

ClearPath RD

clearpathrd.com

Entity Relationship Diagram

Data Dictionary — Version 1.0 — February 2026 — Confidential

What this document covers

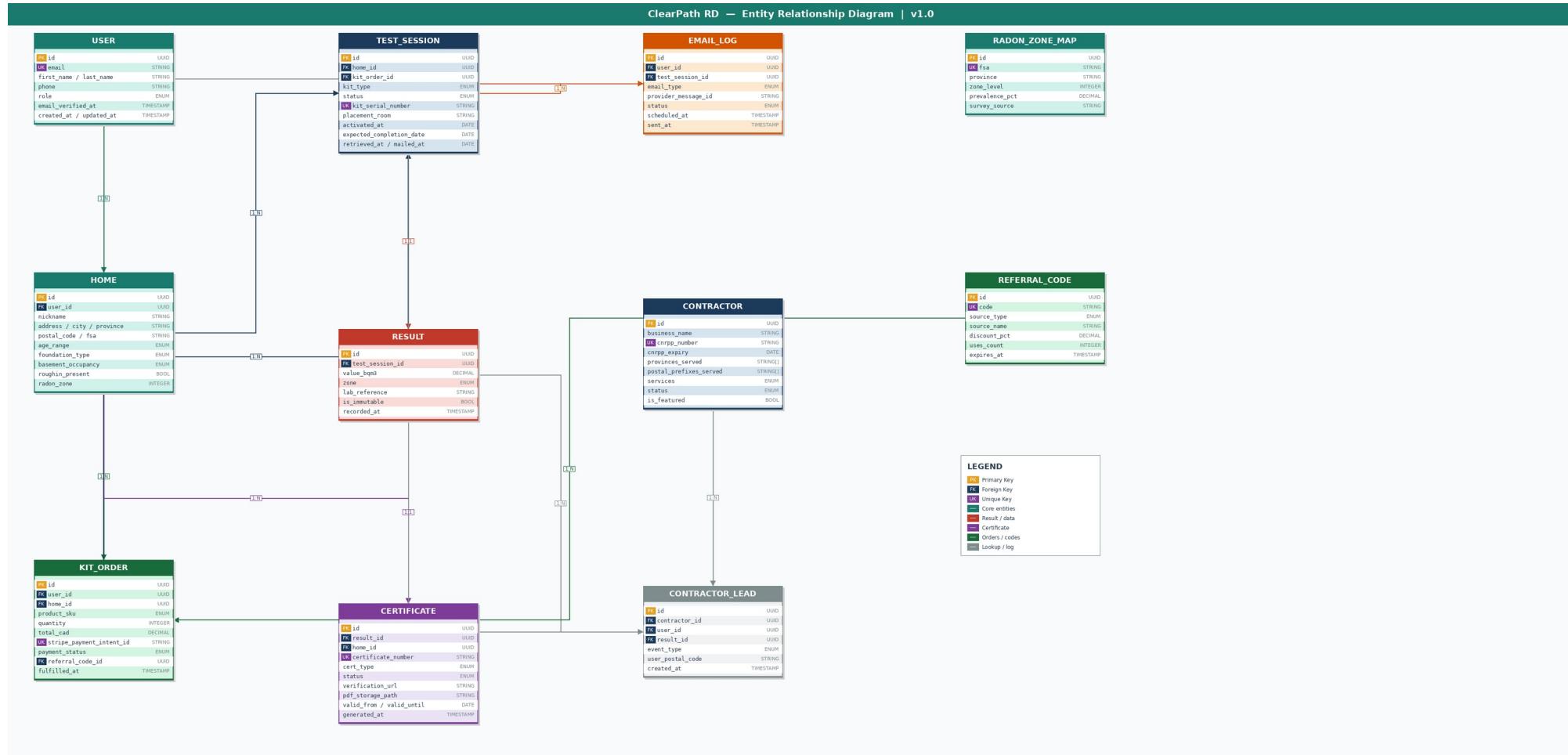
- Full ERD diagram — all 11 entities and their relationships on a single reference page
- Data dictionary — every table with column names, data types, nullability, and business rules
- Enum value definitions — all ENUM columns with permitted values and their meanings
- Relationship map — cardinalities and foreign key descriptions for all 14 relationships
- Index strategy — recommended indexes for query performance
- Design decisions — key architectural choices and their rationale

Stack context

PostgreSQL · Prisma ORM · Node.js + Fastify · Supabase Auth · Stripe · Resend (email) · Railway (MVP hosting)

Entity Relationship Diagram — All Tables

11 entities · 14 relationships · colour-coded by domain



1. Overview

This document provides the complete data model for ClearPath RD. It is the authoritative reference for all database schema decisions, Prisma model definitions, and API contract design. Every table is listed with its full column specification, permitted enum values, business rules, and relationship cardinalities.

