Building Operating Management's
FMXCELLENCE
RECOGNITION PROGRAM

Apply for FMXcellence Recognition

Form must be completed in its entirety
Submitted information may be used in print, online or at conferences or other live events. Material marked "confidential" will not appear in coverage.

1. Name: Tony Meenaghan
2. Title: Senior Director, US Facilities, Engineering, and EHS
3. Company: EMD Serono, Inc.
4. Street Address: 1 Technology Place
   City / State / Zip: Rockland / MA / 02370
5. Phone number: 781-681-2250
6. Email address: tony.meenaghan@emdserono.com

7. Square feet of space that the facility department is responsible for:
   Data centers only: 5,000 or more of raised floor space
   - ❑ 100,000 to 250,000
   - ◪ more than 250,000 to 500,000
   - ❑ more than 500,000 to 1,000,000
   - ❑ more than 1,000,000 to 5,000,000
   - ❑ more than 5,000,000

8. Please provide an overview of one completed FM project/initiative or ongoing FM practice/program that supports the goals of the larger organization. Projects must be completed to be considered. (Limit responses to no more than 2,000 words.) Briefly indicate:
   - Major elements of the project or practice.
   - Steps involved in developing the project or practice, including the start and completion dates, and if applicable, completion date.
   - Scope of the project or practice. Did it involve one building? A business unit or region? The entire organization?
   - Hard and soft costs of the project or practice. Please indicate when estimates are being used.
   - Challenges involved in implementing or maintaining the project or practice.
   - Ways those challenges were overcome.
   - Lessons learned.

8. Overview (cont.)

Confidential Information. All information submitted is Confidential Information of EMD Serono Inc., and may not be disclosed or used without EMD Serono's prior written consent.

EMD Serono Research Institute
Project Name: Unity
Construction: March 2009 – January 2011
Total Project Cost: $57 million construction; $8 million soft costs

EMD Serono, Inc., an affiliate of Merck KGaA, Darmstadt, Germany, is a leader in the US biopharmaceutical arena, integrating cutting-edge science with unparalleled patient support systems to transform people's lives. Focusing on specialized therapeutic areas including neurodegenerative diseases, fertility, endocrinology and rheumatology, EMD Serono is committed to advancing scientific and medical knowledge and truly making a difference in society.

Opened in 2011, the state of the art EMD Serono Research Institute is a 140,000 ft2 expansion of our Billerica, MA campus and is one of four hubs for the company's global research organization. It was built to foster enhanced collaboration and synergies to discover and develop innovative treatments in oncology, neurodegenerative diseases, and fertility.

The facility includes environmentally responsible design features, making it one of only five true R&D labs in Massachusetts to achieve a Gold certification under the U.S. Green Building Concil's LEED® (Leadership in Energy and Environmental Design) Green Building Rating System. The EMD Serono Research Institute has received several honors since the facility's completion at the start of the year, including: the Facilities Management Achievement Award for Best Practices in the Medium Project category from the Boston chapter of the International Facility Management Association (IFMA); the 2011 MassSavers Award from National Grid; and the 2011 Boston Business Journal's Best Green Practices Award.

In 2007, a worldwide selection process took place to identify a location for a new R&D Center of Excellence. After an extensive global analysis, the Billerica campus was chosen as the best location to consolidate U.S. research operations. Concept design began the following year, with ground-breaking taking place in March of 2009 with an accelerated 19-month delivery schedule.

After securing funds for a capital project expenditure of $65 million in light of the economic conditions of 2007-2009, managing the project to that hard-cap dollar figure was an extreme challenge. Due in large part to quality estimation with above-average design elements, a thorough understanding of local and global market conditions, and internal and external benchmarking, our project team was able to stand confidently behind their first public cost estimate.

In order to control costs during design and construction, a strict change control process was developed and implemented. The project's change control process was structured around maintaining costs within the budget line item allowances and available project contingencies. The monthly budgetary estimates to complete played a role in determining savings potential on some items in order to fund better solutions for other challenges that arose. Wherever possible, unit prices and rates were established in the competitive bid process for subcontractors. Detailed breakdowns, as well as the documents initiating the change, were included in change submissions allowing for more efficient validation of costs submitted for extra work. The team would review all change submissions prior to their approval and execution. The project came in under budget, with total project changes at completion amounting to 1.7% of the total cost.

To minimize scientific downtime stemming from relocating 120 researchers and their equipment, the project team had to deliver a complete and fully functioning facility by the end of 2010 to take advantage of a planned shutdown between December 24th and January 3rd, a full 3-5 months faster than initial build time estimates. Overcoming this challenge took a herculean effort to coordinate with our construction, design, and move teams. One of the single key success factors in achieving this was the quality of the front-end concept schematic design which enabled us to pre-plan more precisely. Through aggressive and close collaboration, we delivered the project in the specified 19 month window.

The facility expansion incorporated key stakeholder and end-user input to deliver the project on time and on budget with no recordable construction accidents. The space accommodates over 115,000 ft2 of lab and office space, consisting of 25,000 ft2 of chemistry and screening labs; 25,000 ft2 of biology and cell culture labs; 22,000 ft2 of general lab support space; 20,000 ft2 of office space and conference rooms; and 23,000 ft2 of mechanical space. The foundation of this project was centered on environmental responsibility, cutting edge technology, and a commitment to quality and safety.

