

Mobile Laser Cleaning — Compliance & Safety Report

Manitoba & Federal (Canada) Regulatory Requirements · Equipment Adequacy ·
Mandatory Controls · Verified Suppliers

Prepared for Derek · Beamstop'r Laser Barriers · August 2026

Adequate as-is? No. Safe path exists — with a beam stop.

Your B-35 curtain is **not sufficient as the primary barrier** for focused 300W laser cleaning. It is adequate only as secondary perimeter containment behind a rigid beam stop or full enclosure.

1. Executive Summary

This report consolidates a four-track analysis of your mobile 300W pulsed JPT MOPA fiber laser cleaning operation: regulatory compliance (Manitoba + federal), technical standards (ANSI Z136.1 / EN 60825-4), engineering barrier adequacy, and supplier verification.

Headline findings

1. **No legal numeric mandate exists** for curtain height, irradiance, or optical density in Manitoba or federally. Compliance is judged on whether the barrier stops the beam per ANSI Z136.1 (performance-based).
2. **Engineering reality overrides the legal loophole.** A focused 300W cleaning beam produces irradiance **500–12,000× above the B-35's rating**. The B-35 is breached at sub-mm cleaning spots.
3. **Your supplier's HENAI Laser Defender Pro is a genuine upgrade** (~2× the rating, CW 1070nm-tested) — but still fails focused-spot exposure. It is a proper *secondary* curtain, not a primary beam-absorbing element.
4. **The mandatory primary control is a rigid beam stop / backstop or full enclosure.** The curtain becomes the outer perimeter.
5. **Manitoba requires an LSO, hazard assessment, entry controls, signage, eyewear, and incident reporting** — all covered in Section 3.

2. Regulatory & Standards Landscape

2.1 Governing law (Manitoba + federal)

INSTRUMENT	REQUIREMENT
MB Reg 217/2006 s.16.28 (Radiation)	Lasers used in accordance with ANSI Z136.1-2014 . No numeric barrier spec — performance-based.
MB Reg 217/2006 s.18.4	Worker not exposed above exposure limits; employer duties.
Federal REDR (Health Canada, Oct 9 2025)	Governs sale/lease/import of laser products & classification (IEC 60825-1). Does <i>not</i> govern workplace barrier/curtain use.
ANSI Z136.1-2014	Incorporated by reference. Barrier must withstand direct + diffuse beams, not support combustion, not release LGAC.

Key point: because ANSI Z136.1 is performance-based, a documented test report (like the HENAI's EN 60825-4 result) supports a defense of adequacy — but the barrier must *actually stop the beam*, which is the engineering test in Section 3.

2.2 Height, irradiance & optical density — what's actually required

NO NUMERIC MANDATE Neither Manitoba nor federal law specifies a curtain height, irradiance (W/cm^2), or optical density (OD) value.

- **Height:** Industry practice — most barriers are ~6 ft (MacMullin 2019, IOP Ch.15); RLI offers 7–8 ft. No statute.
- **Irradiance:** Determined by the hazard analysis; the barrier must truncate the Nominal Hazard Zone (NHZ) to below the Maximum Permissible Exposure (MPE).
- **OD/eyewear:** Eyewear needs OD for the wavelength; the barrier itself is not OD-rated — it is a thermal/specular shield.

Conclusion: legal compliance is *satisfiable*, but the real test is engineering (Section 3).

3. Engineering Barrier Adequacy (300W Pulsed JPT MOPA)

3.1 Time-averaged irradiance — the governing metric

Laser cleaning does not spread 300W over a wide area — the beam is focused through a lens and strikes the surface as sub-millimeter dots (0.1–0.5 mm). The B-35 is rated **200 W/cm^2 (2-ply)** and **300 W/cm^2 (3-ply)** at 60–100 s.

SPOT SIZE	AREA (CM²)	AVG IRRADIANCE @300W	VS B-35 (200/300)
6×6 in (15×15 cm)	231	1.3 W/cm²	OK
1 cm²	1	300 W/cm²	At 3-ply limit
0.5 cm²	0.5	600 W/cm²	EXCEEDS
0.1 cm²	0.1	3,000 W/cm²	EXCEEDS
1 mm²	0.01	30,000 W/cm²	EXCEEDS
0.5 mm dia (typical cleaning spot)	0.00196	~153,000 W/cm²	500–750× over
0.1 mm dia	0.00008	~3.8 M W/cm²	12,000× over

A focused cleaning beam breaches the B-35 essentially instantly.