Design principle: USER and HOME are separate entities. A user can own multiple homes; a home can have multiple test sessions over time. The certificate is tied to the HOME (not the user) so it can be shared in real estate transactions regardless of account ownership.

1.1 Relationship Map

All 14 foreign key relationships across the 11 tables.

From Entity	Cardinality	To Entity	Description
USER	1 → N	HOME	A user owns one or more homes. home.user_id is the FK.
USER	1 → N	KIT_ORDER	A user places one or more orders. kit_order.user_id is the FK.
USER	1 → N	EMAIL_LOG	A user receives many email notifications. email_log.user_id is the FK.
USER	1 → N	CONTRACTOR_LEAD	A user's actions generate contractor leads. contractor_lead.user_id is the FK.
HOME	1 → N	TEST_SESSION	A home has many test sessions over its lifetime. test_session.home_id is the FK.
HOME	1 → N	KIT_ORDER	A kit order is placed for a specific home. kit_order.home_id is the FK.
HOME	1 → N	CERTIFICATE	A home accumulates certificates over time (one per completed session). certificate.home_id is the FK.
KIT_ORDER	1 → N	TEST_SESSION	An order can yield 1 or 2 sessions (twin pack). test_session.kit_order_id is the FK.
TEST_SESSION	1 → 1	RESULT	A completed test session produces exactly one result. result.test_session_id is UNIQUE.
RESULT	1 → 1	CERTIFICATE	A result generates exactly one certificate. certificate.result_id is UNIQUE.
TEST_SESSION	1 → N	EMAIL_LOG	A test session triggers many scheduled emails. email_log.test_session_id is the FK.
CONTRACTOR	1 → N	CONTRACTOR_LEAD	A contractor receives many referral leads. contractor_lead.contractor_id is the FK.
RESULT	1 → N	CONTRACTOR_LEAD	A result (especially elevated) can prompt multiple contractor interactions. contractor_lead.result_id is the FK.
REFERRAL_CODE	1 → N	KIT_ORDER	A referral code can be applied to many

			orders.kit_order.referral_code_id is the nullable FK.
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2. Data Dictionary

Each table is documented with: column name, data type, nullability (N = NOT NULL, Y = nullable), and a description of the business rules governing that field.

2.1 users

Core identity table. Managed by Supabase Auth — the id and email columns are written by Supabase; all other profile fields are written by the application.

	Column Name	Data Type	Null ?	Description / Business Rules
PK	<code>id</code>	UUID	N	Primary key. Matches Supabase Auth user id. UUID v4.
UK	<code>email</code>	VARCHAR(255)	N	User's email address. Unique. Used as login identifier. Normalised to lowercase on write.
	<code>password_hash</code>	TEXT	Y	Managed by Supabase Auth. Null if social login only. Never read directly by application.
	<code>first_name</code>	VARCHAR(100)	N	Given name. Required at registration.
	<code>last_name</code>	VARCHAR(100)	N	Family name. Required at registration.
	<code>phone</code>	VARCHAR(20)	Y	Optional. E.164 format. Used for SMS reminders in Phase 2.
	<code>role</code>	ENUM	N	user admin. Default: user. Admin role grants access to admin dashboard.
	<code>marketing_consent</code>	BOOL	N	CASL compliance. Default: false. Must be explicit opt-in, never pre-checked.
	<code>email_verified_at</code>	TIMESTAMP	Y	Set by Supabase Auth on email verification. Null = unverified. Purchasing a kit requires verification.
	<code>created_at</code>	TIMESTAMP	N	Set on insert. UTC. Managed by database default.
	<code>updated_at</code>	TIMESTAMP	N	Set on update. UTC. Managed by trigger.
Business Rules & Notes				
<ul style="list-style-type: none"> Supabase Auth manages authentication. The application maintains a users table with profile data; the Supabase auth.users row is the authoritative identity record. Soft delete is not used. GDPR / PIPEDA deletion requests result in full row deletion and cascade to all child records. Users with role = admin have no special AUTH distinction — the role column is checked by the application layer at each admin endpoint. 				

2.2 homes

A home is a distinct property. It is the central record for radon testing — test sessions, certificates, and orders all reference it. One user may own many homes.