This project was executed in a collaborative and integrated way. Led by an inspirational project director at EMD Serono, the project was built from the ground up with input from the end-users during every step of the way. The engineers' and architects' involvement in creating a sleek, energy efficient, operationally effective building was clearly augmented by feedback from the teams who would ultimately be using the facility. Initially, the facility managers and scientists were involved in discussions on everything from the layout of the building and its incorporation with the existing facility, to the intricate details of the custom 12 foot fume hoods, lab benches, and equipment locations. During the design and construction phase, a 'captain' from each team of scientists was kept informed of the progress of the design and overall strategy of the building. They were also given the opportunity to bring their teams in to review plans and progress, and provide feedback on mock-ups of the laboratory benches and fume hoods. The collaboration was all encompassing, the pace unprecedented, and the dedication to the project by all was absolute.

The EMD Serono Research Institute Is now home to approximately 200 scientists with expertise in cancer biology, cancer immunotherapy, oncogene signaling, protein engineering, therapeutic antibodies, and manufacturing cell lines across the core therapeutic areas. The site's proximity to Boston reinforces EMD Serono's existing networks, scientific collaborations, and commitment to transform science into breakthrough medicine and solutions of the highest quality to make a real difference in the lives of patients and caregivers.

We had a vision to create a "life cycle safety in design" process to drive a purposeful safety culture to deliver our new facility. Our challenge was to deliver the project with no construction recordable injuries while reducing our long-term maintenance risk profile through well-designed safety elements. We succeeded in our pursuit by proactively and meaningfully engaging all key stakeholders in the design process from day one. We actively listened to our construction partners, trade specialists, and end users to incorporate the right design elements into the build process and subsequent occupation.
One of our biggest challenges and rewarding success was achieving Gold certification under the U.S Green Building Council's LEED® (Leadership in Energy and Environmental Design) Green Building Rating System was the result of meticulous planning, design and implementation efforts. This was accomplished because of a high level of teamwork during all stages of the project. EMD Serono's dedication to sustainability, in combination with the ingenuity of the project team, resulted in a successful plan to reduce the overall impact of the building on the environment.

From inception, we sought to make Project Unity different. We built relationships, not business arrangements. We designed with our researchers, not for them. We took every opportunity to provide innovative systems that reduce environmental impact and safety risk profile, not because it made the most business sense but because it was the right thing to do. The collaborative nature of this undertaking was summed up by one of the lead design architects at project completion: "I have worked on more than 300 projects over my 16 year career. This was the most collaborative, passionate, and rewarding project that I have ever been a part of."

The construction of the EMD Serono Research Institute was not just a bricks and mortar project – its purpose is to discover and develop innovative therapies for people living with conditions, such as cancer and multiple sclerosis. This message resonated within all who worked here and lead to a truly unique culture of accountability, passion, and pride. As a result, EMD Serono is now the proud owner of a world-class research facility dedicated to developing innovative therapies for people living with conditions, such as cancer and multiple sclerosis..

9. Describe the larger organizational goals or challenges addressed by the project or practice. Include any impacts that the project or practice had on building occupants. Limit responses to 1,000 words.

Confidential Information. All information submitted is Confidential Information of EMD Serono Inc., and may not be disclosed or used without EMD Serono's prior written consent.

At the time construction began, our 200 scientific staff were occupying three sites in Massachusetts: Rockland, Cambridge, and Billerica. While only separated by 30-40 miles, collaborating was difficult. Meeting space was hard to find. Groups were not familiar with their counterparts at the other sites. Aggressive project time-lines made the choice of traveling between locations challenging - was their time better spent at the bench or in the car?

The over-arching goal of this build was to bring together our three research sites into a single global R&D hub, consolidating the knowledge base for scientific discovery and promoting cross-functional collaboration to further our efforts in cancer, fertility, neurodegenerative diseases, and rheumatology. EMD Serono strongly believes that casual interaction can lead to powerful discoveries. As such, numerous creative spaces were designed to promote the exchange of ideas, including a two-story "Interactive Cafe" with write-on glass walls and tables, couches, and several complimentary coffee machines. A year into occupancy, this area is clearly the nerve center of the Institute - from sun up to sun down, you will find scientists from different therapeutic areas engaging and challenging one another, sketching an idea, or sharing successes or challenges with their current project. We now have 200 researchers under a single roof, with a unified culture, and a single goal: to dicover and develop innovative therapies for people living with conditions, such as cancer and multiple sclerosis.

EMD Serono also recognizes the impact businesses and corresponding facilities have on the environment and its resources. The company’s mission was to create an energy efficient building to significantly reduce its environmental impact while supporting our purpose of advancing scientific and medical knowledge. Due to the nature of the systems required to enable critical R&D functions, implementing building energy efficiencies posed significant challenges. Through the diligent work of the design team backed by a strong ROI, the business supported our initiative 100%. As a result of these efforts EMD Serono achieved a rare LEED Gold certification for a fully functioning R&D building.

