Temperate-Climate Low-Noise Road — One-Page Construction Spec & QC Checklist

Project intent: Double-Layer Porous Asphalt (DLPA) optimized for temperate climate (moderate seasonal rainfall, occasional freeze/thaw, average temps –5 °C to +30 °C), design speed ≥50–80 km/h, mixed car/truck traffic.

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1. System & Targets

- **System:** Double-Layer Porous Asphalt (DLPA): 20–25 mm acoustic wearing layer (0/4 OG) over 30–40 mm drainage acoustic sublayer (0/8 OG).
- **Primary performance targets:**
- CPX pass-by (reference tires) acceptance: **≤97 dB(A)** at 80 km/h (specify exact CPX protocol & tires in contract).
- Mean Profile Depth (MPD): **0.6–0.9 mm** (laser MPD).
- In-place voids (top): **18–20%**; (bottom): **16–18%**.
- Permeability (top lifted core or in-situ): **k ≥ 0.8×10^{-3} m/s**.
- Smoothness (IRI): **≤1.2 m/km**.

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2. Mix & Materials (per m^3 or mass mix proportions validated by gyratory)

Wearing (top) layer — Acoustic OG 0/4

- **Thickness:** 20–25 mm compacted.
- **Gradation (nominal):**
- 4.0 mm sieve: 100% passing
- 2.0 mm: 65–85% passing
- 0.63 mm: 35–55% passing
- 0.125 mm: 5–12% passing
- **Aggregate:** PSV ≥55, Los Angeles ≤25, cubical, low fines.
- **Binder:** SBS-modified bitumen or crumb-rubber modified equivalent; target binder content **4.8–5.2% (mass of mix)** (optimize by gyratory and permeability).
- **Additives:** cellulose fibers 0.3–0.5% (prevent draindown), hydrated lime 1–1.2% (anti-stripping).
- **Voids (as-built):** 18–20%.

Drainage (bottom) layer — OG 0/8

- **Thickness:** 30–40 mm compacted.
- **Gradation (nominal):**
- 8.0 mm sieve: 100% passing
- 4.0 mm: 80–95% passing
- 2.0 mm: 35–60% passing
- 0.125 mm: 3–8% passing
- **Aggregate & binder:** same aggregate quality; PMB, binder content **4.6–5.0%**.

- **Voids (as-built):** 16–18%.

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3. Texture & Drainage

- **Target MPD:** 0.6–0.9 mm (laser measurement grid, 50 m spacing first 1 km).
- **Macrotexture:** negative-type; avoid sharp asperities.
- **Longitudinal cross-slope:** ≥2% (for drainage); provide underdrains or lateral outlets every 30–50 m depending on bandwidth.

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4. Binder / Climate tuning for temperate regions

- **Binder type:** SBS-modified polymer bitumen chosen for elasticity and fatigue resistance; ensure low-temperature cracking performance to at least **–20 °C** equivalent (use supplier performance data).
- **Aging resistance:** mandate G*/sin(δ) and RTFOT/ PAV performance checks in mix design records.
- **Anti-strip:** hydrated lime 1–1.2% or approved liquid anti-strip.

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5. Construction (Key requirements)

- **Paving window:** surface temp >15 °C recommended; no precipitation; wind <20 km/h preferred.
- **Roller strategy:** steel smooth roller(s) only on top surface; avoid pneumatic tire compaction that closes pores. Minimal compaction energy to reach target density while preserving voids.
- **Joint tolerances:** vertical offset ≤3 mm, longitudinal alignment flush.
- **Paving tolerances:** thickness ±5 mm; width ±10 mm.
- **Compaction control:** test strips per lot; adjust binder content if permeability out of range.

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6. Acceptance & QC Tests (lot-based)

- **Acoustic acceptance:** CPX or OBSI run at 50 and 80 km/h after 7–14 days cure. Acceptance: CPX ≤97 dB(A) @ 80 km/h.
- **Voids:** cores per 500 m lane length (min 3 cores/lot). Top in-place voids 18–20% (tolerance ±2%).
- **Permeability:** falling head or in-situ per lot; k ≥0.8×10^{-3} m/s.
- **Texture (MPD):** laser MPD; one reading per 50 m first km, then per 200 m. MPD 0.6–0.9 mm (±0.1 mm).
- **Smoothness:** inertial profiler (IRI) per lot; IRI ≤1.2 m/km.
- **Aggregate & binder QA:** PSV, LA, binder content by ignition, binder recovery tests as per contract; fibers content check.

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7. Maintenance Plan (temperate climate)

- **Routine sweeping:** regenerative air/vacuum sweeping:
- **Monthly** during autumn leaf drop and spring seed season (first 2 years),

- **Quarterly** in other seasons thereafter.
- **Permeability monitoring:** quarterly for first 2 years, then biannually. Trigger cleaning if k $<0.5\times10^{-3}$ m/s.
- **Crack & joint sealing:** flexible low-modulus sealants within 1 year of crack appearance; keep sealant profile flush.
- **Snow/ice:** use plow with rubber blades and calibrated de-icing salts; avoid metal plow wing contact at full force—inspect surface after winter.
- **Rejuvenation:** if noise increases >2 dB (CPX) or MPD or permeability fall beyond thresholds, schedule high-pressure water + vacuum cleaning or minor micro-overlay (10–12 mm) as remedial action.

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8. QC Checklist (to use on site — per lot)

1. Mix design approved & on site (SBS binder data, gradation chart, VMA target).
2. Test strip completed and accepted (record permeability, voids, MPD).
3. Paving conditions logged (air & pavement temp, humidity, wind, no rain).
4. Binder content verification (daily ignition tests / gyratory verification).
5. Cores taken: top layer voids within 18–20% (documented).
6. Permeability test passed (k $\geq0.8\times10^{-3}$ m/s).
7. MPD measured and within 0.6–0.9 mm.
8. IRI measured: $\leq$1.2 m/km.
9. Joints: vertical offset $\leq$3 mm, no overband ridges.
10. CPX/OBSI acoustic run scheduled 7–14 days after paving and documented.
11. Maintenance plan handed over to road authority (sweeping schedule + winter plow instructions).

Notes & clarifications: - Exact CPX method (tire model, mic, distance) must be specified in contract — the dB target above assumes a standard reference tire; revise if owner uses different tire. - If heavy truck percentage >20% consider increasing binder stiffness or slight increase in thickness of bottom layer to limit rutting.

Prepared as a concise construction spec & on-site QC checklist for temperate climate deployment of low-noise DLPA.