

# MAOMENTUM

SPRING 2025

ENGINEERING EXCELLENCE IN THE ARTS



**Mueller**

# FOSTERING CREATIVITY THROUGH TECHNICAL INNOVATION

**Integrating advanced engineering systems in arts facilities represents one of the most complex challenges in building design. These spaces must simultaneously support precise environmental controls, optimal acoustics, specialized infrastructure, and flexible configurations—all while promoting energy efficiency and sustainability goals.**

**Additional complexities include addressing occupant safety from hazardous chemicals or processes used in creative work, often requiring industrial hygienists to provide proper exhaust and ventilation, as well as containing gases, odors, dust, and particulates from various artistic disciplines, such as welding, metalworking, woodworking, painting, and ceramics. These diverse requirements necessitate engineering solutions that safeguard both people and artwork while facilitating creative expression.**

**Mueller Associates' recent completion of several significant performing and fine arts centers demonstrates our expertise in creating these environments—where technical precision meets creative expression. These projects exemplify how thoughtful engineering solutions enable artistic excellence and educational innovation.**



## BREAKING BOUNDARIES

# RADFORD UNIVERSITY'S ARTIS CENTER FOR ADAPTIVE INNOVATION AND CREATIVITY



### A Revolutionary Interdisciplinary Vision

The new **Artis Center for Adaptive Innovation and Creativity** is the largest academic building on Radford University's campus and its largest capital construction project to date. This 178,000 GSF facility embodies a bold vision for interdisciplinary education, where health sciences converge with visual and performing arts under one roof.

The center is home to the university's College of Visual and Performing Arts, the Waldron College of Health and Human Services, and the College of Nursing.

Mueller provided comprehensive mechanical, electrical, plumbing, and fire protection engineering services for this landmark project, working closely with architects **Hord Coplan Macht** and **William Rawn Associates** to bring the university's ambitious vision to life.

*"The Artis Center presented a fascinating engineering challenge. We needed to create systems that could simultaneously support the acoustical environment of a recording studio, the heavy ventilation requirements of art studios, and the precise temperature and humidity control needed for health sciences—all while ensuring these systems remained virtually invisible to the building's occupants."*

**Thomas Syvertsen, PE, LEED AP  
Principal, Mueller Associates**

# COMPLEX CHALLENGES, INNOVATIVE SOLUTIONS



Mueller's engineering team faced the unique challenge of developing MEP systems that could simultaneously support fundamentally different space types with conflicting requirements. Our comprehensive approach addresses these complexities through innovative solutions across multiple engineering disciplines.

## Environment Control and Air Quality

Mueller developed a dedicated air handling unit (AHU) strategy, segregating various adjacent programs, whereby contaminants from the health clinic, odors and particulates from fine art spaces, and winter humidity requirements of the theater spaces, were isolated and confined. The design incorporates ventilation systems with 100% outside air capability for art spaces requiring protection from environmental contaminants, featuring high-plume exhaust fans and makeup air conditioning systems with partial recirculation and enthalpy energy recovery. Our engineers also implemented targeted local exhaust systems designed to capture contaminants while minimizing energy loss, and promoting safety and efficiency.

## Acoustic Engineering and Noise Control

The center's diverse programming demands exceptional acoustic isolation and control. Mueller implemented comprehensive noise mitigation strategies, including reducing duct air velocities, strategically placing duct

silencers, and utilizing acoustic double-wall ductwork in critical areas. Sound lining, pipe, and duct lagging materials were carefully coordinated to maintain optimal acoustics for the main stage theater, black box studio, and recording spaces, while serving adjacent health science spaces. This solution was designed so that activities in one area did not disturb sensitive functions in another.

## Energy Efficiency and Sustainability

Sustainability was integrated throughout Mueller's MEP systems design, starting with the building's connection to the campus system for heating and domestic water. High-efficiency water-cooled chillers and roof-mounted cooling towers provide reliable cooling while minimizing energy use. Energy recovery wheels in air handling units capture and reuse thermal energy that would otherwise be wasted. Adiabatic humidification systems support proper winter humidity control with minimal energy consumption. Meanwhile, LED lighting throughout the center features smart controls, including dimming, daylighting sensors, and occupancy detection, further reducing energy usage.