10. Describe results achieved. Include quantitative and qualitative results. For quantitative results, describe the way that results were measured or evaluated. It is helpful to put savings results in some context – as a percentage of the overall facility or energy budget, for example. Energy and water savings results should be based on hard data, e.g. metered data or utility bills. If the project or practice involved the creation of metrics/measurements, use this space to provide more detail about the metrics program. Limit responses to 1,000 words.

Safety in Design and Construction "A Lifecycle Approach"

We had a vision to create a Life Cycle Safety in Design Process to drive a purposeful safety culture to deliver our new project. Our challenge was to deliver the project with no construction recordable injuries while reducing our long-term maintenance risk profile through well-designed safety elements.

In 2009 (36) Representatives from the Project Team Attended a Custom Program at Harvard University "Safety in Design and Construction: A Lifecycle Approach". Attendees included,
EMD Serono Project Team, Architects, MEP Designers, Construction Managers, Superintendents, and End Users. Construction safety requires real owner investment, selecting the right partners who have a true validated safety record, alignment of safety outcomes with the construction and design teams, purposely designing-in safety from the outset, and holding all stakeholders accountable. This established a meaningful and measurable safety culture from day one resulting in:
• 370,000 man hours with ZERO OSHA-Recordable Injuries
• Key Performance Indicators
o Weekly Safety Inspections (100% of goal)
o Good Job Recognition for Promoting Safety on the job (94% of goal)
o Safety Training completed before working onsite (100% of goal)
o Weekly "Toolbox Talks" focused on safety topics (93% of goal)
o Injury record-keeping log for all injuries (100% of goal)
• Reduced long-term maintenance risk profile
o MEP systems serviceable with minimal safety risk

Sustainability

EMD Serono, Inc. recognizes its responsibility to environmental protection and conservation, as well as for the occupational health, safety and security of its employees and all its assets. EMD Serono strives to achieve excellence in all business practices. The company operates with respect to environmental health and safety in full compliance with the prevailing laws of the United States. Continual improvement requires vigilance by all management personnel and is a priority for every employee at EMD Serono.

LEED Gold
One of our biggest challenges and rewarding success was achieving Gold certification under the U.S Green Building Council's LEED® (Leadership in Energy and Environmental Design) Green Building Rating System was the result of meticulous planning, design and implementation efforts. This was accomplished because of a high level of teamwork during all stages of the project. EMD Serono's dedication to sustainability, in combination with the ingenuity of the project team, resulted in a successful plan to reduce the overall impact of the building on the environment. To help minimize environmental impact, the building's designers incorporated sophisticated and efficient air-handling systems, high-efficiency boilers, a grey-water recycling system, and natural light features into an already complicated laboratory space. The team collaborated with the local utility companies to establish incentive plans and rebates, which were built into the design. Recycled content made up 30% of materials used on-site and 21% of materials were regionally sourced. The project diverted 96.4% of construction waste from landfills.

Building Dashboard
EMD Serono's employees continue to actively focus on sustainability and are able to track this through the use of a large touch screen LCD 'Building Dashboard'. This interactive tool is a permanent fixture in the main lobby, meant to educate both staff and visitors on energy consumption of the building. By making this information easily accessible and displaying it in tangible terms, the goal is that there will be a growing commitment to decrease energy usage, reduce overall environmental impact, and improve operation of the facility.

Building Features
Some of the features incorporated into the building are:
• High - performance envelope design, optimized building orientation
• Solar panels
• 70% of energy purchased from renewable sources
• Efficient mechanical systems: high efficiency chillers and laboratory air handling units and enhanced boiler O2 controls
• Reduced mechanical system demand: reduced air change rates, reduced fume hood face velocity, ventilation-on-demand technology
• Efficient electrical and lighting systems
• Additional alternative transportation: a new MBTA bus route stop

ISO 14001
The new facility maintains an ISO 14001 Certified Environmental Management System, which addresses all regulatory requirements in addition to mandating goals and objectives that require continual maintenance and improvement. Sample objectives are reduction of greenhouse gas emissions by 20% by 2020 and the use of a green purchasing policy. EMD Serono is also managing and reducing solid waste generation, especially with regard to chemical and biological waste associated with research processes.

Energy Efficiency
Mechanical and HVAC efficiency provide a large contribution to the sustainability program at the organization. Rebates were pursued in partnership with National Grid and MassSave. Each of the Categories below contributes to the building's energy efficiency and reduces harmful greenhouse gas emissions:

Motor Up Incentive
• 48 high efficiency motors installed

Variable Speed Drives Incentive
• 5 variable speed drives installed
• Additionally, variable speed drives control the fan motors in response to a condenser water temperature sensor

Chiller Incentive
• High efficiency chiller operates at 0.523 kw/ton

Additional Incentives
• Lab and Vivarium exhaust fans allow to reductions in speed to 40% during unoccupied periods
• Enthalpy economizer
• Demand controlled ventilation
• Gas/boiler combustion controls
• Ventilation heat recovery
• Performance lighting controls

Incentive Results
• Total Energy Saved: 927,351kWh (42,592 therms)
• Incentives Project Cost: $626,725
• NGRID Incentive: $202,300
• Money Saved: $177,735
• Return on investment <2.4 years
• Reduction of approximately 935 tons of carbon being emissions per year

(Note: Data above corresponds specifically to the National Grid incentive project and not all energy saving measures.)

