

COMPANY

McCusker-Gill

LOCATION

Charlestown, Massachusetts

SOFTWARE

**Autodesk® Fabrication Products
Autodesk® Building Design Suite**

After implementing Autodesk Fabrication products, our business increased dramatically, and we catapulted ahead of our competition. We would not be even close to the company we are now, without help from Autodesk Fabrication products.

— **Kevin Gill**
Chief Executive Officer
McCusker-Gill, Inc.

Create a competitive advantage

McCusker-Gill uses Autodesk fabrication products to more accurately detail and fabricate mechanical systems for a new hospital



Image courtesy of Partners Healthcare. Rendering by Perkins+Will.

The project

Founded in 1991, McCusker-Gill is a mechanical systems provider based in Hingham, Massachusetts. The firm's 2,970-square meter manufacturing facility produces over 3 million pounds of HVAC sheet metal ductwork per year. The firm is committed to providing value to its customers through ongoing investment in personnel, facilities, and technology. "Throughout the years we have been an early adopter of technology innovation, including new machinery, manufacturing processes, and software," explains McCusker-Gill's CEO, Kevin Gill. In 2000, the firm implemented Autodesk® Fabrication CADmep™ and Autodesk® Fabrication CAMduct™ software to control and help integrate its engineering and manufacturing workflows through the use of intelligent 3D models. "That was one of the smartest investments we ever made," says Gill. "It gave us the competitive advantage we needed and helped us become one of the largest sheet metal contractors in New England."

The firm recently used Autodesk Fabrication solutions for the detailing, fabrication, and installation of HVAC systems in a 23,200-square meter research and medical facility on Boston Harbor, for one of Boston's premier construction managers, Walsh Brothers Construction. Spaulding Rehabilitation Hospital, a member of Partners Healthcare and one of the largest rehabilitation facilities in the United States, is moving from its existing location in Boston to nearby Charlestown, on land formerly occupied by Charlestown Naval Shipyard. Perkins+Will has designed a new eight-story, 132-bed facility that will include space for physician administration, outpatient services, radiology, a pain management/medical clinic, a conference centre, medical library, family resource centre, and an aquatic therapy centre.

Use design-intent for more efficient and accurate building systems detailing and fabrication

The challenge

Like many medical or laboratory projects, the scope of mechanical work—and all the other building systems—was more complex. “There is more piping, more plumbing, more electrical, and more ductwork that needs to be coordinated,” says Dan Christensen, McCusker-Gill’s Director of Technology. “And the specifications are more stringent, which means a lot of specialty metal fabrication. Therefore, when developing our fabrication model, we needed the flexibility to create and modify specifications to suit the project.”

The solution

The project’s strict schedule necessitated just-in-time just-in-time manufacturing and delivery of prefabricated sub-assemblies were essential. “With Autodesk Fabrication products, the project was prebuilt and detailed using BIM,” says Christensen. “That model was then used directly for the fabrication of all ductwork components, helping us intelligently manufacture and deliver what was needed, when it was needed.” Modularised ductwork was fabricated, assembled, and packaged at McCusker-Gill’s factory, shipped to the job site, and simply lifted into place—minimising onsite fabrication, storage, and field labour.

McCusker-Gill relied on the extensive database of parametric ductwork patterns shared between the Autodesk Fabrication applications to help detail and fabricate the job according to the client’s project requirements—whether those called for standard galvanised steel or the welded 316 stainless steel that was required for many of the systems in the Spaulding Rehabilitation project. This library of real-world, specification-driven components helped the firm control the requirements of each fabricated component on the project and safeguard that what was designed was what was installed. McCusker-Gill also used Autodesk Fabrication CADmep for its own coordination to help proactively find and resolve issues between its fabrication model and other building disciplines competing for space in this complicated health care facility. “Use of this process, in close coordination with the Architect/Engineers design team allowed us to eliminate approximately 600 ceiling access panels from the patient room floors, resulting in a more seamless visual effect,” said Christensen.

