

# Refrigerator Airflow & Thermodynamic Blueprint

Fluid Convection Channels, the 70% Capacity Rule, and Food Safety Microclimates

## 1. Internal Refrigeration Zones & Convective Flow

| Appliance Shelf / Zone   | Target Operating Temp             | Optimal Food Placement & Physics                                                                         |
|--------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------|
| Top Shelves              | 36°F - 38°F (Consistent)          | Most temperature-stable zone. Ideal for ready-to-eat foods, leftovers, cooked meats, and berries.        |
| Bottom Shelf / Back Wall | 33°F - 35°F (Coldest Zone)        | Direct path from evaporator fan. Raw poultry, meat, and fish; traps drips and prevents bacterial growth. |
| Crisper Drawers          | 38°F - 40°F (Adjustable Humidity) | High humidity for leafy greens (closed vent); low humidity for ethylene-emitting fruits (open vent).     |
| Door Compartments        | 40°F - 43°F (Warmest Zone)        | Subject to frequent ambient room air wash. Condiments, pasteurized juices, pickles; NEVER milk or eggs.  |

## 2. The 70% Airflow Clearance Checklist

| Audit Parameter            | Correct Operational Practice                                                | Compressor & Energy Impact                                                    |
|----------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Air Vent Clearance         | Maintain 3-inch empty radius around interior cold air discharge vents.      | Prevents localized freezing and eliminates compressor duty-cycle overheating. |
| Volumetric Density         | Never exceed 70% shelf volume; leave 1-inch gaps between stored containers. | Permits laminar convective air currents; cuts energy draw by 15-20%.          |
| Condenser Coil Cleanliness | Vacuum exterior coils behind/under unit every 6 months.                     | Prevents high head-pressure failure and extends compressor life by 5+ years.  |