AIRE Bulletin

Plastic Pallets: Fire Hazards of Indoor Use and Storage

Plastic pallets are increasingly used across industrial and commercial operations due to advantages such as reduced weight, extended service life, washability, and resistance to moisture, pests, and chemical contamination. These benefits support hygiene, automation, and logistics efficiency objectives.

However, from a fire protection and property risk perspective, plastic pallets present a materially different and often more severe fire hazard than traditional wood pallets—particularly when stored indoors or in high stacks. Organizations transitioning from wood to plastic pallets frequently underestimate the fire load impact and the implications for existing sprinkler protection and emergency response capability.

Fire and Combustion Hazards

Plastic pallets, typically manufactured from polyethylene (PE), polypropylene (PP), or composite polymers, exhibit higher heat release rates, faster flame spread, and significant melting and dripping behavior when exposed to fire conditions.

Key hazard characteristics include:

- Higher fire intensity compared to wood pallets, often exceeding the suppression capability of sprinkler systems designed for ordinary combustibles.
- Rapid fire growth, particularly in idle pallet stacks where air entrainment is unrestricted.
- Molten polymer pooling, which can extend fire spread beyond the original storage footprint.
- Increased smoke production, affecting visibility, tenability, and firefighter intervention.

Under modern fire protection standards, plastic pallets stored indoors are treated as a higher-challenge plastic commodity, which directly impacts sprinkler design density, discharge duration, ceiling arrangements, and storage height limitations.

Storage Configuration

The overall fire risk associated with plastic pallets is highly sensitive to storage configuration. The following conditions significantly increase potential fire severity and loss exposure:

Key hazard characteristics include:

- **High stack heights,** which accelerate plume development and challenge ceiling level sprinkler performance.
- **Dense pallet storage arrangements,** limiting effective water penetration into the fire core.
- **Indoor accumulation of idle pallets**, especially adjacent to production or active warehouse operations
- **Insufficient separation distances** from walls, columns, roof structures, and building openings.
- **Absence of in-rack or ESFR sprinkler protection**, where required based on commodity classification.

Most existing sprinkler systems, particularly those originally designed for wood pallets or Class I–III commodities, are not engineered to control the elevated heat release rates and rapid-fire growth associated with stacked plastic pallets and may require system reclassification, density increases, or enhanced suppression technologies to achieve effective fire control.

Outdoor Storage Guidelinesy

Where operationally feasible, outdoor storage remains the preferred risk control for empty plastic pallets.

Recommended outdoor controls include:

- Store pallets in a designated, fenced yard at a safe distance from buildings, canopies, and egress routes.
- Maintain clear separation from fuel tanks, transformers, and other ignition sources.
- Remove nearby combustible vegetation, cartons, packaging debris, and waste.
- Limit stack heights and ensure stable stacking arrangements to prevent collapse.
- Restrict access and visibility to deter unauthorized use, vandalism, or arson.
- Keep pallets away from vehicle impact zones, including forklift and truck traffic.

Outdoor storage areas should be evaluated as part of the site fire risk assessment and included in emergency response preplanning.

Indoor Storage Guidelines

Where indoor storage of plastic pallets is necessary, a layered risk management strategy should be implemented, incorporating engineering solutions, administrative oversight, and procedural safeguards.

Fire Protection Measures

- Confirm sprinkler system adequacy based on c**ommodity classification, pallet material, pallet configuration, and maximum stack height.**
- Upgrade protection where required, including:
  - Increased sprinkler density
  - Use of ESFR or in rack sprinklers
  - Revised sprinkler head temperature ratings
- Verify water supply duration and pressure under plastic commodity demand scenarios.

Storage Management Controls

- Limit indoor pallet quantities and avoid long-term idle storage.
- Do not store idle pallets in racks.
- Enforce minimum clearance distances from walls, roof structures, lighting, and HVAC.
- Segregate pallet storage from occupied process areas where feasible
- Use dedicated pallet storage rooms or detached structures designed specifically for plastic commodities.

Operational and Governance Controls

- Implement formal pallet management programs (tracking, rotation, disposal)
- Train operations and maintenance staff on fire risk implications
- Review pallet material specifications (reinforced, flame-retardant, open deck vs. solid)
- Integrate pallet storage into site fire load calculations and loss prevention reviews.

Conclusion

Plastic pallets offer operational benefits but introduce elevated and fundamentally different fire hazards, particularly indoor storage configurations. Effective risk management requires recognizing these hazards early, aligning storage practices with modern fire science, and ensuring that sprinkler systems and facility layouts reflect current standards and real fire performance behavior.

Engaging qualified risk engineering resources prior to pallet conversion or storage expansion can materially reduce the likelihood of a severe fire loss and unplanned business interruption.

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