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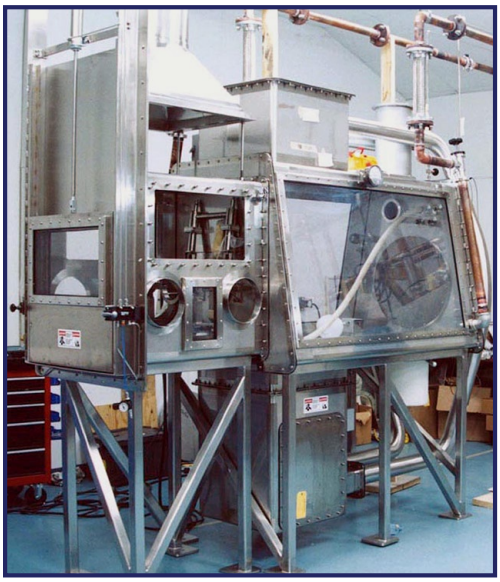
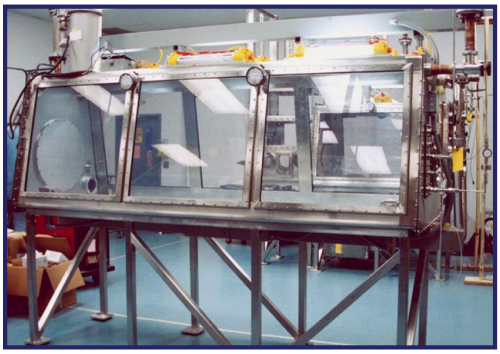
Device Assembly Facility Glovebox Line

Bechtel Nevada Corporation
Los Alamos National Laboratory
Lawrence Livermore National Laboratory
Nevada Test Site - Mercury, Nevada

■ ENGINEERING ■ ARCHITECTURE ■ DESIGN-BUILD ■ GEOSPATIAL SOLUTIONS ■ SURVEYING

Merrick & Company served as the primary engineering firm for the design of the first gloveboxes to be installed inside the Device Assembly Facility (DAF) located at the Nevada Test Site (NTS). The glovebox line is intended to support operations of the Joint Actinide Shock Physics Experimental Research (JASPER) program under development by Lawrence Livermore National Laboratory (LLNL). Merrick developed the detailed glovebox system design which included an inert atmosphere glovebox, a downdraft, laminar airflow glovebox, introductory hood, and inert gas ventilation system. The glovebox system design was developed in support of Bechtel Nevada Corporation, Lawrence Livermore National Laboratory, and Los Alamos National Laboratory.





The DAF was originally constructed in the mid-1980's at a cost of $100 million for the consolidation of all nuclear explosive assembly functions. Since underground nuclear weapons tests are no longer conducted, the DAF is available to fulfill other purposes.

JASPER is a program employing an experimental technique using a two-stage gas gun. The gas gun will fire a projectile at special nuclear material (SNM) target at velocities greater than 2 km/s for measuring the properties of the SNM under extreme conditions including high pressure, temperature, total strain, and strain rate. The Merrick-designed glovebox system is required for the final assembly of the SNM target into the JASPER target subassembly. The final assembly cannot be conducted at LANL or LLNL plutonium facilities because of the inherent risks of target misalignment that may occur during transportation to the Nevada Test Site (Able Site).

Merrick designed the glovebox line to assemble the SNM targets with the JASPER target assembly. To adequately control the technical aspects of the glovebox design and to ensure that all safety hazards have been accounted for, Merrick employed a systems-engineering approach to the design of the DAF's first glovebox system. Recognizing that the first gloveboxes in the DAF will set the standard for glovebox design and fabrication at the facility, Merrick developed the design using standard components utilized at both LANL and LLNL. Merrick also took the initiative to design the gloveboxes using an approach that would allow the gloveboxes to be re-used for other plutonium-handling operations once the JASPER program is complete. In addition, Merrick designed the inert gas delivery system to support ventilation of the gloveboxes. Unique considerations associated with this project include interfacing with multiple users (LANL and LLNL), incorporating glovebox standards from both DOE sites, and incorporating flexibility into the design for future use.

The glovebox system consists of three gloveboxes and a dri-train, inert gas ventilation system. The first glovebox is a target assembly glovebox where the SNM targets would be assembled and dimensionally inspected. A double-door transfer system was installed into the target assembly glovebox to transfer the assembled targets to the downdraft glovebox. The downdraft glovebox was physically separated from the target assembly glovebox due to space considerations inside the facility. The downdraft glovebox was also equipped with a double-door transfer system to receive the targets. The downdraft glovebox was designed for laminar airflow and for inert atmosphere ventilation to mitigate the potential contamination of the target assembly with radioactive particulate. Attached to the downdraft glovebox was an introductory hood which allows operators to insert the target assembly that receives and contains the SNM targets. Merrick developed an airlock device and handling mechanism to be installed inside the introductory glovebox to allow for safe transfer of the targets into the target assembly without releasing radioactive particulate outside the confinement.