

# REFRIGERATED CONTAINERS

## HOW DOES A REEFER CONTAINER WORK?



A reefer container, or refrigerated container, is a specialized shipping container designed to transport perishable goods that need to be kept at a specific temperature.

Here's how it works:

### 1. Insulated Structure

- **Thermal Insulation:** Reefer containers are built with insulated walls, doors, floors, and roofs to minimize heat exchange with the external environment. The insulation helps maintain a stable temperature inside the container, even if the outside temperature fluctuates.
- **Interior and Exterior Walls:** The container has stainless steel walls inside to make it easy to clean and prevent odor absorption, while the exterior is typically made from steel for durability.

### 2. Refrigeration Unit

- **Compressor, Condenser, and Evaporator:** A reefer container has its own refrigeration unit, which consists of a compressor, condenser, and evaporator.
  - **Compressor:** This component compresses refrigerant gas, which then flows through the condenser.
  - **Condenser:** The hot gas is cooled down and converted into a liquid in the condenser.
  - **Evaporator:** The liquid refrigerant is then expanded and evaporates in the evaporator, absorbing heat from the container's interior and lowering the temperature inside.
- **Temperature Control System:** The unit includes a thermostat that allows users to set and control the temperature. The system can cool, freeze, or even heat the cargo to maintain a specific temperature.

### 3. Airflow and Circulation

- **Air Ducts:** Reefer containers have air ducts that circulate cool air evenly around the cargo. Cool air is blown from the refrigeration unit and flows under the cargo through a T-bar floor, then rises up, ensuring consistent cooling.
- **Ventilation Settings:** Certain types of cargo, like fresh fruits and vegetables, release gases and may require ventilation to remove any build-up of gases like ethylene. The ventilation openings can be adjusted or closed to suit the cargo type.

### 4. Humidity and Controlled Atmosphere Options

- **Humidity Control:** Some reefers have humidity control options, allowing them to maintain specific humidity levels, which is essential for products like fresh produce or flowers.
- **Controlled Atmosphere (CA) Technology:** For highly perishable items, advanced reefer containers may include CA technology, which controls oxygen, carbon dioxide, and nitrogen levels, slowing the ripening of fruits and vegetables to extend their shelf life.

## 5. Power Supply

- **Electric Power:** Reefer containers require a continuous supply of electricity to operate the refrigeration unit. They are usually powered by the ship's generator when on board, connected to an external power source at the port, or supplied by a diesel-powered generator during road transport.
- **Backup Generators:** Diesel generator sets (gensets) are often used as backup power sources, especially in remote or transit areas where a direct electrical connection might not be available.

## 6. Monitoring and Alarms

- **Temperature and Alarm Systems:** Many reefer containers come with monitoring systems that record temperature, humidity, and other parameters. They can alert the operators if temperatures go outside the set range, helping to prevent spoilage.
- **Telematics and Remote Monitoring:** Modern reefers may have telematics that allow for remote monitoring and control, enabling operators to track the container's status, temperature, and location in real-time.

## Summary of Reefer Container Operation

- The reefer container maintains a constant temperature by using a refrigeration cycle that cools the inside and circulates air evenly.
- Insulation minimizes temperature changes from outside.
- The container is powered by electricity and can be equipped with sensors and alarms to monitor the temperature, humidity, and other conditions throughout the transport process.

Reefer containers are critical for transporting perishable goods over long distances, ensuring they arrive fresh and unspoiled.

### ModalART Reefer Guide:

<https://modalart.com/reefers.htm>