	Column Name	Data Type	Null ?	Description / Business Rules
PK	<code>id</code>	UUID	N	Primary key. UUID v4.
FK	<code>user_id</code>	UUID	N	References users.id. The account holder who registered this home. ON DELETE CASCADE.
	<code>nickname</code>	VARCHAR(100)	Y	Optional user-defined label e.g. 'Main home' or 'Cottage'. Displayed in dashboard.
	<code>address_line1</code>	VARCHAR(200)	N	Street address. Appears on certificate.
	<code>address_line2</code>	VARCHAR(200)	Y	Suite / unit number. Optional.
	<code>city</code>	VARCHAR(100)	N	City. Appears on certificate.
	<code>province</code>	CHAR(2)	N	Two-letter province / territory code: AB, BC, MB, NB, NL, NS, NT, NU, ON, PE, QC, SK, YT.
	<code>postal_code</code>	CHAR(7)	N	Canadian postal code. Format: A1A 1A1 (with space). Normalised to uppercase on write.
	<code>fsa</code>	CHAR(3)	N	Forward Sortation Area (first 3 chars of postal code). Derived on write from postal_code. Used for zone lookup.
	<code>age_range</code>	ENUM	N	Construction era of the home. Used in risk modifier calculation.
	<code>foundation_type</code>	ENUM	N	Foundation type. Primary factor in radon entry pathway assessment.
	<code>basement_occupancy</code>	ENUM	N	How the basement is used. Affects which test level is recommended.
	<code>roughin_present</code>	BOOL	N	Whether a mitigation rough-in is present. Default: false. Influences mitigation cost estimate.
	<code>radon_zone</code>	INTEGER	N	1–4. Derived from fsa lookup against radon_zone_map. Set on insert / postal code change.
	<code>regional_prevalence_pct</code>	DECIMAL(5, 2)	N	Percentage of homes above guideline in this FSA. Displayed in risk assessment screen.
	<code>created_at</code>	TIMESTAMP	N	Set on insert.
	<code>updated_at</code>	TIMESTAMP	N	Set on update via trigger.

Business Rules & Notes

- The fsa and radon_zone fields are denormalised from radon_zone_map for read performance. They are re-derived whenever postal_code is updated.
- The certificate is tied to the home record. If a home is sold and the buyer registers on ClearPath, a new home record is created — the original certificate remains associated with the original owner's home record.
- Address validation (Canada Post API) is a Phase 2 enhancement. MVP accepts free-text address.

2.3 test_sessions

Tracks one radon test from kit activation through result submission. The lifecycle is managed as a state machine with 8 states.

	Column Name	Data Type	Null ?	Description / Business Rules
PK	<code>id</code>	UUID	N	Primary key. UUID v4.
FK	<code>home_id</code>	UUID	N	References homes.id. The property being tested. ON DELETE RESTRICT — sessions block home deletion.
FK	<code>kit_order_id</code>	UUID	N	References kit_orders.id. The order that fulfilled this kit.
	<code>kit_type</code>	ENUM	N	long_term (91+ day alpha track) or real_estate_short (48–96 hour electret). Determines email schedule and deadline calculations.
	<code>status</code>	ENUM	N	State machine status. See business rules below.
UK	<code>kit_serial_number</code>	VARCHAR(50)	N	Unique serial number from lab. Used to match returned kit to session. Unique constraint.
	<code>placement_room</code>	VARCHAR(100)	N	Room where the kit was placed e.g. 'Basement'. Required before ACTIVE state.
	<code>placement_description</code>	TEXT	Y	Optional notes on exact placement. Stored on certificate.
	<code>activated_at</code>	DATE	Y	Date user confirmed kit placement. Null until status = ACTIVE.
	<code>expected_completion_date</code>	DATE	Y	Calculated on activation: activated_at + 91 days (long_term) or + 4 days (real_estate_short).
	<code>retrieval_due_at</code>	DATE	Y	Date at which RETRIEVAL_DUE reminder triggers (expected_completion_date - 3 days).
	<code>retrieved_at</code>	DATE	Y	Date user confirmed kit retrieved from placement.
	<code>mailed_at</code>	DATE	Y	Date user confirmed kit mailed to lab.
	<code>created_at</code>	TIMESTAMP	N	Set on insert.
	<code>updated_at</code>	TIMESTAMP	N	Set on update via trigger.

Business Rules & Notes

- Status state machine: ORDERED → ACTIVE → RETRIEVAL_DUE → MAILED → RESULTS_PENDING → COMPLETE. Terminal states: EXPIRED (> 120 days past expected completion with no result) and CANCELLED.
- Status transitions are enforced at the application layer — the database allows any enum value but the API rejects invalid transitions.
- A session in ORDERED state that has not been activated within 14 days triggers a reminder email. Sessions not activated within 90 days are flagged for admin review.
- Only one active (non-CANCELLED, non-EXPIRED) session per home at a time is enforced at the application layer. This may be relaxed for twin-pack orders.

2.4 results

Immutable record of a radon test result. Once a certificate has been generated from a result, the row is locked against modification.

