

Healthcare



5

Facade TecNotes Series

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Contents



Executive Summary_____ 1

Introduction to Enclos Technology

Service and Technology_____ 2

Custom Curtainwall Systems_____ 4

Project Delivery_____ 6

Site Operations_____ 8

Green and Sustainable_____ 10



Case Studies

Children's Hospital of Philadelphia_____ 12

NYU School of Medicine_____ 16

Howard Hughes Medical Institute_____ 18

Gonda Mayo_____ 22

Harvard Medical_____ 26

Kaiser Medical Center_____ 30

Barnes Jewish Hospital_____ 32

San Francisco General Hospital_____ 33

Human Genome_____ 34

Saint John's Health Center_____ 35

Olive View Medical Center_____ 36

Eskind Vanderbilt_____ 37



List of healthcare project by Enclos_____ 38

Enclos can provide complete turnkey solutions to your most challenging facade requirements, regardless of size, complexity, product or building program considerations. We are highly experienced in the varied special conditions involving healthcare facilities, ranging from design through site installation, and including both BIM and LEED qualifications.

Healthcare

Executive Summary

Enclos has been a national provider of advanced facade technology on healthcare facilities since the mid 20th century. Our portfolio of completed healthcare related projects numbers over 30, with many landmark facilities among them.

This building type presents a number of unique considerations, among them:

- *floor-to-floor spans are large to accommodate extensive mechanical systems*
- *site conditions are often constrained and crowded with numerous subcontractors and crews*
- *intensive coordination with MEP is required throughout the design and building process*
- *as a result of these various challenges, construction schedules are frequently complex and demanding*

in design

When it comes to hospitals and medical research facilities, Enclos is the ally of both the architect and general contractor because of our extensive experience in the design and construction of

this building type. Our customizable facade technology is easily configured to accommodate any span between floor slabs, as well as to provide for any aesthetic or performance consideration. A large and responsive in-house design and engineering staff assures that the requirements unique to the project will be addressed rigorously and expeditiously, providing critical support to the design team as required.

on site

Our core strength is project management and site operations. Enclos has often been selected over its competition because of the perceived value of its performance on the building site. We have completed numerous high-rise towers on densely packed urban sites where the dominant logistical concern for the entire building program was site management. Enclos has implemented just-in-time delivery practices on many projects as a strategy to minimize or eliminate on-site inventory and ease site congestion. We often mobilize late-shift crews for the same reasons. These

installation strategies are carefully coordinated with the general contractor and other site subcontractors.

on time

Enclos maintains dedicated curtainwall manufacturing facilities plus an extensive network of suppliers and fabricators. This provides us great flexibility in accommodating the most demanding construction schedule, and allows us important control of the delivery of material to the site. It also assures a product quality at the top of the industry.

BIM, LEED, and specialty work

Increasingly, healthcare projects are incorporating building information modeling and LEED building certification programs. Enclos has worked on many projects that have included such programs, and has BIM technicians and LEED accredited professionals on staff. In addition, our advanced facade technology includes all manner of specialty systems, including double-skin walls, cable nets, and point-fixed glazing systems.



Service and Technology

Enclos is expert in the design, engineering, fabrication, assembly and erection of custom curtainwall systems and structural glass facades, providing complete design/build services to the construction marketplace.

We specialize in innovative architecture and challenging building projects. No project is too large, no building site too difficult for our seasoned operations teams.

Our work experience includes many projects with specialized materials, complex geometry, and innovative structural and mechanical system designs.

Enclos curtainwall and facade systems incorporate state-of-the-art materials and performance.

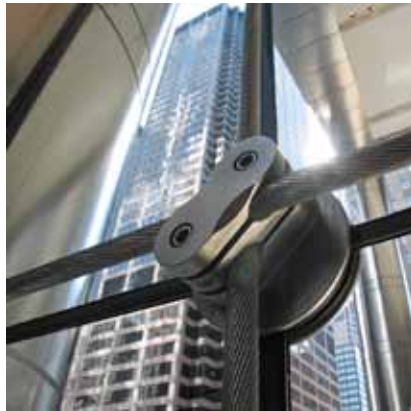
The attributes most appreciated by our clients however, are our site management capabilities and our track record of meeting demanding project schedules.

Custom Curtainwall Systems



Enclos offers the most innovative curtainwall systems in the marketplace, combining aesthetic, performance and economic considerations into optimum solutions to our client's needs. Our inventive unitized systems have evolved through their application on numerous major building projects to represent the state-of-the-art in curtainwall technology and performance. Sophisticated system design features and installation methods have paralleled this evolution, resulting in improved economy as well as superior performance.

Structural Glass facade Systems

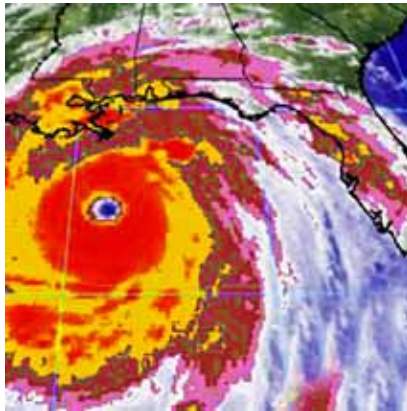


The integration of glass and structure is a predominant attribute of this expressive building form, often employed to maximize transparency in large public spaces. Enclos has played a leadership role in the development and application of this cutting-edge technology, including a range of structure types:

- cable nets
- cable trusses
- long-span truss systems
- grid shells
- spaceframes
- all-glass structures

Our glazing systems include point-fixed types in both bolted and clamped versions, as well as framed system types, all custom designed in response to specific project requirements. For more information see the section titled, Structural Glass Facades and Enclosures.

High Performance Systems



An aggressive and ongoing research and development program has resulted in systems and products designed for special applications. Among these are the following:

- hurricane products, designed and tested in conformance with the South Florida building codes
- security and blast systems
- acoustical wall systems, for those applications with acoustical performance requirements beyond those normally specified
- fire and smoke testing
- enhanced thermal efficiency
- composites, advanced materials, smart materials and systems research
- advanced facade systems, double skin facades and smart facades

International Services



Enclos Corp has been called on to participate in many international projects because of its unique experience and expertise. This participation most commonly involves working with a local design and build team from pre-construction activities through final installation acceptance, providing design, engineering and product development, and specialty construction management

These services are provided for a limited scope of work typically involving the building facade. The construction management services generally include some combination of the following;

- project management
- procurement
- quality assurance
- field coordination

Custom Curtainwall Systems

So, just what is curtainwall?

Curtainwall is a term applied to a widely used facade technology for cladding large buildings. Curtainwall systems do not carry any dead loads imposed from the building structure. They are designed to support their self-weight and to transfer horizontal loads (wind) incident upon them to the primary building structure.

Curtainwall systems are typically “hung” from the building structure, from whence derives the “curtain” reference, most often attached at the floor slabs. The primary functions of the curtainwall is to resist air and water infiltration and to provide a thermal barrier between inside and out. Curtainwall systems are also designed to accommodate the complexities of deflections, thermal expansion and contraction, building sway and relative movements between floors as caused by wind or seismic loads acting globally or locally on the structure.

Special design considerations can include daylighting, thermal, acoustical, security and blast-resistant performance.

Curtainwall designs for large buildings are almost always customized to individual project requirements.

Framing



Curtainwall is designed as cladding materials that are framed and fixed in place by extruded aluminum components. There are two basic types of systems:

Stick systems are built from long vertical extrusions (mullion) attached to the building structure, with horizontal extrusions spanning between the vertical mullions to create frames. Cladding materials are then installed into the frames. All assembly, installation and glazing takes place in the field.

Unitized systems are a newer adaptation of curtainwall technology that has rapidly grown in use in recent years. The vertical and horizontal framing members are figuratively split, allowing independently framed “units” to be assembled and glazed in the factory. Units can be designed to span multiple floors or multiple horizontal modules, and can incorporate multiple cladding elements including operable vents and windows. Completed units are shipped to the site and simply hung on the building. Unitized systems concentrate fabrication and assembly under controlled factory rather than in the field.

