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WHITE PAPER 02 · CHILLING INJURY

Colder Is Not Safer

Chilling injury happens above freezing. Tropical and subtropical commodities fail when reefers are set 'as cold as possible.' Thresholds, symptoms, and dock rules from USDA AH-66 and HB 669.

ProspectSentinel | ~11 min read | USDA AH-66 + HB 669 | For shippers & reefer desks

Cold Chain Index | Transit Guide | Claim Analyzer

Executive brief

The most dangerous myth in reefer freight is that colder is always safer. AH-66's chilling and freezing injury chapter exists because many commodities are injured at temperatures *above* their freezing point. HB 669 repeats the operational punchline: low temperatures can cause chilling injury that may not show until retail — failure to ripen, off-flavors, discoloration, pitting, and other quality defects.

If your desk's default is "set 34°F for everything produce," you are systematically abusing tropical and subtropical lots.

> **Hard rule:** Freezing injury is not the same as chilling injury. Freeze damage is ice-crystal damage near/below the highest freezing point. Chilling injury is cold-stress physiology while still unfrozen.

Who is at risk (teaching set)

AH-66 commodity summaries and HB 669 transit tables jointly flag chilling-sensitive crops. Classic teaching set includes bananas, tomatoes (especially mature-green), cucumbers, many peppers, citrus (varies by origin/season), mangoes, pineapples, sweetpotatoes, basil and other tropical herbs, and several melons at low temperatures.

PATTERN	EXAMPLES	DESK IMPLICATION
Warm transit band	Bananas, many tropicals (often ~55–65°F class)	Group 2 thinking; never “near freezing”
Intermediate band	Some citrus, peppers, snap beans, okra	40s°F is not a compromise for 32°F fruit
Near-freezing OK	Most apples, broccoli, lettuce (if not ethylene-abused)	Still watch freeze floor & floor-level air

Do not memorize every number from a blog post — look them up per lot: **Cold Chain Index** (storage + flags) and **Produce Shipper Transit Guide** (transit setpoints + red-flag lists).

Symptoms brokers should recognize in claim photos

- Pitting / surface scald patterns inconsistent with simple dehydration
- Failure to ripen after warm-shelf display (tomatoes, tropicals)
- Internal browning or abnormal texture after cold transit
- Increased decay after cold stress (chilling often predisposes to pathogens)

When logs show “cold and stable,” do not close the file. Compare the stable setpoint to the commodity’s chilling threshold in **Perishable Claim Analyzer** and **Cold Chain Index**.

Decision rules

1. Identify the **most chilling-sensitive** item in a mixed load — it sets the floor upward.
2. If that floor conflicts with a near-freezing item's needs, you need **split loads or multi-temp**, not an average thermostat.
3. Winter linehauls need freeze protection at floor level even for chill-sensitive cargo (under-load airflow / insulation practices in HB 669).
4. Receiver "we always run 34" is not a specification for bananas.

Check chilling flags | Transit red flags | Next: Ethylene →

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FAQ

- Is this official USDA guidance?
- Can I share these with customers?
- Where are the interactive tools?

Sources & interactive tools

- USDA AH-66 — The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks (2016)
- USDA AMS HB 669 — Protecting Perishable Foods During Transport by Truck
- **Federal rules (eCFR):** 7 CFR Part 46 — PACA regulations · 49 CFR Part 370 — Principles and practices for the investigation and voluntary disposition of loss and damage claims
- **Cold Chain Index** — 200+ commodity storage/transit matrix + co-load checker
- **Produce Shipper Transit Guide** — dock setpoints, mix load, checklist
- **Reefer Precool Time Estimator** — half-cooling-time style estimator
- **Perishable Claim Analyzer** · **PACA Good Arrival Calculator** · **Produce Truck Rate Explorer**
- Freight claim package checklist · Claim / Carmack deadline calculator

Primary sources: USDA-ARS Agriculture Handbook 66 (2016); USDA-AMS Handbook 669, *Protecting Perishable Foods During Transport by Truck* (1995, reprinted 2008), including Load Compatibility Groups from USDA Marketing Research Report 1070 (Lipton & Harvey, 1977). Selected federal regulation entry points: 7 CFR Part 46 (PACA); 49 CFR Part 370 (freight claims).

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