	Column Name	Data Type	Null ?	Description / Business Rules
PK	<code>id</code>	UUID	N	Primary key. UUID v4.
FK	<code>test_session_id</code>	UUID	N	References <code>test_sessions.id</code> . UNIQUE constraint — one result per session. ON DELETE RESTRICT.
	<code>value_bqm3</code>	DECIMAL(8, 2)	N	Measured radon concentration in Bq/m³. Must be ≥ 0 .
	<code>zone</code>	ENUM	N	Derived on insert from <code>value_bqm3</code> . below_guideline (<100) caution (100–199) action_required (200–599) urgent_action (≥ 600).
	<code>lab_reference</code>	VARCHAR(100)	Y	Lab's internal reference number for this analysis. Sourced from lab report.
	<code>entered_by_user_id</code>	UUID	N	FK to <code>users.id</code> . The user who entered the result. Stored for audit.
	<code>is_immutable</code>	BOOL	N	Default: false. Set to true when certificate is generated. Once true, all UPDATE operations on this row are rejected by the application layer.
	<code>recorded_at</code>	TIMESTAMP	N	When the result was recorded by the user (distinct from <code>created_at</code> which is server time).
	<code>created_at</code>	TIMESTAMP	N	Server-side insert timestamp.

Business Rules & Notes

- Zone is always derived server-side from `value_bqm3`. It is never accepted from the client. Calculation: $<100 = \text{below_guideline}$; $100\text{--}199 = \text{caution}$; $200\text{--}599 = \text{action_required}$; $\geq 600 = \text{urgent_action}$.
- Immutability is enforced at the application layer, not the database. Once `is_immutable` = true, any PUT/PATCH to `/api/v1/results/:id` returns HTTP 409 Conflict.
- The result record is the source of truth for the certificate. The certificate PDF is regenerated from this record if the stored PDF is unavailable.

2.5 certificates

The ClearPath Certificate is the primary deliverable. Each certificate has a globally unique UUID used for public verification at [clearpathrd.com/verify/\[id\]](https://clearpathrd.com/verify/[id]).

	Column Name	Data Type	Null ?	Description / Business Rules
PK	id	UUID	N	Primary key and public certificate identifier. UUID v4. Non-sequential. Used in verification URL.
FK	result_id	UUID	N	References results.id. UNIQUE — one certificate per result. ON DELETE RESTRICT.
FK	home_id	UUID	N	References homes.id. Denormalised for fast lookup without joining through result and session.
UK	certificate_number	VARCHAR(30)	N	Human-readable certificate number e.g. CRD-2026-00142. Sequential, zero-padded. Distinct from UUID.
	cert_type	ENUM	N	residential (long-term test) or real_estate (short-term test). Displayed on certificate.
	status	ENUM	N	valid expired superseded. Checked by public verification endpoint.
	verification_url	TEXT	N	Full URL: https://clearpathrd.com/verify/[id] . Stored for convenience; derived from id.
	pdf_storage_path	TEXT	Y	Path in Supabase Storage bucket. Null until PDF generation job completes.
	valid_from	DATE	N	Test completion date. Start of 5-year validity window.
	valid_until	DATE	N	valid_from + 5 years. Used to auto-expire certificates via scheduled job.
	generated_at	TIMESTAMP	N	When the certificate record and PDF were created.
	superseded_at	TIMESTAMP	Y	Set when a newer certificate for the same home supersedes this one. Status set to superseded.

Business Rules & Notes

- The public verification endpoint (GET /verify/:id) is unauthenticated. It returns: property address, test date, result zone, and current status. It does NOT return the numeric Bq/m³ value to prevent data mining.
- Certificate expiry (5 years) is enforced by a nightly job that sets status = expired where valid_until < CURRENT_DATE.
- When a new result is recorded for a home that already has a valid certificate, the old certificate is set to status = superseded. The superseded_at timestamp is recorded. The new certificate is generated from the new result.
- The certificate_number sequence is managed by a PostgreSQL sequence object: certnum_seq. This ensures no gaps and no collisions under concurrent writes.

2.6 kit_orders

Records every kit purchase. Integrates with Stripe for payment and with the lab partner for order fulfilment. The stripe_payment_intent_id is the canonical reference for payment disputes.

	Column Name	Data Type	Null ?	Description / Business Rules
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PK	id	UUID	N	Primary key. UUID v4.
FK	user_id	UUID	N	References users.id. The purchasing account. ON DELETE RESTRICT.
FK	home_id	UUID	N	References homes.id. The home this kit is for. ON DELETE RESTRICT.
	product_sku	ENUM	N	standard_long (\$54.99) real_estate_short (\$89.99) twin_pack (\$99.99).
	quantity	INTEGER	N	Default 1. Twin pack is quantity 1 of product_sku = twin_pack (contains 2 kits).
	shipping_address_line1	VARCHAR(200)	N	Shipping address. May differ from home address.
	shipping_city	VARCHAR(100)	N	Shipping city.
	shipping_province	CHAR(2)	N	Shipping province code.
	shipping_postal_code	CHAR(7)	N	Shipping postal code.
	subtotal_cad	DECIMAL(10, 2)	N	Pre-tax total in Canadian dollars.
	tax_cad	DECIMAL(10, 2)	N	HST/GST/PST calculated at order time by province.
	total_cad	DECIMAL(10, 2)	N	subtotal_cad + tax_cad. Amount charged to Stripe.
UK	stripe_payment_intent_id	VARCHAR(100)	Y	Stripe PaymentIntent ID. Unique. Set when Stripe checkout session is created. Null until then.
	payment_status	ENUM	N	pending paid failed refunded. Updated by Stripe webhook handler.
FK	referral_code_id	UUID	Y	References referral_codes.id. Nullable. Set if a referral code was applied at checkout.
	lab_order_reference	VARCHAR(100)	Y	Lab's reference for this order. Set when order is transmitted to lab partner after payment.
	paid_at	TIMESTAMP	Y	Set by Stripe payment_intent.succeeded webhook.
	fulfilled_at	TIMESTAMP	Y	Set when lab confirms dispatch. Triggers order confirmation email.
	created_at	TIMESTAMP	N	Set on insert.