3.2 Pulsed peak power

Peak power = pulse energy ÷ pulse width. A JPT MOPA at 2 mJ / 2 ns = **1 MW peak**. Peak irradiance at a focused spot reaches 10^6 – 10^{10} W/cm² — enough to ablate/vaporize the fabric in a single pulse.

3.3 Specular reflections — the real hazard

Metal is a mirror-like specular reflector (especially at glancing angles before cleaning removes the coating). A reflected focused beam carries near-full power density and can go **in any direction** — at the operator and at the curtain.

REAL-WORLD PROOF A 9 kW 1064 nm laser (Argentolux) melted a metal warning sign via specular *and* diffuse reflections inside a containment area — the sign was not in the direct beam path. Reflections are a genuine hazard, not theoretical.

3.4 Containment verdict

Blocking off a room with a B-35 curtain is NOT adequate as the sole primary barrier

- The B-35 cannot withstand the focused beam (primary or reflected).
- The beam path is not fixed in mobile cleaning — the handpiece moves freely.
- ANSI Z136.1 requires the barrier to withstand direct *and* scattered beams.

What IS required: a **rigid beam stop / backstop** that terminates the primary beam and absorbs reflections, or a full 3–4 sided engineered enclosure — with the high-power curtain as *secondary perimeter containment only*.

4. Your Supplier's Curtain: HENAI Laser Defender Pro

Test report QT-20211122-02 · Test Center of Aerospace Information Research Institute (CAS) · CNAS-accredited · Jan 4 2022.

4.1 What the test shows

PARAMETER	VALUE
Laser / mode	IPG fiber laser, continuous-wave , 1070 nm
Spot at sample	5 mm dia (radius 2.509 mm, area 19.78 mm ²), at L=80 cm from focus
Protective Exposure Limit (PEL)	605.264 W/cm² (10 s) · 543.348 W/cm² (100 s)
Rear-surface leakage	1.791 mW (10 s) / 1.894 mW (100 s) — under Class 1 AEL (1.95 mW)
Thickness	1.34 mm
Standards referenced	EN 60825-4:2011 (Laser guards), EN/IEC 60825-1:2014, GB/T 7247 series

4.2 Does it meet Manitoba/federal requirements? — Qualified yes

FACTOR	ASSESSMENT	VERDICT
CW 1070 nm tested	Directly addresses your CW gap (B-35 only CW-tested at 1W)	STRONG
Irradiance rating	543–605 W/cm ² — ~2× the B-35	BETTER
Independent lab	CNAS-accredited third party	STRONG
Standard referenced	EN 60825-4, not ANSI Z136.1 (which MB law incorporates)	DOC GAP
Flammability	NFPA 701 / flammability not shown in report	GAP
Focused-spot survival	Still fails at sub-mm spots	SAME AS B-35

Bottom line: The HENAI is the right *kind* of curtain — CW-tested at your wavelength, ~2× the rating, independently verified. But it is still a secondary curtain, not a primary beam-absorbing element for focused cleaning. Confirm with HENAI: (1) flammability/NFPA 701 certification, and (2) ANSI Z136.1 documentation.

5. Mandatory Safety Controls

5.1 Engineering controls (the non-negotiable layer)

1. **Rigid beam stop / backstop** — terminates the primary beam, absorbs specular reflections. *Single most important addition.*
2. **Full 3–4 sided engineered enclosure** around the workpiece, or a rigid backstop behind the cleaning surface.
3. **Matte / diffuse surface treatment** on nearby metal surfaces to reduce specular reflections.
4. **Local exhaust ventilation** — the curtain does not control laser-generated fumes.

5.2 Administrative & personnel controls (Manitoba legal requirements)

- **Laser Safety Officer (LSO)** — designated & trained per ANSI Z136.1. Manitoba does not license LSOs, but one must be appointed. Duties include hazard analysis, NHZ evaluation, approving controls/SOPs/eyewear/signage, and training.
- **Hazard assessment** (MB Reg 217/2006 s.2.1 hierarchy) + **safe work procedures** (s.2.1.1).
- **Entry control at occupied sites** — temporary laser controlled area (LCA) with ANSI NOTICE signage; non-involved personnel kept out via barriers + supervision. Site employees/patrons who cannot leave must be excluded from the LCA.

