TOWSON UNIVERSITY

Design Guidelines and Construction Standards

Department of Facilities Management

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Towson University Design and Construction Standards
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Introduction

OVERVIEW - These Design Guidelines and Construction Standards have been developed to provide architects, engineers, contractors and Towson University in-house staff with guidelines for acceptable practices, methods and materials for design and construction projects. They are a compilation of planning, design, construction and maintenance information provided by university personnel.

These standards generally apply to all projects, regardless of the value, type, or location of the work. While most sections refer to the A/E or Consultant, these standards are intended to apply to all parties charged with the design, administration or construction of the proposed work.

A CHANGING DOCUMENT - These standards are considered a "living document" and are subject to change. As the university develops new Standards, or changes existing Standards, that information will be included into the current edition. Always consult with the Towson University's Facilities Management Department for the most current edition.

FORMAT – These Standards are comprised of Design Guidelines, Construction Standards and Appendices.

Design Guidelines – These Standards provide a comprehensive overview of the baseline concepts and philosophies for design on Towson University's campus.

Construction Standards – These standards provide guidelines for minimum requirements and recommended products and practices for application in each Section.

Appendices – While Appendices are integral to these Standards, they are referenced in the Table of Contents and bound separately due to their size.

The Construction Standards have been written in standard CSI format to allow easy reference to applicable sections. Not all sections are included in the document.

STANDARDS VS. SPECIFICATIONS - These Standards are *not intended as specifications*, nor are they intended as a substitute for design responsibilities and specifications developed by the design professional for a specific project. Where practices, methods, or products are given, they should be considered as a guideline for typical minimum requirements and a basis for the beginning of design. They should be expanded upon as required and all standards must be confirmed and verified for application to any specific project.

SUMMARY – Summaries are intended to give the reader conceptual insight regarding past practices and existing and future preferences. Not all sections contain summaries.

QUALITY ASSURANCE – Where the reader finds reference to minimum qualifications for a specific application, those qualifications should be included in the design documents or generally complied with by the contractor.

PROPRIETARY PRODUCTS – Some products found in these Standards are noted as being proprietary. Within acceptable procurement practices, only *those* products are acceptable and may not be substituted with proposed equal or other products.

Part 1

Design Guidelines

Design Guidelines

1.0 Purpose

The purpose of these design guidelines is to provide a framework for the development of future campus buildings and landscape improvements that supports and advances the Campus Master Plan vision and the university mission. The expectation is that the use and application of these guidelines will result in the evolution of a well-planned, unified and consistent campus environment that is responsive to existing needs and future growth.

Application and use of these guidelines are intended to support and advance the Campus Master Plan vision and university mission by:

- Providing a framework and tools necessary for the development of a campus environment that provides a coherent public face for the institution that represents and supports its mission as Maryland's Metropolitan University.
- Defining the organization of buildings and open spaces in a way that promotes teaching and learning.
- Blending the natural and built environments to create a campus that is welcoming, safe, functional and aesthetically pleasing.
- Achieving an appropriate balance between aesthetic considerations, operation and maintenance costs, energy conservation measures, and systems life.
- Improving the health of natural areas and reducing the impact of buildings and development on the environment.

1.1 Design Principles

These design guidelines set forth numerous planning and design principles intended for consideration and use in the development of new and renovated facilities and site improvements on campus. Although not proposed to be prescriptive in nature, these principles embody and reflect best practices in planning and design for which, all new facility projects will be required to observe and incorporate. The following sections provide a narrative and graphics that describe each design principle.

1.2 Identity

Developing a sense of place is often dependent on the creation of a unique character or striking difference that resonates with members of a community and visitors. Defining the campus identity will be dependent on the unity of character between campus buildings and grounds. Adherence to the campus character is critically important at the campus boundaries, where visitors should understand a defined threshold to the campus.

1.3 Compatibility and Harmony

The goal of creating a coherent and consistent campus is best attained through buildings and open spaces that maintain a sense of harmony, where buildings complement one another and the landscape in which they reside. Inappropriate juxtapositions rarely achieve a sense of compatibility and should be avoided within the design of campus facilities. Use of consistent materials, fenestration patterns and scale should transition gracefully between adjacent facilities.

1.4 Visual Clarity

Simplicity is often more successful in making contextual relationships than overly complicated designs. Quiet, clear building designs contribute greatly to the creation of meaningful open spaces and make a better backdrop for the life that occurs outside. Simple landscape designs that maximize the usable space and minimize visual distractions are important to the success of these outdoor rooms.

1.5 Organization and Pattern

The logic of the open space system determined under the Campus Master Plan creates a hierarchical system of buildings and open spaces. This system is dependent on buildings and grounds that hold to the pattern of development created in the Master Plan. Building edges, features and entries, in conjunction with landscape elements and open spaces, create this pattern. Variances from the organization of this pattern can detract from the goals of the Campus Master Plan.

1.6 Environmental Impact

It is a requirement of Towson University, to achieve a Silver rating for new and renovated buildings on the United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) rating system. Although a Silver Rating is considered a goal, design teams should strive to achieve the highest rating possible. Particular attention should be given to project impact on storm water run-off, site disturbance, system energy consumption, alternative transportation options, and indoor environmental quality. Projects limited to site work, utility work or renovation should consider environmental goals and utilize applicable USGBC standards.

2.0 Architectural Guidelines

The following guidelines include recommendations concerning campus open space, buildings and natural systems. They apply to all projects, both new construction and renovation.

2.1 Buildings

When implemented, the design guidelines will promote and enhance a consistent architectural character. They will provide visual and functional ties between new and existing buildings by creating order, clarity, interest and human scale.

These architectural guidelines provide a framework for decisions about site considerations for buildings, as well as the appearance of buildings. Because design is a process that must consider many factors (i.e. cost, function, and specific site restrictions), these guidelines should be used as design parameters rather than rigid design solutions. General architectural guidelines and principles are described below and include:

- Since a campus should be a cohesive arrangement of elements, each new building design or expansion project should consider pedestrian and vehicular access; parking, service, and open space requirements; and future plans for the campus as proposed in the Campus Master Plan.
- Buildings should be placed in the locations identified in the Campus Master Plan.
- The desired campus architecture should be integral and appropriate to a building’s use and context. New structures should be thoughtful, artful and handsome, but contextual and modest.
- A building’s prominence and hierarchy should be carefully considered within the context of its neighboring buildings as well as the entire campus. All new construction should be in some ways harmonious with the context of the existing campus architecture through the use of scale, fenestration, materials, massing design, roof or other uniting elements.
- New campus buildings should maintain appropriate relationships to the campus spaces in which they are adjacent to, be they quadrangles, malls or streets. The goal should be to achieve the desired functional relationships among and within buildings, the appropriate symbolic implications of continuity versus contrast, and the successful orchestration of visual effects; that is, the play of foreground and background buildings.
- Referential campus designs that provide strong appropriate images are encouraged. Elements that help create institutional symbols such as colonnades, identifiable entrances, pergolas, fountains, bell towers, ceremonial stairs, and other “place markers,” enrich the built environment of the university.
- New buildings should be reflective of the existing campus buildings.
- Building design should consider the view from any prominent vantage point. Visible roof areas should be given a finished appearance and designed with the same care and consideration as the other exterior components of the building envelope.
- Light and shadow should be introduced into the design through careful planning and design of the exterior components of the building. Large blank wall surfaces are rarely an asset.
- Building lobbies, atriums and major corridors should complement the external campus circulation system, both in function and design. Internal and external materials and patterns should relate to each other. Building lobbies and atriums should be of adequate size to announce arrival, support pedestrian traffic and provide a sense of direction within the facility. Stairwells and elevators should be positioned logically and in locations where they can be easily found. Corridors should have some natural light and provide occasional views to key outdoor spaces to help orient the user. Public and required exit stairwells should also have natural light and have doors held open

to the corridor whenever permitted by the applicable code. Public and exit stairwells should have the same quality finish as the other major public spaces within the building.

- Public restrooms should be carefully designed, functional, spacious and constructed of easily maintained high quality materials. Restrooms should be positioned logically and in locations where they will be easily accessed from public spaces.
- Support facilities, including bike lockers, storage, and shower facilities, are a priority whenever possible for building occupants to support bicycle use.
- Central recycling, trash collection, and composting facilities wherever food service is provided should be included in all new buildings and should be located within easy access to loading areas. Collection facilities should allow for easy transfer to collection vehicles en-route to central collection locations.
- Mechanical equipment, including roof top equipment, should be screened from view, and should be kept away from major sight lines and pedestrian pathways. Careful consideration should be given to noise that may be generated from mechanical equipment and its impact on adjacent spaces.

2.2 Site Considerations

Consider the existing natural elements and climactic conditions present on the campus in the design of new facilities and building renovations to include:

- Design buildings to maintain and enhance attractive site features such as mature trees, environmentally sensitive areas and pleasant views. Buildings should be sited to minimize the impact on existing topography, and mature vegetation both during and after construction. All mature vegetation should be protected during construction. Utilize existing views from the building for major spaces, entries or circulation elements within the building. Utilize views to the site to locate major massing elements such as entries, towers or special roof forms.
- Avoid elements that can adversely impact design, and cause difficulties and increased costs, such as drainage ways and wetlands. Buildings should not be located in the natural drainage path of storm water through the site. As a part of the overall campus goal for improving storm water conditions in and around campus, each project should reduce the amount of impervious surface on the site when completed. Buildings should be designed to slow the flow of storm water from roof areas through retention systems or plantings. Buildings should not be built on sites where subsurface conditions are known to be unstable or where foundation systems may involve increased costs. Buildings should be located and designed to minimize mass regrading of natural topography and excavation of existing rock.
- Consideration of climactic conditions such as seasonal solar orientation and prevailing wind direction can reduce the demands on mechanical systems and make buildings and adjacent outdoor spaces more comfortable. Carefully consider window areas and entry points that face prevailing north or west winter winds and protect north-facing exterior walls, whenever practicable. Consider solar orientation when selecting glazing and provide appropriate selections for each face of the building. Optimize the buildings' exterior surface areas whenever possible to reduce heat loss in the winter and gain in the summer. Utilize sensitively designed sun shading devices where applicable.
- Use the buildings to define useful outdoor spaces, and where appropriate, provide additional enclosure with landscaping and other site elements. Use buildings to participate in the creation and further definition of significant open spaces, including streets, as indicated in the campus physical development plan. Furnish adequate lighting, furniture and landscaping to make the outdoor areas comfortable. Design all open spaces that are adjacent to buildings so that spaces

have an attractive, finished appearance. Where buildings participate in existing open spaces, utilize plantings and site furnishings consistent with the rest of the space to create a coherent and complete environment.

2.3 Composition



Contextual relationships are important components of building design on campus. In order to create a consistent experience on campus a survey of existing open spaces, pedestrian movement, vehicular movement, architectural character and landscape should be undertaken with each design project. New construction should develop in relation to the features that have been identified as characteristic of campus buildings. This will include materials and details, as well as roof shaping and massing. Duplicating context is not the aim. An inventive interpretation of forms that acknowledges the evolutionary nature of architectural expression is the goal.

Buildings should be designed to reinforce the design intent of the Campus Master Plan in the creation of open space, pedestrian and vehicular networks. The designer should demonstrate the relation of the new building to the entire campus. The new work should develop the fabric of the campus, developing relationships of outdoor space and circulation networks which will strengthen and extend the system depicted in the Master Plan.

For additions and renovations, conduct an “existing conditions survey” that assesses the materials, structural systems, mechanical systems and past modifications of buildings to be renovated or the collection of buildings near the proposed new construction. The survey should determine the character of the buildings through an historic analysis. Such a formal analysis provides a basis for any new design by identifying the significant features of the buildings. In the case of buildings that have been expanded, the analysis identifies the transformation of the original.

Identify the significant qualities of the existing buildings in relationship to campus arrangements, especially to the definitions of boundary and qualities of closure. Identification of the underlying compositional order is the goal.

All buildings should be designed with five design principles in mind: Massing, Form, Scale, Rhythm and Materiality.

2.4 Massing

Massing refers to a building's overall volume. Massing is critical to creating a coherent and unified campus. This will maintain unity of the campus, permit natural vegetation to show strong visual presence, and establish a human scale. A building should be evaluated on three criteria when determining its massing: context, stature and scale.

Massing should be used to transition between buildings and open spaces on campus. Buildings should reflect the scale of their surroundings and respond to their context by relating to the massing of adjacent buildings. This is particularly critical in transition areas between campus areas or between campus and adjoining neighborhoods. In the design of new construction, size the plan and the elevations to relate to the mass of adjacent structures.

The stature of buildings on campus can take one of two basic positions: background or foreground. Background buildings line the edges of significant outdoor spaces and create a backdrop for the activity within these spaces. The massing of these buildings should be simple, using rhythm and materials to lend richness to the design. Typical background buildings should address the edges of the spaces they are participating in without significant massing elements.

Foreground buildings are located at the visual or activity focal points of outdoor spaces, as indicated on the physical development plan, and generally contain significant or public program elements, such as student unions, museums, libraries or large meeting halls. These buildings must respond to their use or site through manipulation of their massing.

The massing of a building under consideration can be evaluated by scale as well. Larger buildings, such as cultural, athletic, research and medical facilities, should use significant manipulations of their massing to reduce the overall scale of the building. Smaller buildings, particularly office and residential buildings, should have more straightforward massing and depend on small-scale materials and detailed fenestration to lend character to the design.

2.5 Form

A building's form is its outline or silhouette. The form of new buildings should relate to the adjacent structures and their overall characteristics to ensure compatibility. The primary form givers are the size and proportion of the elevation and the roof shape.