Cladding



Glass is the most common infill material used in curtainwall systems, but other cladding materials include metal panels, natural stone and terracotta. The curtainwall systems typically span across the floor slabs, creating a need for opaque cladding material over and in the vicinity of the floor slab to conceal the slab edge, fire-safing and any between-floor mechanical systems. A spandrel panel is often located between vision glass panels to conceal this area. To achieve opacity, spandrel glass is treated with a ceramic coating (called a frit), a film, or is incorporated into an assembly called a shadow box.

Glass is used extensively as a curtainwall cladding material because of its transparency and ability to provide daylight and view. Solar gain in such applications can present challenges with respect to energy performance and thermal and visual comfort, and represents an important design consideration in the development of an appropriate curtainwall facade. Enclos has worked with leading architects in the development of glass facades on many buildings pursuing Leed certification.

Facade Integration



In addressing the challenges discussed above, and in meeting the generally escalating performance demands on the building skin, curtainwall designs have become increasingly complex. Facade system requirements now frequently include daylight harvesting, daylight and glare control, artificial lighting, and even power generation. Techniques for addressing these considerations are being integrated into the curtainwall system, providing advanced functionality to the building facade. Photovoltaic systems, shade fins, light shelves, louvers, operable blinds, sensors, and multiple skins are among the things being integrated into the curtainwall system.

The building community has recognized the facade as a primary means to improve energy performance and occupant comfort, and even as a potential power source.

Anchorage



It is an exciting time for the development of advanced facade technology. At the same time, the fundamentals of sound curtainwall design have lost none of their critical import.

One of the basic considerations that impacts every building project without exception is the means by which the curtainwall is anchored to the building. Anchor design can affect many things beyond the immediate curtainwall design, including the work of other trades and the design of the building interior. As with so many other aspects of the building skin, Enclos continues to lead the way with anchor design. Enclos anchor designs can be positioned on the face, top or bottom of slab, or recessed in any of these positions. The Enclos anchoring method is highly efficient, speeds field installation of the curtainwall and provides optimum economy to the building developer.

Curtainwall anchors are set prior to the commencement of unit installation. If the anchors are to be recessed, they are sometimes set prior to the concrete floor slabs being poured.

Installation



Installation strategy is highly sensitive to specific site, schedule, and coordination requirements. All Enclos operations are driven by the requirements of the building site.

Unitized curtainwall systems provide optimum flexibility in this regard. Materials can be fabricated, assembled and stored offsite, and be delivered on a just-in-time basis as required to support installation crews, thus minimizing on-site storage and staging requirements on highly congested building sites. Assembled units are delivered to the site on open flatbed trailers. Units can be lifted by crane from the trailer and directly set in place on the building facade. Alternately, units can be designed to be installed from inside the building. Installation crews working from a floor above use a small jib crane to lower units to a setting crew below.

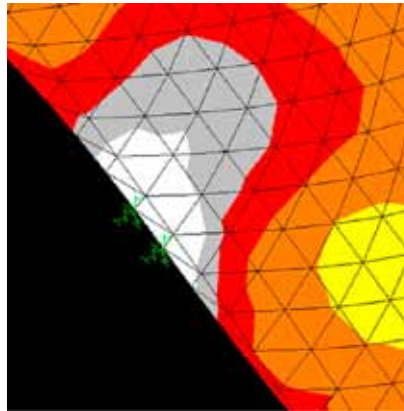
Installation strategy, site logistics and operations are among the greatest strengths of Enclos, and represent the capabilities most valued by our general contracting clients.

Project Delivery

Managing the project delivery process is the core strength of Enclos, something at which we excel beyond all our competition. This capability provides us consistent control over the vital requirements of schedule, quality and cost, and allows us to consistently deliver top quality economically and on time. This capability is the basis for our many long term relationships with developers, general contractors and architects.

Each new project undertaken by Enclos is treated as unique, and a custom delivery strategy is developed in direct response to the singular set of considerations presented by the project. This custom strategy however, is developed through a uniform process unique to Enclos that embraces the spectrum of activities from preconstruction through design, engineering, procurement, fabrication, assembly, and erection. This process, developed and refined through the successful completion of hundreds of remarkably diverse facade and curtainwall installations, serves to mitigate the inherent risk of a challenging building project by enhancing the predictability of performance, schedule and cost.

Design and Engineering



The foundation of a successful facade or curtainwall project is innovative system design and engineering. Our D&E group develops custom solutions to each new project, derived from a robust framework of Enclos technology and know-how. Design considerations range from the aesthetic and performance requirements determined in collaboration with the architect, to the fabrication and installation requirements that must be anticipated by the system design to assure a successful project completion.

An in-house team of engineers, architects and designers over 100 strong comprise the Design and Engineering Group at Enclos Corp, representing a unique talent pool that has consistently delivered innovative, effective and elegant solutions to the most demanding building facade requirements. Autocad, Inventor, Revit, Space Gass, Strand 7, FloVENT CFD, are among the many tools that comprise our design development process. Building Information Modeling (BIM) is another service we provide our clients.

Project Management



Project management is an empowered function at Enclos Corp, and key to our success. Personnel skilled and experienced in project management are vital to the success of any construction project. Our project management teams lead design development, production engineering, fabrication and assembly, and field operations, bridging these various activities to form an organized, unified continuum of project development throughout the design and build process. Enclos project management personnel receive extensive training and years of on the job experience before being appointed to the position and entrusted with the responsibility of running their own projects.

Our people understand the critical importance to a building project of on-time, on-budget performance, a fact which our past clients can best attest to. We will happily provide you with such references.

Fabrication



Curtainwall fabrication and assembly is a critically important part of the project development process. Enclos Corp maintains dedicated manufacturing operations in key geographic locations capable of providing fabrication services for the most complex designs and the most challenging project schedules. Our facilities incorporate state-of-the-art equipment and processes for curtainwall unit fabrication and assembly. In addition, to provide adequate capacity for the fluctuating demands typical of the building marketplace, we have developed a network of outside fabrication sources, all of whom have been rigorously trained and qualified in all aspects of Enclos systems materials, fabrication and assembly, and all of whom have successfully provided services on prior Enclos projects.

Supply Chain Management



Our global supply chain is a significant corporate asset that we provide to our clients, who receive the benefit of the most competitive possible cost independent of the fluctuations of local market conditions. Global economies, currencies and markets are shifting faster and more dramatically than ever before. In order for domestic firms to provide optimum solutions to their client's needs, it is mandatory that they be able to procure materials and services from any global market providing the best combination of quality, lead time and cost.

Recognizing this, Enclos Corp launched an initiative in 2002 to develop its nascent network of key suppliers into a world class global procurement machine. Enclos has successfully provided project materials and services from diverse areas of Europe and Asia on dozens of domestic projects, saving our clients many millions of dollars in the process. In circumstances where domestic supply is a requirement Enclos has both its own dedicated manufacturing facilities and qualified domestic suppliers.

Quality Assurance



Design or material supply problems surfacing in manufacturing are a frustrating and costly annoyance; design or manufacturing problems surfacing on the building site are a disaster. There is far too much at stake in the building process to settle for anything less than top quality and the programs that consistently deliver it. Effective quality programs garner the participation of everyone in the organization from top to bottom while reaching throughout the web of company operations and activities. We have developed and refined our quality assurance and quality control programs over the span of many years and hundreds of diverse project experiences, another way that our deep experience works for you. These programs are robust and all embracing, ranging from management systems and procedures to the minutia of in-line quality verification processes. In addition, we develop a specific quality plan for each new project based on an analysis that identifies and accounts for any unique aspect of the project whether it be material type, location, site condition, performance requirement or design detail.