Energy Management
The building has been tracking energy costs since construction (new facility and original structure combined), and will continue to do so to improve efficiencies in every way possible.
Some current energy statistics are below:

Energy Cost Reduction
• 2010 (prior to expansion): ~$0.12/ft2
• 2011 (including expansion): ~$0.05/ft2
• 58% reduction

Water Cost Reduction
• 2010 (prior to expansion): ~$0.28/ft2
• 2011 (including expansion): ~$0.21/ft2
• 25% reduction

11. Describe methods used to communicate the results of the project or practice to the greater organization. (If the project or practice was a communications effort, use this space to provide more detail about the communications program.) Limit responses to no more than 500 words.

Confidential Information. All information submitted is Confidential Information of EMD Serono Inc., and may not be disclosed or used without EMD Serono's prior written consent.

Transparency being one of our company values, our employee base was kept well informed throughout Project Unity. From the onset of the project an intranet site was developed and managed by the team, sharing key information on project progress, site logistics, real-time schedule updates, key building highlights, FAQ, and a live panoramic web-cam of the project site. Employee's had the opportunity to submit questions online and answers were posted for the general population to review. The live web-cam, intranet page, and additional multimedia sources were used to broadcast project progress at our other sites, providing a constant stream of information.

As the project evolved so did the content of the intranet site. From project information to move logistics and re-location schedules, to providing access to key documents like building information, floor plans, community area information, and what to expect on opening day.

Upon completion of the project, a Building Dashboard was established allowing EMD Serono's employees to continue to actively track the buildings performance. This interactive tool is a permanent fixture in the main lobby, meant to educate both staff and visitors on energy consumption of the building. By making this information easily accessible and displaying it in tangible terms, the goal is that there will be a growing commitment to decrease energy usage, reduce overall environmental impact, and improve operation of the facility.

Further enhancing end-user engagement in the energy performance of the building, a Shut the Sash Campaign has been established with the research scientists. A series of LCD displays were installed throughout the laboratory entrances, to monitor and communicate energy use from their research hoods and the impact of shutting the sash on chemical fume hoods. The communication of real-time results and ability to track progress has helped engage employees in a culture of sustainability, further reducing our carbon footprint.

12. In order to verify the effectiveness of the project or practice being submitted for consideration, attach a letter from a key manager outside the facility/real estate department describing the impact of the project or practice. If a letter is not possible, please provide the name, phone number and email address for a key manager outside the facility/real estate department who we can contact (examples of key managers: CEO, CFO, COO, business unit manager, vice president, etc.).

Key Manager Name:

Title:	Noreen Nugent, Director, US Research Operations
Phone:	978-294-1208
Email:	noreen.nugent@emdserono.com

13. Attach a list of key in-house participants in the project or practice, both those who work in the facility department and those from other departments. (Do not include outside service providers, contractors, etc.)

14. Attach any other material to support the application. Attachments can be related to any of the questions on this form or can provide relevant information on areas outside those questions. Limit additional material (not counting the letter and list of participants) to no more than 20 pages. Using sample pages, tables of contents, etc., can reduce the number of additional pages submitted.

☐ I have read the guidelines and to the best of my knowledge, I am eligible to submit and all the information supplied is correct. I understand the information submitted here could be used by *Building Operating Management* magazine and NFMT for their own purposes if my submission is selected (other than material marked confidential). The box must be checked to submit entry.

Please save this document on your PC and send as an attachment, along with supporting documents, to edward.sullivan@tradepress.com. If you have any questions, please contact edward.sullivan@tradepress.com.

FMXcellence Award Submission

EMD Serono Incorporated– Project Unity
Key Participants

Question 13

Facilities Management Team
Tony Meenaghan
Chris Nesman
Lenny Dipasquale
Lisa Derby
Jeff Hyman
Pam Duprez
Barbara Miller
Mike Albano
Nate Anderson
Jack Conway

Corporate Communications
Jen Bianco
Kristen Laverghetta
Steve McGettrick

Finance
Chris Finnegan

Legal
Mike MacDougal

Research
Steve Arkinstall
Noreen Nugent

QUESTION 14

Additional Materials

ISPE submission
Harvard Letter

EMD Serono

Living science, transforming lives

EMD

project unity

ANTHONY J. MEENAGHAN

SENIOR DIRECTOR

US FACILITY MANAGEMENT/ENGINEERING AND ENVIRONMENTAL HEALTH & SAFETY

EMD SERONO, INC.

Executive Summary

Location: 45A Middlesex Turnpike, Billerica, Massachusetts 01821
Construction: May 2009 - December 2010
Total Project Cost: $65 million
Job Growth: 100 new research jobs will be added in Massachusetts as a result of the building expansion

---

EMD Serono, Inc., an affiliate of Merck KGaA, Darmstadt, Germany, is a leader in the US biopharmaceutical arena, integrating cutting edge science with unparalleled patient support systems to improve peoples' lives. Focused on specialized therapeutic areas, including neurodegenerative diseases, fertility, endocrinology, oncology, and rheumatology, EMD Serono is committed to advancing scientific and medical knowledge and truly making a difference in society.

