

WHITEPAPER

Cold Store Forklift Selection

What to specify, why it fails, and how to compare quotations

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1. Why cold store specification is different

A forklift working at -25°C is not a standard forklift with a heated cab bolted on. Every system that depends on fluid viscosity, chemical reaction rate, battery chemistry or material toughness behaves differently below freezing, and some of them behave differently in ways that only show up after months of operation.

This whitepaper sets out what changes, what to specify, and how to compare quotations that look similar on paper but are not.

It is written for warehouse managers, procurement engineers and 3PL operations preparing a cold store or freezer expansion, and for distributors who need to explain the difference to their own customers.

2. Temperature bands and what they mean for equipment

Cold storage is not one environment. The band you are operating in determines which components need to change.

Band	Typical use	What it does to equipment
Chilled, +2 °C to +8 °C	Fresh food, dairy, produce	Little effect on standard trucks. Condensation is the main issue.
Low-temperature frozen, –18 °C to –22 °C	Most frozen food distribution	Hydraulic oil thickens, grease stiffens, battery capacity drops, steel is still ductile.
Deep freeze, –25 °C to –30 °C	Ice cream, imported frozen meat	Steel toughness starts to matter. Standard hydraulic oil is unusable. Seals harden.
Blast freezer / tunnel, –35 °C to –40 °C	Blast freezing, tuna, pharmaceutical	Requires purpose-built equipment. Most standard trucks are not suitable at any price.
Mixed dock and freezer	Loading bays serving both	The hardest duty cycle. Thermal cycling drives most failures.

The band you operate in should be stated in the enquiry. A quotation for –18 °C equipment used at –30 °C will fail early, and the failure will usually be blamed on the manufacturer rather than the specification.

3. What actually fails below –20 °C

3.1 Hydraulic oil

Standard ISO VG 46 hydraulic oil becomes too viscous to flow properly at low temperature. Symptoms are slow lift, jerky descent, and pressure spikes that damage seals and pump internals.

What to specify: low-temperature hydraulic oil rated for the operating temperature, for example a synthetic or semi-synthetic ISO VG 32 or lower with a pour point well below the lowest ambient the truck will see. Confirm the pour point on the datasheet, not just the viscosity grade.

3.2 Seals and hoses

Nitrile (NBR) seals stiffen and lose elasticity. At low temperature they stop sealing properly and start weeping, especially on lift cylinders and steering rams.

What to specify: low-temperature rated seal material, and hoses rated for cold flex. Silicone or low-temperature nitrile compounds are common choices. Ask what the seal compound is, not just whether it is "cold store rated".

3.3 Battery

Lead-acid capacity falls sharply with temperature. A battery rated 100 Ah at 25 °C may deliver only around 60 to 70 percent of that at –20 °C. Charging also becomes problematic: a cold battery will not accept a normal charge profile, and charging in a warm area then moving to a freezer causes condensation inside the compartment.

Lithium (LiFePO₄) holds capacity better at low temperature and has a much flatter discharge curve, but most lithium packs must not be charged below 0 °C. This single constraint drives most of the practical differences between the two options.

What to specify: either a battery sized with the derating factor applied, or a lithium pack with a low-temperature charge strategy and a defined charging location.

3.4 Steel toughness

Carbon steel transitions from ductile to brittle behaviour as temperature falls. Common structural steels have a transition range that can sit close to –20 °C to –30 °C depending on grade and thickness. Brittle failure is sudden and does not give warning.

For deep freeze and blast freezer work, ask what steel grade is used in the mast and chassis, and whether impact testing at the operating temperature is available. This is one of the questions that separates a genuine cold store build from a standard truck with a heater.

3.5 Condensation and the thermal cycle

A truck moving from –25 °C into a +15 °C dock, and back, gains and loses moisture continuously. Water condenses inside the mast channels, inside electrical enclosures and on cold metal surfaces. Combined with salt or food acids on the floor, this is the main driver of corrosion in cold store fleets.

4. The specification checklist

Use this as the basis of your enquiry. Each line is something a supplier can answer specifically.