Business Rules & Notes

- Orders are created with status = pending when the user reaches checkout. They become paid on Stripe webhook. Unfulfilled paid orders after 5 business days trigger an admin alert.
- Tax calculation logic is applied at the application layer based on shipping_province at the time of purchase. Tax rates are stored in a config file, not the database.
- Refunds are processed via Stripe and reflected by setting payment_status = refunded. Associated test sessions are set to CANCELLED.

2.7 email_log

Audit log for all outbound emails. Used to prevent duplicate sends, track delivery status, and debug email flow issues.

	Column Name	Data Type	Null ?	Description / Business Rules
PK	id	UUID	N	Primary key. UUID v4.
FK	user_id	UUID	N	References users.id. The recipient account. ON DELETE CASCADE.
FK	test_session_id	UUID	Y	References test_sessions.id. Nullable — order confirmation emails are not session-specific.
	email_type	ENUM	N	One of 8 scheduled email types. See enum values table.
	provider_message_id	VARCHAR(200)	Y	Resend message ID. Set when email is accepted by provider. Used for delivery status lookup.
	status	ENUM	N	queued sent delivered bounced failed.
	scheduled_at	TIMESTAMP	N	When the email was queued for delivery.
	sent_at	TIMESTAMP	Y	When Resend confirmed acceptance. Null if not yet sent.

Business Rules & Notes

- Before sending any scheduled email, the system checks email_log for an existing row with the same user_id, test_session_id, and email_type. If found and status is not failed, the send is skipped. This prevents duplicate reminders.
- Bounce and failure statuses are set by Resend webhook. After 3 consecutive bounces to the same email address, the user account is flagged for admin review.
- Email log rows are retained for 2 years then purged by a scheduled job.

2.8 contractors

Directory of C-NRPP certified radon professionals. Seeded manually for MVP launch. Each contractor has a service area defined by province and postal prefix arrays.

	Column Name	Data Type	Null ?	Description / Business Rules
PK	id	UUID	N	Primary key. UUID v4.
	business_name	VARCHAR(200)	N	Trading name of the business.
	contact_name	VARCHAR(100)	Y	Primary contact person. Optional.
	phone	VARCHAR(20)	N	Primary phone. E.164 format.
	email	VARCHAR(255)	Y	Business email. Optional.
	website	TEXT	Y	Website URL. Optional.
UK	cnrpp_number	VARCHAR(50)	N	C-NRPP certification number. Unique. Used to verify

				against C-NRPP public directory.
	cnrpp_expiry	DATE	N	C-NRPP certification expiry date. Admin alerted 60 days before expiry.
	provinces_served	TEXT[]	N	Array of province codes served e.g. {AB, SK}. Used for geographic matching.
	postal_prefixes_served	TEXT[]	Y	Array of FSA prefixes e.g. {T2J, T2K}. More specific than province. Used if present.
	services	ENUM	N	measurement mitigation both. Determines in which result context they appear.
	status	ENUM	N	active inactive pending expired. Only active contractors appear in directory.
	is_featured	BOOL	N	Default: false. Featured contractors appear first in results. Reserved for paid listings.
	referral_fee_cad	DECIMAL(6,2)	Y	Monthly or per-lead fee. Nullable — not all contractors have a fee arrangement.
	created_at	TIMESTAMP	N	Set on insert.
	updated_at	TIMESTAMP	N	Set on update.

Business Rules & Notes

- Geographic matching logic: if postal_prefixes_served is not null and not empty, match on FSA prefix first. Fall back to province match if no prefix match found.
- Contractors with cnrpp_expiry within 60 days have status auto-set to pending by a nightly job. Admin must re-verify and set to active.
- MVP launch target: minimum 3 contractors in each of Calgary, Edmonton, Winnipeg, Halifax, Moncton, Ottawa, Saskatoon, Regina.

2.9 contractor_leads

Event log for contractor interactions. Every time a user clicks to view, call, or email a contractor, a lead event is recorded. Used for contractor billing and platform analytics.