# A MULTIFACETED EDUCATIONAL ENVIRONMENT

## Performance Venues

- A 500-seat main stage proscenium theater with state-of-the-art computer consoles, projection and sound systems, LED lighting, a complete fly system with line sets, an orchestra pit lift, modern dressing rooms, and a green room
- A flexible 200-seat black box theater for smaller, student-led productions
- A versatile studio theater for dance performances and other productions
- The Performance Hub, a dynamic central atrium with "learning stairs" that hosts pop-up concerts, art events, fashion shows, theatrical performances, and public gatherings

## Specialized Academic, Arts, Health Sciences, and Lab Spaces

- Clinical areas where music therapy and speech-language therapy students share spaces with observation rooms
- A large active-learning classroom accommodating 80 nursing students, configured in pods with mobile monitors
- Art department studio labs for foundations, painting, drawing, ceramics, and photography
- Computer lab studios for graphic designers
- Theater production facilities, including a costume shop, design lab, and scene shop
- Music facilities, including a piano classroom, state-of-the-art recording studio, and specialized music education and therapy classrooms
- Dance studios overlooking the campus, designed as transparent "jewel boxes," allowing observers to witness artistic expression in action
- Interior design learning space and a CAD lab
- Fashion design and merchandizing labs
- A "maker space" with a light lab for transforming creative concepts into reality
- A courtyard with an amphitheater for outdoor performances and gatherings



*The Artis Center creates a unique intersection of disciplines through thoughtfully designed spaces serving multiple functions.*



# HARMONIZING PERFORMANCE AND EDUCATION

## SAINT MARY'S COLLEGE OF MARYLAND'S DODGE PERFORMING ARTS CENTER



Students from diverse disciplines converge in the Artis Center, where Mueller's engineering solutions support everything from theater spaces and art studios to health science instruction, clinical, and lab spaces.

### Breaking Down Educational Silos

The Artis Center's design deliberately avoids rigid departmental divisions, instead interspersing classrooms and studios throughout the building to foster organic interactions between disciplines.

The architectural transparency of the building—with glass-encased studios and open sight lines between different functional areas—reflects the center's commitment to openness and engagement. This design philosophy creates numerous opportunities for collaborative learning: speech and physical therapy students may hold classes alongside artists sketching or musicians performing; theater students might assist nursing students with simulation exercises; and music therapy students can work alongside health sciences students to develop innovative treatment approaches.

*"The program was incredibly innovative in how it brings together diverse schools and uses to create an exciting learning environment, where disciplines converge rather than remain in silos. Radford's willingness to break down traditional academic boundaries resulted in a facility embodying the idea of convergence between sciences and arts, setting a new standard for interdisciplinary education."*

— Paul Lund, AIA, LEED AP BD+C  
Principal, Hord Coplan Macht

### A Cultural and Educational Landmark

The **Nancy R. & Norton T. Dodge Performing Arts Center** represents a transformative addition to St. Mary's College of Maryland, serving as both a world-class performance venue and an advanced educational facility. Mueller Associates provided mechanical and electrical engineering design services for this milestone project, working closely with **GWWO Architects** and the **GUND Partnership** to create a facility that seamlessly integrates artistic excellence with pedagogical innovation.

*"The Dodge Performing Arts Center exemplifies our commitment to engineering that enhances both the user experience and environmental performance. Our team was tasked with creating systems to meet the exacting acoustic requirements of a premier performance venue while achieving ambitious sustainability goals. The success of this project demonstrates how thoughtful engineering can support artistic expression while significantly reducing energy consumption—a win for both the college and the environment."*

