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SAE J2601 Simplified:

The Engineer's Checklist for Heavy-Duty HRS

SAE J2601

As the hydrogen fuel cell vehicle market expands, particularly for heavy-duty transit buses and vehicles, the need for a standardized fueling protocol becomes increasingly crucial. SAE J2601 serves as the cornerstone for ensuring safe, efficient, and consistent fueling practices across the industry. This standard provides a comprehensive set of guidelines that define the performance requirements and safety limits for gaseous hydrogen fuel dispensers, specifically catering to the unique demands of heavy-duty vehicles.

The significance of SAE J2601 lies in its role as a performance-oriented

document that offers guidance to fueling system builders, manufacturers of gaseous hydrogen-powered heavy-duty transit buses, and operators of hydrogen-powered vehicle fleets. It outlines the necessary conditions for achieving a full fill or 100% state of charge (SOC) in the vehicle's tank storage system, without being overly prescriptive about the methods to reach these goals.

By adhering to SAE J2601, heavy-duty hydrogen refueling station (HRS) OEMs can ensure that their systems are capable of safely fueling vehicles with a combined vehicle CHSS capacity larger than 10 kilograms, which includes most transit buses. The standard also harmonizes with

the fueling assumptions used for on-board fuel systems provided by gaseous hydrogen transit bus manufacturers, ensuring compatibility and safety across different components and systems.

In essence, SAE J2601 is not just a set of technical specifications; it's a blueprint for the future of hydrogen fueling infrastructure for heavy-duty vehicles. It supports industry growth by providing a clear and consistent framework that promotes safety, reliability, and customer confidence in hydrogen fuel technology.



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The checklist to serve as a quick yet comprehensive reference

This checklist is designed to serve as a quick yet comprehensive reference for engineers to evaluate and enhance their heavy-duty hydrogen refueling stations, ensuring they meet the rigorous standards set by SAE J2601. Keep this list at hand to systematically verify compliance and elevate the safety, efficiency, and reliability of your refueling solutions.



- Dispenser Performance Standards:** Confirm that dispensers provide fueling at 35 MPa for heavy-duty vehicles and achieve 100% SOC as per SAE J2601.
- Ambient Condition Adjustment:** Adjust fueling protocols to ambient temperature conditions to prevent over-temperature and over-density conditions.
- Safety Limits Adherence:** Integrate safety limits into dispenser designs, ensuring MAWP and NWP do not exceed -40 to 85 °C for temperature and 5 MPa to 43.8 MPa for pressure.
- Dispenser Performance Validation:** Perform field testing to ensure dispenser fueling protocols meet the fueling limits for the operating fleet within temperature, pressure, and SOC limits.
- Pressure Condition Management:** Ensure dispensers can handle CHSS capacities over 10 kilograms, denoted as 'H' followed by the pressure in MPa, such as H35.
- Operational Staff Training:** Train personnel on operational parameters, safety procedures, and emergency protocols to manage the refueling process effectively.
- Communication Protocol Implementation:** Establish communication protocols for critical information exchange, including error checking and fail-safe fault control.
- Emergency Shut-off Systems Installation:** Equip dispensers with ASOV and ESDS to isolate the hydrogen supply in case of safety incidents.
- Refueling Process Control:** Design fueling algorithms to keep the process within the ambient temperature range of -40 °C to +45 °C and dispenser sensor pressure below 125% NWP.
- Integrity Testing Protocols:** Conduct 'Integrity Validation Test' before fueling to ensure leak-tightness, monitoring the pressure change over time (dP/dt) to detect leaks.

●● SAE J2601 provides a foundation in supporting the industry's development while ensuring users' safety and reliability. ●●

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