Site Operations

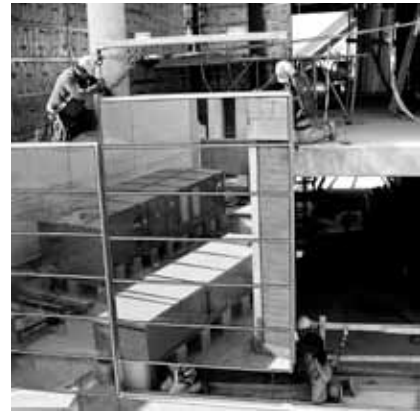
Enclos has been awarded many of its projects over its competitors because of its reputation for performance on the building site.

Everyone involved in the construction process knows the critical importance of the building site, the playing-field for the contracting teams. This is where the myriad complexities of a construction project converge and coalesce into architecture. The building site must be a particular focus for systems such as the building skin where a large part of the process takes place off site; design, engineering, fabrication and assembly all precede the delivery of material to the site and the commencement of field installation. Yet the site is where all must come together. These preceding activities must be accomplished with a keen eye to the site, anticipating unique site-specific requirements and developing effective installation strategy to assure an efficient and effective performance. Poor performance by a single contractor can disrupt an entire building site.

Field operations are a core strength of Enclos Corp, and the attribute for which we are most widely recognized by the building community, and for good reason.

Our performance on the building site mitigates risk for both the design and build teams. This core strength has proven an effective tool in helping architects realize their design intent while staying within a determined budget, in assisting general contractors in controlling the building site and maintaining project schedules, and in providing owners a top quality building coupled with the economics of efficient delivery.

Field Operations Teams



The Enclos field operations teams manage our site operations across the country. They begin their project involvement in collaboration with the pre-sales design and estimating team, assisting in analyzing the site, determining installation strategy and preparing for the project bid. On new contracts they continue this involvement by coordinating installation requirements through all pre-installation activity: design, engineering, fabrication and delivery.

Our experienced and talented project managers and field supervisors undertake comprehensive installation planning and the development of a unique strategy carefully tuned to the specific requirements of each project and building site. They are in constant motion visiting active sites on a regular basis, monitoring progress and looking for opportunities to expedite work.

Preplanning and Installation strategy



Our people understand the building site. Enclos Corp has secured many of its projects on the basis of a clear and convincing installation strategy. Constrained urban sites with ambitious building programs present perhaps the biggest single challenge in the entire building process. Virtually every aspect of the facade design must be considered with respect to the building site, with many design decisions ultimately constrained by the realities presented.

The success of Enclos as a provider of curtainwall systems for some of the most ambitious building project in history results in large measure from the ability of the firm to design, engineer, fabricate, assemble and deliver a product in support of a superior installation strategy, a product that goes together faster and cheaper on the building site. This is not simply a matter of a good anchor detail; it is a function of advanced system design, delivery sequencing, material handling, crew rotations, equipment usage, and the minutia of planning and scheduling amidst the remarkable complexity of a demanding building site.

Union Field Personnel



Enclos Corp is proud to have a long and productive relationship with both the ironworker and glazier unions. Through offices located across the United States, Enclos has established lasting connections with ironworkers and glaziers in each region. We manage our field operations through a mobile group of national superintendents, and with national support we train our field teams, ensure compliance with best practices, promote safety and quality standards, and coordinate with labor unions.

Our talented union crews most effectively differentiate us from our competition on the building site.

Safety



The safety of our people is of paramount importance, and we endeavor to be most rigorous in our safety planning. Enclos Corp has embraced a Zero Accident philosophy as represented by the Construction Industry Institute. We have a comprehensive site safety plan, and institute and manage a project specific safety program for all of our employees and subcontractors. The program consists of training, weekly toolbox meetings and careful site evaluation prior to the commencement of work activities. Our safety program includes the following practices:

- preparation of a site-specific safety plan for each project
- inclusion of safety training as a budget item in project bid preparation
- top management participation in investigation of recordable injuries
- provision for anonymous disclosure of unsafe conditions or behavior
- assurance that every worker receives a minimum of 4 hours per month of safety training
- each safety professional serving a maximum of 50 site workers

Green and Sustainable Facade Technology

The building skin affects both the appearance and performance of a building like no other building system.

Facade and curtainwall systems are thus of paramount importance when considering issues of green building and sustainable design. We at Enclos understand the importance of leading the effort to improve the performance and sustainability of the building envelop, and we commit ourselves to supporting the design team in their sustainable design efforts.

We have LEED accredited professionals on staff, a mechanical engineering group with advanced CFD analysis capability, and the ability to perform whole-building energy analysis. An aggressive and ongoing research and development program assures you of state-of-the-art wall systems engineered and tested to the most demanding performance criteria. We are continuously seeking new materials and methods to further enhance this performance.

LEED Certified Buildings



The Leadership in Energy and Environmental Design (LEED) Green Building Rating System has proven to be a viable and effective means of reducing overall energy consumption and improving the sustainability of building practices, while at the same time bringing increased value to a building as evidenced by higher occupancy and rental rates. The building skin is a paramount consideration in any building project, but presents particular opportunities in a project where LEED certification is part of the program.

Enclos understands the nuances of the LEED rating system particularly as it relates to the building skin.

Double-skins and Active Facades



This emergent technology is finding increased application in building projects where the attributes of transparent facades are desired yet the performance of the building skin is paramount. These sophisticated facade designs can compensate for the inherently poor insulating properties of glass. In addition to providing a thermal barrier, the systems can also provide an effective means of ventilation, and often involve shading devices for the control of solar penetration and glare.

They can also provide significantly enhanced acoustical performance, and in certain applications are used for this reason alone. The Loyola Information Commons features a west facing dual skin active facade with a cable net supported outer skin. This project was one of three featured at the McGraw-Hill Innovation Conference on Net-zero Energy Use in Buildings (Loyola is featured on pages 106 and 107).

Enclos can provide complete design/build services for custom double-skin unitized curtainwall systems or more complex long-span facade systems.

Building Systems Integration



Optimizing energy performance in buildings requires an integrated approach to building systems design, analysis and implementation. Building-integrated photovoltaics (BIPV) is an increasingly popular approach for using the building skin as a means to harvest solar energy. More recent technique involves systems of lighting, lighting controls, sensors, and shading devices all integrated with the building skin, and in turn integrated with the building HVAC systems. Such design strategies can reduce heat gain or loss, control direct solar penetration and glare, harvest daylight to reduce cooling load, and even provide ventilation, producing a more comfortable interior space in the process.

Enclos Corp has the ability to develop custom integrated systems in response to your particular building performance requirements.

From Net-Zero to Net-Plus



Oil prices may fluctuate in the short term, but in the long term there is little doubt that energy costs will continue to rise, as will the cost to the environment of unwise use of our energy resources in buildings. It is imperative that we improve the efficiency and sustainability of our built environment. Net-zero energy use in buildings is a goal being increasingly embraced by forward thinking building designers and developers. An even greater opportunity presents itself in the notion of our buildings as energy producers.

Enclos sees the potential for the building skin to make a major contribution in this regard, and toward this end we are committed to continuing to play a leadership role in facade system development.

Childrens Hospital of Philadelphia (CHoP) Abramson Pediatric Research Center

The Agramson Pediatric Research Center represents two projects in one building for Enclos Corp. The original 14-story tower and 5-story wing were completed in 1995, firmly establishing CHoP as one of the premiere research and treatment institutions for children in the world. The facade program included a mix of systems and materials, and presented the technical challenges that are characteristic of this building type.