Adopt model-based fabrication

McCusker-Gill used the Autodesk Fabrication CADmep model to examine and designate sections of the project that needed to be fabricated and shipped to the job site to stay on schedule. “Whilst he was on-site, the job foreman would review drawings with 3D views of the fabrication model, and mark up duct work that the installation crew needed in the coming days and weeks, colour coded by delivery date,” says Christensen. By visualising the project in 3D, the foreman was better able to “see” what was required for short-term installation, and communicate those requirements to the factory. “Based on this feedback, we scheduled the necessary production using the fabrication model and the CNC post-processors built into Autodesk Fabrication CAMduct software,” continues Christensen. “Fabrication lots went through the shop and items were palletised individually or assembled in sections. The pallets were then wrapped, labeled, and stored at the shop so they could be loaded and delivered at just the right time.”

McCusker-Gill used that same 3D fabrication model to better visualise the tight spaces and virtually coordinate the project. The firm’s coordination group imported BIM-based architectural, structural, and MEP design models as developed by Perkins+Will Architects and Thompson Consulting Engineers to perform clash detection between those major building systems and their own fabrication model. “As the use of BIM grows in the building industry, clashes are being discovered earlier in the design cycle or avoided altogether,” says Christensen.

“It gave us the competitive advantage we needed and helped us become one of the largest sheet metal contractors in New England.”

— Kevin Gill
Chief Executive Officer
McCusker-Gill, Inc.



Spaulding Rehab project viewed from Charlestown Navy Yard.

Streamline hanger installation

In addition to using Autodesk Fabrication CADmep for the prefabrication of modular sub-assemblies, McCusker-Gill also extracted information from the model for the fabrication and installation of hangers. Information such as hanger type, rod length, and rod diameter were extracted from the model for hanger fabrication. The prefabricated hangers were packaged, labelled, and shipped to the site, helping to minimise field labour.

“The Autodesk Fabrication CADmep model is so detailed that we can even output the data points of the hangers and download them into laser positioning devices that our crews use to help identify the exact location of the hangers on the job site,” says Christensen. “No more manual measurements using ladders. Now we just shoot hanger points using the laser. We can locate about 400 hanger points in eight hours, compared to 50 when doing it manually.” This use of the model to pre-install the hangers not only improves productivity, it also helps streamline the installation of the duct work, setting the stage for the efficient installation of pre-assembled duct runs.

Integrate Detailing and Fabrication Model-based processes helped McCusker-Gill bridge the gap between detailing and fabrication—enabling the firm to maximise modular fabrication capabilities, and minimise onsite fabrication.

“With assistance from Autodesk Fabrication CADmep, we knew that the sub-assemblies we fabricated in our factory would fit in properly when they were installed at the job site,” says Gill. “And by using a virtual fabrication model based on industry-standard, pressure-class content, we were able to easily model systems based on the project’s exacting material and manufacturing specifications.”

“Each service was identified as a unique line in the fabrication model, and the whole service was intelligently connected,” explains Christensen. “We could select the line and change attributes to the whole service with one click, helping to streamline the entire detailing process.” For example, using Autodesk Fabrication CADmep, a McCusker-Gill detailer would select the ‘Return HVAC system’ and change every component in that system from one material to another. The software

automatically replaced and re-sized all the ductwork, components, and connectors—down to the flanges, the welds, even the requisite nuts and bolts.

After detailing was completed, McCusker-Gill used the Autodesk Fabrication CADmep models to automatically output ductwork manufacturing to its production line, controlled by Autodesk Fabrication CAMduct. The software contains post-processors that support a variety of major machine manufacturers, including the two coil-fed plasma cutters and three welding stations on McCusker-Gill’s factory floor.