Steven Gillis, PE  
Principal, Mueller Associates

## Strategic Campus Integration

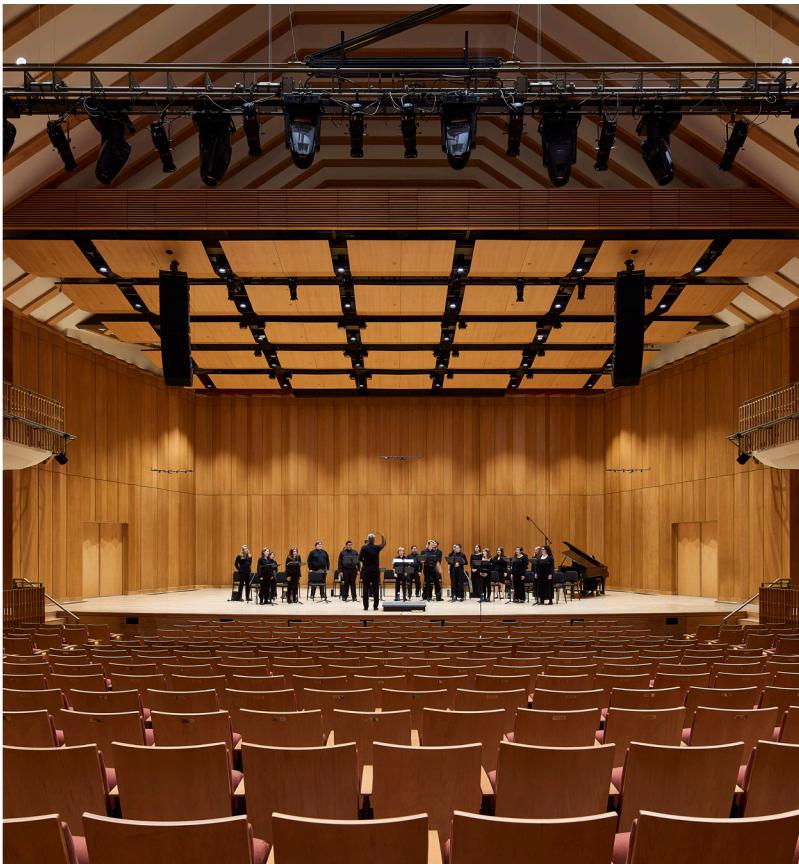
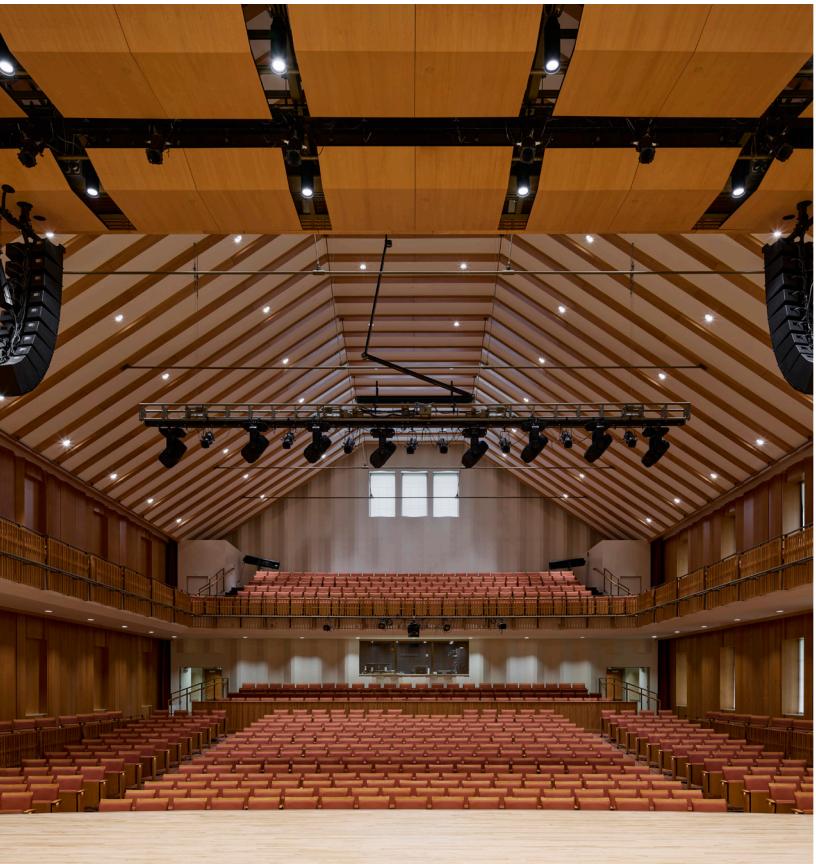
Located in the core academic district, the Performing Arts Center (PAC) and Learning Commons buildings thoughtfully connect with adjacent campus housing, enlivening and energizing the learning environment. This redevelopment of a central campus area is highly accessible for all college community members, forming a gateway that, together with the redesigned campus landscape, completes a network of pathways connecting the core academic area with residential neighborhoods to the east and north.