Glass curtainwall was used as a major facade element, along with precast panels and interspersed windows. Custom window wall systems were developed for the wing. On the basis of this successful program, Enclos was invited back to participate in an expansion program, adding 9 stories to the original building wing, bringing it up to full tower height. The expansion was completed in 2002.

owner CHoP

architect Ellenzweig Associates

gc L.F. Driscoll Company

building type research

program 14-story tower, 5-story wing; 429,000 sqft; 9-story expansion of 5-story wing; 125,000 sqft addition

completion 1995; 2002

facade glass curtainwall, precast concrete and granite

description The Abramson building, completed in 2002, consolidates biomedical research laboratories and administrative facilities into one facility capable of supporting up to 800 scientists, while also doubling CHoP's research space; an expansion completed in 2002 brought one of the nations premier children's research centers to 15-stories tall with the addition of 24 new laboratories atop the previous structure, in addition to renovating bridges connecting the structure to previous facilities and the existing plaza

This project received an Honor Award for Laboratory Design: Boston Society of Architects/AIA and the New England Healthcare Assembly





Childrens Hospital of Philadelphia (CHoP)
South Campus
Colket Translational
Research Building



owner CHoP
architect Ballinger
engineer LeMessurier Consultants
gc Turner Construction Company
facade consultant Gordon H. Smith Corporation / Simpson Gumpertz & Heger
completion 2009
program 11-story; 450,000 sqft
building type healthcare / research
facade design/build program for custom unitized curtainwall system
glass standard 1 inch insulated, low-e coating
description 11-story tower (expandable to 20+ stories) as part of \$1 billion expansion of South Campus

This is Enclos's third facade project for a major building program on the CHoP campus. The Colket Translational Research Building is part of a comprehensive expansion of the South Campus.

The \$400 million research tower comprises four laboratory floors, a two-story ground floor housing a lobby, cafeteria, conference space, and four administrative office floors, three of which are convertible to future laboratory use. The building has been designed to expand vertically to 20+ stories to provide for future growth.

The new building will provide flexible state-of-the-art laboratory space for the hospital's Center for Childhood Cancer

Research as well as the Center for Cellular and Molecular Therapeutics. The stated goal of the facility is to advance the health of children by turning scientific discovery into medical innovation.

The South Campus complex is estimated to cost more than one billion dollars and consist of more than one million square feet of clinical and research space.

Enclos is providing a comprehensive design/build program for the building facade, comprised primarily of a custom unitized curtainwall system.



CHoP Colket is seeking LEED® Silver Certification.



NYU School of Medicine Smilow Research Center Manhattan

owner New York University School of
Medicine

architect Mitchell-Giurgola Architects

engineer Severud Associates

gc Turner Construction Company

facade consultant R.A. Heintges & As-
sociates

completion 2006

program 13-stories; 230,000 sqft

building type medical / research / educa-
tion

facade design/build facade program
including custom unitized curtainwall
system, aluminum sunscreens, custom
canopies with AESS steel and point-
fixed structural glazing

glass 1 inch insulated reflective pat-
terned glass, fully tempered laminated
and perforated structural glass with
ceramic frit

description NYU revamps its medical
facilities with the largest addition to Mid-
town Manhattan's eastern sector in half
a century; reflective glass and acoustic
components shield the building from its
surrounding elements



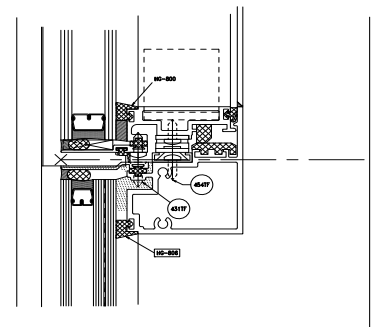
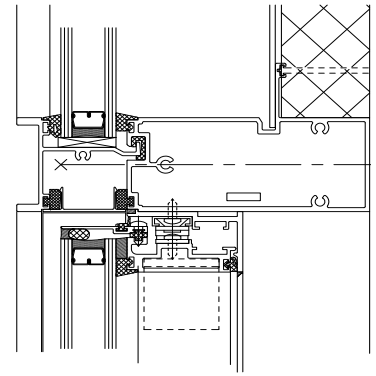
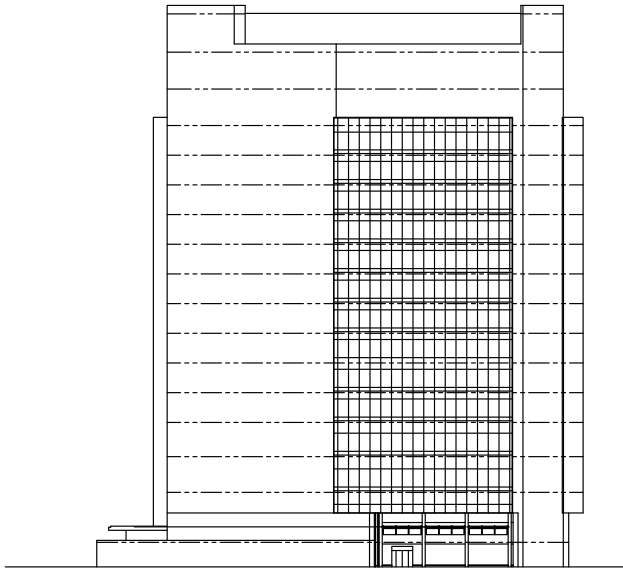
NYU's state-of-the-art facility is home
to 40 multidisciplinary research teams
dedicated to accelerating the devel-
opment of new medical treatments.
The Joan and Joel Smilow Research
Center includes facilities for biomedical
research such as cancer, cardiovascular
biology, dermatology, genetics, infec-
tious diseases and neuroscience. Of the
building's 230,000 square feet, nearly
half are devoted to research laborato-
ries.

The trapezoid shaped tower is the larg-
est addition to Midtown Manhattan's
eastern sector in half a century, and
the only major project expansion of the
NYU campus in over a decade. Designs
called for an open space laboratory area

separated by neither walls nor doors to
encourage interaction between scien-
tists. The open laboratories, multiple
meeting and class rooms, courtyard
and 140 seat lecture hall also facilitate
interaction.

The building stands open to direct sun-
light throughout the day. To reduce glare
from both sunlight and the adjacent
East River, the structure's building skin
employs a highly reflective glass system
with a ceramic frit. Aluminum sun-
screens aid in reducing the glare of the
east facing facade during the morning
hours. To mitigate noise pollution from
the surrounding urban environment,
measures were taken to enhance the
acoustic performance of the facade. 12

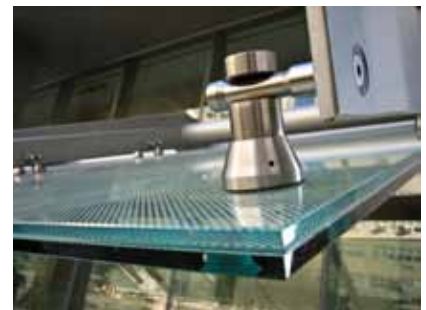




foot acoustic curtainwall units shield the facility from the noise of adjacent FDR Drive and a nearby helipad.

Site logistics were complicated by the dense urban site. Surrounded by buildings in tight quarters between the East River and amongst NYU's extended campus in Midtown, construction staging areas were extremely limited. Enclos dealt with this challenge through a strategy of just-in-time delivery of prefabricated curtainwall units to the site, which were immediately installed by Enclos site operations crews.

This project received an Award of Merit, Higher Education category, from New York Construction Magazine, 2007.



Howard Hughes Medical Institute: Janelia Farm Research Campus Ashburn Village, VA

owner Howard Hughes Medical Institute

architect Rafael Viñoly Architects

engineer Thornton Tomasetti Group

gc Turner Construction Company

facade consultant Building Enclosure Analysis LLC

completion 2006

building type medical / research / education

facade design/assist-design/build program for one of the largest and most diverse installations of structural glass in the US at 147,000 sqft; fail-safe design strategy; seven unique interior and exterior system types; system's performance and design validated by one year of independent testing; installation time at 85,000 man-hours; 60 custom dies for aluminum extrusions systems included doors, rainscreen roof panels and operable vents

glass low-iron glass throughout 16 different glass panel types with little dimensional repetition; design demanded the outer limits of glass production capabilities; glass panel sizes up to 13 ft x 10.5 ft, 3-ply at 1800 lbs., 4-ply glass portal beams at dim. between bolts; horizontal 20 ft-8 inch, vertical 9 ft-1 inch

description over 900 ft long 3-story complex following the curving contour of the site; over 740,000 sqft including laboratories, conference and recreational facilities and housing; second largest green roof with many other sustainable design features



1

Cladding high-rise towers using advanced exterior wall technology is a specialty of Enclos. Building enclosures come in wide variations of design and performance criteria, and Enclos particularly excels at the custom, highly complex structural glass enclosures that push the boundary of design, material, and installation.