Roof forms can be used to help disguise the mass of a building or transition to adjacent buildings. Use of parapets, penthouses and roof transitions can help to create connections between adjacent buildings of different relative sizes. These forms can also be used to manipulate the scale of the building or to support the rhythm of the façade.

Important connections to the surrounding campus should be reflected in the form of the building. Using towers, dormers or pediments to reflect visual or spatial connections to surrounding areas is important to creating a well-connected campus and easing the transition between different campus areas. These connections may also be important markers on approaches to the university from the surrounding communities. Major vehicular and pedestrian paths should be considered in the development of building form.

2.6 Scale

Scale refers to how building elements such as windows and doors are perceived in relation to other building forms. Buildings should be detailed to provide a human scale. For larger buildings utilize breaks in the massing of the building to reduce the overall scale of the building, particularly where new buildings are adjacent to smaller historic structures. For more modest sized buildings, masonry patterns and reveals can help create the proper sense of scale. Materials, such as brick, and highly detailed fenestration can be used to provide a human scale in smaller buildings. Tall buildings should be detailed with a base relating to adjacent buildings thus providing a sense of human scale.

Limit large expanses of blank walls and use landscaping to help create a comfortable human scale. Canopy trees can be used to mask the scale of buildings by providing a sense of containment or by visually screening upper portions of large buildings. Using landscape is especially important where tall buildings are constructed close to major streets.

2.7 Rhythm

The term rhythm is used here to describe the design of wall panels and fenestration of the building. It is the placement and pattern of solids and voids. The rhythm of new buildings should relate to the adjacent structures and their overall characteristics to ensure compatibility. Modulations in the fenestration of the building can be used to support the human scale of the building, create hierarchy or visual interest. Long facades should be divided into regular bays, reducing the scale of the building. Tall buildings should be divided horizontally to create a base in proportion to the scale of adjacent buildings.

Utilize piers, reveals, windows, arcades, columns and other elements to create multiple layers of detail in a façade and create multiple rhythms.

2.8 Materiality

Different areas of the campus have different contexts and may require different material palettes, however brick should be the prominent material and chosen for its specific context. For example, the South Campus is unique due to the scale and type of buildings which may require a different material palette. The West Village has developed its own identity and vocabulary appropriate for its setting. The Academic Core is influenced by a range of materials and styles which have developed over the years, but is primarily a red brick campus. Deviations from the core materials palette should be considered on a case by case basis due to its location and use.

Materials should be selected for their durability, context and scale. Whenever possible, these materials should be selected from local or regional sources to maintain a character consistent with the regional built environment, shorten shipping distances and develop a consistent campus-wide palette over time.

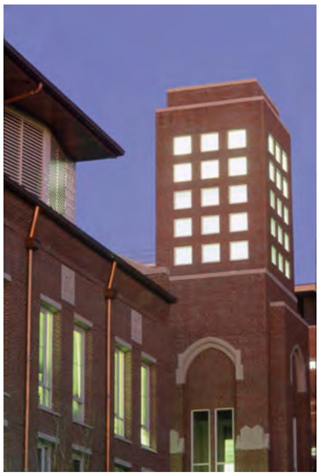
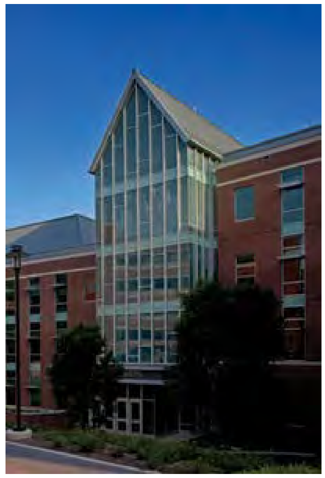
The base material for exterior walls is typically brick with other materials used for accent, detail or transition between building masses. Materials such as terra cotta, stone, concrete cast stone, and natural metals (copper, zinc, stainless steel) are strongly encouraged for these details on exterior walls. These materials are durable and require minimal regular maintenance. Glass should be considered where appropriate for its potential to add natural light to interior spaces, as well as its potential to provide transparent, active and illuminated spaces on the campus at night. Glass features on buildings can act as “lanterns” on the campus landscape providing focal points as well as exterior illumination.

Materials should also be selected in relation to the scale of the building. Larger buildings can successfully use limestone or pre-cast concrete, without affecting the scale of the building, while smaller buildings rely on the scale materials to provide a human scale.

3.0 Design Elements

By creating an appropriate palette of design elements to be used for any new construction, the existing architectural character will be maintained and reinforced.

3.1 Towers


Strong vertical elements may be used to signify the terminus of significant visual axis, pedestrian or vehicular routes or create a major feature for a building. Towers can act as a threshold or marker at the transition onto campus or between distinct areas of campus. These elements should not be overused and should designate significant entries and important internal elements in addition to contributing to the external experience of campus.

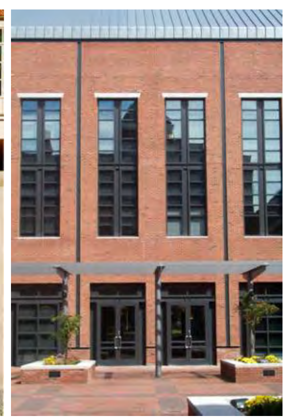
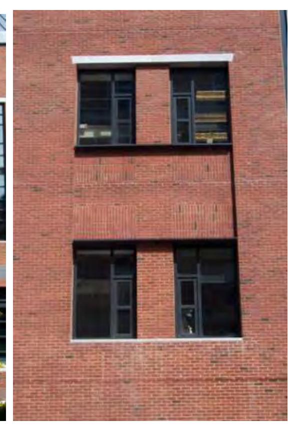
3.2 Roofs


Roof forms can be used to reinforce visual axis, manipulate massing and scale or reinforce edges. Appropriate scale is critical to the success of roofs. Long uninterrupted areas of roof should be avoided, whether flat or pitched. Parapets, penthouses or serrated roof forms may be used to mask, interrupt or manipulate large areas of roofing.

Where pitched roofs are used, long lasting and durable materials should be used. Zinc coated or painted standing seam metal roofs can be used on sections of roof, features such as dormers, turrets, mechanical equipment screens, etc. or on outbuildings. All roofing materials should be Energy Star Labeled and should be selected for their durability and regional availability. Flat roofs should incorporate green roof technology whenever practical.

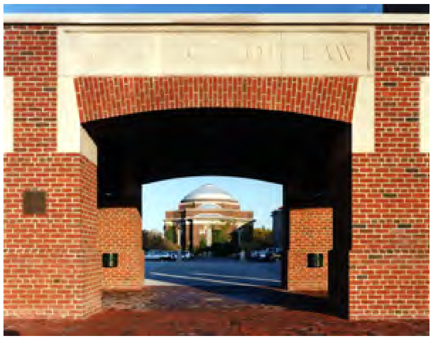
3.3 Fenestration and Patterns



The rhythm of new façades should reflect the rich history of architecture on the Towson campus. Elements such as windows, doors, trim and masonry patterns can be used to lend character to the building and relate in scale to the adjoining buildings. Careful attention should be given to windows and large areas of glazing. These can be used to create daylighting of active areas within a building, as well as transparency and supplemental lighting of the campus at night. Entrances should be carefully considered and highlighted in new buildings.

3.4 Pathways and Entries



Where buildings cross or block significant pedestrian routes, pathways should be created to allow external passage between open spaces on campus.

Major building entries should be appropriately articulated and massed to create a visual focal point. Entries should be located at prominent locations on the site and open onto streets or campus open spaces. Building entrances should be a visible, dominant feature of the building elevation. Main entrances should be located either on a major open space or a street. Place main entrances to respond to primary pedestrian circulation patterns. Wherever possible lobbies and entrances should be used to create connections through a building to connect various open spaces. The potential extension of floor materials can be considered to integrate a building’s lobby and interior spaces with the adjacent exterior spaces, and create a seamless path through a building. Use larger, recessed entries with glass doors whenever possible. Consider vestibules at all entrances to trap seasonally conditioned air and lower utility costs. Lighting and landscaping design should highlight and identify major entrances. Wash wall surfaces of recessed entries with light to enhance impact and safety. Provide accessible main entrances that conform to Americans with Disabilities Act (ADA) requirements.

3.5 Corridors, Arcades, Lobbies, and Stairs

Everyone who experiences a building does so through the circulation elements, either internal or external. These elements should be carefully considered in the design of the building. Lobbies and circulation spaces should be visible from the exterior of the building for both security and ease of use by visitors. Wherever possible interior spaces should be used to connect streets and campus open spaces through buildings. Security and control of access to a building must be carefully considered when developing the circulation systems. A building may have different requirements for levels of control and access at different times of day.

Corridors reflect the life and activity within a building and are part of the common experience of a building. These spaces should be provided with natural light and ventilation whenever feasible and they should be made visible from the outside of the building.

Arcades and colonnades are similar to corridors and can be used to enrich the design of a building. Exterior circulation should be connected to prominent building entries and should be utilized to create connections between exterior spaces or between interior and exterior spaces.

Exterior stairs can add to the experience of entering a building, but they must be seamlessly integrated with ramps. Internal stairs contain significant activity and can be used to enliven the exterior of a building. Stairs should be provided with natural light and can be used to alter the rhythm of the façade or designate an entry. An open, public stair should be readily visible from the lobby of the building and should be located in conjunction with an elevator.

Lobbies play an important role in transitioning from the exterior circulation to the internal circulation of buildings on campus. Wherever possible, lobbies should be visible from the outside and contain views of the campus outside. Lobby design should take into consideration orientation, security and circulation. A main stair and elevator core should be visible from the lobby in order to aid efficient circulation through the building and in order to provide orientation for visitors. Where appropriate, a security desk should be included as an integral part of the lobby design. Attention should be paid to the volume of the lobby, and in most cases, lobbies should connect more than one floor.

Materials should be selected for durability and the tactile nature of the material.

3.6 Floors

Stone, terrazzo, ceramic tile, architectural concrete, carpet, and in some cases wood are appropriate flooring materials. Whenever possible carpet should be avoided in high traffic areas. Walk-off mats should be incorporated within the design of the vestibule and lobby.

3.7 Walls

Wood paneling, benches, display cases, fabric panels and locations for artwork should be considered. Large expanses of blank wall without articulation should be avoided. A designed pattern utilizing reveals should be considered for surfaces large enough to require gypsum board control joints. Use of lighting sconces, interior glazing and balconies should be considered, particularly in multi-story spaces. Wherever possible, wall-mounted diffusers and grilles should be incorporated in the design.

3.8 Ceilings

Ceiling articulation should be utilized to modulate the scale of the space and reduce noise in major building lobbies. Materials should be considered for their aesthetic and acoustical properties appropriate for the specific location and use. Access to high ceilings for maintenance of lights and fixtures should be considered. Locations of access panels required for mechanical equipment should be carefully considered early in the design process to avoid excessive panels that are located as an afterthought.

3.9 Lighting

A building's lighting, both internal and external, is a critical design element and should be carefully considered in the context of the overall campus plan. Consistent lighting design can help to unify the campus visually and enhance the appearance of buildings and grounds.

All exterior light fixtures should follow established university standards. In general, exterior lighting should be as identified in TU Design and Construction Standards. The use of indirect lighting is encouraged for lighting buildings and landscape elements. Whenever possible, locate light sources so they are not directly visible. Consider the color and texture of surfaces that are receiving light and use them to enhance the appearance and functionality of the exterior lighting. An indirectly lit building wall providing a lighted background, will usually provide more visibility and a safer environment then high glare, direct fixtures mounted on a building wall.

A building's appearance at night, when windows, lobbies, and doorways are lighted, should be carefully considered and used to create desired effects. A building's interior lighting can spill out and enhance the exterior environment if properly designed. Buildings can act as "lanterns" at night creating desired focal points or brighter exterior spaces.

In general, lighting should not be an afterthought. A building's potential relative to lighting should be carefully considered from the earliest stages of planning a building's location and relationship with the campus.

3.10 Service and Mechanical

Locate service areas discreetly and screen unattractive views. Provide vehicular access to service areas, keeping in mind that the points where pedestrian walkways cross the vehicular access should be visible to vehicular traffic. Service areas should be located on the least prominent side of buildings whenever possible. Service areas should not be located in close physical or visual proximity to main entrances or major pedestrian areas. These areas should be designed to discourage pedestrian use as a shortcut.

Locate mechanical equipment within the building envelope whenever possible. Avoid prefabricated penthouses and exposed mechanical equipment. Laboratory and other potentially hazardous exhausts mounted on the open rooftop must be given special consideration to reduce the impact of their appearance. When mechanical equipment must be externally located above grade, group the equipment appropriately and screen the elements with plant materials and/or masonry walls that are integrated with the design of the building. Design the condition to minimize the impact of noise and/or exhaust. Mechanical equipment should not be located along major circulation paths or adjacent to major entrances or significant outdoor spaces.

Locate building air intake and exhaust louvers away from loading dock facilities, designated smoking areas and pedestrian drop-off areas to minimize the impact of vehicle/building exhaust and other unpleasant odors.

Locate air intake and exhaust louvers to assure proper function and appropriate indoor air quality. Any design should carefully consider the existing conditions that may impact the proper function of the louvers. Integrate louvers and other related mechanical elements with the architecture of the building.

4.0 Landscape Guidelines

The following guidelines relate to landscape architecture and the design of exterior spaces within the campus. The landscape guidelines are described in terms of overall landscape design principles, functional aspects of landscape, landscape typologies, and landscape elements. It is important to refer to the *Towson University Construction Standards* for current specifications for landscape elements such as paving materials, site furnishings, lighting, etc.

