Main Hall, Union Station

Washington, DC

Relied upon since 1908, Washington D.C.'s Union Station is both a landmark and a Mid-Atlantic transit hub. The principal architect of 1893s World's Fair, Daniel H. Burnham, designed Union Station in the Beaux Arts- style. Union Station's design is credited with having inspired much of the Washington D.C.'s monumental architecture. Listed on the National Register of Historic Places in 1969, the aging structure attracts an unbelievable 90,000 visitors on a daily basis for train, bus and subway transport.

Union Station was designed with the Main Hall at the entrance. It greets patrons as they arrive and depart from the capital city. The size of the hall is majestic. At its peak, the dome is 96 feet above the marble floor below. The sheer vastness of the room taunts the eye to look up and take notice of the historical details. Roman statues stand guard above and stained glass windows shower a soft glow below. Visitors are often caught snapping pictures with their cameras and cell phones. Union Station has a dedicated Instagram account sharing these photos.

Much of Union Station's Main Hall was under heavy construction during 2014. The hall was dissected into five bays and contractors evaluated the project's unique installation requirements and bid accordingly. Norwood Environmental Systems, Inc. of Upper Marlboro, Maryland worked with Waldron of Maryland and won the contract to replace the HVAC ductwork in four of the five bays over the dome in the Main Hall. (At the time of publishing, Bay #5 was still in planning.)

Safety

Over time, Union Station's ornate plaster ceiling had weakened with age. The 2011 earthquake measuring 5.8 on the Richter Scale exposed a significant safety risk when pieces of the ceiling fell below. One event involved a restaurant employee. Before Norwood could begin its HVAC system installation above the dome, the plaster ceiling was strengthened and secured.

In addition to hard hat and fall safety regulations, an above-head protective net was installed to mitigate future incidents. During the renovation of Bay 3, a significantly stronger netting was placed over the Main Hall's centrally located restaurant. The same technology used to protect the vice president during the US Presidential Inauguration in 2008 was used to construct the heavy safety netting suspended between the renovation and the restaurant patrons below. As the renovation moved from bay to bay, the scaffolding and safety precautions followed. It was obvious that strict and organized safety protocols were necessary for this public jobsite to remain accident-free.

Material Logistics

The Main Hall of Union Station remained open throughout renovation. Union Station bustled with more than 100 specialty retail shops, 35 food establishments, and 100,000 square feet in office space. As such, material delivery and installation involved a complex schedule and extensive coordination with the factory.

The location above the Main Hall's dome where the duct was to be installed is 115 feet high above the floor. Contractors accessed the workspace by navigating two levels of tall scaffolding tied together by a web of narrow ladders. It was impossible to carry the ductwork up these ladders. Norwood and building engineers were challenged to devise the best method of delivery. Site officials quickly observed that delivery during operational hours was unfeasible.

Project officials were also forced to evaluate the materials themselves. The system was designed to include round ductwork with outside diameters of up to 32". Specifications called for 2" double wall, or insulated, ductwork because the space is unconditioned. These specifications made the rigid materials heavier than single wall round ductwork. Thousands of pounds of ductwork was required and getting the material above the arched ceiling proved challenging. As that labor was inescapable it was critical to Norwood to utilize a system which would save them installation labor costs in the assembly process. Linx Industris, Inc., the ductwork manufacturer, sent representatives to visit Union Station and evaluate the project's challenges.

Two solutions were devised. Both methods were difficult, restrictive, and could only be performed at night. The first involved a 4' x 8' opening in the scaffolding floor.

Norwood used a pulley system to shuttle pieces between the ground floor and the levels of the scaffolding. According to C. Vernon Norman, president of Norwood Environmental Systems, his crew was just one of many trades who found the pulley useful for material delivery.

The second method employed the office elevator. Ductwork sections were deliberately fabricated by Linx or cut onsite to fit into the elevators. It was to the installers benefit that the smaller sections made the metal duct easier to handle. Both methods required 26" x 75" doorways to be cut into the historic building's plaster walls to reach above the dome for the HVAC repairs.

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Installation

Jobsite materials were staged high above just outside the dome and on the scaffolding. Once the ceiling was deemed safe, Norwood's installation crew tore out the old duct system and replaced it with Linx Double Wall with the Lindab Safe gasket system. Modifications were made onsite and coordinated with the duct manufacturer in order to accommodate prefabricated duct supports and space constraints. "This project came with unusual design and fabrication needs. Linx has been great meeting these needs," said Norman.

One installer noted how much easier it was to install with a gasketed connection. The narrow space in the dome was hot, humid, and not for those adverse to heights. Linx's gasketed system proved easier to install and because it does not require sealing at connection points, the crew saved valuable time. It would have been difficult if installers were required to paint sealant around the entire circumference of the installed duct. Not only was the cost of the external duct sealants saved, but also the cost and hassle of getting the buckets of sealant up above the ceiling.

In Hindsight

The HVAC renovation at Union Station's Main Hall held unusual safety, logistic and design challenges because of the buildings age, importance, and public nature. The project was successful because of the high-level coordination between the engineers, architects, Norwood Environmental Systems, and Linx. The renovated Main Hall is a historic treasure for Washington DC, a transit hub for commuters, and showcase of cooperation for both Norwood and Linx.

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