The architect's design for the Janelia Farms site provided a milestone for load-bearing structural glass design at Enclos, and in fact represents one of the largest installations of its type in the world.

The research facility is a 900 foot long, three-story, serpentine building set into



2



3

a hillside along the Potomac River in Northern Virginia. The enclosure consists predominately of custom structural glass constructs. The interior of the building also features large expanses of structural glass wall systems. Low-rise private residences compliment the custom glass designs of the project.

The facility's massiveness is masked by the property's wooded tree lines and the second largest green roof in the world, but if stood upright the central facility would equal the equivalent of an 85-story building. Two arch-like glass enclosures supported by a minimalist stainless steel framing system connect the top two floors of the campus, ac-

centing the facility's flowing curves and surrounding topography while continuing the theme of expansive glass corridors. Throughout the first floor, trellis beams extend to support the exterior glass wall and roofing system, enclosing the corridors and providing the housing for HVAC, sprinkler and lighting systems.



4



5



6

- 1 residences for visiting scientists line the lakefront with the research facilities behind.
- 2,4 long glass corridors line the perimeter of the research buildings.
- 3 main entrance to the complex.
- 5,6 material handling logistics for hundreds of large, heavy glass panels over the rambling site was a major challenge.

Howard Hughes Medical Institute (continued)



1

Enclos acted as the design/builder of the various unique glass systems, working closely with the architect to realize the vision of maximized transparency in the building enclosure. This was accomplished by developing seven unique glass system types in response to differing functional requirements, including using glass as a structural element in support of glass cladding. Considerations of redundancy were a primary design driver for systems such as the glass corridors that resemble a “house of cards” made entirely of glass. As typical of the Enclos project development process, a safe and efficient installation method was developed in parallel with the fail-safe design.

Glass entrances, corridors and interior wall partitions were created using monolithic ultra-clear, low-iron glass. The corridor glass consists of dual interlayer, 3-ply laminated glass lites of 3/8 inch Diamant with .060 clear PVB interlayers. The large 3-ply panel sizes of approximately 140 square feet resulted in individual fabricated panel weights approaching 1,800 pounds.

Site logistics and scheduling issues were particularly challenging on this project, and represented a leading reason Enclos Corp was selected as the glazing design/builder.

- 1 the stairway enclosures act as the hubs of the sprawling complex
- 2 the high transparency of the enclosure results from the large glass module and the minimal structure.
- 3 an interior view up the stairway.
- 4 a typical connection detail at the intersection of stainless steel plate members, with integrated sprinkler plumbing.
- 5 an upper level corridor penetrates the enclosure as a bridge.
- 6 an interior view down the stairway from the upper level bridge.

glass stair enclosures

The focal points of the sprawling facility are three identical glass structures enclosing stairways connecting the various levels of the building. The architect wanted the enclosures to be highly transparent, with a finely detailed exposed supporting structure, and economical.

structural system

The Enclos design team developed a minimal structural system of prefabricated stainless plate. Exposed pinned connections use a custom stainless fastener. The structures were developed as a kit-of-parts system that was fabricated to high tolerance under factory controlled conditions, then delivered to the site for assembly. Sprinkler and electrical system requirements were treated as an integral part of the system design. A large grid module was used to elevate transparency. The inner lite of the insulated glass unit is laminated as required for overhead glass. A low-e coating is applied to the number 2 surface. Low-iron glass is used throughout.



2



3



4

nexus of transparency

The appearance of the glass stairway enclosures is consistent with the vocabulary of glass and transparency that runs throughout the facility. The enclosures act as hubs and landmarks within the sprawling complex, where levels and corridors merge in pools of daylight and openness, where the boundary between inside and out fades away. At night, artificial lighting renders the enclosures as soft lanterns in the darkness, preserving the sense of form and place from daylight into night.



5



6

Gonda Building Mayo Clinic Rochester, MN

The Gonda Building is the heart of the Mayo Clinic campus, designated as one of the best hospitals in the nation. Gonda was designed to a long-range plan requiring the flexibility to adapt with the ongoing advances in medicine. All systems, including structural and mechanical features, are designed to support up to 10 additional floors for future expansion. The flexible systems allow for redesign of the facility as

required to make room for new, state-of-the-art medical equipment.

Each floor of the Gonda Building connects with the Mayo Building to the south, providing convenient access to all primary facilities for both patients and healthcare professionals. A 7-story skyway and pedestrian subway link Gonda with facilities throughout the campus. The clinic's interconnected

owner Mayo Clinic

architect Pelli Clarke Pelli Architects /
Ellerbe Becket

engineer Wenzel Engineering

gc Centex Rodgers Construction Com-
pany

facade consultant Israel Berger & As-
sociates

completion 2001

program 20-stories, 305 ft; 1,614,600
sqft

building type healthcare / research
facility

facade design/build facade program
comprised of 10 different curtainwall
systems, making heavy use of structural
glass and stainless steel

glass Viracon types: VWA1-22, VA1-13,
VE1-2M in insulated and laminated units

description this 20-story tower inte-
grates the Mayo campus through a
connection with the Mayo building at
each floor, and a 7th story skyway and
pedestrian subway link to the rest of the
campus



grounds total more than 3.5 million square feet — the largest of its kind in the world — with its campus consisting of approximately 30 buildings in downtown Rochester.

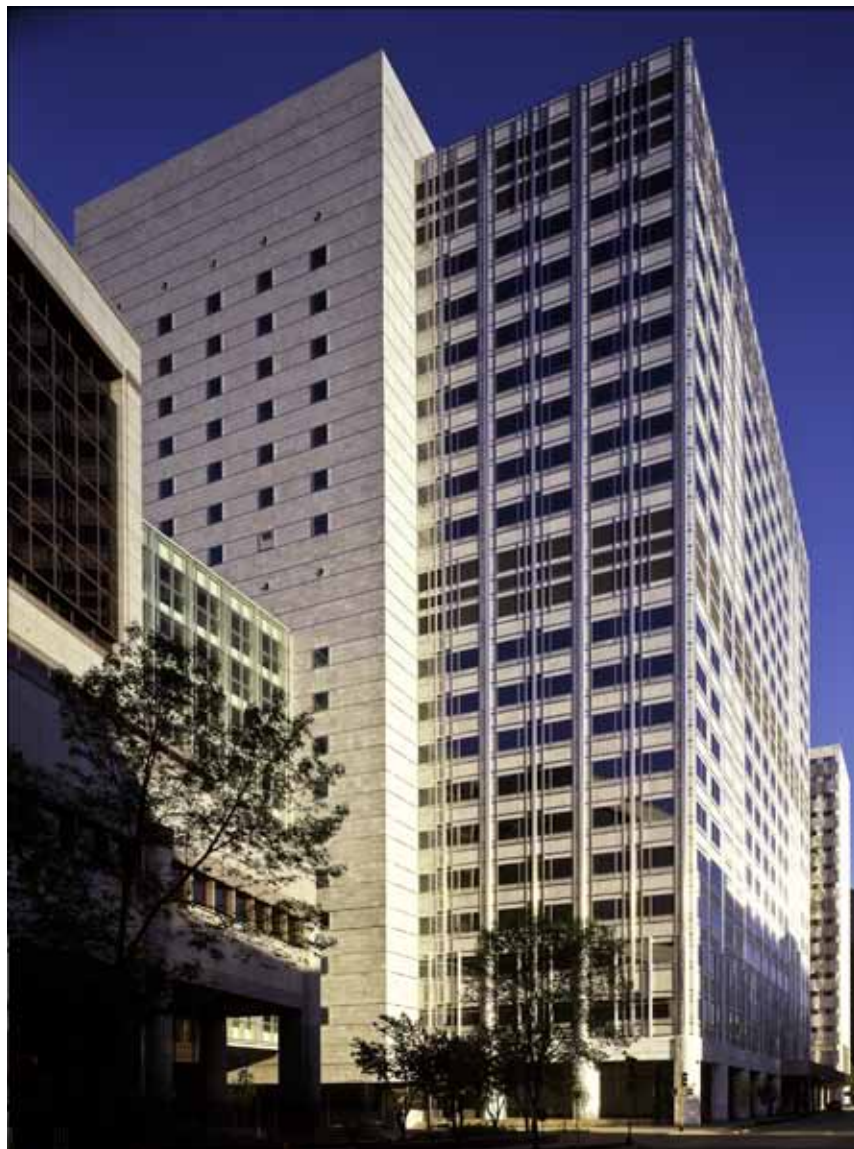
Design challenges included matching Mayo's 13 foot floor-to-floor heights with a complex new building system that typically would incorporate 15 to 16 foot heights. Custom expansion joints link

both buildings and allow each to react independently to dynamic loads.

