

Invest in Solid Engineering

COOL IT.

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In order to maximize space in the data center and accommodate for increased data, rack-mount enclosures are becoming populated with high-density servers and network equipment, causing a surge in kilowatt-hours of electricity and increased operating expenses. A well planned and managed airflow strategy is able to produce an efficient data center where utility consumption is reduced, IT equipment life is extended, and cost savings is realized in multiple areas of the data center.

Choosing to partner with Great Lakes provides access to a multitude of resources, including: CFD analysis; multi-functional enclosures; accessories to implement best practices; localized containment and advanced containment solutions; high-density cooling options; airflow solutions for industrial applications; and the integration of environmental monitoring products.

ENCLOSURES

Thoughtfully developed enclosures serve as the foundation for any cooling strategy. Great Lakes ES and EN enclosures are flexible and able to be upgraded to support heat densities from 4 to 30 kW, while simultaneously providing a platform for increased security, connectivity, and power needs.







ES

- Flexible enclosure that accepts all Great Lakes airflow solutions
- 24"W enclosure ideal for servers; 30"W for networking and dense cable applications
- Dedicated space in the rear for vertical cable troughs and PDUs—eliminates cable messes that block equipment exhaust
- 3300 lb. weight capacity to hold a full load of equipment
- The Flexible Mounting Profile (FMP) along the mounting rails create increased mounting space; installation of ZR brackets along the FMP accept 1 and 2 RMU equipment for mounting items such as patch panels

ΕN

- Designed to accommodate the unique airflow requirements of switch equipment from manufacturers such as Cisco
- Ideal to support high density cable applications
- Accepts accessories to support airflow best practices
- Identical enclosure height and profile for deployment alongside ES enclosures in containment applications
- The Flexible Mounting Profile (FMP) along the mounting rails create increased mounting space; installation of ZR brackets along the FMP accept 1 and 2 RMU equipment for mounting items such as patch panels

RETROFIT

- Typical containment requires enclosures of the same height be deployed in at least two rows of the same length—we can help make that happen!
- Adapt pre-existing, third-party enclosures to accept Great Lakes airflow products
- Modify third-party frames/doors to seamlessly deploy alongside Great Lakes enclosures

BEST PRACTICES

The segregation of cold and hot air inside the enclosure has been identified by industry organizations as the first step in achieving energy efficiency. Creating segregation and eliminating bypass airflow is obtained through implementing best practices: **filling** open RMU and cable knockouts; **reducing** hot spots; and **sealing** cable cutouts.





FILL IT

FILLER PANELS

- Fill empty RMU between rack mount equipment
- Multiple sizes and styles available
- Standard and tool-less metal panels, snap-in plastic panels for quick installation, and panels with brush grommet to allow cable pass-thru

BRUSH GROMMET RAIL KIT

- Brush extends from the rail to the side panel to allow cable pass-thru
- Prevents conditioned air from flowing around the rails
- Installs along the FMP of the mounting rails, but outside of the EIA pattern

BRUSH GROMMET KITS FOR CABLE PASS-THRU

- Cover cable knockouts on the enclosure top and side
- Brush allows cable pass-thru

REDUCE IT

DOOR FAN ASSEMBLY

- Eliminate hot spots that appear in one or two vertical locations in the rear of the enclosure
- Install at various heights along mesh contour door to expel exhaust

MESH CONTOUR DOOR

- Installation on enclosure front allows optimal amount of cold air to flow into the enclosure
- Installation on the rear allows exhaust to escape freely
- Accepts door fan assemblies

SPLIT FAN DOORS

- Alleviate multiple hot spots that appear in the rear of the enclosure
- Installation on the rear of the enclosure accelerates exhaust removal

SEAL IT

RAISED FLOOR GROMMETS

- Seal existing or new floor tile cutouts while still allowing cable pass-thru
- Increase under floor static pressure and improve air delivery through perforated tiles in the cold aisle
- Multiple sizes, shapes, and materials available

FOAMBLOCK

- Fill holes in the enclosure, between equipment, or in raised floor tiles
- Flexible 24" x 24" sheets can be separated and manipulated for problem areas

LOCALIZED CONTAINMENT

Together, the Adjustable Air Manager and Exhaust Chimney work to contain conditioned air and remove exhaust from the enclosure while virtually eliminating bypass airflow and hot air recirculation. The air manager or exhaust chimney can be used alone, however, when used in conjunction with best practices, the products create a "Localized Containment" solution. This solution eliminates the hot aisle and reduces the need for perforated tiles in the cold aisle. Depending on data center conditions, localized containment can be either passive or active.