The state of the art EMD Serono Research Institute, which opened in 2011, is one of four hubs for the company's global research organization. It was built to foster enhanced collaboration and synergies to discover and develop innovative treatments in oncology, neurodegenerative diseases, and fertility.

A unique approach during the programming and design phase achieved remarkable results. The 140,000 ft^2 research facility incorporated key stakeholder and end-user input to deliver the project on time and on budget with no recordable construction accidents. The space accommodates over 115,000 ft^2 of lab and office space, consisting of 25,000 ft^2 of chemistry and screening labs; 25,000 ft^2 of biology and cell culture labs; 22,000 ft^2 of general lab support space; 20,000 ft^2 of office space and conference rooms; and 23,000 ft^2 of mechanical space. The foundation of this project was centered on environmental responsibility, cutting edge technology, and a commitment to quality and safety.

The facility includes environmentally responsible design features, making it one of only five labs in Massachusetts to achieve Gold certification under the U.S Green Building Council's LEED® (Leadership in Energy and Environmental Design) Green Building Rating System. The EMD Serono Research Institute has received several honors since the facility's completion at the start of the year, including: the Facilities Management Achievement Award for Best Practices in the Medium Project category from the Boston chapter of the International Facility Management Association (IFMA); the 2011 MassSavers Award from National Grid; and the 2011 Boston Business Journal Best Green Practices Award.

The EMD Serono Research Institute is now home to approximately 200 scientists with expertise in cancer biology, cancer immunotherapy, oncogene signaling, protein engi-

neering, therapeutic antibodies, and manufacturing cell lines across the core therapeutic areas. The site's proximity to Boston reinforces EMD Serono's existing networks, scientific collaborations, and commitment to transform science into breakthrough medicine and solutions of the highest quality to make a real difference in the lives of patients and caregivers.

Entrance to EMD Serono Research Institute

Rear view of EMD Serono Research Institute

Project Uniqueness and Innovation

The success of this project was largely due to the collaborative efforts of the design teams and end users. Their work resulted in the construction of a world class research facility and sparked the start of a unique culture, not found on many projects. This helped to drive all who worked on this building to feel a great deal of personal accountability, passion for the project, and a sense of pride in the quality of workmanship. A team with one, unified purpose was formed – Project Unity, as it was named, was not just a bricks and mortar project: its purpose was to find a cure for cancer, a meaningful social impact which affected everyone involved.

Programming Phase

The design process began with a programming phase effort in April 2008. Its goal was to allow the design team, led by the architecture and lab planning firm Ellenzweig, to gain the best understanding of the detailed requirements for the building and the spaces within, so that the optimal environment was created to support the drug discovery research mission. Numerous meetings were held with EMD Serono scientists and staff that allowed for the overall organization of the building to be established, so the design phases could commence.

Design Phase

At the beginning of the this phase, key decisions were made that paved the way for the success of the project. The location of the new main entry and skylit lobby, large seminar room on the first floor, and cafeteria and dining area on the ground floor provided a logical and functional center to the overall building. Similarly, critical decisions were

made to organize the labs and offices in the new research wing so effectively that many EMD Serono scientists stated that they could not have imagined a better design solution. A senior scientist noted that the labs are now the best in the company on a global level.

One of the most important aspects of this project was to link the original structure with the new facility in a way that promoted collaboration between the two spaces and across all therapeutic areas.

Essential participants in the design process included Bard Rao + Athanas (BR+A), the building design engineers, and LeMessurier Structural Engineers. These consultants contributed to the creation of a sustainable design and helped ensure an impeccable safety record was maintained.

Quality and Safety

A custom project quality control program was put in place by Jones Lang LaSalle (JLL), construction manager, and involved the design team with representation from EMD Serono, JLL, and key subcontractors and suppliers. The usual shop drawing and submittal process was enhanced by detailed pre-installation conferences for all work. Here, the installing foreman was involved with other team members in a full review of the work to take place in regard to coordination with other trades and adjacent work, product specifications, manufacturers' recommendations, drawings, logistics, and safety. In many cases where questions or concerns arose on products such as roofing, flooring systems, and paints, the manufacturers became directly involved.

A continuous multi-tiered inspection and documentation program of all work was performed not only by each factory and manufacturing facility and the installing trade, but by the project superintendents, the design team, and the project's dedicated quality control managers from JLL and EMD Serono. Non-conforming work was corrected as quickly as possible and work was validated at all levels prior to final acceptance.

For EMD Serono and the entire project team, safety was always regarded as the number one priority. The project team fostered a collective goal towards zero construction recordable accidents and established a proactive safety culture from the start. During the design phase of the project, the owner demonstrated involvement and commitment to safety by sponsoring the training of the entire design and construction leadership team at Harvard's Environmental Health and Safety program - "Safety in Design and Construction: A Life Cycle Approach". This program focused on two key items: considering the long term end-users' safety during design and working to make a safer project site during construction.