The facility's most expansive renovation includes a 195,000 square foot facade of custom unitized glass and stone curtainwall with linen finish stainless steel features, and a 10,500 square foot steel-supported serpentine structural glass wall.



Gonda Building
(continued)



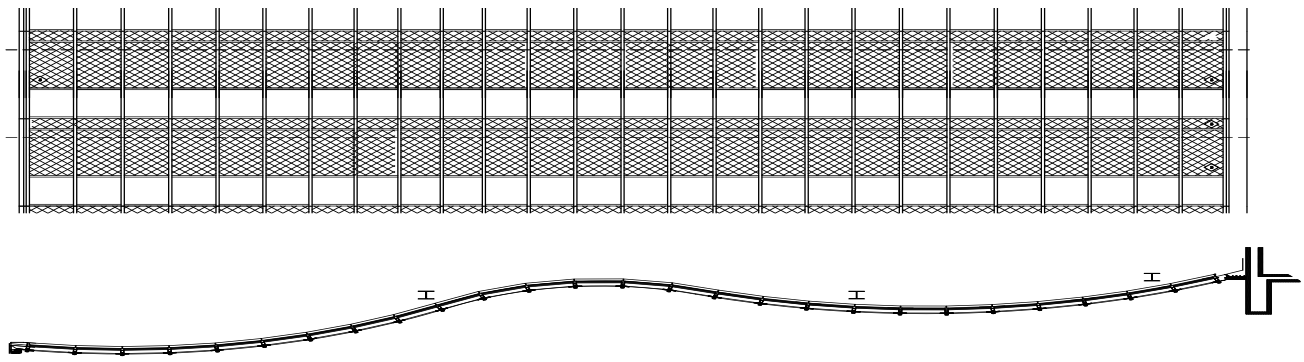
With 10 different custom curtainwall systems, including structurally glazed system types, the technical requirements for the Gonda facade place it among the most challenging building skins ever constructed. Insulated, laminated, and insulated-laminated glass panels were all used in the building facade. A serpentine curve to the high-rise curtainwall over the building entrance presented some significant geometric

complexity to the curtainwall system, resulting in considerable fabrication and installation challenges. In addition to the curtainwall, the facade systems incorporate window wall units in glass and stone, decorative metal panels, doors and other facade elements.

The relatively small floor-to-floor spans for this building type required extensive planning and coordination to assure the

successful installation of the MEP systems. Enclos designed the curtainwall systems to accommodate the requirements of the MEP systems.

Enclos also provided cladding systems for the bridges that tie the Gonda building to the Mayo complex. These systems are designed to accommodate the high differential movement that occurs between the buildings.



The serpentine plan curvature to the curtainwall over the main entrance.

Harvard Medical School Research Building Boston



owner Harvard University

architect Architectural Resources
Cambridge

engineer LeMessurier Consultants

gc William A. Berry & Son

facade consultant Gordon H. Smith
Corporation

completion 2003

program 10-stories; 525,000 sqft

building type education / research

facade design/build custom curtainwall
for tower featuring glass “pods” and
“sky-lobbies;” design and supply of a
4-story custom stainless steel cable
truss structural system to support point-
fixed glass; system includes castings,
machined fittings, cables and fabricated
stainless spreader strut

glass fully tempered insulated glass
units perforated for point-fixing with
spider glass system

description Harvard Medical School
unites two of its major areas of focus
to encourage research and student
interaction

The New Research Center has been referred to by the AIA as “a monument to the pragmatic blend of form and function.” The facility is the largest expansion of the Medical School campus in more than 100 years, and the largest research and education building Harvard University has ever built. A stunning 3 and 4-story structural glass facade

parallels the street front while incorporating the building’s main entry, bathing the interior with natural light. Inside, a 500-seat auditorium and multiple meeting rooms accommodate up to 800 researchers working at the facility. The \$260 million structure at 77 Avenue Louis Pasteur aims at fundamental discoveries to treat disease and injuries.



This project received an AIA Higher Education Design Award.



The 4-story structure is backed by a 10-story tower. Curtainwall designs for the complex tower facade program were developed by Enclos to provide ample daylight and flexible, open laboratory spaces. Multiple story sky lobbies and split-level communal areas feature clear glass facades with sprawling views of downtown Boston. These high-traffic

areas are situated to encourage both formal and informal interaction between the center's biomedical researchers and department of genetics and pathology students. Cable truss supported glass walls wrap the entire 4-story lobby and conference area at street level. The cable truss system is comprised of a series of regularly spaced pre-stressed

vertical cable trusses at five feet on center, supporting a point-fixed glazing system. This entire facade program was designed and built at a blistering pace, and was completed both on time and under budget.



Harvard Medical School
(continued)



If God is in the details, as Ludwig Mies van der Rohe is said to have claimed, then the 4-story lobby for the research facility is a bit of modernist heaven. The enclosure is wrapped in a highly transparent glass facade. Point-fixed glass is supported by elegant stainless steel cable trusses spanning between a structural pipe frame.



The structural system includes a 225 pound ductile iron casting to provide the cable truss anchors across the structural pipe frame. The casting also supports a spider glass fitting at its end. The stainless steel cast spiders support the glass panels at their corners. A field-applied butt glazed silicone joint applied between the glass panels provides the weather seal to the enclosure.



The cable trusses are comprised of stainless steel cables and fabricated stainless steel spacer struts. The trusses were assembled in the factory to save labor cost and speed site installation work. The assembled trusses were carefully racked to prevent damage during shipment and to facilitate handling of the trusses in the field.



An innovative glass canopy is integrated into the glass facade design. Cables provide simple support for the canopy gravity loads, but uplift loading presented a problem; there was no way to cable-stay the canopy against uplift wind loads because there was no way to prevent cables below the canopy from interfering with occupant egress to the building. The solution was to design a spring mechanism into the wall connection of the canopy supports. Under uplift loading the springs compress to restrict canopy deflection.



Grade 316 stainless material is used for the structural components and castings, with the exception of the ductile iron casting, which received a high performance 3-part aliphatic urethane finish to match the finish on the structural pipe frame.



The glass enclosure provides a spectacular light-flooded space as the lobby and reception area for the various activities of the medical school.

Kaiser Medical Center Downey, CA

owner Kaiser Permanente

architect HMC Architects

engineer Taylor & Gaines

gc McCarthy Building Companies

facade consultant DW Associates

completion 2008

program 6-story and 3-story building;
1 million sqft

building type healthcare

facade 37,000 sqft facade package included procurement, assembly and installation of over 37,000 sqft of exterior building skin; comprised of customized variations of Kawneer curtainwall, window-wall and storefront systems

glass 1 inch insulated glass HS/HS, captured 2-sides horizontally, vertical edges are structurally glazed with no exterior capture

description an extensive use of glass allows natural lighting to penetrate to designated areas of this sizeable structure, now the second largest hospital facility belonging to Kaiser Permanente



Kaiser Permanente's Downey location is their second largest hospital facility. The new facility includes 352 beds for 82 different medical departments, including an 85 room emergency facility offering both inpatient and outpatient care.