	Column Name	Data Type	Null ?	Description / Business Rules
PK	<code>id</code>	UUID	N	Primary key. UUID v4.
FK	<code>contractor_id</code>	UUID	N	References contractors.id. ON DELETE CASCADE.
FK	<code>user_id</code>	UUID	N	References users.id. The user who triggered the event. ON DELETE CASCADE.
FK	<code>result_id</code>	UUID	Y	References results.id. The result that led the user to this contractor. Nullable — some views occur before a result exists.
	<code>event_type</code>	ENUM	N	<code>profile_view</code> <code>contact_click</code> <code>phone_click</code> <code>email_click</code> .
	<code>user_postal_code</code>	CHAR(7)	Y	User's home postal code at time of event. Stored for geographic analytics without needing a join.
	<code>created_at</code>	TIMESTAMP	N	Event timestamp. Immutable.
Business Rules & Notes				
<ul style="list-style-type: none"> This table is append-only. No updates or deletes (except PIPEDA deletion requests which cascade from users). Contractor billing (where applicable) is calculated monthly by aggregating <code>contact_click</code>, <code>phone_click</code>, and <code>email_click</code> events. <code>profile_view</code> events are not billed but are included in analytics to show funnel conversion rates. 				

2.10 radon_zone_map

Lookup table mapping Canadian Forward Sortation Areas to Health Canada radon risk zones. Populated from the 2024 Cross-Canada Radon Survey dataset. Read-only at runtime — updated only by admin tooling.

	Column Name	Data Type	Null ?	Description / Business Rules
PK	<code>id</code>	UUID	N	Primary key. UUID v4.
UK	<code>fsa</code>	CHAR(3)	N	Forward Sortation Area code e.g. T2J. Unique. Uppercase.
	<code>province</code>	CHAR(2)	N	Province code derived from FSA. Stored for fast province-level aggregation.
	<code>zone_level</code>	SMALLINT	N	1 = Low (<5% above guideline) 2 = Moderate (5–14%) 3 = High (15–29%) 4 = Very High (≥30%).
	<code>prevalence_pct</code>	DECIMAL(5, 2)	N	Percentage of homes in this FSA tested above 200 Bq/m ³ . Source: Health Canada survey data.
	<code>survey_source</code>	VARCHAR(100)	N	Data source citation e.g. 'Health Canada 2024 Cross-Canada Survey'.
	<code>survey_year</code>	SMALLINT	N	Year of the survey data. Used to display data

				currency notice to users.
	schema_version	SMALLINT	N	Version of the zone mapping schema. Incremented when zone boundaries change.
	updated_at	TIMESTAMP	N	Last updated timestamp. Displayed in admin dashboard.

Business Rules & Notes

- This table is populated from a CSV derived from Health Canada's public FSA-level radon data. The import script is in /scripts/seed/radon_zones.ts.
- Not all FSAs have survey data. Where an FSA is absent, the application falls back to the province-level average zone.
- The prevalence_pct and zone_level displayed to users carry a note of the survey_year so users understand the data is point-in-time.

2.11 referral_codes

Referral and promotional codes used by real estate agents, partner organisations, and marketing campaigns. Applied at checkout for discounts or tracking.

	Column Name	Data Type	Null ?	Description / Business Rules
PK	id	UUID	N	Primary key. UUID v4.
UK	code	VARCHAR(30)	N	The code string entered by the user at checkout. Uppercase, alphanumeric. Unique.
	source_type	ENUM	N	agent inspector broker partner promo. Determines attribution reporting.
	source_name	VARCHAR(200)	N	Human-readable name of the referral source e.g. 'RE/MAX Calgary West'.
	source_email	VARCHAR(255)	Y	Contact email for the referral source. Used for partner reporting.
	is_active	BOOL	N	Default: true. Inactive codes are rejected at checkout.
	uses_count	INTEGER	N	Default: 0. Incremented on each successful application. Used for reporting and optional max_uses enforcement.
	discount_pct	DECIMAL(5, 2)	Y	Percentage discount applied to order subtotal. Nullable — some codes are tracking-only with no discount.
	created_at	TIMESTAMP	N	Set on insert.
	expires_at	TIMESTAMP	Y	Optional expiry. Null = no expiry. Codes past expires_at are rejected at checkout.

Business Rules & Notes

- Code validation at checkout: check is_active = true AND (expires_at IS NULL OR expires_at > NOW()). If invalid, proceed without discount and log the attempted code.
- uses_count is incremented using an atomic UPDATE ... RETURNING to prevent race conditions under concurrent checkouts.
- Partner reporting: a monthly summary of uses_count grouped by source_type and source_name is generated for admin review.

3. Enum Value Definitions

All ENUM columns and their permitted values. These are defined as PostgreSQL native ENUM types. Prisma maps them to TypeScript union types.

