

Impact analysis and optimization of tie-down device for radioactive material transport container

In order to ensure the safe transportation of radioactive materials, it is necessary to design a safe and reliable tie-down device that meets the requirements of transportation organizations. Considering the load and space constraints of transport vehicles, the size and weight and freight volume of transport containers, the tie-down device should be designed as lightweight and miniaturized as possible. In addition, the good matching between the front and rear transport links should be taken into account to facilitate the transfer, fixation, loading and unloading operations.

In this paper, the design of tie-down device for square radioactive material transport container is carried out: The tie-down device is mainly composed of base, rotary lock and linkage operation board. Four locating pins matched with the bottom of the container are designed at the four corners of the base. It plays the role of guiding and locating, and it restrains and limits the horizontal direction of the transport container; Two rotary locks are designed in the middle of two sides of the base. The two rotary locks are rotated by 90 degrees to clamp the bottom beam of the transport container, so as to restrict and limit the vertical direction of the transport container. The two rotary locks are operated by a linkage control panel, which can realize synchronous locking and unlocking operation simply and quickly; Anti-loosening grooves and limit pins are designed on the linkage control board, which can ensure that the rotation lock will not be loosened due to the loosening of the linkage control board during transportation.

In order to further optimize the operation, combined with the mechanical simulation calculation and analysis, the maximum acceleration factor generated in the transportation process is used as the verification safety factor for modeling and calculation. Through the comparison of stress, strain and other parameters, the iterative optimization design is carried out: Four corners of each base are provided with a shaft seat, wherein every two are coaxial; The two rotary lock shafts can penetrate through the shaft seats of all the bases along the arrangement direction, so as to realize rotatable connection; The rotary lock shaft is provided with pressing plates, and the position of pressing plates is changed by rotating the rotary lock shaft, so that the pressing plates is attached to or separated from the bottom beams of the transport container, thereby restraining and limiting the vertical direction of the transport container, and two rotary lock shafts can realize the linkage fastening of a row of transport containers. Handles are arranged at both ends of the rotary lock shaft, and quick pins are arranged on the handles which are used for matching with the bases to prevent the accidental rotation of the rotary lock shaft from causing the tethering device to fail. This scheme reducing the difficulty and time of fastening operation.

The tie-down device is installed in a 20 ft container by anchor bolts, welding or other alternative ways. The 20 ft is a open-top fully enclosed container, the transport containers to be hoisted in and out of the box from the top. The two ends are provided with door opening design, the operator avoids entering the container to carry out multiple fixing operations in a narrow space, but can complete the fastening operation outside the box body. The container meets the needs of multimodal transport by sea, highway and railway.

Country or International Organization

Instructions

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Track Classification: Track 2 Safety and Security by Design - Regulatory and Industry Perspective