With such a high level of support from the owner, safety was seamlessly incorporated into daily construction operations. Stringent safety expectations were written into contracts of subcontractors. The construction budget contained dedicated funds to cover enhanced site safety facilities, incentive programs, training, and equipment. Temporary heated and air conditioned facilities that enhanced the workers on-site comfort were

provided, including sanitary facilities and a site cafeteria facility training room for 120 people with vending machines, cable TV and appliances. Safety training was required for every individual who entered the site, initially for employees on their first day, and then on a weekly basis with their supervisors and JLL's superintendents. Targeted safety inspections by JLL and EMD Serono were performed regularly, with documented minutes and actions. Key performance indicators (KPIs) were documented, tracked, and reviewed at monthly executive meetings. Safety statistics were discussed at weekly construction meetings; attention was brought to near misses, and they were used as a learning opportunity for all in an effort to potentially determine a safer way to perform a task.

EMD Serono provided a team atmosphere and motivation to the project workers by providing quarterly safety awards for 'doing it right' and 'setting the example'. In addition, lunchtime celebrations were held to recognize milestones of hours worked without loss-time accidents. The result: 370,000 hours without a single recordable lost-time accident.

Harvard University acknowledged this great achievement by sending the project team a congratulatory letter and informed them that the EMD Serono Research Institute would be used as a case study in future sessions of the "Safety in Design and Construction: A Life Cycle Approach" course.

Operational Excellence

The project team worked to design and build a cutting edge facility to attract top talent and drive innovation in research. Some of the building's specialized technologies and features were developed through input from more than 120 key stakeholders.

Compound Storage

This laboratory space has the capability to store and distribute all internal pharmaceutical compounds from three global sites: Darmstadt, Geneva, and Billerica. The new facility has the ability to store compounds in liquid form at -20 degrees Celsius. This prevents degradation of materials and allows for more efficient tracking and distribution. The laboratory was also designed to hold robotic equipment designed to aid in dispensing, storing, and distributing these compounds, thereby increasing efficiency.

Mechanical Design Flexibility

The mechanical, electrical, and plumbing (MEP) configuration in the laboratory spaces has been designed to allow easy capital equipment upgrades as the technology of the instruments and the needs of Research Institute change. Additionally, laboratories were specifically tailored for each research group to provide best-fit MEP for the equipment needs required by the various therapeutic areas.

Increased Bench Space and Continuity in Labs

Researchers' input indicated that additional bench space would result in more efficient

work. Approximately 50% more bench space was allocated for each scientist, allowing more room for equipment, instruments, and materials at the bench. This enables multiple researchers to work side-by-side when necessary, with ample of space to conduct experiments and collect data.

Open Laboratory and Collaboration Space

Open laboratories with less division allow different research groups to collaborate with ease. These interactive spaces, including coffee bars and lounge areas, bring researchers together in a planned fashion while also maximizing the real estate assets for future development.

Custom 12 Foot Fume Hoods

The facility is home to one of the greatest single concentrations of 12 foot fume hoods in the country. These hoods allow chemists adequate room to run multiple reactions in the same ventilated space, with proper mechanical controls and systems to ensure safety of the user. A mock up of the fume hood was provided for all scientists to review prior to the start of fabrication, allowing critical feedback to be added into the final design specifications.

Vivarium

The research facility was designed to minimize contamination while maximizing flexible laboratory spaces. In the past, groups have been confined to separate suites. Protocols have been established for the movement of materials and personnel throughout the facility that allow users to share space across multiple target areas of study. This allows for more efficient experiment and study design, as well as making accommodations for future needs.

Researchers are afforded an average of 600 ft^2 in which to perform their work

Automated liquid storage and retrieval system minimizes compound degradation

Custom 12 foot fume hoods feature energy saving design elements

Project Execution

Project Management

From the outset of the programming phase our construction manager, Jones Lang La-Salle, was an active participant. This early involvement facilitated budget, safety, and feasibility assessments and provided feedback to the design teams and EMD Serono. In addition to optimizing decision making, initial involvement in the approval process within the community helped to develop partnerships with abutters, local authorities, and others throughout the project. This increased collaboration and minimized issues that could have potentially impacted the project. JLL customized many of their processes to suit the needs of EMD Serono and this specific project. Customized tracking applications, reporting forms, and other tools were developed and implemented for use across all trade disciplines.

One key area where this early collaboration achieved outstanding results was the ability to include the following items in the bid documents:

- a detailed project safety plan with procedures
- a multi-phased site logistics plan addressing all aspects of concern, including:
  - safety of project workers and EMD Serono employees
  - protection of surrounding wetlands
  - minimizing impact to abutters and local traffic patterns

The project team took the concept of an 'open book' guaranteed maximum price (GMP) process to new levels. The open process included EMD Serono and the design teams in the development of subcontractor bidder pre-qualifications, interviews, scope reviews, selection, and award. This allowed for the early release of time-sensitive procurement items such as structural steel and the commencement of foundation construction prior to final construction documents being available; this aided the team in staying within time constraints without taking on unnecessary financial risks.

