2]. Alpine/inland-winter operators.

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4. Common faults & diagnostics (symptom → cause → action)

Low/no heat: scale in heat exchanger → **descale**; oversized/worn tool jet → replace; exhaust-side blockage → clean; temp control down / faulty dump solenoid → adjust or refer; overheats & shuts down → restricted orifice/screen or low-pressure dump solenoid → clean/replace, check fuse. [S2]

Low pressure: faulty regulator → repair/replace; worn pump seals/valves → test output, reseal; loose/broken belt → adjust/replace; low pump RPM → set engine to spec (TITAN **3,150 rpm under 14 in Hg**); wrong/missing orifice (correct **0.033"**) → fix; restriction/scale at wand → clean/descale; pulsation → air leak or faulty check valve. [S2]

Loss of vacuum: air leak → check relief valve (**14 in Hg**), lid gasket, drain valve closed, hoses for cuts; blower slow → set RPM; high gauge no hoses → clogged recovery filter or collapsed internal hose → clean/replace; loud blower → **low blower oil (inspect immediately)** or internal damage → refer; **blower locked** (idle & unlubed → rust) → penetrating oil, wait ≥1 h, free gently at the pulley OD (never the shaft); water in exhaust → overfilled/foamed tank, condensation, or **leaking heat exchanger**. [S2][S3]

Engine: won't turn over → battery terminal/dead battery/blown fuse/**seized blower** (turn coupler by hand). *Never jump-start the truck-mount from a running vehicle — automotive amperage damages the charging system* [S2]. No start with spark → recovery tank full/faulty float; spark & no start → fuel not reaching rail, flooded, worn plugs; won't reach RPM → excessive load or exhaust back-pressure (heat-exchanger blockage); overheats → poor van ventilation, low oil, back-pressure, coolant (**DexCool only**). [S2]

Pump cavitation: water box empty/slow-fill → supply restriction or faulty float → inspect/repair; overflow → faulty/waterlogged float; chemical won't prime → check valves/diaphragm, clogged filter, pinched line, faulty selector valve. [S3]

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5. Service intervals & who services

- **Operator-level:** all daily checks and top-ups, blower lube, filter/screen cleaning, leak inspection, belt-tension checks, scheduled oil changes, water-system flushing, and **routine descaling** [S1][S2][S3].
- **Authorised service agent (refer out):** temperature-controller/sensor testing, ignition faults, internal blower damage/seizure, pump rebuilds beyond seal kits, electrical diagnosis, and warranty work. Have model + serial ready [S2][S3].
- **Run-hour anchors to teach:** break-in at **5 h** (engine oil) and **50 h** (pump oil, set-screws); then the **50/100/500/1,000 h** cadence. Engine-oil interval varies by engine (50 h Boxxer vs 100 h Sapphire vs 150 h PSI GM) — **read the engine plate/manual** [S1][S2][S3].
- **Australian service network:** HydraMaster and Sapphire are distributed in Australia through **CCW** (NSW Seven Hills, QLD Boondall, VIC Bayswater North), with **Dzyner** (SA) and **Tasmanian Cleaner's Specialist** (TAS). Warranty, parts and agent servicing route through these outlets [S5][S6].

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6. Consumables & spares

Item	Grade / part	Src
Engine oil filter (Boxxer)	00-049-014	[S1]
Engine oil (Boxxer)	5W30 synthetic	[S1]
HP pump oil	HydraMaster **GP Series 100**; Sapphire **CAT 13-000**	[S1][S3]
Blower oil	**Pneulube 000-087-034**; Sapphire **AEON PD-XD**	[S1][S3]
Blower spray lube	HydraMaster 000-087-006	[S1][S3]
Pump drive belt (Boxxer)	000-010-125 (Sapphire EPDM only)	[S1][S3]
Air filter (Boxxer)	000-049-053, 000-049-012	[S1]
Spark plugs	gap 0.76 mm, OEM only	[S1][S3]
O-ring/quick-connect lube	Sapphire 13-003	[S3]
Descaler + recirc kit	**TM DeScaler + P/N 078-058**	[S2]

Do not invent substitutes. Branded oils (GP Series 100, CAT 13-000, Pneulube, AEON PD-XD) are manufacturer spec — confirm exact viscosity/part against the unit manual before ordering.

Assessment checks

- Complete a daily maintenance walk-around and state the 5/50/100/500/1,000-hour anchors.
- Test water hardness and state when a softener + descale is mandatory (AU thresholds).
- Diagnose low heat, low pressure and loss of vacuum from symptoms.