- **Laser safety eyewear** rated for 1064 nm (OD7+ recommended) for operator and all personnel in the LCA.
- **Panic button / non-lockable disconnect** for rapid deactivation.
- **Signage:** ANSI NOTICE sign (white background, red laser symbol, blue field, black lettering) posted during service.
- **Transport:** laser stored/disabled when not in use; no specific MB OHS transport rule beyond general duties.
- **Incident reporting:** notify WSH immediately (1-855-957-SAFE or 204-957-SAFE, Option 1) for serious incidents incl. permanent/temporary loss of sight; preserve scene; internal investigation.
- **Documentation:** NHZ analysis, SOPs, training records, incident records.

5.3 CW laser expansion (your planned purchase)

GAP Your B-35 was only CW-tested at 1W. CW delivers *continuous heat* (worse for fabric than pulsed). Polyester melts ~260°C; cotton ignites ~215–400°C. Do not assume the B-35 or HENAI contains a high-power CW beam as primary. A high-power CW laser needs a rigid beam stop/enclosure + a CW-specific certified curtain. CW irradiance at 2000 W: only a beam $\geq$ ~50 mm dia stays within B-35 rating; sub-20 mm spots exceed it.

6. Verified Suppliers — Laser Protection for 300W 1064nm Cleaning

21 products across 13 verified companies. See the accompanying spreadsheet for the full comparison.

6.1 Rigid beam stops / primary barriers (mandatory)

COMPANY	PRODUCT	SPEC (1064NM)	CANADA
Laser Safety Industries	Hardwall Barrier	2,500 W/cm ²	Yes (CAD)
AKON (curtain-and-divider.com)	Rigid Panel	10,000 W/cm ²	Yes
Kentek	TRAP-IT Beam Dump	1000 W avg	Yes
Thorlabs	Beam Trap / Block	up to 500 W	Yes

6.2 High-power CW-rated curtains (secondary perimeter)

COMPANY	PRODUCT	SPEC (1064NM)	CANADA
AKON	Triple-layer curtain	2,150 W/cm ²	Yes
Laser Safety (lasersafety.com)	Triple-layer curtain	2,150 W/cm ²	Yes
Laser Safety Industries	Laser Safety Curtain	575–625 W/cm ²	Yes (CAD)
PhotonWeld / PhotonSafe	Laser Welding Curtain	543 W/cm ²	Yes
Crossfire Welders	Laser Curtain (in-Canada)	300+ W/cm ²	Yes (local)

Benchmark: HENAI Laser Defender Pro = 543–605 W/cm². AKON/Laser Safety triple-layer (2,150 W/cm²) comfortably exceeds it.

6.3 Full enclosures

Kentek (welding booth/enclosure, ANSI Z136), **Lasernet** (interlocked enclosures + beam dumps), **machineenclosure.com** (Class 4, interlocked), **Li10 Laser** (LASERVISION Class 3B/4), **Laser Photonics** (turnkey Class 1 enclosed cleaning system).

6.4 1064 nm laser eyewear

Laser Safety Industries (OD7+ @1064nm) · **Thorlabs** (OD7+, LB7 rating).

7. Prioritized Action Plan

PRIORITY	ACTION
1 — BEFORE OPERATING	Acquire a rigid beam stop / backstop (or full enclosure) as the primary control. Do not run focused cleaning with only a curtain.
2 — BEFORE OPERATING	Appoint & train an LSO ; complete the hazard assessment + NHZ analysis + safe work procedures.
3 — BEFORE OPERATING	Confirm HENAI flammability + ANSI Z136.1 documentation, or use an AKON/Laser Safety triple-layer (2,150 W/cm ²) curtain for secondary containment.
4 — BEFORE OPERATING	Stock 1064 nm OD7+ eyewear for operator + all LCA personnel; install panic button; post ANSI NOTICE signage.
5 — BEFORE OPERATING	Set up local exhaust ventilation for fumes.
6 — BEFORE CW PURCHASE	Treat CW as a separate hazard. Buy a CW-specific certified curtain + rigid enclosure; do not rely on B-35/HENAI as primary for CW.
7 — ONGOING	Keep documentation: NHZ analysis, SOPs, training records, incident records; review insurance (CGL + laser-specific, WCB registration).

Disclaimer: This report is an engineering and regulatory analysis intended to inform safety decisions. It is not legal advice. Consult a qualified Laser Safety Officer and Manitoba/Canadian legal counsel before commencing commercial operations. Test values are from vendor-supplied documents and are reproduced as reported.