The PAC's centerpiece is a carefully engineered 700-seat main auditorium that supports diverse programming, ranging from orchestral and choral performances to theatrical productions, lectures, and community events. The auditorium features 450 seats on the main floor and 250 in surrounding tiers and the balcony, creating an intimate yet versatile performance environment. Supporting spaces include a 125-seat recital hall with precision acoustics, professional-grade rehearsal studios, dedicated music department classrooms and offices, and a striking floor-to-ceiling curved-glass lobby for receptions.

The adjacent Learning Commons offers a new study space available throughout the day, where students can read, research, collaborate, and concentrate. This multipurpose building also houses a café, an education curriculum center, offices, and seminar rooms, reinforcing the project's integration of artistic and academic functions.

*“Critical to the success of the project was utilizing the Dodge as a bridge between the residential and academic sides of campus, coming together through the project’s open outdoor areas, lounge spaces and the performing arts.”*

— Mark Lapointe, AIA  
Principal, GWVO Architects



# ENGINEERING FOR PERFORMING ARTS EXCELLENCE

Performance spaces are designed with special attention to acoustics and intimacy, creating an engaging experience that fosters a connection between performers and the audience, inspiring confidence and achievement. For the PAC, Mueller's engineering team developed sophisticated systems that address these unique requirements.

Ultra-low velocity air distribution systems minimize background noise in performance spaces, while vibration isolation for all mechanical equipment prevents unwanted sound transmission. The strategic placement of mechanical systems remote from performance spaces, sound-attenuated ductwork and piping systems, and variable air volume systems with acoustic damping, ensures the engineering infrastructure remains invisible to performers and audiences alike.

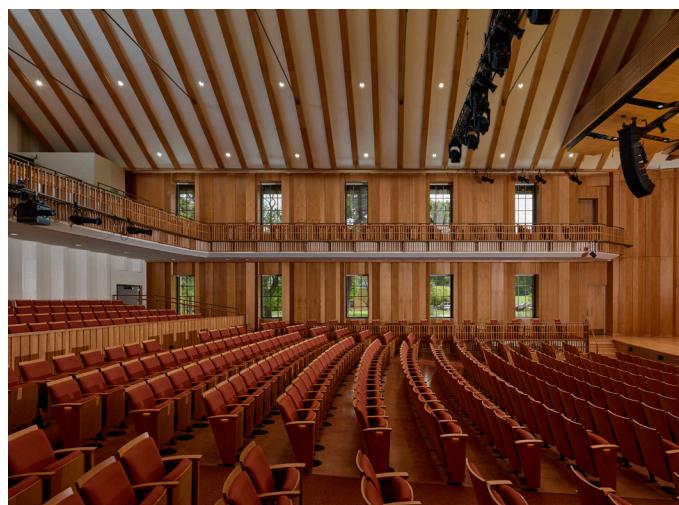
The auditorium utilizes an innovative underfloor air distribution system to enhance comfort and optimize stratification during high-occupancy events. This approach enhances the audience experience and improves energy efficiency during performances.

Climate control systems provide precise humidity regulation to protect valuable musical instruments, while multi-zone temperature management addresses varying occupancy loads throughout the facility. Advanced air distribution systems operate efficiently in both occupied and unoccupied modes, and specialized ventilation and air-conditioning systems for the glass lobby maintain comfort during receptions regardless of exterior conditions.

The center's electrical infrastructure also exemplifies Mueller's expertise in performance venue design. Advanced dimming and control systems provide the precision necessary for sophisticated lighting productions, while carefully segregated emergency and show-power systems support safety and continuity of performance. The electrical distribution system's flexible design accommodates the varying power demands of different productions, from intimate recitals to full-scale theatrical performances.

***"Sustainability goals were a constant driving force for the project team and owner. The Dodge Center is integrated into the campus-wide heating and cooling loop, and it is a vital piece of the college's commitment to campus-wide sustainability."***

***Lauren Park, AIA, LEED AP BD+C, WELL AP Sustainability Specialist, GWVO Architects***



***The Nancy R. & Norton T. Dodge Performing Arts Center (lower left) harmoniously integrates with St. Mary's College of Maryland's Tidewater Village architectural context, while achieving ambitious sustainability goals through Mueller's innovative engineering systems.***

## Sustainable Design Integration

St. Mary's College demonstrates its commitment to sustainability through responsible stewardship, and this LEED Silver-certified building continues that tradition.