3.1 users.role

Value	Meaning
user	Standard account. Access to own homes, orders, sessions, and certificates only.
admin	Full platform access. Admin dashboard, contractor management, certificate management, email log, platform metrics.

3.2 homes.age_range

Value	Meaning
pre_1980	Built before 1980. Highest risk modifier — older construction techniques, more entry pathways.
1980_2000	Built 1980–2000. Moderate risk modifier.
2000_2010	Built 2000–2010. Lower risk modifier — better sealing but before modern radon-resistant construction codes.
post_2010	Built after 2010. Lowest risk modifier — modern codes in most provinces include radon-resistant construction requirements.
unknown	User does not know construction year. No modifier applied; conservative estimate used.

3.3 homes.foundation_type

Value	Meaning
full_basement	Full finished or unfinished basement below grade. Highest radon entry risk.
partial_basement	Partial basement or walkout. Moderate risk.
crawl_space	Crawl space foundation. Moderate-to-high risk depending on venting.
slab	Slab-on-grade. Lower risk but radon can still enter through cracks and penetrations.
unknown	Foundation type unknown. Conservative estimate used.

3.4 homes.basement_occupancy

Value	Meaning
primary_living	Basement is used as primary living space (bedroom, family room, office). Highest occupancy weighting.
occasional	Basement used occasionally (laundry, hobbies). Moderate weighting.
storage	Basement used only for storage. Lower weighting.
no_basement	No basement / not applicable. Used when foundation_type = slab.

3.5 test_sessions.kit_type

Value	Meaning
long_term	Alpha track detector. 91–365 day exposure. Required for standard residential testing. Recommended for homeowners not in a time-constrained transaction.
real_estate_short	Electret ion chamber or activated charcoal. 48–96 hour exposure. For use during real estate transaction conditional periods. Requires closed-house conditions 12 hours prior.

3.6 test_sessions.status

Value	Meaning
ordered	Kit has been purchased. Serial number assigned. Awaiting delivery and user activation.
active	User has confirmed kit placement. Timer running. Expected completion date set.
retrieval_due	System-set state when retrieval_due_at is reached. Triggers retrieval reminder email.
mailed	User has confirmed retrieval and confirmed kit is mailed to lab.
results_pending	Lab has received kit (optional confirmation). Awaiting analysis.
complete	Result entered. Certificate generated (if applicable). Terminal success state.
expired	Set by nightly job if no result has been entered 120 days after expected_completion_date. Terminal failure state.
cancelled	Session manually cancelled by user or admin, or by refund. Terminal state.

3.7 results.zone

Value	Meaning
below_guideline	< 100 Bq/m ³ . Well below the Health Canada action guideline. Low exposure. Certificate recommended. Re-test in 5 years.
caution	100–199 Bq/m ³ . Below the action guideline but above the WHO reference level. Certificate issued. Mitigation optional but can be considered.
action_required	200–599 Bq/m ³ . At or above the Health Canada guideline. Mitigation recommended. Contractor referral surfaced. Certificate issued.
urgent_action	≥ 600 Bq/m ³ . Significantly above guideline. Mitigation strongly recommended. Elevated urgency in UI. Contractor referral prominently displayed.

3.8 certificates.cert_type

Value	Meaning
residential	Generated from a long-term (91+ day) alpha track test. Standard residential certificate. 5-year validity.
real_estate	Generated from a short-term (48–96 hour) test. Intended for real estate transaction disclosure. 5-year validity but carries a note that short-term tests are a snapshot, not a long-term average.

3.9 certificates.status

Value	Meaning
valid	Certificate is within its validity period and has not been superseded.
expired	Certificate validity period (5 years from valid_from) has passed. Set by nightly job.
superseded	A newer certificate for the same home has been generated. This certificate is no longer the current record.

3.10 kit_orders.product_sku

Value	Meaning
standard_long	Single long-term alpha track kit. \$54.99 CAD + tax. 91+ day exposure period. Suitable for most residential testing.
real_estate_short	Single short-term electret kit. \$89.99 CAD + tax. 48–96 hour exposure. For use during conditional period of a real estate transaction.
twin_pack	Two long-term alpha track kits. \$99.99 CAD + tax. Recommended for homes with multiple levels. Creates two linked test sessions.

3.11 email_log.email_type

Value	Meaning
order_confirm	Sent immediately on kit_order payment_status = paid. Confirms order and estimated delivery date.
activation	Sent when test_session status changes to ACTIVE. Includes placement guide and kit serial number.
day_30	Sent 30 days after activated_at. Educational / check-in content. Not a reminder — a

	value-add.
day_60	Sent 60 days after activated_at. Second educational touchpoint.
day_80	Sent 80 days after activated_at. Heads-up that test end is approaching.
day_88	Sent 88 days after activated_at (3 days before expected 91-day completion). Clear retrieval instruction with deadline.
results_prompt	Sent 10 days after mailed_at with no result entered. Prompts user to check lab results and enter them.
certificate_ready	Sent when certificate status changes to valid. Links to certificate vault. Journey completion moment.