Hydraulics

Low-temperature hydraulic oil, pour point below lowest operating temperature

Cold-flex hoses

Low-temperature seal compound on lift and steering cylinders

Electrical

Controller and wiring rated for the temperature band

Heated or sealed display where the operator reads it

Insulated and heated battery compartment, if lead-acid

Battery and charging

Capacity calculated with low-temperature derating applied

Defined charging location and temperature

For lithium: low-temperature charge protection and warm-up strategy if charging below 0 °C

Structure and finish

Steel grade suitable for the band, with impact test evidence for deep freeze

Surface preparation and coating suitable for wet, salty or acidic floors

Stainless or galvanised options where washdown or food acids are present

Operator environment

Heated cab with demisting, if the operator stays inside for a full shift

Heated seat and handgrips for open trucks

Anti-fog lighting and windows

Service

Spare parts availability for the specific cold-rated components

Service intervals appropriate to the duty cycle, not the standard schedule

5. Duty cycle: the number most quotations get wrong

A cold store truck often works fewer hours per shift than a general warehouse truck, but each hour is harder. Two factors to calculate before specifying:

Thermal cycles per shift. Every trip through the dock door is a thermal cycle. Count them. A truck doing 40 door passes per shift is doing 40 thermal cycles, which is a different maintenance proposition from a truck that stays inside.

Condensation dwell time. Time spent in the warm zone is when condensation forms. Minimising dwell time is often more valuable than any single component upgrade.

Where the operation allows it, dedicating trucks to the freezer and using a transfer arrangement at the dock is usually better than running the same trucks in and out. It costs more equipment but far less maintenance.

6. Comparing quotations

Two quotations for a "cold store forklift" can differ by a large factor and still look similar on a specification sheet. Check for these specific lines:

Item	Standard truck	Cold store build
Hydraulic oil	ISO VG 46 standard	Low-temperature, stated pour point
Seal material	Standard NBR	Low-temperature compound
Battery capacity	Rated capacity	Rated capacity with derating stated
Charging	Any location	Defined location and temperature
Steel grade	Not stated	Grade stated, impact test if deep freeze
Cab	Optional	Heated, demisted, insulated
Coating	Standard	Specified for wet or acidic floors
Warranty on cold components	Usually excluded	Should be stated explicitly

A quotation that does not address the battery derating and the charging temperature is incomplete, regardless of the price.

7. Common mistakes

Specifying to the average temperature rather than the lowest. Equipment fails at the minimum, not the average.

Ignoring the dock. Most cold store fleet problems originate at the door, not inside the freezer.

Buying a standard truck and adding a heater. The heater addresses the operator, not the hydraulics, seals, battery or steel.

Charging lithium below zero. Most lithium packs will accept charge below 0 °C only with specific protection. Doing it without is a fast route to a failed pack.

Assuming a higher price means a proper cold store build. Ask for the specific component list. Price alone does not tell you what is inside.

Not planning spare parts. Cold-rated seals, hoses and oil are not always available locally. Establish supply before the first failure, not after.

8. Choosing the truck type for a cold store

The temperature band determines the components. The operation determines the truck type.

Operation	Typical choice	Why
Pallet movement in freezer aisles	Electric pallet truck, cold-rated	Lowest cost per pallet, simple maintenance
Stacking to 3-6 m in a freezer	Electric stacker, cold-rated	Reach and lift without a large footprint
Loading and unloading trailers	Counterbalance, cold-rated	Needs lift height and outdoor capability

Operation	Typical choice	Why
Very narrow freezer aisles	Reach truck or three-way	Aisle width is usually the constraint, not load
Repetitive point-to-point	AGV, cold-rated	Only where the route is stable and volumes justify it
Blast freezer or -40°C	Purpose-built, discuss with manufacturer	Standard platforms are not suitable

For narrow aisle work, the aisle width calculation is normally done before the truck selection. See the aisle width article for the method.

9. Questions to ask a supplier

1. What is the pour point of the hydraulic oil you are quoting?
2. What is the seal compound on the lift and steering cylinders?
3. What battery capacity do you guarantee at our lowest operating temperature?
4. At what temperature may the battery be charged, and where?
5. What steel grade is used in the mast and chassis?
6. Is impact testing at operating temperature available for deep freeze?
7. Are the cold-rated components covered by the warranty, and for how long?
8. What spare parts should we hold on site from day one?

A supplier who can answer all eight is quoting a cold store truck. A supplier who can answer three is quoting a standard truck.

10. Summary

Cold store specification is about four systems: hydraulics, battery, steel and moisture. Get those right and the truck performs. Get any one wrong and the failure will appear within the first year, usually at the dock,

usually in a way that looks like a manufacturing defect.

The practical approach:

1. State the lowest operating temperature, not the average.
2. Count the thermal cycles.
3. Specify the four systems explicitly.
4. Compare quotations line by line, not on price.
5. Decide the charging strategy before ordering, not after.
6. Hold cold-rated spares from day one.

This whitepaper is published by WR Forklift (Taizhou Worui Warehousing and Logistics Equipment Co., Ltd.) as general guidance for cold store equipment selection. Specific applications vary; confirm the final specification with your supplier against your actual operating conditions.

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