PASSIVE

The adjustable air manager is mounted in the bottom of the enclosure and helps channel under floor conditioned air to the front of the rack mount equipment. As exhaust escapes from equipment into the rear of the enclosure, the exhaust will naturally rise upward toward the chimney so that it returns to the CRAC unit.

+ ACTIVE

When static pressure or airflow is too light, standard fan trays (600 CFM) or high flow fan trays (940 CFM) can be added to the air manager to increase airflow to the front of equipment. Chimney fan trays, available in standard (1200 CFM) and high flow (2260 CFM) versions, can be added to exhaust chimneys to accelerate the removal of exhaust from the enclosure.



A successful Localized Containment configuration utilizes a mesh front door, air manager, exhaust chimney, and solid rear door.

CONTAINMENT DESIGNS

Implementing best practices is the first step in achieving energy efficiency; however, building physical barriers around hot or cold aisles to create a containment solution further improves data center airflow. The complete separation of the hot and cold aisle has been shown to improve equipment reliability, increase cooling capacity, and in most cases, reduce power consumption. Combining Great Lakes containment products allow a number of configurations to be constructed, including:





CONTAINMENT ELEMENTS

Metal products manufactured by Great Lakes, when combined with airflow products from industry leaders, allow Great Lakes to provide an extensive range of containment solutions. Enclosure "walls" (used to create complete and even enclosure rows), aisle doors, and overhead options range from modular solutions for temporary "quick fixes" to semi-permanent solutions that are in place for any length of time.



ENCLOSURE "WALLS"

Floor Mount Rigid "Walls"

- Ideal in instances where there are data center obstructions (pillar) or an aisle faces the wall
- Fill gaps between enclosures, enclosures and the wall, or build panels around standalone enclosures

Enclosure Mount Rigid "Walls"

- "Walls" install on top of enclosures to create an even plane between enclosures of substantially different heights
- Typically necessary when horizontal containment panels are used

Adjustable Rack Gap Panels

- Enclose 10-60" wide gaps between enclosures
- Attaches to side panels magnetically for quick installation and removal
- Reversible for white or black panel

AISLE DOORS

Metal Aisle Containment Doors

- Great Lakes Aisle Containment Doors (ACD) enclose aisle widths of 48-72"
- Available in sliding or quick release (includes sliding and push option)

Polycarbonate Doors

- Double or single sliding doors and double or single pivot doors
- Available with an auto close or manual close option
- Built to support unique data center scenarios

Bi-directional Swinging Doors

- Install in a matter of minutes with twist-lock magnets
- Swinging hinges for easy open and close
- Door stops to hold the door open if necessary

Curtain Panels

- Economical solution to enclose aisles
- High grade vinyl curtains
- Easy to install and flexible to redeploy

OVERHEAD OPTIONS

Horizontal Panels

- Horizontal panels install across the top of enclosures
- Melt-away horizontal ceiling panels shrink and drop to the floor prior to fire suppression being activated
- Mechanical drop away ceiling panels fall when a signal from existing smoke or heat detection system is received

Vertical Panels

- Panels in cold aisle applications trap the cold air and keep it where it is needed—in front of enclosures to flow into equipment inlet
- Panels in hot aisle applications capture all enclosure exhaust so it naturally rises to the overhead return plenum

Rack Top Baffles

- Angle baffles (30°) recommended for cold aisle installations
- Vertical baffles (90°) for hot aisle installations
- Attaches magnetically to the top of the enclosure for quick installation and removal

CONTAINMENT SOLUTIONS



Great Lakes EN enclosures face an incomplete row of ES enclosures. The spaces between ES enclosures, left for future deployment of in-row cooling units, are filled with gap panels (1) while floor mount rigid walls (2) make the two rows even. Sliding polycarbonate doors (3) close the aisle off.