Budget Control

EMD Serono and JLL worked closely on budget goals and controls. In addition to team reviews of issues and associated costs on a regular basis, a value engineering effort was ongoing throughout the project. This assured best practices and appropriate efficiencies were incorporated in the initial construction documents. Additionally, means, methods, and associated costs were analyzed prior to implementation. Due to the early establishment of a GMP prior to completion of design, numerous line item allowances were incorporated. To track these, and all other budget items within the GMP, a detailed estimate was developed and maintained throughout the project with monthly team reviews. Line items were put in place to address site safety, temporary facilities, environmental protection, and many other project costs to a greater level of detail than usual, allowing for superior decision making and budget tracking.

Organization

EMD Serono drove a truly collaborative process for the project across all disciplines. Input was always sought where appropriate from designers, end users, facility maintenance staff, specialty consultants, subcontractors, suppliers, and many others before a decision was finalized. Each firm on the project team brought its best talent and practices to the table with constant involvement from the principals of each firm, including a monthly executive meeting that was held throughout the project. EMD Serono involved participants into the process for quality control, site safety, and other matters working directly with construction team members on-site. With open communication being key, the project's non-linear team structure welcomed input from all participants, and resulted in constant improvement to best practices throughout the build.

Innovative Project Delivery

This project was executed in a collaborative and integrated way. Led by an inspirational project director at EMD Serono, the project was built from the ground up with input from the end-users during every step of the way. The engineers' and architects' involvement in creating a sleek, energy efficient, operationally effective building was clearly augmented by feedback from the teams who would ultimately be using the facility. Initially, the facility managers and scientists were involved in discussions on everything from the layout of the building and its incorporation with the existing facility, to the intricate details of the fume hoods, lab benches and equipment locations. During the design and construction process, a 'captain' from each team of scientists was kept informed of the progress of the design and overall strategy of the building. They were also given the opportunity to bring their teams in to review plans and progress and provide feedback on mock-ups of the laboratory benches and fume hoods. The collaboration was all encompassing, the pace unprecedented, and the dedication to the project by all was absolute.

Response to Business Plan

EMD Serono is dedicated to the pursuit of treatments that could potentially improve the quality of life for those with unmet medical needs, a mantra espoused as a critical component of the project's mission. This underlying sentiment was shared by all participants in the project - each day taken and each dollar spent had to contribute to this goal.

Change Control

The project's change control process was structured around maintaining costs within the budget line item allowances and available project contingencies. The monthly estimate to complete played a role in determining savings potential on some items in order to fund better solutions for other challenges that arose. Wherever possible, unit prices and rates were established in the competitive bid process for subcontractors. Detailed breakdowns, as well as the documents initiating the change, were included in change submissions allowing for more efficient validation of costs submitted for extra work. The team would review all change submissions prior to their approval and execution. Total project changes at completion were 1.7% of the total GMP.

Schedule Control/Expediting

The JLL team developed critical path schedules and short term 'look-ahead' tools to manage the project's pre-construction and construction phases. Early development of these tools allowed the team to prioritize and focus on crucial deliverables.

In pre-construction, this method facilitated the prioritization of decisions regarding early release packages for long lead items and critical upfront needs, such as structural steel and foundation work.

During construction, constant real-time updates to these tools coupled with a thorough site logistics plan went hand-in-hand to provide flexibility in dealing with some challenges, including:

- maintenance of the operations of the adjoining existing facility
- protection of adjacent wetland property
- designing and constructing around unforeseen geotechnical challenges
- extensive coordination of lifts and major crane picks
- preparing for and working through several unusual weather events

These were all instances where time may have been lost if a high level of detail and flexibility was not incorporated into these plans from their inception. In addition, these tools helped with communications to keep all EMD Serono employees and construction workers apprised of the schedule and logistical challenges.

Novel Strategy

Throughout the project every team member was striving to complete the project on-time to ensure that the scientists would be able to continue their research without interruption.

Completing the project on budget at the highest level of quality, without any time lost to accidents, was a requirement. The principle strategy employed here was coaching by the EMD Serono project director to maintain the team's open and collaborative approach. The project director involved all principle team participants in customized programs related to safety, risk management, and other relevant topics. EMD Serono did not merely tell the team what they expected - they actively led the team to a shared successful conclusion.

Sustainability

EMD Serono, Inc. recognizes its responsibility to environmental protection and conservation, as well as for the occupational health, safety and security of its employees and all its assets. EMD Serono strives to achieve excellence in all business practices. The company operates with respect to environmental health and safety in full compliance with the prevailing laws of the United States. Continual improvement requires vigilance by all management personnel and is a priority for every employee at EMD Serono.

LEED Gold

Achieving Gold certification under the U.S Green Building Council's LEED® (Leadership in Energy and Environmental Design) Green Building Rating System was the result of meticulous planning, design and implementation efforts. This was accomplished because of a high level of teamwork during all stages of the project. EMD Serono's dedication to sustainability, in combination with the ingenuity of the project team, resulted in a successful plan to reduce the overall impact of the building on the environment.

To help minimize environmental impact, the building's designers incorporated sophisticated and efficient air-handling systems, high efficiency boilers, a grey-water recycling system, and natural light features into an already complicated laboratory space. The team collaborated with the local utility companies to establish incentive plans and rebates, which were built into the design. Recycled content made up 30% of materials used on-site and 21% of materials were regionally sourced. The project diverted 96.4% of construction waste from landfills.