The project employed a combination of passive and mechanical strategies to achieve ambitious energy goals, ultimately achieving 21.5% savings compared to ASHRAE 90.1-2010. The design team established a 75 kBtu/sf-yr target early in the project, maintaining this focus throughout the design progression and the value engineering process. This disciplined approach resulted in a final LEED submission EUI of 74 kBtu/sf-yr, an impressive 29% lower than the year-one performance benchmark of 104 kBtu/sf-yr.

Passive design strategies played a significant role in the project's success. The two buildings were carefully sited to maximize north-south exposures while minimizing east-west exposures whenever possible. The window-to-wall ratio was kept to a modest 23%, and ceramic frit was strategically applied to glazing to reduce solar heat gains. The building's lighting system is primarily LED, achieving a lighting power density 58% below ASHRAE 90.1-2010 requirements.

Mueller's engineering systems complement these passive strategies through high-efficiency air-cooled chillers and condensing boilers, which supply the variable air volume systems. The system serving the theater utilizes an innovative underfloor air distribution system to enhance ventilation effectiveness and occupant comfort, while also capitalizing on stratification during high-occupancy events. The primary VAV systems feature energy recovery to minimize ventilation impact and incorporate sophisticated controls, including economizers, duct static pressure reset, supply air temperature reset, and demand control ventilation.

# SUSTAINABILITY BY THE NUMBERS

## STRATEGIES

- High-efficiency air-cooled chillers and condensing boilers
- Underfloor air distribution system in the theater
- Energy recovery for ventilation energy reduction
- Comprehensive control systems: economizers, duct static pressure reset, supply-air temperature reset, and demand-control ventilation
- Solar panels on southern façade

## ACHIEVEMENTS

- 21.5% energy savings over ASHRAE 90.1-2010 baseline
- Final EUI of 74 kBtu/sf-yr, 29% below year-one benchmark of 104 kBtu/sf-yr
- Lighting power density 58% below ASHRAE 90.1-2010 requirements
- LEED Silver certification achieved

## Community Impact

As the region's premier performance venue, the Dodge Center attracts world-class talent while providing an advanced music education facility for the next generation of artists. The center serves as a vibrant community gathering space, fostering cultural exchange and artistic appreciation through its diverse programming, extending beyond the college boundaries to enrich the region's artistic landscape.

The design utilizes the vocabulary of the Tidewater Village context to unify the two new buildings within the campus's overall composition, while allowing key program elements to be expressed and celebrated. This thoughtful integration of architecture and engineering creates spaces that will inspire learning for generations to come, elevating the Music and Educational Studies programs while serving as a cultural beacon for the entire community.



# BRIDGING TRADITION AND INNOVATION

## CHRISTOPHER NEWPORT UNIVERSITY'S TORGGLER FINE ARTS CENTER



## A Visual Arts Masterpiece

The **Mary M. Torggler Fine Arts Center** stands as a sparkling gem on the jewel box campus of Christopher Newport University in Newport News, Virginia, seamlessly blending modern design with the Neo-Georgian campus aesthetic, while boldly looking toward the future. Mueller Associates provided comprehensive mechanical, electrical, and plumbing engineering services for this project, collaborating with **Glavé & Holmes Architecture** to create a facility that would serve as the university's fine arts hub and a cultural destination for the entire region.

The 83,000-square-foot center's most striking feature is its luminous atrium capped by three cascading glass domes, symbolizing the three ships—Discovery, Godspeed, and Susan Constant—commanded by the university's namesake, Christopher Newport. This dramatic entrance creates an immediate visual impact while forming a flexible rotunda where visitors are welcomed and often awed by their first encounter with the space. The signature façade bows graciously to the colonial architectural vocabulary of the campus, while establishing the Torggler Center as a forward-looking institution.