Because there is no formal design review process on campus, these guidelines serve to provide a framework for incremental development moving toward a unified, cohesive campus and to prevent the appearance of landscapes or landscape elements being "plopped down". In some instances, the guidelines are fairly prescriptive where a standard has been set and new projects need to specifically follow these standards to reinforce the legacy image of the institution. In other instances, deviation from the standards can occur on a case-by-case basis.

It is important to note that while a unified campus is desired, the landscape is nuanced and varies among the different campus districts. Following is an overview of the primary differences among the campus districts:

Academic Core: The Academic Core is the heart of the institution and, therefore, is characterized by a greater richness in terms of materials, detailing and variety of open spaces. This richness should be reinforced with each new development project/enhancement. Key distinctions include:

- Most of the open spaces/landscapes in the core are very public as they are associated with uses that serve students, administrators, faculty and visitors. These spaces are important in reinforcing the image of the campus.
- There is a greater richness in the variety of spaces, including large gathering lawns large and small plaza areas, courtyards associated with specific buildings, amphitheaters and special spaces.
- In terms of materials, concrete unit "brick" pavers are used extensively throughout the core on primary, secondary and tertiary pathways. Only very minor or utilitarian walkways are concrete.

West Village: The West Village, is primarily a residential precinct bounded by natural areas. The open spaces/landscape, therefore, support the residential community in terms of providing amenity space. The richness in detailing and materials is limited to the most significant spaces – plazas and primary walkways (Towson Way) that link the West Village to other campus districts. Secondary and tertiary walkways are concrete.

West of West Village: The West of West Village is an extension of the West Village but is distinct in that it is currently undeveloped and there is an opportunity to develop it as an "eco district." Open spaces/landscapes in this district should emphasize sustainability. The standard "brick" paving will be limited to the Towson Way extension from West Village.

South Campus: The South Campus is characterized by large footprint buildings, athletic fields and expansive open spaces. The landscapes should continue to be compatible to the large scale of the facilities in this area while providing organization to the pedestrian circulation system. Paving in this precinct should be predominantly concrete.


The landscape adjacent to the SECU Arena utilizes broad sweeps of grasses and shrubs appropriate to the large scale of the adjacent facilities in the South Campus.

4.1 Campus Landscape Design Principles

Open space and green space, in particular, is an important component of the campus environment, with green space having a hierarchy of functions. In addition to supporting aesthetic and recreational aspects of the campus, green spaces also function as working landscapes. If preserved or developed appropriately, they address erosion, provide stormwater infiltration, improve habitat and provide buffers between incompatible uses. While landscape guidelines can be quite specific, the following are ten fundamental principles that should be considered for every landscape design within a campus environment. They are described in more detail below.

1. Landscapes that include broad lawns and large canopy trees can make the most impact on a campus, however, they need to be balanced with other landscapes
2. Responsible landscape design respects and accentuates landform, natural systems, architectural design, function and community context
3. Landscape elements help to define and reinforce spaces, direct movement, and focus views
4. Natural Systems Components should be maintained and enhanced where possible
5. Shrub beds limited to bold massings with a minimum of plant types within a bed are the most effective
6. Landscape design should provide for seasonal interest
7. Appropriate plant types are selected for specific locations
8. Native Plantings are often valuable landscaping components
9. A common palette of landscape elements unifies the overall campus landscape
10. Landscape enhancements should be sensitive to security concerns

4.1.1 Broad lawns and large canopy trees

The most memorable campus images are usually comprised of stately buildings, open lawns, and broad shade trees. Open lawns provide places to gather and socialize, and offer settings befitting for institutional buildings. Large deciduous trees provide scale, organization, and shade while allowing views and vistas beneath their canopies. It should be noted, however, that open lawns should primarily be used where space needs to accommodate activities, and where they will make the most visual impact. Many campus areas tend to be over-maintained, so there should be a balance between manicured lawn areas and areas where an ecological solutions might be more appropriate.

4.1.2 Respect and accentuate landform, natural systems, architectural design, function and community context

Placement of buildings, roadways, paths, stormwater management facilities and landscape elements should respect the context — both natural and man-made — of the University. This includes landform, woodlands, drainage systems, and the physical relationship of the institution with the surrounding community.

4.1.3 Define spaces, direct movement, and focus views

While architecture is the predominant element that defines campus spaces, landscape elements — including formal and informal groupings of trees, walls, and shrub masses — can be equally effective in defining spaces or reinforcing spaces defined by architecture. Additionally, landscape elements can direct pedestrian and vehicular movement by defining view corridors and reinforcing desire lines.

4.1.4 Maintain and Enhance Natural Systems Components

Natural systems provide many functions that otherwise require a great deal of infrastructure development to replace those natural services. Such infrastructure is often prone to high maintenance costs or failures. Examples of some functions that natural systems provide include water quality treatment, erosion control, and flood abatement, among others.

4.1.5 Limit Shrub beds to bold massings with a minimum of plant types

Bold, simple masses of plant material that are generally subordinate in the landscape complement the scale of institutional buildings and provide a calm and ordered landscape. “Fussy” plant beds, with many plant types planted as single specimens, should be avoided as they tend to call attention to themselves and can create a sense of chaos and disorder.

4.1.6 Provide for seasonal interest

Campuses tend to be most active during the fall, winter, and spring seasons, and many important events occur in the early fall and late spring. The use of plant materials with outstanding characteristics such as spring flowers, fall color, interesting branching habit and bark texture are most appreciated by the users and provide the campus with the strongest identity at times when it is most critical.

4.1.7 Select appropriate plant for specific locations

Campuses that contain a wide variety of plant types can be the most interesting, especially if plants are selected so that their natural characteristics complement adjacent buildings, spaces, and natural areas.

Plants that are inappropriate for the space in which they are located can be visually disruptive, detract from any sense of organization, and negatively impact safety considerations

4.1.8 Emphasize native, adaptive and non-invasive plantings

While it is not necessary to exclusively utilize native plants, the use of native and/or adaptive plants helps support indigenous wildlife, and produce a more robust landscape. The plants are adaptive to the local conditions and can be less maintenance intensive whether native, adaptive, or non-native, non-invasive plants should be used to prevent uncontrolled plant community invasions.

4.1.9 Unify the Campus with a common palette of landscape elements

A prevailing common design theme in landscape elements — such as benches, site lighting, trash receptacles, bicycle racks, and paving — can play a significant role in creating a visually cohesive campus image, even if there is great variation among designs of individual buildings and open spaces. While the majority of the landscape may reinforce this common design theme, deviation from this theme can be appropriate for some spaces where a unique design is warranted.

4.1.10 Design to be sensitive to security concerns

The use of low plantings/lawns and high-canopied trees, as described in the first part of this section, is an important principle to follow when addressing security concerns in addition to aesthetic concerns. Landscape designs should, where appropriate, maintain open sight lines by utilizing ground-level plantings (approximately 2' and lower) and trees with branching heights at a minimum of 7' (at time of installation and much higher for mature trees). In addition, planting adjacent to buildings should be carefully considered in context of the building design, especially with respect to windows and doors. Trees should be used to frame views from windows, not block them. For all campus spaces it is important to be able to see into the space as well as see out of it.

In addition to the above planting guidelines, exterior lighting should be provided throughout the campus but particularly in areas that are somewhat hidden. Site lighting needs to be designed in conjunction with the landscape design so that planting is not placed in locations that compromise the functioning of the lighting. Emergency call boxes should also be provided at regular intervals and in visible locations, particularly at the junction of important pedestrian corridors.

4.2 Functional Aspects of Landscape

In addition to aesthetics, responsible design can also reinforce functional aspects of the landscape. These aspects include enhancing the natural environment and ecological functions, establishing and/or reinforcing the campus image, enhancing and defining open spaces and reinforcing circulation patterns. These are described in more detail below.

4.2.1 Enhance the natural environment:

Woodlands are woven throughout the campus and play an important role in its ecology, as well as that of the surrounding community. One function of the landscape is to enhance the ecological setting by restoring woodlands to create healthy forests, reforestation of some open, previously wooded areas, using tree masses to connect forest canopies and restoring and enhancing natural drainage systems. These enhancements can be made in any open space area, regardless of whether the space is formally or informally designed. Working with natural processes enhances the regenerative ability of natural systems and reduces the costs and complexity of establishing, operating, and maintaining man-made infrastructure alternatives such as storm drains or concrete channels.

4.2.2 Establish campus image:

A positive campus image and identity is important for those who use the campus, as well as those who experience it from around its perimeters. The campus landscape influences community perceptions, provides distinct campus identity and contributes to a clear sense of arrival and direction. Regardless of whether it is a large public quadrangle, an intimate residence hall courtyard, or a streetscape, the landscape design should always take into consideration the impact it has on the University's image.

4.2.3 Enhance active open spaces:

A campus is comprised of public, semi-private, and private spaces, each of which has primary and secondary functions. The landscape can enhance spaces and reinforce functions by helping to distinguish "public" from "private" spaces, allowing the space to be flexible to accommodate a variety of uses, by providing for user comforts (access to shade, exposure to sun, seating and safety), reinforcing visual connections to adjacent spaces, and achieving a unique sense of place for each space.

4.2.4 Reinforce circulation:

Good circulation, particularly pedestrian circulation, is critical to the successful functioning of a campus. Landscape can be used to distinguish the hierarchy of circulation systems, identify gateways and entrances, and help to direct movement.

4.3 Landscape Typologies

As described earlier, the campus is comprised of several different landscape typologies that fall under the broad categories of natural landscapes and cultivated landscapes. Essentially, cultivated landscapes are those landscapes that have been manipulated to some degree by human intervention. Each of the natural and cultivated landscapes, along with design guidelines for each, are described below in more detail.

4.3.1 Natural

Natural landscapes are comprised of Woodland/Forest and Riparian Areas (within the woodlands) and are found throughout the campus.

Woodlands/Forest

Woodlands are densely forested areas interspersed throughout the campus, primarily on steep slopes and often enveloping riparian corridors. A significant woodland are in Towson's campus is the Glen Arboretum.

Woodlands provide wildlife habitats, protect stream valleys and help to prevent erosion on steep slopes. In addition to their environmental benefits, they also provide spatial definition within the campus. In most instances, design interventions within Woodland areas should be discouraged; in fact, many of Towson's designated Woodlands are protected as Forest Stands. Guidelines for interventions when warranted include:

- Restore healthy forests by removing invasive plant materials and replacing with native, non-invasive trees and understory plantings.
- Enhance woodland edges with native, non-invasive trees and shrubs that offer seasonal interest including spring flowers and outstanding fall color.
- Minimize pathway access. When required, utilize pervious materials and/or boardwalks.
- For any necessary structures located within and adjacent to woodlands, such as walls and site furnishings, utilize natural stone and log construction, such as that used in the University Union Plaza Extension.
- Stormwater management facilities located within and/or adjacent to woodlands should utilize naturalistic designs and plant palettes.

Riparian

Riparian areas are those areas associated with the natural drainage system. In most instances, they are wooded. Specific guidelines for natural areas are described below in *Section 6.9, Natural Systems and Ecological Management Guidelines.*

The woodlands throughout the Towson University Campus enrich the landscape experience

Example of how woodland edges can be supplemented with understory planting that offers seasonal interest.

4.3.2 Cultivated

Cultivated landscapes are the most prominent campus typology, and that in which human interventions are most noticeable. In some instances, these landscapes are "naturalistic" in design and provide transitions to the natural areas described above. In most instances, however, they are designed to accommodate programmed activities and provide places for informal social activity while at the same time providing context for campus buildings. Many different landscape environments comprise this typology, including transitional/woodland, transitional/open, quadrangles, front lawns, plazas, courtyards, green roofs and athletic turf. Additionally, these landscapes include focal points/special places and transit stops. Each of these landscapes and guidelines for their development are described below.

Transitional Woodland

Transitional woodland areas form the boundaries between Woodlands and various cultivated landscapes. They take the form of tree groves that extend the canopies of the natural woodlands into the cultivated landscape. Guidelines for these areas include:

- Tree groves and extended canopies should be used where a continuous overhead canopy of tree cover is desired, but where open sight lines are also important. While not offering the full ecological benefits of woodlands, extended canopies will provide connections to adjacent woodlands so as to serve various forms of wildlife. In addition, they offer a shaded environment for spaces which are intended to provide a different aesthetic experience than, for example, more open quadrangles, or open lawns.

- Tree groves and extended canopies should utilize predominantly tall canopy trees, utilizing native species predominant (or desired) in the adjacent woodland.

- Generally, stormwater management facilities located within and/or adjacent to woodlands should utilize naturalistic designs and plant palettes so that they appear as natural extensions of the woodlands. An Exception to this is when space requirements or desired aesthetics warrant utilizing planter structures integrated into the design of the architecture of the adjacent building.

Examples of tree groves showing how tree plantings can extend the canopies of adjacent woodlands while allowing for open sightlines beneath the canopies.

Transitional Open

Transitional open areas are those areas that transition to natural woodlands and riparian areas utilizing more open landscapes that are not intended to accommodate activity. They are primarily visual open spaces. Currently these landscapes throughout the campus are highly maintained lawns, however, there is the opportunity to utilize meadows and "limited mow" lawns in some of these areas instead. Specific guidelines include:

- Where appropriate, utilize a limited mow landscape in which the lawn is mowed only a few times a season to provide a more diverse habit, reduce regular maintenance and expand the variety of landscape types.
- Maintain open sightlines across these landscapes. Mowing should be scheduled to keep grasses under 24" in height.
- It is critical that limited mow areas appear as intentional landscapes. Provide a manicured edge as a transition between the limited-mow area and pathways, plazas and active open spaces. Otherwise, they will appear to be unmaintained landscapes.
- Stormwater management facilities in these areas should utilize grass swales and rain gardens/micro-bioretention areas that incorporate broad sweeps of grasses and other plants appropriate for the limited-mow landscapes. They may also incorporate clusters of shade trees.