The exterior wall systems skinning the steel braced-frame structure were designed to meet the demanding seismic requirements of California Building Code.



Full scale mockups were constructed and tested at Smith Emery facilities in Los Angeles. The testing program required monitoring water penetration and air infiltration under load, including movements mimicking those that could occur in a seismic event.

To accelerate the erection schedule and minimize trade congestion, the Enclos field operations team presented an





installation strategy that allowed the installation of glass and metal facade systems prior to the plaster wall systems. The general contractor accepted the proposal, and Kawneer provided custom packaged framing by unit types to facilitate field assembly. Working in step with the general contractor, Enclos constructed an assembly yard at the exterior perimeter of the job site, greatly simplifying delivery logistics and further

speeding the schedule.

The exterior wall systems comprised over 37,000 square feet, including 22,930 square feet of Kawneer 2250 Series window-wall/storefront and 14,400 square feet of curtainwall. Large curtain-wall units were up to 26 feet in length.



Barnes Jewish Hospital Center for Advanced Medicine St. Louis

owner BJC Healthcare

architect HOK

engineer Cannon

cm J.S. Alberici Construction Co.

completion 2001

program 14-stories; 640,000 sqft

building type hospital

facade precast concrete and glass
curtainwall that features seven different
system types

description BJH is the largest hospital in
Missouri, and was constructed around
severe urban site congestion

awards AIA Design Award



BJC HealthCare's North Campus Integration project. Known as the Center for Advanced Medicine and the Alvin J. Siteman Cancer Center, the 640,000-square-foot project consists of an 8-story cancer center attached to a 14-story ambulatory care center. The building physically attaches to the currently occupied Schoenberg/Waldheim Pavilions and is linked to an elevated pedestrian walkway and parking structure via a network of bridges.

There were stringent seismic requirements for the building, requiring an unusually sophisticated structural steel system for the building. This demanded an equally sophisticated curtainwall system to accommodate the differential movements of the building structure

under load. The highly custom facade program utilizes an intricate precast concrete and glass curtainwall, involving seven different system types.

An equally daunting challenge was presented by the facade installation requirements on a severely congested urban site in a fully-operational hospital.

Barnes Jewish Hospital Center for Advanced Medicine was the recipient of an AIA Design Award.

San Francisco General Hospital

owner City of San Francisco

architect Fong and Chan Architects

engineer ARUP North America Ltd

gc Webcor Builders

cm Jacobs Global Buildings

completion 2015 (facade construction
Jun 2011 – Jan 2012)

project type Hospital

program 8-stories, 129 ft; 320,000 sqft

facade design/assist of 129,596 sqft
facade package, including: curtainwall,
foam core panels, composite panels,
louvers, skylights, automatic sliding
doors, punch windows, stud/sheathing,
backup system; Wausau curtainwall sys-
tem with units measuring 5 ft by 16 ft

glass 1in IGU's consisting of 1/4in heat
strengthened, 1/2in airspace and 1/4 in
heat strengthened; provided by Viracon

description Enclos is currently in the
design phase of this LEED inclusive
project, its third project with Webcor
Builders in recent years

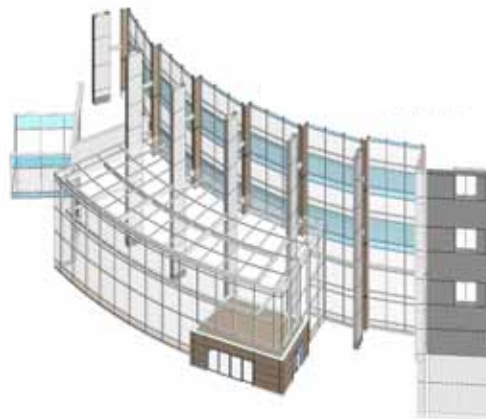


In the highly competitive market in which Enclos successfully pursued this diverse and complex facade program, the firm was chosen because of its demonstrated ability to control cost, meet demanding scheduling requirements, and contend with challenging site conditions. We can provide any level of design and engineering input to the architect, thus easing the burden on the design team. And we simply dominate the facade program delivery with our core strengths of project management and site operations, thus making life just a little easier for the build team. Simply put, we predictably deliver a quality product on time, on budget, and at a competitive price. Like many Enclos clients, Webcor is a repeat customer.

Hospital facade programs are typically complex, and the scope for San

Francisco General is no exception. The program includes multiple custom wall types, and a diverse mix of panels, windows, doors, and other facade elements. The technical program, again typical of hospital projects, is challenging in the extreme, involving exceptional performance requirements, spanning conditions, and coordination with MEP; all of this in a context that includes BIM and LEED.

Enclos has the experience and expertise to manage this type of highly technical program involving multiple material suppliers, fabricators and subcontractors. We have the flexibility to use our own manufacturing facilities or to draw on our network of qualified vendor/partners.



Human Genome
Sciences
Rockville, MD



owner Human Genome Sciences, Inc.
architect Davis, Carter, Scott
gc/cm Gilbane Building Company
facade consultant Williamson & Associates
completion 2002
program 6-stories; 900,809 sqft
building type education / research
facade design/build facade program
comprised of custom unitized curtain-
wall system, 4-sided structurally glazed
units
glass 1 inch insulated glass units with
blue reflective coating
description the sinuous facade of blue
reflective glass provides an appropri-
ately iconic image on this high tech
campus

Architect Davis, Carter, Scott and Gilbane Building Company were commissioned by Human Genome Sciences to create a headquarter campus on a 50 acre site located in Maryland. The total area of this office and biotechnological research laboratory facility is approximately 1,030,000 F.A.R. square feet, encompassing seven buildings and two parking garages. First phase consists of one 6-story building, two 4-story buildings and one parking garage for about 900 cars, all amounting to more than 900,000 square feet of building area. The main 6-story building has an atrium lobby with elaborate landscape features and high-end finishes.

The building structure is a concrete frame wrapped in an all glass facade. The clean curving lines are accommodated by a custom unitized glass curtainwall system provided by Enclos Corp. Four sided structurally glazed units were fabricated and assembled in one of the firm's manufacturing facilities, and shipped to the rural site in large prefabricated assemblies to minimize field labor and speed erection. The curtainwall uses 1 inch insulated glass units with a blue-green metallic coating to improve thermal performance.



Saint John's Health Center Santa Monica



owner Sisters of Charity of Leavenworth
Health Services Corporation

architect Stone Marraccini Pederson /
HOK

gc J.A. Jones Construction

completion 2002

program 4-stories; 200,000 sqft

building type healthcare / research

facade procurement, fabrication and
installation services for facade package
comprised largely of custom windows
and curtainwall provided by Kawneer;
Elward Metal Panel Systems and ICU
sliding doors

glass blue body tint glass with custom
features including acoustic properties,
glare resistance, and coatings to filter
harmful solar rays

description this soft pastel colored
facade incorporates large expanses of
glass that boost both natural luminance
and patient morale



After being devastated by the Northridge Earthquake, Phase 1 of the St. John's Health Center renovation has restored the facility as a premier health-care provider in Southern California. St. John's was severally damaged by the 6.7 earthquake, resulting in closure of the hospital for nine months, and requiring the demolition of an entire wing. The North Pavilion addition for the private Catholic hospital adds 154 beds for critical care, labor and delivery, neonatal intensive care and general surgeries. The addition cost nearly \$400 million.

The North Pavilion is built upon a base isolation system, which will let the structure withstand an earthquake twice the size of the Northridge event of 1994. A combination of below ground rubber plates, steel and lead rest between support columns and allow the building to sway under seismic forces.