Building Dashboard

EMD Serono's employees continue to actively focus on sustainability and are able to track this through the use of a large touch screen LCD 'Building Dashboard'. This interactive tool is a permanent fixture in the main lobby, meant to educate both staff and visitors on energy consumption of the building. By making this information easily accessible and displaying it in tangible terms, the goal is that there will be a growing commitment to decrease energy usage, reduce overall environmental impact, and improve operation of the facility.

Building Features

Some of the features incorporated into the building are:

- High-performance envelope design, optimized building orientation
- Solar panels

- 70% of energy purchased from renewable sources
- Efficient mechanical systems: high efficiency chillers and laboratory air handling units and enhanced boiler O_2 controls
- Reduced mechanical system demand: reduced air change rates, reduced fume hood face velocity, ventilation-on-demand technology
- Efficient electrical and lighting systems
- Additional alternative ransportation: a new MBTA bus route stop

ISO 14001

The new facility maintains an ISO 14001 Certified Environmental Management System, which addresses all regulatory requirements in addition to mandating goals and objectives that require continual maintenance and improvement. Sample objectives are reduction of greenhouse gas emissions by 20% by 2020 and the use of a green purchasing policy. EMD Serono is also managing and reducing solid waste generation, especially with regard to chemical and biological waste associated with research processes.

Energy Efficiency

Mechanical and HVAC efficiency provide a large contribution to the sustainability program at the organization. Rebates were pursued in partnership with National Grid and MassSave. Each of the categories below contributes to the building's energy efficiency and reduces harmful greenhouse gas emissions:

Motor Up Incentive

- 48 high efficiency motors installed

Variable Speed Drives Incentive

- 5 variable speed drives installed
- Additionally, variable speed drives control the fan motors in response to a condenser water temperature sensor

Chiller Incentive

- High efficiency chiller operates at 0.523 kw/ton

Additional Incentives

- Lab and Vivarium exhaust fans allow to reductions in speed to 40% during unoccupied periods
- Enthalpy economizer
- Demand controlled ventilation
- Gas/boiler combustion controls
- Ventilation heat recovery
- Performance lighting controls

Incentive Results

- Total Energy Saved: 927,351kWh (42,592 therms)
- Incentives Project Cost: $626,725
- NGRID Incentive: $202,300
- Money Saved: $177,735
- Return on investment <2.4 years
- Reduction of approximately 935 tons of carbon being emissions per year

(Note: Data above corresponds specifically to the National Grid incentive project and not all energy saving measures.)

Energy Management

The building has been tracking energy costs since construction (new facility and original structure combined), and will continue to do so to improve efficiencies in every way possible. Some current energy statistics are below:

Electricity Consumption (Monthly Average) - Q1-Q2: 2011

- 418.41 MWh

Natural Gas Consumption (Monthly Average) - Q1-Q2: 2011

- 2,999 MMBTU

Heat Recovery System (Monthly Average) - Q1-Q2: 2011

- 590 MMBTU

Solar Energy Production (Total) - May-September 2011

- 3,000 kWh

Energy Cost Reduction

- 2010 (prior to expansion): ~ $0.12/ft^2
- 2011 (including expansion):~ $0.05/ft^2
- 58% reduction

Water Cost Reduction

- 2010 (prior to expansion): ~ $0.28/ft^2
- 2011 (including expansion):~ $0.21/ft^2
- 25% reduction

EMD Serono Project Unity

EMD Serono Project Unity

HARVARD SCHOOL OF PUBLIC HEALTH

Department of Environmental Health
665 Huntington Avenue, Boston, MA 02115

voice: +1 617 384 8812
fax: +1 617 384 8767

7 March 2011

Tony Meenaghan
Senior Director of US Facility Management
Engineering and Environmental Health and Safety
EMD Serono Inc.
One Technology Place
Rockland, MA 02370

Dear Tony:

I am writing in support of your submission of Project Unity to the IFMA. Project Unity represents the dream of any professor that their teachings make a difference in the real world.

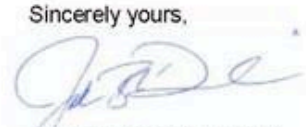
Through our partnership that started in the classroom for *Safety in Design and Construction* in early 2009, you along with those at Jones Lang LaSalle have completed Project Unity with no lost time recorded injuries for a job that took 370,000 man hours.

Based on the partnership, you changed design and construction delivery methods to reduce workplace hazards. You initiated and implemented award programs that provided incentives to individuals to find creative and innovative ways to design and do the job safer. You made safety priority number one for the construction project for a building whose mission is to improve the health and well being of those around the world faced with cancer. You made a huge difference for the workers at the facility, including those who built the building, who will maintain the building, and those who will work in the building.

As you know, we now use Project Unity as a case study in our class, *Safety in Design and Construction: a Lifecycle Approach*. We commend you on your efforts. It is an honor to work with such early adapters of this approach and be part of their success.

We wish you success and hope to work again with you on future projects.

Sincerely yours,



Jack T. Dennerlein, Ph.D.
Senior Lecturer on Ergonomics and Safety
jax@hsph.harvard.edu