Example of stormwater management adjacent to woodland

Open spaces adjacent to the campus' athletic fields are good candidates for utilizing low-mow lawns or meadows in place of manicured lawns as illustrated in this example.

<u>Quadrangles</u>

Quadrangles, or "quads," are very public spaces and generally include a prominent central open lawn. The Academic Quad and the West Village Quad are two of Towson's most notable quads.

Quads often serve as social centers of activity within the campus. They provide a location for students, staff, and faculty alike to relax, contemplate, and socialize with peers. The open spaces of quads are not expansive but, rather, become outdoor rooms that reinforced with strong edges. These edges are often formed or reinforced by building facades and/or rows of trees which enclose the quad. Design guidelines include:

- Utilize canopy shade trees in an informal or formal design to reinforce the edges of quads.

- Maintain large central open spaces that are flexible to accommodate a variety of activities while allowing for framed vistas through the quad.

- For the most part, utilize manicured lawn within the center of the quad to allow for passive use, low impact recreation and programmed events.

- With the exception of occasional specimen trees, avoid planting trees in the center of the quad. If specimen trees are planted as focal points, utilize canopy trees. Small ornamental trees should not be planted in the center of quads.

- With the exception of portable chairs, limit seating to the edges of quad spaces.

- Similarly, limit special planting areas utilizing shrubs, groundcovers and seasonal plantings to the edges of quad spaces

- Stormwater management areas located within quads should be carefully integrated into the overall design. Generally, facilities should be incorporated into the edges of quad spaces in structured planning or linear facilities to allow for flexibility in use for the center of the quads. In some instances, stormwater facilities may extend into the centers of quad spaces. In these instances, it is critical that the facilities be designed as landscape features with opportunities for pedestrians to interact with the facilities.

The West Village Quad (above left) illustrates how quad edges can be established with formal rows of the same variety of tree. A quad at the JHU campus (above right) illustrates how quad edges can be reinforced with informal plantings of a variety of tree species.

Example of a SWM facility located at the base of an open quad that serve as a focal point within the quad.

The proposed Academic Quad is defined by canopy trees along the edges and includes opportunities to incorporate stormwater management as landscape features.

Front Lawns

Like quads, front lawns are also public open spaces. However, whereas quads are framed by the surrounding architecture and landscape, front lawns actually serve to frame, or emphasize, significant campus architecture. Towson's most familiar front lawn is the open lawn between York Road and the historic Newell, Richmond, and Stephens Halls. Front lawns are almost always located adjacent to the primary streetscapes along the campus perimeter, where they reinforce a positive and monumental campus image. Acting as a campus "front door," these spaces welcome visitors into the campus at some of its most grand entrances. Front lawns are left open to preserve or enforce a vista into the campus. Design guidelines include:

- Emphasize predominantly manicured lawns that reinforce a collegiate image.
- Use canopy trees to frame views and reinforce edges. With the exception of occasional specimen trees located within the lawn, keep canopy trees along the perimeter of the spaces.
- Limit the use of ornamental trees to areas where they won't interrupt important sight lines.
- Stormwater management facilities located within front lawns need to be carefully integrated with the overall landscape design. They should be integrated along the edges of the space rather than

in the center where they would become a visual distraction.

The Newell/Stephens Lawn is the most iconic front lawn on campus. While it should remain as a manicured lawn, its edges need to be reinforced with additional canopy trees.

<u>Plazas</u>

Plazas are large, open areas for gathering. They are generally characterized by significant amounts of paving and site furnishings. Guidelines include:

- Locate plazas in areas where adjacent development, building entrances and circulation ways will activate the spaces.
- Large plazas may be a landscape feature in and of themselves while smaller plazas can occur in association with other landscape typologies, such as along the edges of or as a terminus to a quad.
- Plazas should incorporate a variety of seating options – benches, umbrella tables and moveable chairs.
- Plazas that serve more of a campus-wide function and aren't necessarily associated with one particular building should utilize campus paving standards ("brick" pavers and "bluestone" concrete pavers) and site furnishing standards.
- Plazas that are primarily associated with specific buildings *may* deviate from campus paving and site furniture standards if it is important that the plazas be designed as extensions of those adjacent buildings.
- Stormwater management facilities located in plazas should utilize highly structured facilities such as planters that are closely integrated into the design of the space.

Freedom Square is an example of a successful campus-wide plaza space that utilizes campus standards in paving and site furnishings.

Examples of how bioretention facilities can be incorporated into plaza designs.

<u>Courtyards</u>

Courtyards are semi-private spaces, and are generally associated with a specific building or group of buildings and often serve as spots for quick breaks between or during class. Specific guidelines include:

- In most instances, courtyard designs should be influenced by adjacent structures.
- Courtyards are locations where highly detailed planting designs are appropriate.
- Terraces should be utilized where it is important to accommodate changes in topography.
- Courtyards should incorporate a variety of seating options – benches, umbrella tables and moveable chairs.
- Stormwater management facilities located within courtyards need to be integrated into the overall

design of the space and, in most instances, should utilize flow-through planters and structures that are closely tied to the design of the adjacent architecture.

Example of flow-through planters integrated into a courtyard design

Green Roofs

Green roofs are the landscaped and sometimes usable spaces at the top of a building or a building wing. Currently, the College of Liberal Arts building and the West Village Commons building both feature green roofs. Green roofs are important components of the campus landscape as they can contribute to meeting campus stormwater management requirements, and can sometimes serve as wildlife habitats. Unfortunately, green roofs are often the first project components to be "value-engineered" out of the project. Efforts should be made to incorporate green roofs as part of most development projects. Specific guidelines include:

- Green roofs may be strictly vegetated, or may be a combination of hardscape and landscape elements.

- When green roofs are open to pedestrian traffic, they should be designed as courtyards — providing areas for brief respite, such as that developed at the West Village Commons.

- Green roofs that are not open to pedestrians should, as much as possible, be located on lower level roofs where they are visible from above.

- Interpretive signage should be included with green roofs and can be located indoors near windows looking out onto the green roof and/or outdoors in the case of green roofs that are accessible to pedestrians.

The West Village Commons is a successful example of integrating green roof and courtyard spaces.

The College of Liberal Arts Building has a green roof which helps with storm water management, extends roof life, and assists in insulates the building.

Transit Stops

Transit stops should be designed to strengthen the presence of transit stops and to provide an aesthetic environment for transit riders. Specific guidelines include:

- In addition to utilizing the standard transit shelter structure, provide canopy trees nearby to provide shade for pedestrians as they wait for transit.
- Utilize bold masses of low ground plane planting that offers seasonal interest.

Focal Points/Special Places

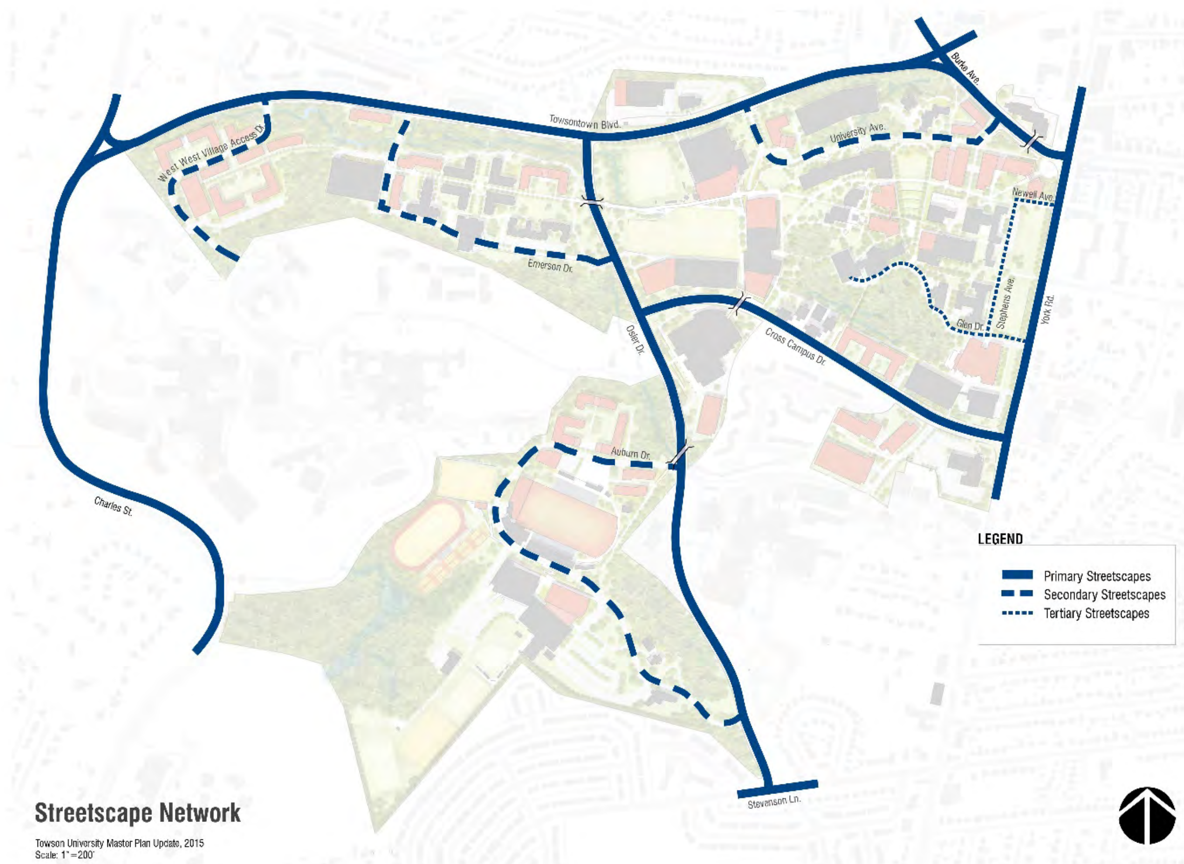
Focal points and special places are areas that are unique in the campus and appropriate for designs that deviate from campus standards. These landscapes may include memorials, alumni gardens, and class gifts to name a few. Specific guidelines include:

- Locate these spaces in highly visible areas along significant pedestrian routes, adjacent to building entrances or along the edges of quads and plazas.
- Utilize unique design elements such as wall and paving materials, site furnishings, etc. to highlight the uniqueness of these spaces.
- Consider the incorporation of public art and water features.

Examples of special places on the Towson University campus where deviation from design standards is appropriate

4.3.3 Streetscapes

Streetscapes are linear landscapes for accommodating vehicular, bicycle and pedestrian traffic within and around the campus. Streetscapes provide critical linkages among various sectors of the campus, and one's perception of a campus is often established from their experiences along these streets. Streetscapes are categorized as primary, secondary and tertiary.

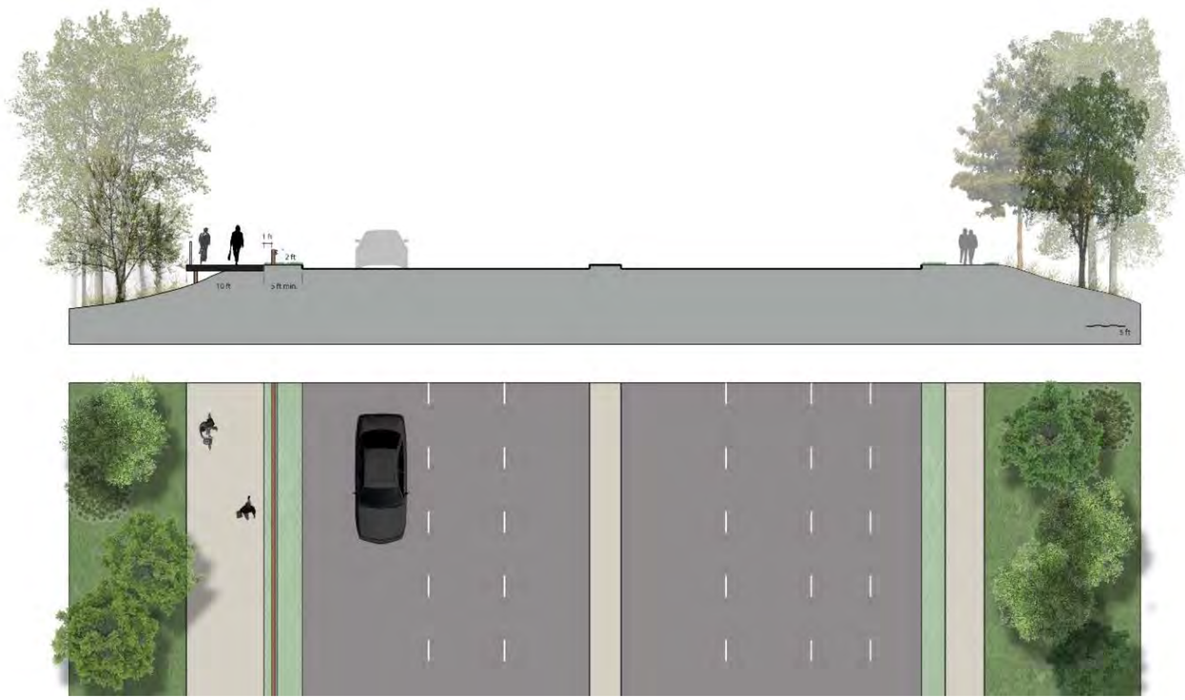


Primary Streets

Primary streetscapes are major thoroughfares that connect campus traffic with the regional transportation network. Surrounding Towson's campus, York Road, Towsontown Boulevard, and Burke Avenue are primary streetscapes, as are Cross Campus Drive and Osler Drive. Primary streets are the widest of the streets and the streetscapes help to reduce an often intimidating scale. Specific guidelines include:

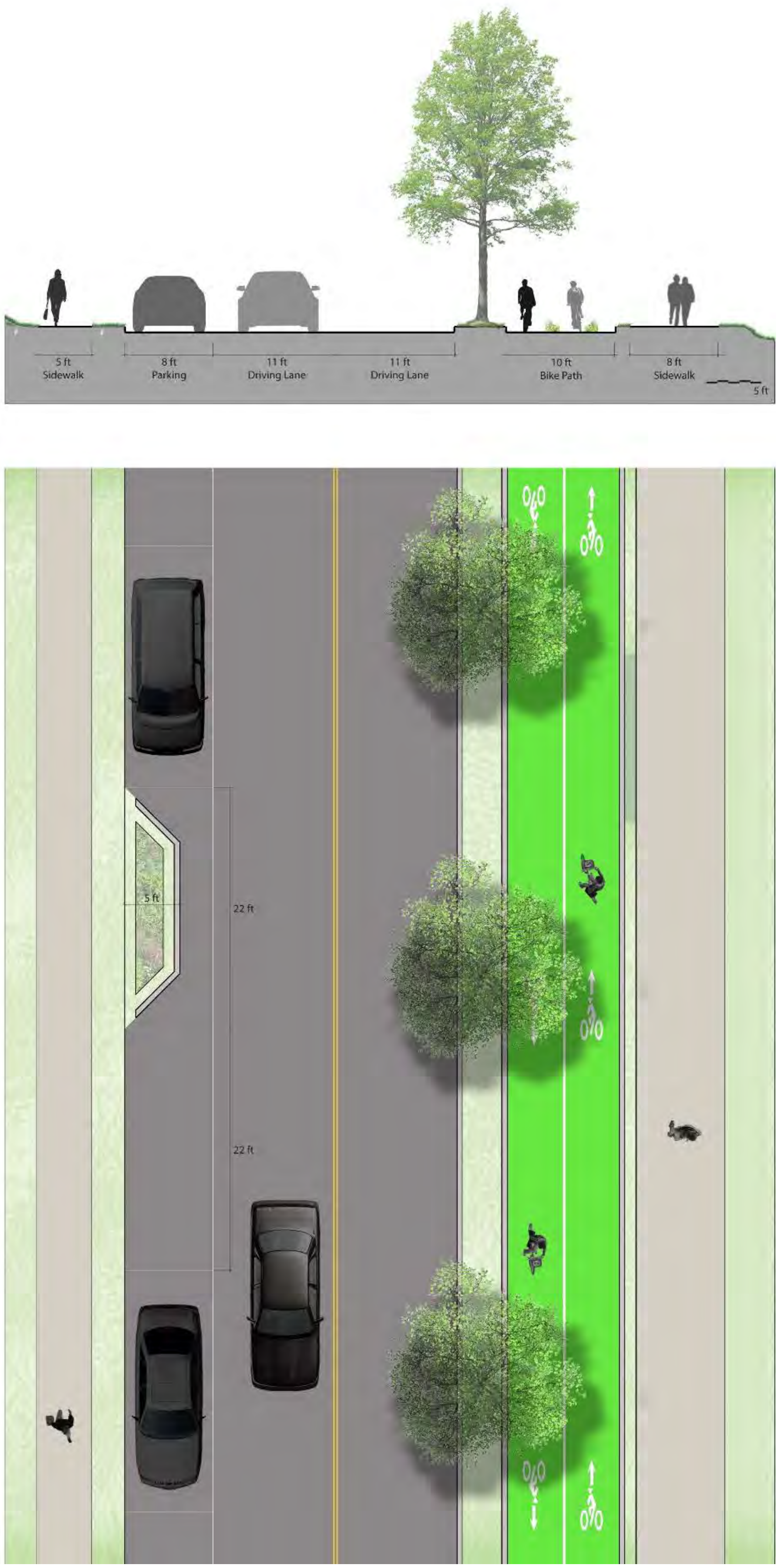
- Work with local governmental agencies and utility companies to explore long-term undergrounding of overhead utilities and/or relocation of utility poles where undergrounding is not feasible.
- Incorporate multi-use pathways that accommodate two-way bicycle and pedestrian movement on the campus side of the primary streets.
- Streetscape planting along primary streets should primarily be comprised of tall canopy trees that allow for sightlines underneath their canopies.

- The streetscape design should reinforce one of four character zones along the campus perimeter: Woodland, Woodland Transition, Urban and Front Lawn as describe later under *6.7.5, Gateways and Campus Perimeter*.
- Stormwater management facilities that occur along primary streets should utilize flow-through planters (where feasible, particularly along Cross Campus Drive) and/or linear swales and rain



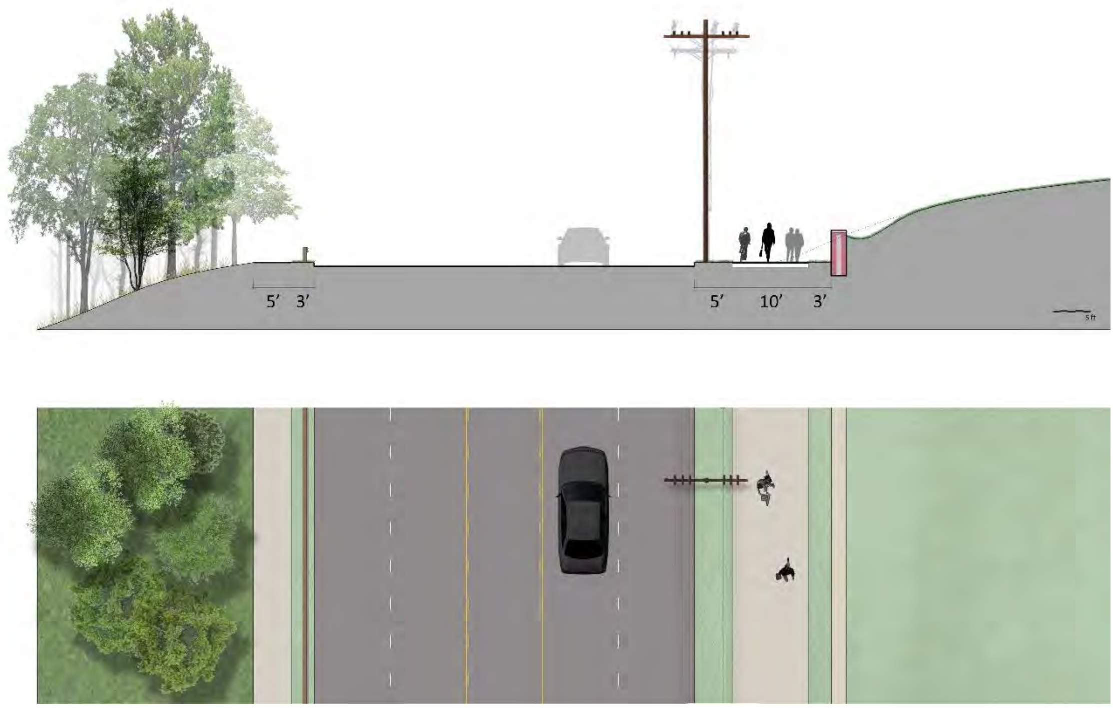
Burke Avenue where grade slopes away from the street

Burke Avenue where grade rises from the street

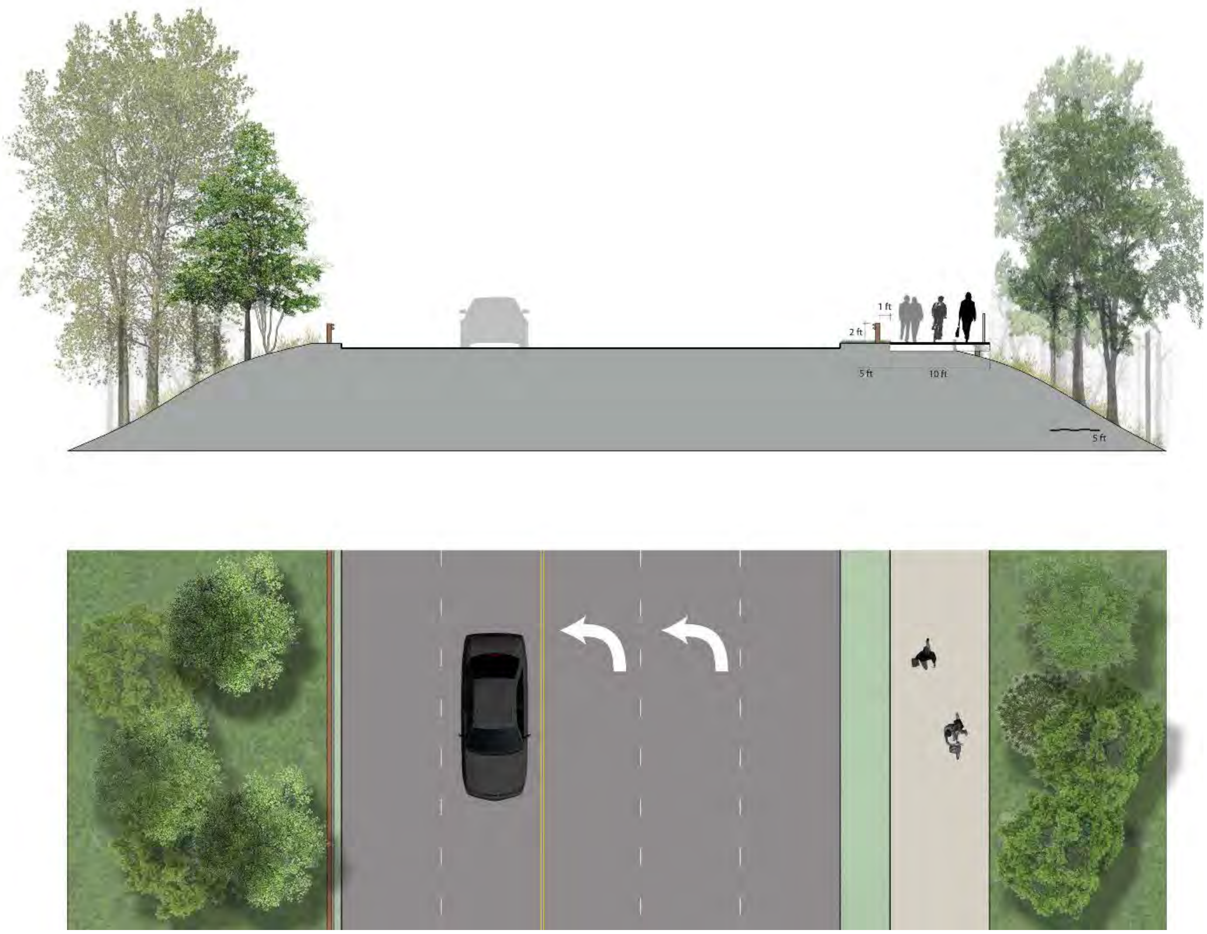


Cross Campus with Cycle Track

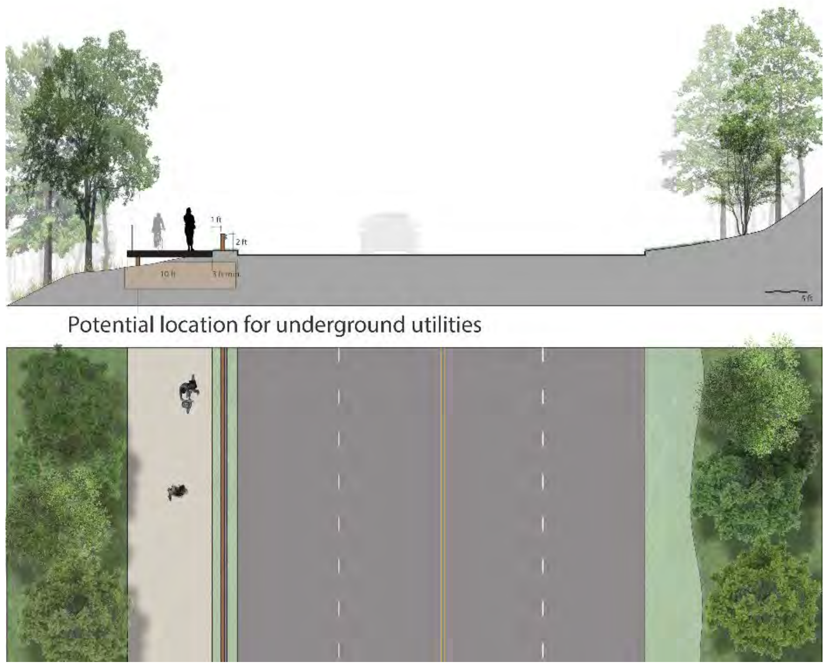
Osler Drive South, Below Ground Utilities