The design program for the North Pavilion called for a more relaxed atmosphere than typical of traditional hospitals. To accommodate this design objective, patient rooms are located on the perimeter of the structure with

wide windows overlooking the facility's lush landscape of trees and gardens, with the surrounding Santa Monica Mountains as a backdrop. The extensive window areas provide patient comfort by warming the interior quarters with an abundance of natural light, creating a facility less dependant on florescent luminance and reducing energy consumption. The glass facade systems feature enhanced acoustic properties, control of direct solar penetration, glare resistance, and special coatings to improve thermal performance and filter harmful solar rays.

Olive View UCLA Medical Center Sylmar, CA



owner Los Angeles County
architect Charles Luckman Associates
gc Newberg-Brinderson JV
completion 1987

building type healthcare

facade design/build custom unitized
curtainwall system with operable win-
dows

glass 1 inch insulated units with blue
mirror coating

description this multi-story structure
with a distinctive blue glass facade re-
places the original building destroyed in
the 1971 San Fernando earthquake

This Southern California facility is one of the San Fernando's oldest hospitals, originally created to treat the overpopulated tuberculosis facilities of County General Hospital in 1920. Olive View has since evolved into an acute care center for the surrounding community, and home to part of the UCLA Medical School's training program in Los Angeles. A new hospital was completed in December of 1970, only to be destroyed less than two months later from structural failures during the 1971 San Fernando Earthquake. Olive View served patients through an interim facility for the next sixteen years.

The rebuilt Olive View Medical Center was opened in 1987 with a 377 bed

state-of-the-art facility. The joint venture of Olive View and UCLA became official in 1992, when the facility became the Olive View - UCLA Medical Center. The facility houses eight internal medicine wards, and is a primary training site for UCLA's residency programs.

The Enclos design and engineering team worked closely with legendary architect Charles Luckman in developing a state of the art curtainwall design for the facility. The custom system incorporated operable windows and was manufactured in an Enclos facility and shipped to the site, where the firm's site operations group installed the prefabricated curtainwall units.



Eskind Biomedical Library Nashville



owner Vanderbilt University
architect Davis Brody Bond LLP
gc Turner Construction Company
completion 1994
program 80,000 sqft
building type education / healthcare / research
facade 50 ft vertical span high-transparency facade, custom AESS truss system with integral glass glazing
glass standard 1 inch insulated
description entire north facing facade of this library facility is transparent glass, one of the first examples of a high-transparency facade in the US

Architect Davis Brody Bond wanted to utilize the emergent facade technologies of Europe for the library facility at Vanderbilt University, ultimately one of the very first applications of such technology in the US. The facade is supported by a hybrid truss system consisting of custom AESS vertical lattice trusses spaced 14 feet on center. The outer truss chords consist of 2 inch by 4 inch steel tubes with inner members of 2 inch diameter tube. The trusses are internally stabilized by crossing 3/8 inch diameter stainless steel tension rods. The trusses are laterally braced with a horizontal configuration of tension rods.

Sets of 2 inch by 4 inch horizontal steel tubes span between the outer truss chords and intermediate vertical members, creating a 7 x 3.5 foot exterior grid of flat, high tolerance steel. The glazing system is integral with this steel face of the truss system. Removing the redundancy of a structural system and add-on curtainwall system contributed to the project's economy and transparency.

This same technology has since been used by Enclos in many diverse applications.



This project received numerous awards, including an AIA/ALA Library Building Award, 1999.

Healthcare

a select listing of healthcare project types

Project Name	Location	General Contractor	Architect	Completion Date
BJC North Campus	St. Louis, MO	J.S. Alberici Construction Co.	Hellmuth, Obata + Kassabaum, PC	2002
Brigham & Women's Clinical	Boston, MA	W.A. Berry & Son	Tsoi Kobus & Associates	1994
Children's Hospital of Philadelphia - Abramson Building Expansion	Philadelphia, PA	L.F. Driscoll Co.	Ellenzweig Associates	2002
Children's Hospital of Philadelphia	Philadelphia, PA	L.F. Driscoll Company	Ellenzweig Associates	1995
Community North Hospital	Indianapolis, IN	Geupel DeMars	Boyd Sobieray & Associates	1985
Cook County Hospital	Chicago, IL	Walsh/Riteway	Loebl, Scholssman & Hackl Hague/Richards	2001
Copley-Rush Medical Campus	Aurora, IL	M.A. Mortenson Company/Schwendener JV	OWP&P	1995
CSULB - Physical Education Addition	San Diego, CA	Huber, Hunt & Nichols, Inc.	CHCG Architects, Inc.	1994
Dana Farber Cancer Institute	Boston, MA	Perini Building Company	Shepley Bulfinch Richardson	1997
Duchossois Center for Advanced Medicine	Chicago, IL	Turner Construction Company	Hansen Lind Meyer & Tsoi/Kobus & Associates	1995
Florida Hospital	Orlando, FL	H.J. High Construction	Sge/Schweizer Associates	1984
Gonda Building – Mayo Clinic	Rochester, MN	Centex Rodgers Construction Company	Pelli Clarke Pelli Architects/ Ellerbe Becket	2001
Grady Memorial Hospital	Atlanta, GA	Turner Construction Company	URS Consultants/Grady Team	1993
Harborview Medical Center	Seattle, WA	M.A. Mortenson Company	Kaplan/McLaughlin/Diaz Inc.	1998
Harvard Medical Research Center	Boston, MA	William A. Berry	Architectural Resources Cambridge Inc.	2003
Howard Hughes Medical Institute - Janiela Farms Research Campus	Ashburn, VA	Turner Construction Company	Rafael Vinoly Architects	2006
Human Genome Sciences	Rockville, MD	Gilbane Building Company	Davis Carter Scott	2002
Johns Hopkins Medical Research Facility	Baltimore, MD	Whiting-Turner Contracting Company	Hansen Lind Meyer, Inc.	1991

Project Name	Location	General Contractor	Architect	Completion Date
Kaiser Medical Center	Downey, CA	McCarthy Building Companies	HMC Group	2008
Maternal & Child Health	West Covina, CA	Millie & Severson	Stone Marraccini Pederson	2000
Milwaukee Co. Medical Complex	Wauwatosa, WI	M.A. Mortenson Company	Engberg Anderson	1994
N.Y.U. School of Medicine - Smilow Lab	New York, NY	Turner Construction Company	Mitchell-Giurgola Architects	2006
New England Deaconess Hospital	Boston, MA	Walsh Brothers	Shepley Bulfinch Richardson & Abbot	1995
New England Medical Center	Boston, MA	Turner Construction Company	Shepley, Bulfinch Richardson	1994
Northwestern Memorial Hospital	Chicago, IL	Power Construction Co/CRSS	Hellmuth, Obata + Kassabaum, PC/Ellerbe Becket	1999
Olive View Medical Center	Sylmar, CA	Newberg-Brinderson	Charles Luckman	1986
Saint John's Health Center	Santa Monica, CA	J.A. Jones Construction	Stone Marraccini Pederson/Hellmuth, Obata + Kassabaum, PC	2002
San Francisco General Hospital	San Francisco, CA	Webcor Builders	Fong and Chan Architects	2015
University of Pennsylvania - Biomedical Research II	Philadelphia, PA	BTK	Perkins & Will/Francis, Cauffman, Foley, Hoffman Architects, Ltd.	1999
Washoe Medical Center	Reno, NV	Sellen/Clark & Sullivan Joint Venture	HDR Architecture Inc.	2007
Worcester Medical Center	Worcester, MA	Centex Rodgers Construction Company	Hoskins Scott & Partners, Inc.	1999

Enclos Press Publications

*Inter-Story Acoustical Evaluation of
Unitized Curtainwall Systems - 2008*

*Analysis and Design of Spandrel and
Shadowbox Panels in Unitized Curtain
Walls - 2009*

Enclos: Collective Works - 2009

Facade TecNotes Series:

1 *Skylight*

2 *Double Skin*

3 *Architecturally Exposed Structural
Steel (AESS)*

4 *Airports*

5 *Healthcare*

6 *BIM and the Building Facade*

7 *Cable Nets*

8 *Security*

9 *LEED Skins*



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