*"Our challenge was to create building systems that could support the precise environmental conditions needed for a museum-quality exhibition space while complementing the dramatic architectural elements. The glass domes presented particular technical challenges for maintaining stable temperature and humidity levels without compromising the aesthetic vision. By working closely with the architects from the earliest design stages, we developed integrated solutions that remain largely invisible to visitors, while ensuring the protection of valuable artworks and the comfort of occupants."*

**Daniel Carmine, PE, LEED AP**  
**Senior Project Manager, Mueller Associates**

## Sophisticated Spaces for Art and Learning

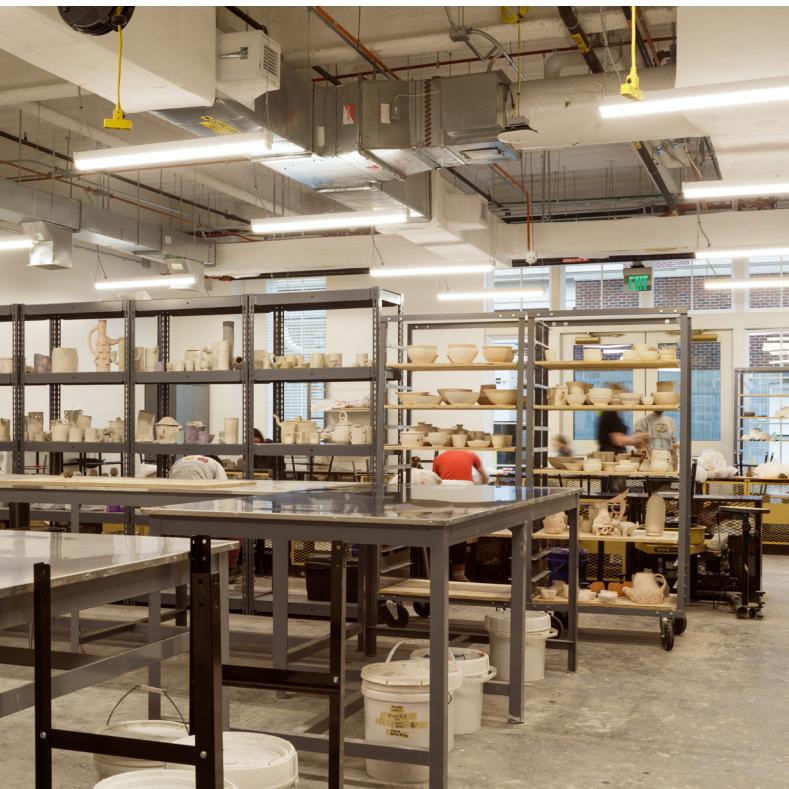
The Torggler Center features an impressive array of purpose-built environments for experiencing and creating art.

The **Anne Noland Edwards Gallery** is the primary exhibition space, showcasing professional work by artists from diverse media with national and international reputations. This two-story gallery spans most of the second and third floors and features movable walls and structures that enable flexible configurations for each exhibition.

Additional gallery spaces include the **William M. Grace Community Gallery**, featuring work by local and regional artists; an **Academic Gallery** showcasing work by Christopher Newport students, faculty, and alumni; and a **Microgallery** for experimental projects in an intimate setting.

An interactive **Art Explorers Gallery** for children completes the building's offerings, allowing the center to serve visitors of all ages. The space between the new building and the existing Ferguson Center for the Performing Arts is an outdoor museum space, while a café provides refreshments near the outdoor terraces overlooking the entryway.

Educational spaces include a 150-seat art history lecture hall, studio classrooms for academic and public art classes, and specialized facilities for various artistic disciplines. The first floor houses studios for 3D art, while the second floor contains classrooms and lab spaces, including a dark room, photo lab, light lab, and digital art studios. The third floor features drawing and painting studios.



## Technical Engineering Excellence Supporting Artistic Vision

Mueller's engineering expertise extends throughout the building, addressing the complex requirements of a premier fine arts center.

### Climate Control for Art Preservation

Museum-quality heating, ventilation, and air conditioning systems maintain precise temperature and humidity levels throughout the exhibition areas, protecting valuable artwork from environmental fluctuations. The museum area is served by a dedicated air handling unit (AHU). Six different temperature zones are spread throughout the gallery, each with humidity sensors, and humidity control averaged across all zones.