Sources: [S1] HydraMaster Boxxer 423S Maintenance Schedule; [S2] HydraMaster Titan 875 Owner's Manual (MAN-182-077-D); [S3] Sapphire 454 SS Service & Operation Manual (49-042 Rev B); [S4] HydraMaster "Last Job of the Day"; [S5] HydraMaster International Distributors; [S6] CCW (ccwonline.com.au); [S7] AU water-hardness data (flowy.com.au, waterscore.com.au). Cross-check the operator's exact model + engine manual before finalising model-specific figures.

Unit 3.5 — Image Catalogue (verified source URLs)

Course: Truck-Mount Operator Course (Module 03) Every direct image URL below was verified (HTTP 200, `image/*`) at capture. **Copyright:** manufacturer/distributor images (HydraMaster, Legend Brands/Sapphire, AU distributors) are usable as **reference/teaching material with attribution** — a licence is needed for any **commercial reuse** (paid course, marketing). Free-licence and stock items are noted individually.

> Use these as reference links in the course. Before publishing a paid version, either license the manufacturer images (via CCW's distributor relationship) or replace them with the CC-licensed field photo and CCW's own product photography.

1. Full units

- HydraMaster Boxxer 318HP — `https://hydramaster.com/wp-content/uploads/2017/01/Boxxer318HP_Main.png` (© HydraMaster)
- HydraMaster Boxxer XL — `https://hydramaster.com/wp-content/uploads/2017/01/BoxxerXL_Main.png` (© HydraMaster)
- HydraMaster CDS xDrive — `https://hydramaster.com/wp-content/uploads/2016/12/CDSxDrive_Main.png` (© HydraMaster)
- Sapphire 370 EFI (hero) — `https://www.legendbrands.com/hs-fs/hubfs/LB_website/assets/databases/products/test-lb/370%20EFI%20Truckmount/SS_370EFI_FaceR.png` (© Legend Brands)
- Sapphire 370 EFI (side) — `https://www.legendbrands.com/hs-fs/hubfs/LB_website/assets/databases/products/test-lb/370%20EFI%20Truckmount/SS_370EFI_LeftSide.png` (© Legend Brands)
- HydraMaster TITAN 575 (AU listing) — `https://tcspec.com.au/cdn/shop/products/Titan-575-510x668_compact_ae8070b5-f3f0-4e07-a605-38337e44c58d_1024x.png?v=1592186221` (tcspec.com.au, © HydraMaster)
- **370SS page refs** (no direct hotlink): prochem.co.uk/product/sapphire-370ss-2018/ · powervac.com.au/product/sapphire-scientific-370-truckmount/ · manual w/ photos: `https://www.legendbrands.com/media/x4rmbkz3/49-038-manual-sapphire-370-ss-rev-f-web-version.pdf`

2. Van / install layouts

- CDS xDrive in-van — `https://hydramaster.com/wp-content/uploads/2016/12/CDSxDrive_Main2.png`
- CDS xDrive layout diagram — `https://hydramaster.com/wp-content/uploads/2016/12/CDSxDrive_Main4.png`
- TITAN 575HP in Ford Transit — `https://hydramaster.com/wp-content/uploads/2026/03/TITAN-575HP-installed-in-Ford-Transit.jpg`
- TITAN 575HP in Gorilla truck box — `https://hydramaster.com/wp-content/uploads/2026/03/575HP-in-Gorilla-1-TruckBox.png`
- Sapphire 370SS sub-mount fresh tank — `https://www.legendbrands.com/hs-fs/hubfs/LB_website/assets/databases/products/Sapphire%20370%20and%20570%20Submount%20Fresh%20Water%20Tank/68-197s_370ss_submount_fresh_water_tank_full_10-800.png`
- Saddle tanks — `https://www.legendbrands.com/hs-fs/hubfs/LB_website/assets/databases/products/Saddle%20Tanks/saddle_tanks_gray_full_10-800.png`
- Auto waste pump-out — `https://www.legendbrands.com/hs-fs/hubfs/LB_website/assets/databases/products/Automatic%20Waste%20Pump-Out%20System/124982_apo_system_full_10-800.png`
- **AU van fit-out guides** (page refs): advancedse.com.au/carpet-cleaning-van-fit-out-guide/ · advancedse.com.au/truck-mount-carpet-cleaning-systems-guide/