3.12 contractors.services

Value	Meaning
measurement	Contractor is certified to conduct radon measurements only. Surfaced when user is researching testing options.
mitigation	Contractor is certified to install radon mitigation systems only. Surfaced in results screens for elevated results.
both	Contractor is certified for both measurement and mitigation. Surfaced in all contractor referral contexts.

4. Index Strategy

Recommended indexes beyond primary keys and unique constraints. All primary keys (UUID) are automatically indexed by PostgreSQL. All foreign keys should be indexed for join performance. The following are additional indexes for expected query patterns.

Table	Columns	Type	Purpose
homes	user_id	FK	All homes for a user (dashboard load)
homes	fsa	BTREE	Zone lookup on postal code update
test_sessions	home_id	FK	All sessions for a home
test_sessions	kit_order_id	FK	Sessions for a given order
test_sessions	status	BTREE	Filtering active sessions for reminder job
test_sessions	kit_serial_number	UNIQUE	Kit lookup by serial (auto from UK constraint)
test_sessions	expected_completion_date	BTREE	Date range queries for expiry job
results	test_session_id	UNIQUE	One result per session (auto from UK constraint)
results	zone	BTREE	Analytics: result distribution by zone
certificates	result_id	UNIQUE	One cert per result (auto from UK constraint)
certificates	home_id	FK	All certs for a home
certificates	status, valid_until	BTREE	Nightly expiry job: WHERE status = valid AND valid_until < NOW()
kit_orders	user_id	FK	Order history for a user
kit_orders	stripe_payment_intent_id	UNIQUE	Webhook lookup by Stripe ID (auto from UK constraint)
email_log	user_id, email_type	BTREE	Duplicate-send check before sending scheduled email
email_log	test_session_id, email_type	BTREE	Session-specific duplicate-send check
contractor_leads	contractor_id	FK	Lead count per contractor
contractor_leads	contractor_id, event_type	BTREE	Billing: contact events per contractor per period
radon_zone_map	fsa	UNIQUE	FSA lookup (auto from UK constraint)
radon_zone_map	province	BTREE	Province-level fallback lookup
referral_codes	code	UNIQUE	Checkout code validation (auto from UK constraint)

5. Design Decisions

Key architectural choices in this schema and the reasoning behind them. These should be read before making schema changes.

5.1 UUID v4 Primary Keys Throughout

All primary keys are UUID v4. Rationale: sequential integer PKs expose record counts (number of users, number of orders) via URL enumeration. UUIDs also make the certificate verification URL non-guessable, which is a security requirement. The performance cost of UUID PKs vs. integer PKs at MVP scale (< 100K rows per table) is negligible.

5.2 HOME as a First-Class Entity

The home record is separate from the user record. This is the most important architectural decision in the schema. It enables: (a) multi-home management per user, (b) the certificate being tied to a property rather than a person, enabling real estate use cases, and (c) future transfer of home ownership without certificate invalidation. Do not collapse HOME into USER.

5.3 Result Immutability

Once a certificate is generated, the underlying result row is locked (`is_immutable = true`). This is enforced at the application layer. If a user believes their result is incorrect, they must open a new test session — they cannot edit a result that has a certificate. The certificate then reflects whether it has been superseded. This preserves the integrity of the certificate as a legal document.

5.4 Certificate UUID is the Public Identifier

The certificate id (UUID v4) is the public verification token. It appears in the verification URL and on the QR code. Because it is a UUID v4 (random), it cannot be guessed or enumerated. The verification endpoint returns minimal public information only — no Bq/m^3 values, no personal information — so that certificates can be shared freely without privacy risk.

5.5 Enum Values Over Boolean Flags

Where a field has more than two meaningful states, ENUMs are used rather than multiple boolean columns. The `test_session` status field is the clearest example — it has 8 states, not a combination of `is_active`, `is_complete`, `is_expired` booleans. This makes state transitions explicit, makes invalid states impossible to represent, and makes query filtering straightforward.

5.6 Denormalised Fields for Performance

`homes.fsa`, `homes.radon_zone`, and `homes.regional_prevalence_pct` are denormalised from `radon_zone_map`. This avoids a join on every home profile load and risk assessment render. These fields are re-derived whenever `postal_code` is updated. The tradeoff is a slightly more complex write path, which is acceptable given that postal code updates are rare.

5.7 contractor_leads is Append-Only

The contractor_leads table is an event log, not a state table. Records are never updated. This makes it safe for analytics aggregation and simple for billing calculation. It also means the full interaction history is preserved even if a contractor is deactivated.

— *End of ERD & Data Dictionary* —
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