### Lighting Systems for Optimal Art Display

Advanced lighting systems throughout the galleries provide flexible illumination that can be adjusted for various exhibitions, while minimizing harmful UV exposure to sensitive artwork. Energy-efficient LED systems were carefully selected to achieve the perfect balance between conservation standards and optimal viewing conditions.



## Specialized Studio Infrastructure

Custom exhaust and ventilation systems were designed for studios handling materials that require containment, such as ceramics, photography, and other media that use potentially hazardous substances. An enhanced electrical service supports specialized equipment for various artistic disciplines, while water and waste systems accommodate the unique requirements of different studio processes.

## Integrated Building Systems

Mueller's engineers designed a seamless integration of mechanical, electrical, and plumbing systems within the distinctive architectural elements, ensuring the infrastructure remains invisible to visitors while maintaining optimal performance. Particular attention was paid to the glass dome atrium, where specialized systems maintain comfortable temperatures despite significant solar gain while preserving the dramatic visual impact of the space.

*"One of our greatest challenges was designing systems that could maintain strict temperature and humidity control for art preservation while accommodating the significant solar loads from the signature glass domes. By employing advanced computational modeling and carefully coordinating with the architectural team, we developed solutions that protect valuable artwork while preserving the dramatic visual impact that makes this facility so distinctive."*

**Matthew Velky, PE**  
Project Manager and Lead Mechanical Engineer  
Mueller Associates

*"The Toggler Center was one of the most strategic and important undertakings CNU orchestrated for their growing campus. It physically bridged the abstract character of the Fine Arts Center with the classical framework of the overall campus, while also connecting the curriculum of the fine arts to the liberal arts and general undergraduate studies. The glass domed lobby is a center of campus and community interaction, forging a new synergy between 'town and gown'."*

**H. Randolph Holmes, FAIA**  
Principal, Glavé & Holmes Architecture

## Engineering Behind the Iconic Domes

The cascading glass domes defining the Torggler Fine Arts Center's entrance represent an architectural triumph and a significant engineering challenge. These three-tiered domes create a dramatic visual identity for the facility while presenting unique technical hurdles for building systems integration. The extensive glazing also introduces substantial solar heat gain and potential temperature fluctuations that could compromise the precise environmental conditions required for the preservation of artwork.

Mueller's engineers developed a sophisticated solution to this challenge, implementing carefully calibrated HVAC systems that maintain stable temperature and humidity levels despite the variable conditions created by the glass enclosure. Computational fluid dynamics modeling helped the team understand airflow patterns within the dome space, leading to strategically placed supply and return air locations that maintain comfort and remain visually unobtrusive.

The domes also presented interesting lighting control challenges. Mueller's electrical engineers worked with the A/E team's lighting designers to ensure the solution balances natural daylighting with supplemental artificial lighting, incorporating photo sensors and programmable controls that adjust throughout the day to maintain optimal lighting conditions for the rotunda.

space. Special attention was also given to minimizing UV exposure and preventing harsh shadows or glare that could affect the experience of visitors.

The result is a luminous, welcoming entrance that serves as both a functional gathering space and an architectural statement, demonstrating how engineering solutions can enhance—rather than constrain—bold design elements.