3. Control panel / gauges

- Sapphire 370 EFI numbered callouts — `https://www.legendbrands.com/hs-fs/hubfs/LB_website/assets/databases/products/test-lb/370%20EFI%20Truckmount/370EFI-Numbered.png`
- TITAN 575 throttle detail — `https://hydramaster.com/wp-content/uploads/2021/01/Titan-575-new-throttle-400x400.png`
- Panel/gauge diagrams in manuals: 370SS `https://www.barker-hammer.com/items/Manuals/Sapphire-Scientific/Sapphire-Scientific-SS-370-Truckmount-Manual.pdf` · regulator video `https://www.youtube.com/watch?v=-P-VfZnId0U`

4. Hose reel / wands / glides

- Solution hose reel — `https://www.legendbrands.com/hs-fs/hubfs/LB_website/assets/databases/products/Solution%20-%20Water%20Supply%20Hose%20Reel/68-023_solution-garden_hose_reel_full_10-800.png`
- Evolution Wand — `https://hydramaster.com/wp-content/uploads/2017/01/Main-EvoWand2-1.jpg`
- Evolution Wand 6-jet head — `https://hydramaster.com/wp-content/uploads/2017/01/MainEvoWand-6Jet.jpg`

5. Heat exchanger / pump / blower

- TITAN 575 access panels open (internal plumbing) — `https://hydramaster.com/wp-content/uploads/2026/03/575-Other-Side-Open.jpg`
- Kubota WG972-G engine — `https://hydramaster.com/wp-content/uploads/2026/03/WG972-G-KUBOTA.png`
- Component page refs: truckmountstore.com (heat exchanger) · steam-brite.com (air-to-water heat exchanger / blower silencer)

6. PPE / safe operation

- **Field photo (free licence)** — `https://upload.wikimedia.org/wikipedia/commons/1/1d/Truck_mount_steam_carpet_cleaner.JPG` — **CC BY 3.0, credit "Dwight Burdette, CC BY 3.0"** (safe for commercial reuse with attribution).
- PPE doctrine (text): Carpet Cleaning SWMS — cleansepro.com.au/product/carpet-cleaning-swms/
- Licensed stock (licence required): Adobe Stock 1178301691 · Getty 2214252287

7. Maintenance actions

- Descaling — `https://cdn.shopify.com/s/files/1/1065/3536/files/descaling_your_truckmount_equipment_480x480.jpg?v=1693206057`
- Descaling process — `https://cdn.shopify.com/s/files/1/1065/3536/files/descaling_a_truckmount_process_480x480.jpg?v=1693206103`
- Descaling via onboard tank — `https://cdn.shopify.com/s/files/1/1065/3536/files/how_to_descale_a_truckmount_with_onboard_water_tank_480x480.png?v=1693205932`
- Procedure refs: cleanfax.com/truckmount-maintenance-make-it-routine/ · carpetcleaningdigital.com/truckmount-maintenance-schedule/ · HydraMaster CDS xDrive manual PDF (oil/filter diagrams)

Licensing note for CCW: the cleanest path to a fully commercial course is to (1) keep manufacturer images as in-training reference under CCW's distributor relationship, (2) shoot CCW's own product/field photography of the AU units, and (3) use the CC BY 3.0 field photo where a free image suffices. ExtractionZone and AdvancedSE block hotlinking (403/Cloudflare) — those are page references only.

Unit 3.6 — Assessment & Operator Competency Sign-Off

Course: Truck-Mount Operator Course (Module 03) This unit certifies that an operator can run the specific machine safely. It has two gates: a **trainer pre-flight** (the course cannot be delivered on wrong data) and an **operator competency assessment** (the operator cannot be signed off unproven).

> **Why this gate exists.** Units 3.1–3.4 are Australianised and sourced, but every safety-critical setpoint (water temperature, working pressure, RPM, service intervals, torque) is **model- and engine-specific** and several compliance points are flagged ⚠ **CONFIRM**. This course is training reference, not a substitute for the unit's manual. **No operator is signed off, and the course is not taught as fact, until Gate A below is complete for the actual machine in front of them.**

Gate A — Trainer pre-flight (complete BEFORE delivering the course)

The trainer confirms the course content against the **specific unit + engine manual** and the operator's **State**. Tick every row; attach the source.