Support BIM workflows

McCusker-Gill recently implemented the Autodesk® Building Design Suite Ultimate and uses the software to manipulate Revit® design models for pre-construction planning and coordination. In addition, the firm uses Autodesk® Navisworks® Manage software to improve its coordination with other building systems and trades during the design, fabrication, and construction phases of its projects. “Autodesk Fabrication CADmep has built-in features that allows us to import CAD and BIM designs—including native Autodesk® AutoCAD® and Revit models—and help streamline our design-to-detailing-to-fabrication processes,” says Christensen. “As the project progresses, we use the Building Design Suite to help keep our fabrication models in sync with the other building models, and update them based on architectural or structural changes (for example), that may affect the original mechanical engineering design.”

The Autodesk Fabrication CADmep model is so detailed that we can even output the data points of the hangers, and down-load them into laser positioning devices that our crews use to help identify the exact location of the hangers on the job site. No more manual measurements using ladders. Now we just shoot hanger points using the laser. We can locate about 400 hanger points in eight hours, compared to 50 when doing it manually.

— **Dan Christensen**
Director of Technology
McCusker-Gill, Inc.

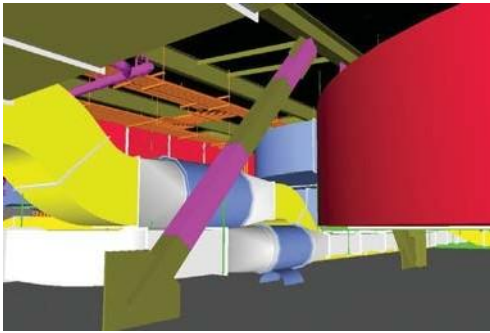
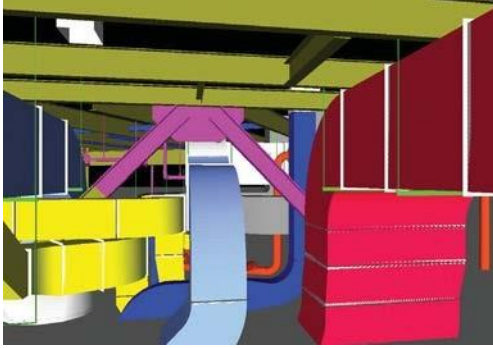


One of McCusker-Gill’s truck fleet delivers duct safely and protected from the elements.



Inventory of palletised and wrapped ductwork labelled and sorted for on time delivery.

Adopt model-based fabrication to better control manufacturing schedules, processes, and material costs



Images from Autodesk® Navisworks® showing coordination within mechanical room

The result

Construction of the new 23,200-square meter Spaulding Hospital project, slated for a spring 2013 opening, is entering its final stages, and McCusker-Gill's onsite installation of the mechanical system is finished. "Given the difficult schedule requirements on this project, we could not have completed the job as efficiently and cost effectively without Autodesk Fabrication software," says Christensen. "With support from the integrated detailing and fabrication tools within the Autodesk Fabrication applications, we were able to reduce the cost of this job from our original estimate by 8 percent."

"Autodesk Fabrication products help us better control our job schedule, manufacturing processes, and material costs," says Gill. "In the past we just kept ordering more metal, without really understanding the costs of a job," adds Christensen. "But with Autodesk Fabrication products, we can better know and predict—day by day—our material, labour, and machinery costs for any given project. Armed with this information, we can more accurately schedule our work force and material procurement and, more importantly, help keep and exceed the commitments we made to our clients."

"After implementing Autodesk Fabrication products, our business increased dramatically and we catapulted ahead of our competition," says Gill. "We would not be even close to the company we are now, without help from Autodesk Fabrication products."

For more information, visit www.autodesk.com/fabrication.

Given the difficult schedule requirements on this project, we could not have completed the job as efficiently and cost effectively without help from Autodesk Fabrication software. With support from the integrated detailing and fabrication tools within the Autodesk Fabrication applications, we were able to reduce the cost of this job from our original estimate by 8 percent.

— **Dan Christensen**
Director of Technology
McCusker-Gill, Inc.