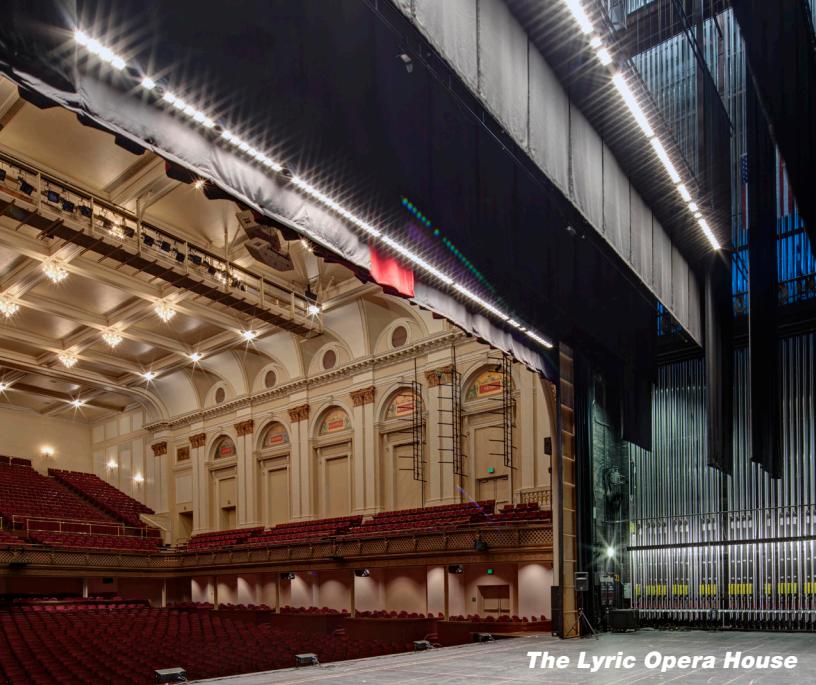
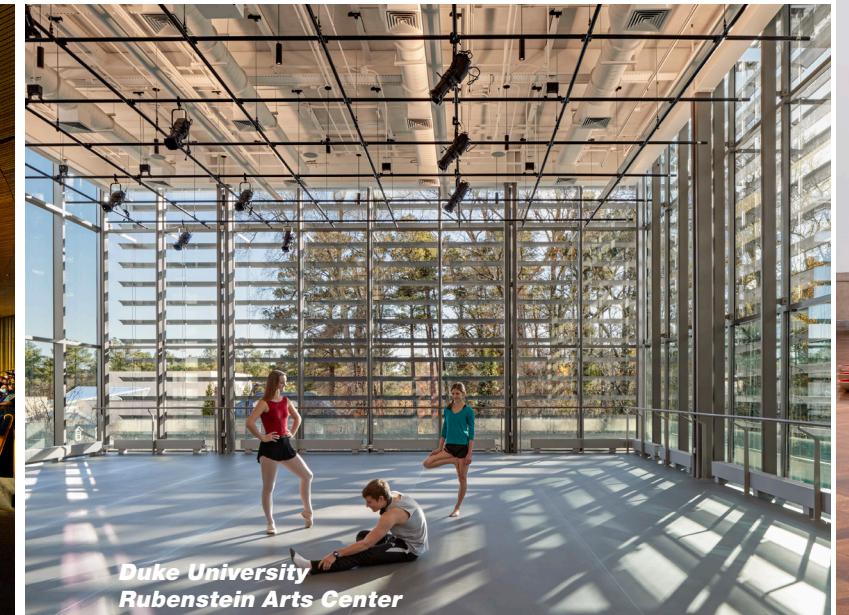
# ENGINEERING EXCELLENCE BEHIND THE SCENES

## Prioritizing the Arts Experience

At Mueller, we believe engineering should enhance—never detract from—the core mission of arts facilities. We design systems that maintain optimal acoustic environments for performances, precise environmental conditions for art preservation, safe environments for the creation of the fine arts, and comfortable spaces for audience engagement, all while remaining virtually imperceptible to users. In practice, this translates to ultra-low velocity air distribution in performance halls, specialized zoning that isolates noise-producing equipment from sensitive spaces, and carefully coordinated lighting systems that complement rather than compete with artistic expression. These are just a few examples of the many engineering facets for arts and design buildings.

## Designing for Flexibility and Adaptability

Arts facilities must accommodate a remarkable diversity of uses—from orchestral performances to experimental installations, from traditional studio instruction to digital media creation. Our engineering solutions incorporate flexibility from the outset, with systems that can adapt to changing requirements without requiring significant modifications.



## Integrating Systems with Architecture

The aesthetic experience of arts facilities begins with the architecture itself, requiring engineering systems that support rather than detract from the design vision. Our engineers worked closely with our architectural partners to develop solutions that maintain environmental stability while preserving visual impact. We carefully coordinate and facilitate the seamless integration of complex ventilation systems. This collaborative approach ensures engineering components enhance architectural expression rather than compromising it.

## Engineering for Energy Efficiency

Arts facilities present particularly complex challenges for sustainable design due to their specialized requirements for climate control, lighting, and acoustics. Mueller addresses this challenge by employing advanced energy modeling early in the design process to optimize system performance. By carefully analyzing usage patterns, employing strategic zoning, and integrating energy recovery systems, we deliver solutions that achieve sustainability and energy-efficiency goals without compromising artistic requirements.



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