Osler Drive South, Above Ground Utilities

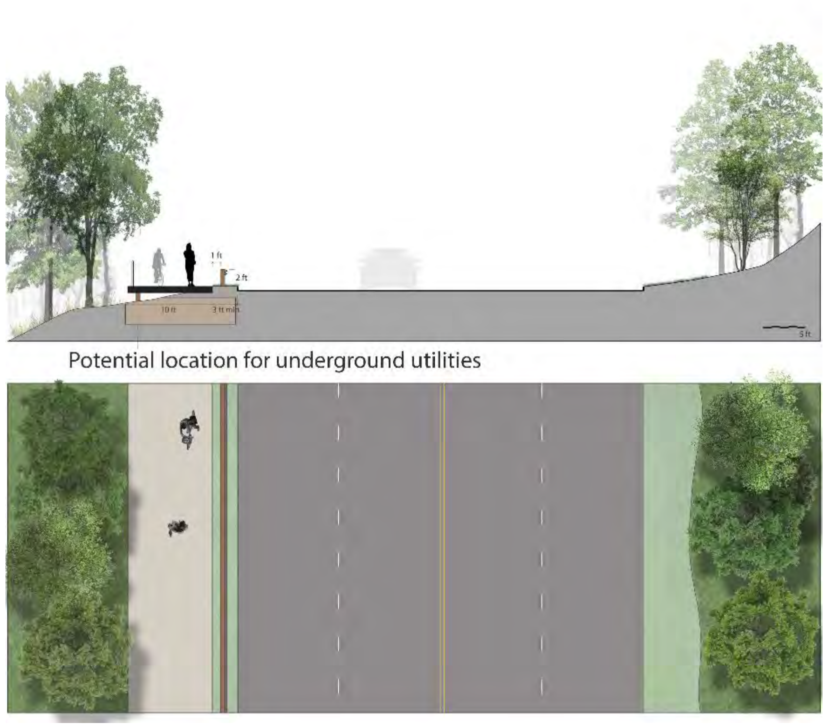


Osler Drive North



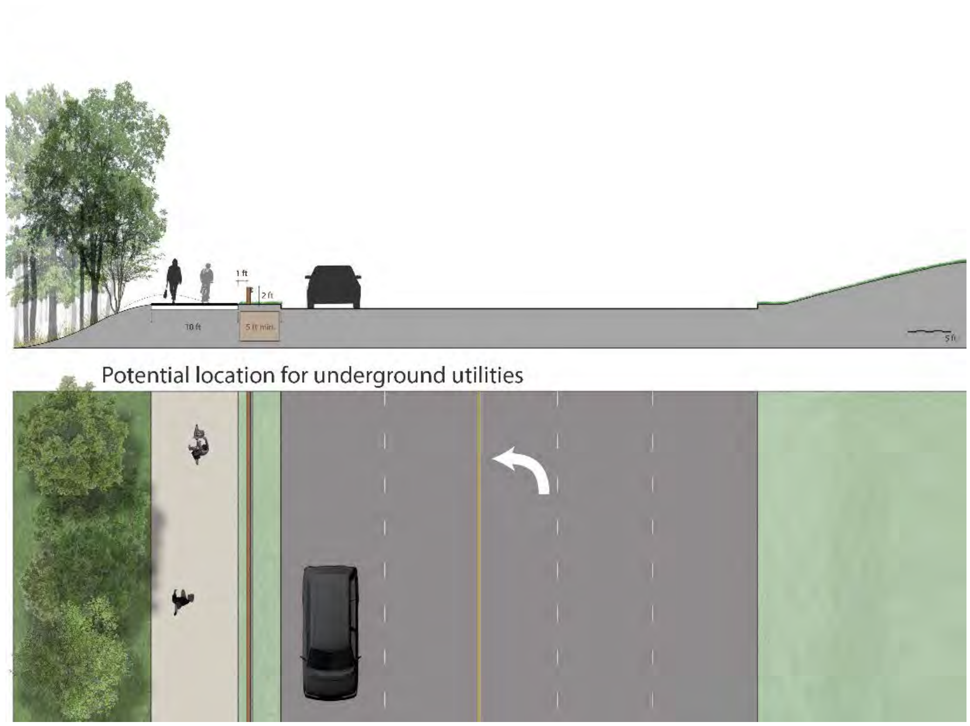
Towsontown Boulevard, Below Ground Utilities

Towsontown Boulevard, Above Ground Utilities



Towsontown Boulevard, Below Ground Utilities

Towsontown Boulevard, Above Ground Utilities



Towsontown Boulevard, Below Ground Utilities

Towsontown Boulevard, Above Ground Utilities

Towsontown Boulevard West

York Road, Below Ground Utilities

York Road, Above Ground Utilities

York Road, Below Ground Utilities

York Road with Stormwater Management, Above Ground Utilities

Secondary:

Secondary streetscapes are the significant arteries that convey vehicular, bicycle and pedestrian traffic into and through the campus. University Avenue, Auburn Drive, Glen Drive, Emerson Drive, and the West of West Village Access Drive act as secondary streetscapes through Towson's campus. Secondary streetscapes reinforce internal circulation routes and their scale is narrower than those associated with primary streets. Specific guidelines include:

- Utilize shared vehicular lanes that are shared by bicyclists. Provide sidewalks separated from the street by a street tree planting zone.
- For the most part, utilize regularly spaced canopy trees to reinforce a strong streetscape. Where regularly spaced formal street tree plantings are utilized, the same tree species should be utilized within logical sections (or "blocks") of these streets to reinforce design continuity.
- For streetscapes where an informal tree planting is appropriate, such as along some sections of Auburn Drive, a greater variety of tree species is appropriate.
- Stormwater management facilities that occur along secondary streets should utilize flow-through planters (where feasible) and/or linear swales and rain gardens that can be incorporated into the

overall streetscape design.

Auburn Drive and University Avenue both utilize regularly spaced canopy trees to reinforce these as important circulation routes internal to the campus.

Tertiary:

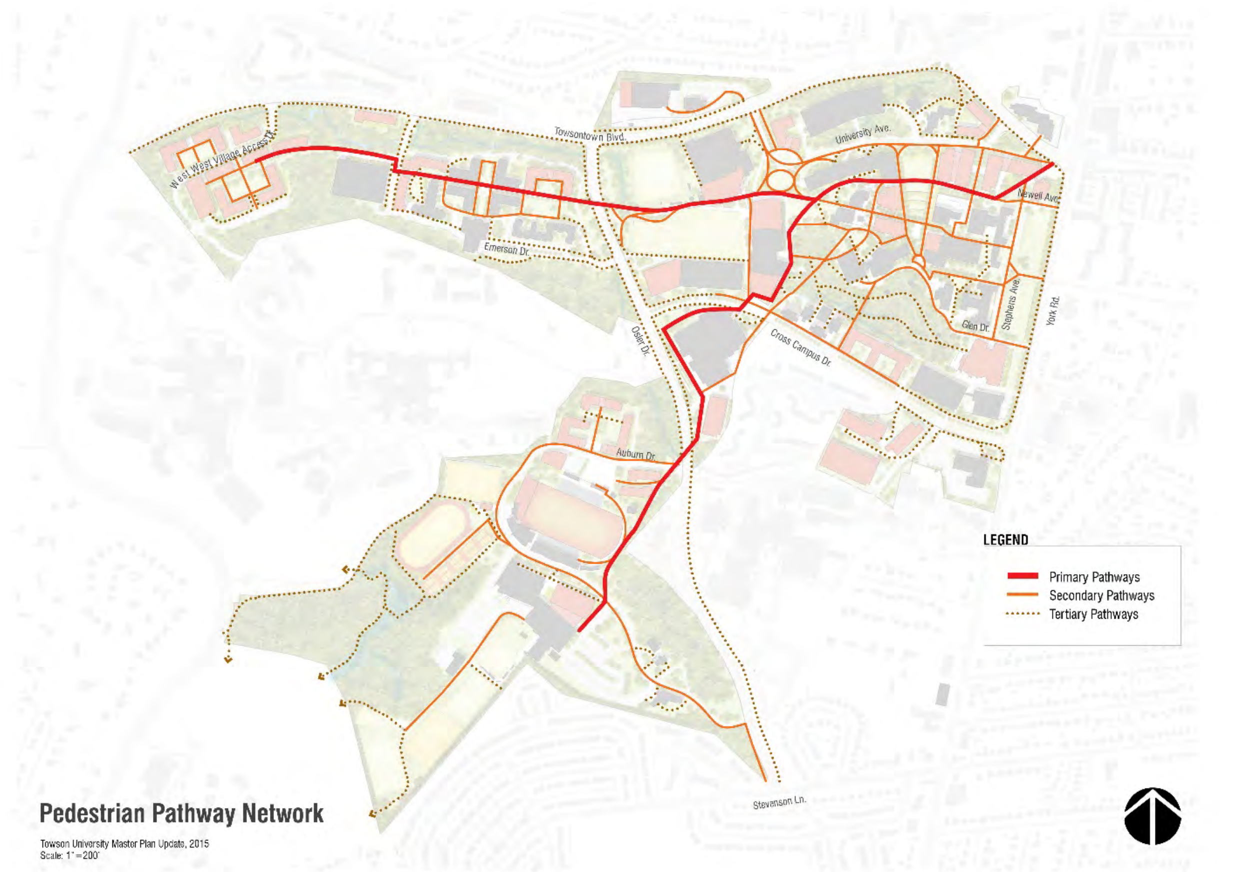
Tertiary streetscapes are the minor driveways that link the secondary road network with individual sites and buildings. Specific guidelines include:

- Tertiary streetscapes should minimize the visual and physical intrusion of a roadway on the landscape by allowing the roadway to be ancillary to the landscape through which it passes.
- Tertiary streetscapes should blend into the surrounding environment in a way that reduces their intrusion.

- As tertiary streetscapes are often interwoven with pedestrian pathways, consideration for safety is critical.

4.3.4 Pedestrian Paths

Complementary to the street network, pedestrian paths accommodate foot traffic and provide critical connections throughout the campus. In addition, a majority of the campus experience is conveyed along pedestrian pathways. Pathways are categorized as primary, secondary and tertiary.



Primary

Primary pedestrian paths are the major routes for moving pedestrians and, sometimes, bicyclists across the campus. They provide a cohesive link among campus districts while at the same time accommodate service and emergency access. Towson Way, or “The Miracle Mile,” is the primary east-west path on the Towson University campus and links the Academic Core with the West Village and West of West Village. An additional north-south primary path links the Academic Core with the South Campus. The design aesthetic for primary paths is generally consistent from one district to the other Specific guidelines include:

- Much of Towson Way is already implemented, however, additional sections that extend to York Road and to the West of West Village should utilize the same pavers and paving pattern as those sections already implemented.

- The width of Towson Way should match that of existing sections, however, narrower widths may be considered in the connection to the West of West Village, depending upon unique site constraints adjacent to Towson Run.

- The north-south primary path is partially implemented in the Academic Core. Additional sections in the core should utilize the same width, paving and paving patterns.

- Sections of the north-south primary path implemented in the South Campus should ideally utilize the same paving, paving pattern and width standards as those utilized for the core, however, topographic and other site constraints may require deviation from some of these standards. If deviations are required, the design should result in one where it is visually obvious that the pathway is part of the primary network.

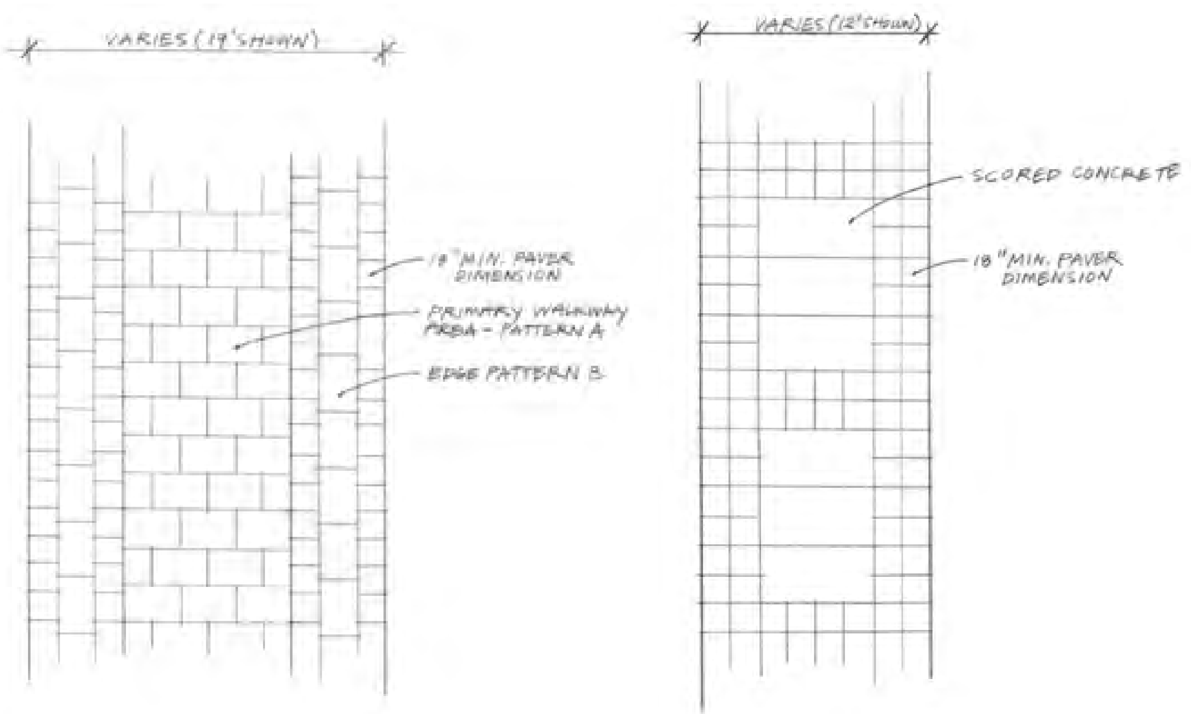
- The north-south primary path is the only pathway where “brick” pavers are appropriate in the South Campus.

