

CASE STUDY

# Federal Dirksen Building



Perimeter Induction Unit Replacement



## CASE STUDY - FEDERAL E. M. DIRKSEN BUILDING

# Background



The Dirksen Building which was designed by the famous architect Ludwig Mies van der Rohe and was originally constructed between 1959 and 1964. The building is 383' high and features 30 floors above ground, has a gross area of more than 1.4m sqft occupying a full City block in the heart of the Chicago Loop. The building is home to the U.S. District and Bankruptcy Courts, Court of Appeal along with many other tenants. The overall operation of the building is the responsibility of General Services Administration (Great Lakes - District 5)

In 2009, Turner Construction, SOM architects (Skidmore, Owings & Merrill), ESD engineers (Environmental System Design) and Great Lakes Heating & Plumbing Mechanical Contractors were appointed to renovate this building for GSA under the American Recovery and Reinvestment Act (ARRA).

While the design team was tasked with delivering an energy efficient and sustainable building, the biggest obstacle to overcome was that the renovation had to take place whilst the building was still occupied by its tenants, therefore a full scale upgrade to the existing perimeter induction system had to be undertaken.

The project team had to consider whether to just replace the existing system components with a like-for-like performance or to seek higher energy efficiencies and therefore several manufacturers including Carrier (manufacturer of original PIU) and Canadian Rosemex were considered. After a full design review and site mock-up it was determined that DADANCO superior product performance, technical support and manufacturing capabilities provided the best energy savings within the overall time, cost and project constraints.

# The Project

## Key requirements

1. Undertake renovation while the building was still occupied and therefore continue to provide comfort as well as minimizing disruption to existing tenants.
2. Replace perimeter induction units (PIUs) with 5103 new high efficiency DADANCO HEPIUs.
3. HEPIUs must fit into existing enclosures as well as matching the pipe and duct connections of the old Carrier 36SL PIU
4. Achieve quieter operation while still delivering cooling and heating capacity.
5. Performance of the PIUs had to be independently tested and confirmed.
6. Improve energy efficiency over existing system by 30%

As the building has been in operation since 1964, most of the HVAC equipment was approaching the end of its working life. The scope of the project was to replace AHUs, fans, perimeter induction units and all other equipment necessary for seamless, efficient operation of the new HVAC system.

While the requirements and demands of renovating a perimeter induction system are generally known and understood, undertaking and managing this process while the building was still occupied added to the complexity of a project of this magnitude.

Technically, several challenges were looming:

DADANCO HEPIU delivered the required cooling and heating performance by utilizing less primary air at a lower static pressure. Although those are very desirable features from energy savings perspective, balancing airflow on newly



*Federal Dirksen Building houses Federal and State Courts and offices for judges and their staff.*

renovated floors with those that were not yet renovated presented significant management issue.

Previously during start-up of the building or on very humid days condensation would occur on the PIU's to such an extent that the drip trays would overflow causing damage to carpets and floors. The project design team needed to eliminate this ensuring that under normal operating conditions no condensation occurs again. It was therefore necessary to raise the chilled water temperature feeding the HEPIUs while maintaining the same cooling capacity as previously achieved.

The existing noise levels had to be reduced from the mid NC40's to levels needed to meet the current code requirement for modern office environments. Further reductions were necessary in the courts and judges chambers.

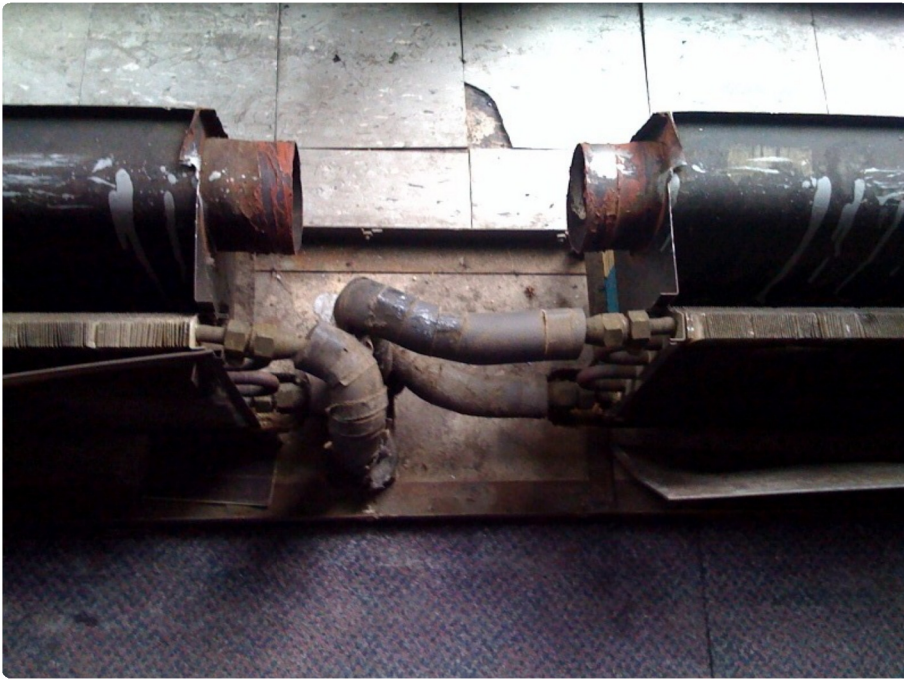




# The Installation

One of the main project requirements was to have a HEPIU which was a DIRECT replacement of the existing Carrier 36 SL PIU. The unit had to fit into the existing enclosures, be mounted using existing brackets, connect to the chilled water pipes and primary air

## Gallery 1.1 Induction Units



*Existing Carrier 36 SL units. Please note tight space for piping and duct*



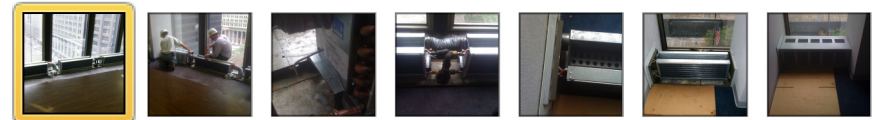
ducts without any modifications due to the limited space available within the tight enclosures and the requirement to minimize disruption to tenants.

DADANCO met the challenge head-on by providing a new HEPIU as a direct drop-in replacement for the existing Carrier 36 SL PIU, while still delivering enhanced performance needed to achieve new design criteria.

## Gallery 1.2 Trial run Installation of DADANCO HEPIUs



*Change-over of six HEPIUs complete within 1 hr*



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# Project Summary

Project name: Federal Everett McKinley Dirksen Building  
Location: 219 S Dearborn, Chicago, IL  
Building size: 1.4m sqft  
Scope: Overall retrofit  
Value: \$110m  
Duration: Sep 2009 - Sep 2012  
Energy Savings: 45% over original

Client: General Services Administration (GSA)  
Construction: Turner Construction  
Architect: Skidmore, Owins & Merrill (SOM)  
Engineer: Environmental Systems Design (ESD)  
Mechanical: Great Lakes Heating and Plumbing

HVAC: 5103 Perimeter Induction Units  
20 AHU units  
648 VAV boxes  
New BMS system

Quantity: 5103 Units  
Manufacturer: DADANCO  
Local rep: Windy City Representatives



### **DADANCO HEPIU benefits**

1. Reduced Primary Air flow by 30%
2. Reduced static pressure at the PIU by 1"
3. Increased Chilled Water temperature from 54F to 58F
4. Reduced noise level from NC 42 to NC 33
5. Matched existing pipework, ductwork connections, brackets and enclosure
6. 10 minute change-over from existing to new HEPIU