#	Item to confirm	Source to check	Confirmed
A1	Exact **safe water/solution temperature** and any over-temp cutout	Unit manual (the 370 SS manual states only "adjust to desired temperature" — no fixed °C)	☐
A2	**Max working pressure** for this unit (TITAN warranty caps at 1,000 psi; some units run to 1,500 psi)	Unit manual	☐
A3	**Engine oil interval + grade**, pump-oil and blower-oil grades/part numbers	Engine + unit manuals	☐
A4	**Water hardness** for the operator's supply, and softener/descale requirement	Local water test / authority	☐
A5	**Load-restraint guide** applicable to the operator's vehicle (light ≤4.5 t vs heavy) + the exact light-vehicle performance wording	NHVR / NTC guide	☐
A6	**Load-vs-modification** status of the install (cargo vs permanent mod) + rego/insurance position	Vehicle signatory (see Module 02)	☐
A7	**Per-State petrol "tools of trade" limit** and jerrican class	State EPA / WorkSafe	☐
A8	**Trade-waste disposal point + permit** for the operator's area	Local water authority	☐
A9	**CO exposure standard** current value (30 ppm, reducing to 20 ppm in 2026) and alarm setpoint (35 ppm)	Safe Work Australia	☐

Trainer: _____ **Unit make/model/serial:** _____ **Date:** _____ *Course must not be delivered as fact until every A-row is confirmed for this unit.*

Gate B — Operator competency assessment

The operator demonstrates each competency on the actual machine. Mark **C** (competent) or **NYC** (not yet competent). All must be **C** to sign off.

B1 — Machine knowledge (Unit 3.1)

- [ ] States how the machine is powered (petrol engine + 12 V DC, **not** 240 V mains)
- [ ] Identifies the model, reads the spec plate (pressure, heat, vacuum)
- [ ] Names CCW as the AU service/warranty channel

B2 — Safe operation (Unit 3.2)

- [ ] Performs the full **pre-start walk-around** (all fluid levels, fuel, hoses, belts, CO/exhaust)
- [ ] Executes the **startup sequence in correct order** (water on → engine → pressure; no dry-run)
- [ ] Primes the chemical system correctly
- [ ] Sets pressure/temperature for the tool and fibre
- [ ] Executes the **shutdown sequence in correct order** (chemical flush → cool-down → depressurise → water off → drain)
- [ ] Demonstrates **pressure relief before opening any fitting**

B3 — Carbon monoxide (Unit 3.2) — *critical, zero-tolerance*

- [ ] States CO is odourless/colourless and lethal in minutes
- [ ] Positions the vehicle outdoors with exhaust aimed away from all openings **before** starting
- [ ] Fits/checks a CO monitor and states the **35 ppm alarm → evacuate + shut down** rule
- [ ] States the AU exposure standard (30 → 20 ppm) and the never-remain-in-van rule
- [ ] States the never-enter-to-rescue-without-ventilating rule *(A **NYC** on any B3 item is an automatic fail of the whole assessment.)*

B4 — Transport, storage & road safety (Unit 3.3)

- [ ] Secures the unit/tanks to the load-restraint standard (0.8 g forward)
- [ ] States GVM/axle check with full water and the rego/insurance modification trap
- [ ] Stores fuel and chemicals correctly (approved containers, SDS in vehicle, not in cabin)
- [ ] States lawful trade-waste disposal (approved sewer point, never stormwater)

B5 — Maintenance (Unit 3.4)

- [ ] Completes the daily maintenance walk-around
- [ ] States the 5/50/100/500/1,000-hour anchors
- [ ] Tests water hardness and states when a softener + descale is mandatory
- [ ] Diagnoses low heat, low pressure and loss of vacuum from symptoms

B6 — Emergencies (Unit 3.2)

- [ ] Correct response to a CO alarm, HP hose burst, engine shutdown, and petrol spill/fire

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Sign-off

I confirm the above operator has been assessed on the specific machine and is **competent to operate it unsupervised**, and that Gate A was completed for this unit.

- Operator name / signature: _____ Date: _____
- Assessor name / signature: _____ Date: _____
- Unit make / model / serial: _____
- **Re-assessment due:** _____ (recommended annually or on change of machine/model)

Training material — not legal advice and not a substitute for the manufacturer's manual or a licensed practitioner. Sign-off certifies operator competency on this unit, not regulatory approval of the vehicle or its installation (see Module 02).

Related: Module 01 — Dehumidifier Deployment: Contractor Responsibilities & Risk Management is a separate module in the CCW Restoration Training Manual (duty of care and secondary-damage prevention for water-removal equipment).

Sources are listed at the foot of each unit — manufacturer service/owner manuals (Sapphire 370 SS #49-038, 454 SS; HydraMaster Boxxer 423S, Titan 875), Australian primary authorities (NHVR, NTC, Safe Work Australia, state transport & water authorities), a WA/NIOSH carbon-monoxide fatality investigation, and live Australian distributor pages including ccwonline.com.au. Manufacturer images referenced in Unit 3.5 remain their owners' copyright; licence before commercial reuse.