- Expanded “nodes” should be provided at key intersections along the primary paths such as those existing in the Academic Core. These nodes should utilize the “bluestone” concrete pavers as has been done in the core.

- Planting along the primary paths varies from one location to another and is dependent upon the overall context. In very tight areas, such as the West Village, regularly spaced canopy trees should be utilized. Regardless, planting designs should utilize bold sweeps of plant material should continue to be utilized, appropriate to the scale of the primary pathways.

- Stormwater management facilities located along primary paths should be designed as special features and integrated into the overall landscape design. As appropriate, allow for the pathway to engage these features by passing alongside or through.

Much of Towson Way has been successfully implemented throughout the Academic Core and West Village and serves as the standard for future segments of primary paths.



Primary Pathway Standard

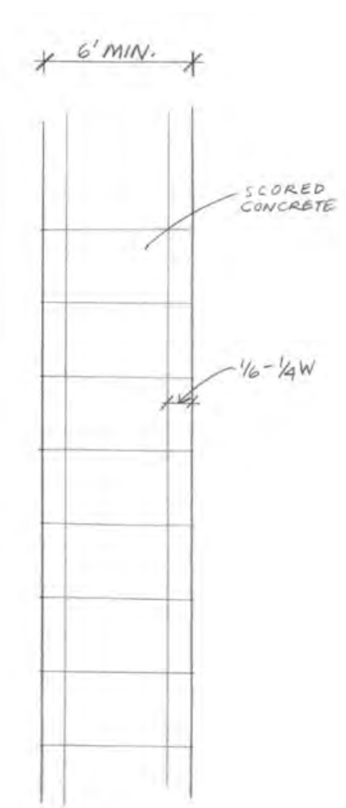
Secondary:

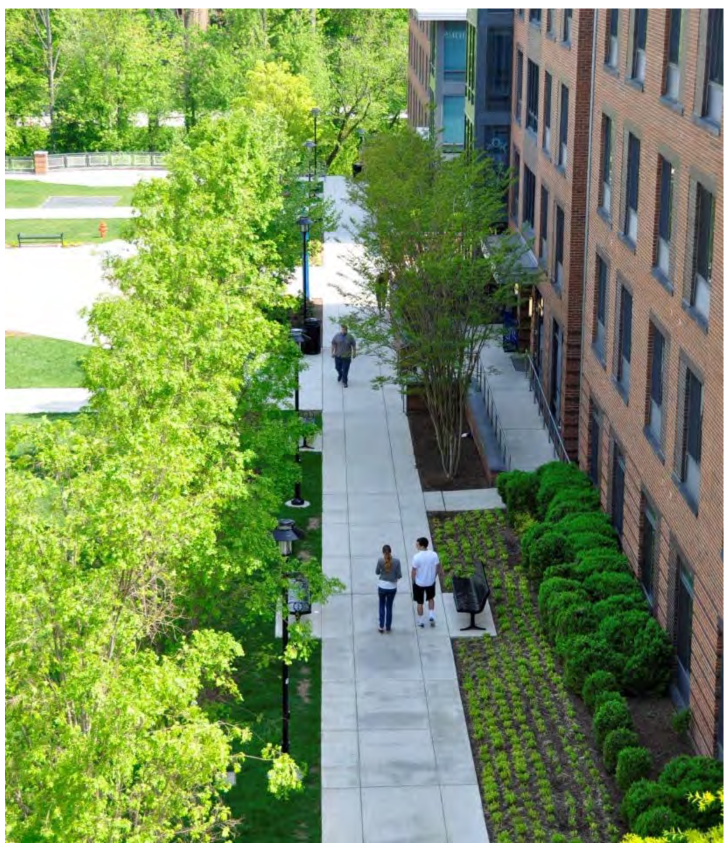
Whereas primary paths connect campus districts, secondary pedestrian paths are usually confined to a single campus district. They provide clear and unified connections among buildings and destinations within a space and among spaces within a district. The design treatment for secondary walkways within a district will be consistent along the entirety of each path, but path designs may differ from one district to the next. Specific guidelines include:

- Utilize “brick” pavers for all secondary pathways located within the Academic Core to match secondary pathways already implemented. The paving pattern shall utilize the simple banding and field pattern.

- Utilize concrete for secondary pathways located in the West Village, West of West Village and South Campus districts. The concrete walks should be scored to result in a wider field flanked by banding. The banding should be 1/6-1/4 the width of the overall walkway. Scorelines down the center of the walkway should be avoided.

The secondary walks in the Academic Core reflect the importance of this district and are comprised of “brick” pavers with a simple band along the edge.



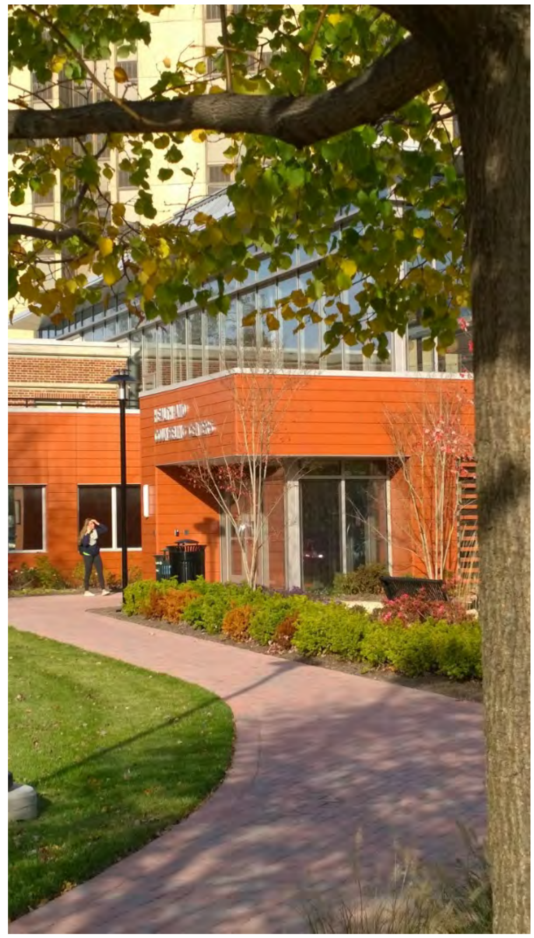


The secondary walks in the West Village effectively use concrete with a distinct banding score pattern and serves as the standard for the South Campus and West of West Village.

Tertiary

Linking buildings entrances to primary and secondary pathways or joining two pathways to each other, tertiary pedestrian paths provide minor connections within a campus space. Specific guidelines include:

- Design treatment of tertiary paths will be informed by the surrounding landscape and architectural elements.
- Within the Academic Core, tertiary paths will utilize “brick” paving to match those already implemented. Tertiary paths will be scored concrete in all other districts. Generally, the scoring pattern will result in a simple square informed by the walkway width (5’ x 5’, 6’ x 6’, etc.). In some instances a different scoring pattern may be utilized if it is important that the walkways respond to the aesthetics established by the adjacent building design.



An existing tertiary walkway in the Academic Core utilizes a simple “brick” pattern and serves as the standard for other tertiary walks within the core.

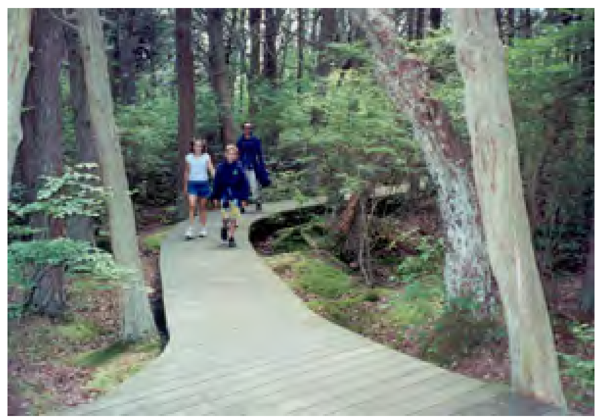
Trail, Bike Boardwalks, and Regional Recreational Paths:

Trails provide access to woodlands and natural areas. Additionally, the use of boardwalks can accommodate travel through or around sensitive areas, such as wetlands and stream crossings, and areas where the terrain would otherwise present a challenge. Examples of trail and recreational paths at Towson University include the multi-use trails along primary roadways and trails into and throughout the Glen Arboretum. Specific guidelines include:

- Multi-use trails that support two-way bicycle and pedestrian traffic along Towsontown Boulevard, Burke Avenue, Osler Drive and Cross Campus Drive should generally be comprised of asphalt where located on grade. Along York Road, this should be scored concrete or "brick" pavers to match others in the Academic Core. This will determined at the time of design.

- In areas along Towsontown Boulevard and Burke Avenue where existing topography requires the use of a cantilevered trail, the multi-use trail shall be constructed of either boardwalk (with slip resistant surface) or concrete and will be determined at the time the first section is designed.

- For trails located in sensitive natural areas,

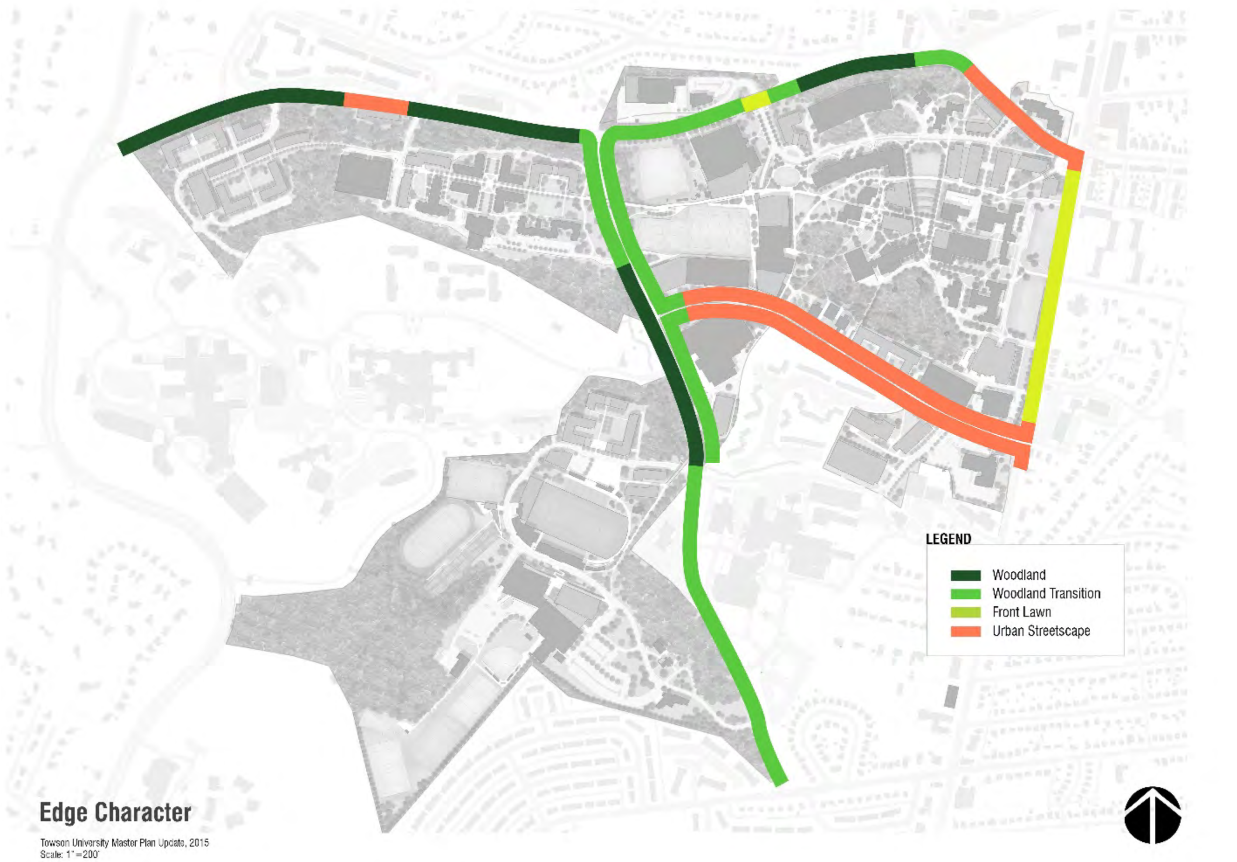


they should be comprised of crushed stone or boardwalk.

Example of a cantilevered walkway constructed of concrete at the Johns Hopkins Homewood Campus and an example of a low-impact boardwalk through environmentally sensitive areas.

4.3.5 Gateways and Campus Perimeter

Gateways provide entrances and windows into the heart of the campus. Gateways and the campus perimeter areas play a strong role in establishing initial impressions of the campus and reinforcing the campus image. As described earlier under Streetscapes, the character of the campus perimeter changes depending upon its context.