While the data center undergoes reorganization, modular airflow accessories are deployed in this cold aisle containment application. Rack Top Panels (4) help keep conditioned air in the aisle and vinyl curtain panels (5) seal the end of the aisle.



ES enclosures are deployed in rows with vertical containment panels (6) and metal aisle containment doors (7) to completely enclose hot aisle containment pods.

INTEGRATION SOLUTIONS

Configured enclosures from Great Lakes create a streamlined data center deployment that results in reduced freight costs, decreased on-site labor, and overall time and money savings. Purchased Great Lakes airflow accessories can be integrated into enclosures and accessories which cannot be installed prior to shipping (e.g. exhaust chimney) will be packaged and placed inside of the enclosure all at no additional cost.

As a premium service, accessories related to Building Automation Systems (BAS), Data Center Infrastructure Management (DCIM)*, and additional third party products can be installed. Customers can arrange to have components drop shipped or directly sourced by Great Lakes.

Configured enclosures can include the following:

- Environmental sensors
- Asset managers
- PDUs
- Intelligent door handles
- Patch panels
- KVM switches
- Rack mount consoles



*Please note that Great Lakes does not assist with software/ hardware installation and maintenance. **CFD** Prior to implementing any airflow solution, Computational Fluid Dynamics (CFD) software is able to provide visual insight into the airflow and temperature of the entire data center, as well as into individual enclosures. Software integration with thermal, power, and asset management tools allow the assessment of current data center performance, identification of **inefficiencies**, testing of **new design** concepts, and evaluation of **"what-if"** scenarios. Through on-site surveys and/or customer supplied data, an accurate report can be created to determine effective upgrades that result in increased PUE and equipment ROI.





1 INEFFICIENCIES:

- Over cooling
- Recirculation
- Obstructions in air delivery

2 NEW DESIGN IDEAS:

- Containment
- Aisle layouts
- IT hardware deployment
- Floor tile migration/movement

3 "WHAT-IF"

- CRAC unit failures
- Increasing IT load capacity
- Increasing temperatures in the data center

ALTERNATIVE SOLUTIONS



IN-ROW COOLING UNIT

In-row cooling units can serve as the sole source of conditioned air in small server and networking rooms. When high density heat loads are a concern in data centers, in-row cooling units can be deployed between enclosures to cool surrounding enclosures that have heat loads in excess of 30kW. Through the use of adjustable airflow baffles, in-row cooling units can focus air to adjacent enclosures or enclosures across the aisle. In-row units are 12 and 24" wide and occupy no more space than the standard enclosure footprint. The limited space needed for installation makes planning for future enclosure upgrades a simple task. Variable cooling technology is able to handle immediate cooling needs while increased cooling capacity can be reached when neighboring enclosures become denser.



HIGH DENSITY COOLING: ENHANCED CLOSED-LOOP

In partnership with ScaleMatrix, a San Diego co-location company, Great Lakes is able to offer an enhanced closed-loop enclosure capable of supporting up to 52kw of heat load. The enhanced closed-loop enclosure, coined Dynamic Density Control (DDC) by ScaleMatrix, is able to perform, function, monitor and operate in much the same manner as a full-size data center. The enclosure is integrated with air-handlers, access control, fire suppression, and capable of supporting high thermal densities while maintaining a low cost-ofownership. The enhanced closed-loop enclosure can be deployed throughout the entire data center, or it can be implemented as a stand-alone enclosure to house high density IT equipment. The enclosure is manufactured to NEMA 3 specifications, allowing the enclosure to be utilized in industrial and warehouse environments.

INDUSTRIAL

Great Lakes industrial Type 12, 3R, 4 and 4X enclosures can be outfitted with NEMA rated, UL listed air conditioning units to maintain safe operating temperatures when mounted in harsh indoor or outdoor environments. Vertical mount, top mount, and bottom flow AC units are available in numerous configurations capable of supporting anywhere from 1000 to 27000 BTU. Integration of digital controllers and thermal management packages allow remote management of the unit with expanded temperature and alarm ranges. Additional accessories include heat exchangers, filtered fans, low ambient packages, and condensate evaporators.





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