Specific guidelines for gateway and campus perimeter include:

- Landscape enhancements along a campus perimeter should reinforce one of the four character zones illustrated in the diagram.
- Any piers, retaining walls or freestanding walls located along the campus perimeter should be constructed of brick and designed to be compatible to the standard set by the main entrance walls at University Avenue and Towsontown Boulevard.
- Any fencing required along the perimeter should be compatible with the fence elements included in the main entrance.
- As described under *6.7.3, Streetscapes*, the potential to improve the campus perimeter through the undergrounding of utilities should be explored on a case-by case basis, with the York Road perimeter being the most important. In some instances where utilities cannot be located underground, pole and

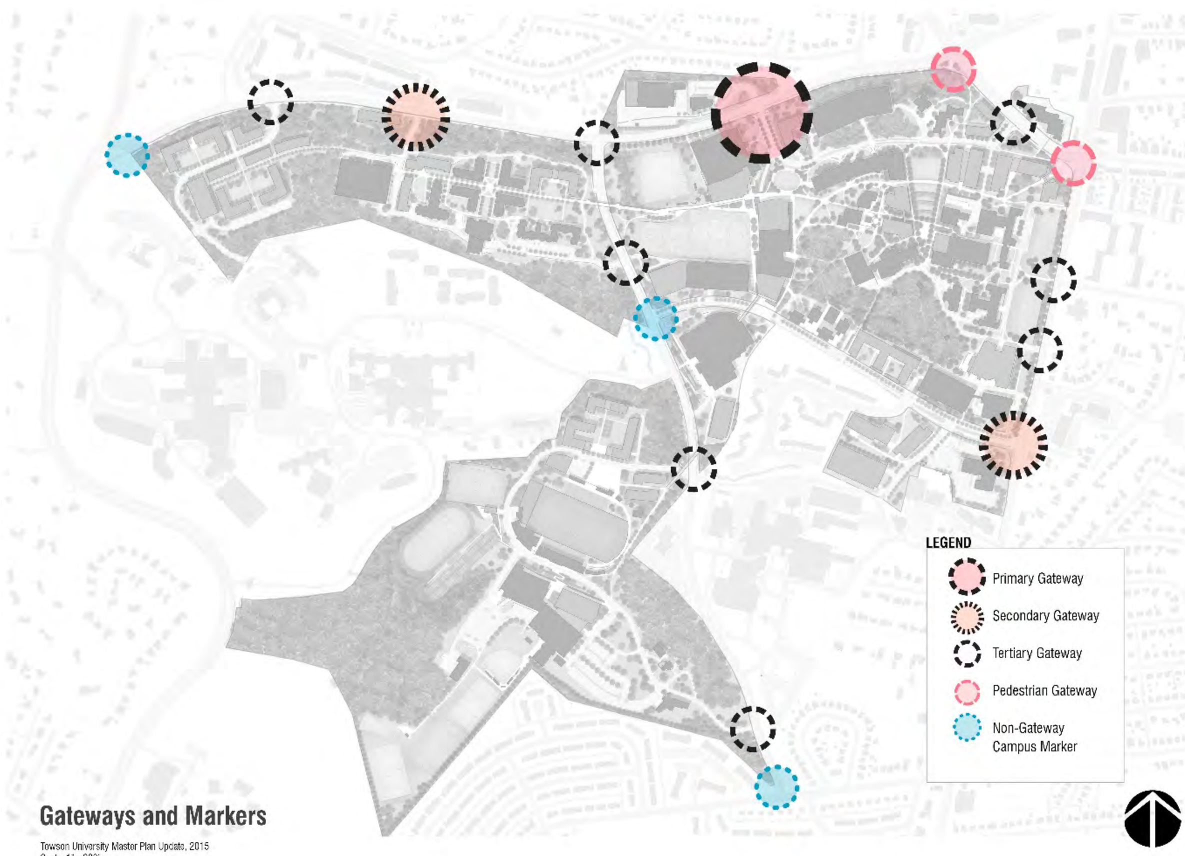
trail locations should be coordinated to minimize inconvenience to pedestrians. In some instances, the poles should be relocated and in others, the trail may route around the pole.

- Gateways should be designed in a hierarchy of primary, secondary, tertiary and pedestrian-only gateways and non-gateway campus markers following the standards set with the main entrance. The level of detailing and scale of each will be appropriate to the hierarchy. Regardless of the scale and level of detailing, it should be visually clear that all gateways are part of the same design family established by the main entrance. These different classifications are described and illustrated in more detail below.

- All gateways will include Towson University identification signage, the scale of which will be determined by the hierarchy of the gateway.

- In addition to identification signage, directional signage should be located within the gateway area and thoughtfully incorporated into the overall gateway design.

- Special planting should be incorporated into the overall gateway design and scaled appropriately for the hierarchy. Planting should be done in simple massings and beds that visually support the gateway design. "Fussy," overly detailed and residential-scaled planting designs that are visually distracting should be avoided at gateways. The goal should be simplicity.



__Primary Gateway:__

There is one primary gateway on campus and it is located at the main campus entrance at Towsontown Boulevard and University Avenue. This gateway has been successfully implemented in recent years and sets a grand expression of the campus' identity for both vehicular and pedestrian

The primary gateway at Towsontown Boulevard and University Avenue represents a grand statement of the campus' identity and sets the design standard for other gateways.

<u>Secondary Gateways:</u>

Secondary gateways clearly identify the campus presence at other important vehicular entrances to the campus. There are two secondary gateways; one located at the intersection of Towsontown Boulevard and Emerson Drive and the other located at the intersection of York Road and Cross Campus Drive. Specific guidelines include:

- While not as significant as the primary gateway, secondary gateways should be fairly substantial and utilize pier, wall and identification sign elements.

- In addition to identification signage, directional signage should be located within the gateway area and thoughtfully incorporated into the overall gateway design.

- Special planting should be incorporated into the overall gateway design and scaled appropriately for the hierarchy. Planting should be done in simple massings and beds that visually support the gateway design. “Fussy,” overly detailed and residential-scaled planting designs that are visually distracting should be avoided at gateways. The goal should be simplicity.

Potential example showing how the primary entrance design can be modified for secondary entrances. The actual scale and design will be determined at the time the secondary entrances are implemented.

Tertiary Gateways:

Tertiary gateways clearly mark the minor vehicular entrances into the campus and include eight locations as illustrated on the diagram. Specific guidelines include:

- While utilizing the same design aesthetic as the primary and secondary gateways the actual designs are dependent upon the context of each entrance and should be determined on a case-by-case basis. Identification signage should be reduced to a simple sign panel

- In addition to identification signage, directional signage should be located within the gateway area and thoughtfully incorporated into the overall gateway design.

- Special planting should be incorporated into the overall gateway design and used to a minimal degree for tertiary gateways. "Fussy," overly detailed and residential-scaled planting designs that are visually distracting should be avoided at gateways. As with other gateways, the goal should be simplicity.

Potential examples showing how the primary entrance design can be modified for tertiary entrances. The actual scale and designs will be determined at the time the tertiary entrances are implemented.

Pedestrian Gateway

Pedestrian gateways identify significant pedestrian campus entrances that are not associated with a vehicular gateway. The campus includes two such entrances, both located along Burke Avenue where the highest concentrations of pedestrians are likely to enter campus coming from Downtown Towson. One is at the intersection of York Road and Burke Avenue; the other at the intersection of Towsontown Boulevard and Burke Avenue. Specific guidelines include:

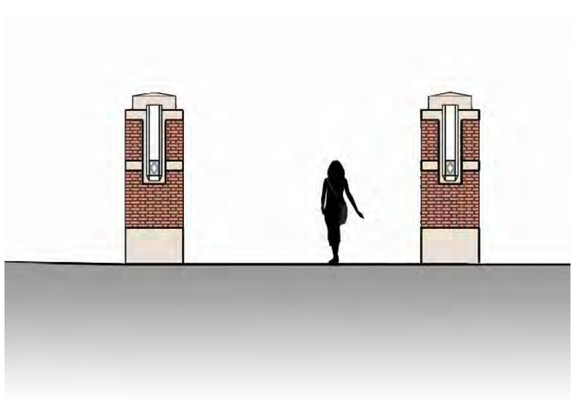
- Pedestrian gateways act as anchors and celebrate arrival to the campus from the perspective of a pedestrian. Pedestrian gateways should be designed as a fusion between a plaza, a gateway, and a pedestrian path.

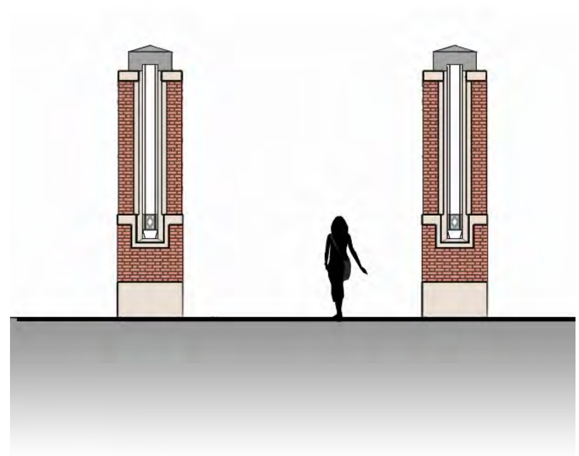
- In addition to identification signage, directional signage should be located within the gateway area and thoughtfully incorporated into the overall gateway design. In particular, campus maps and campus directories should be incorporated into the design.

- Pedestrian gateways should be designed as gathering areas and may incorporate plazas.

- Special planting should be incorporated to enhance these spaces as gathering areas. Unlike other campus gateways, a higher level of detail and plant variety may be used.

- Storm water management facilities may also be incorporated in the form of planters and serve as design features.



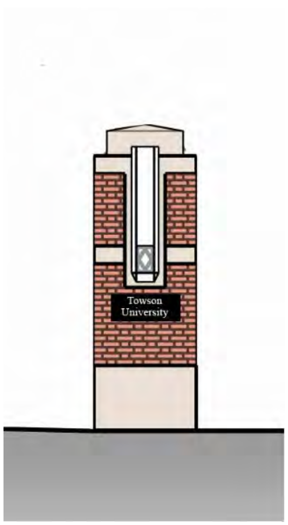


Potential examples showing how the primary entrance design elements can be modified for pedestrian entrances. The actual scale and designs will be determined at the time the tertiary entrances are implemented.

Non-Gateway Campus Marker

Non-Gateway markers are located at the corners and "ends" of the campus, such as where Stevenson Lane intersects with Osler Drive, Charles Street with Towsontown Boulevard and Cross Campus Drive with Osler Drive. These campus markers delineate the presence of the campus, despite being at a location where there is little or no ability to enter the campus. Specific guidelines include:

- Non-gateway campus markers should convey the campus identity, but are modestly designed, in comparison with the other gateways.
- These markers may or may not include identification signage, however, the use of common materials will convey that they are part of an overall design aesthetic.
- In the case of Towsontown Boulevard and Charles Street, the retaining walls required to accommodate the multi-use trail should be considered part of this non-gateway campus marker.



Potential examples showing how the primary entrance design elements can be modified for campus markers. The actual scale and designs will be determined at the time the tertiary entrances are implemented.

4.4 Landscape Elements

4.4.1 Site Furniture

For the most part, site furniture should be of the same design “family” throughout the campus to establish a sense of continuity. To date, the University has been incrementally implementing these standards throughout the campus and has made significant progress in establishing a unified campus image. As described earlier, in some instances, such as in courtyards and special places, a unique site furniture design may be used (and is encouraged to be used) to provide variety and respond to a particular building design or site purpose. Below is a composite illustration of the campus standards and the specifications are included in the *Towson University Construction Standards*. Still, some guidelines need to be described below and include:

- All site furniture shall be located within the sidewalk area or on a paved pad that extends from the sidewalk or located near the sidewalk.

- For benches and bicycle racks, the paving material of the paved pad should reflect the paving of the adjacent sidewalk. For trash receptacles and ash urns, the pads should be concrete.

- For railings, the standard illustrated below should be used for most campus areas. However, in some instances, it is important for the railing style to be determined based on the adjacent building and should be determined as part of that design.

- Similarly, for low walls the Towson standard of brick with a bluestone cap should be used in most cases. However, in some instances they should be designed as extensions of adjacent architecture. In other instances, where they are primarily utilitarian and not visible from important campus spaces, they may be constructed of other materials.

- Walls within woodlands and, in some instances, woodland transitions should be constructed of natural stone.

- Walls, wall elements and piers along the campus perimeter must be constructed of brick and precast, utilizing the design standards set at the primary gateway.

- Bike racks are often inappropriately placed as afterthoughts. Areas for bike racks must be thoughtfully incorporated into the overall landscape design for each building and site project.

- Sled-type bike racks should be utilized in place of the bike racks currently being utilized as they are less prone to degrade where they are joined to the ground.

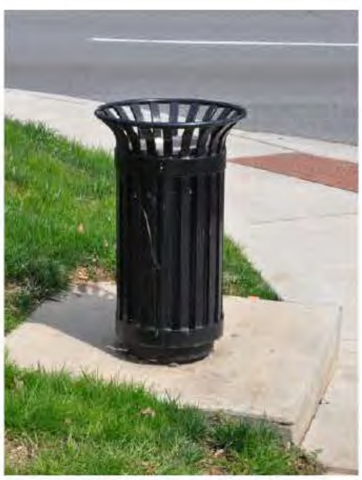
- In addition to the bike repair station located at the University Union, at least one additional bike repair station should be located on campus.

- Ash urns should be limited to perimeter areas.

- The use of boulders and natural rock as landscape accents should be restricted to areas adjacent to woodlands, within woodland transitions, within plazas and courtyards and within special focus areas. Rocks, boulders and natural stone should not be used along campus perimeters.

TRASH & RECYCLING RECEPTACLES

ASH URNS



TABLES

BENCHES

BOLLARDS

FLAG POLES

SIGNAGE

The above photos illustrate the campus standards for site furnishings. Specifications for current campus standards are included in the Townson University Construction Standards.

4.4.2 Site Lighting

Site lighting plays an important role in providing for pedestrian safety and reinforcing campus spaces and circulation routes at night. Lighting specifications are provided in the Towson University Construction Standards, however, a few important guidelines are identified below:

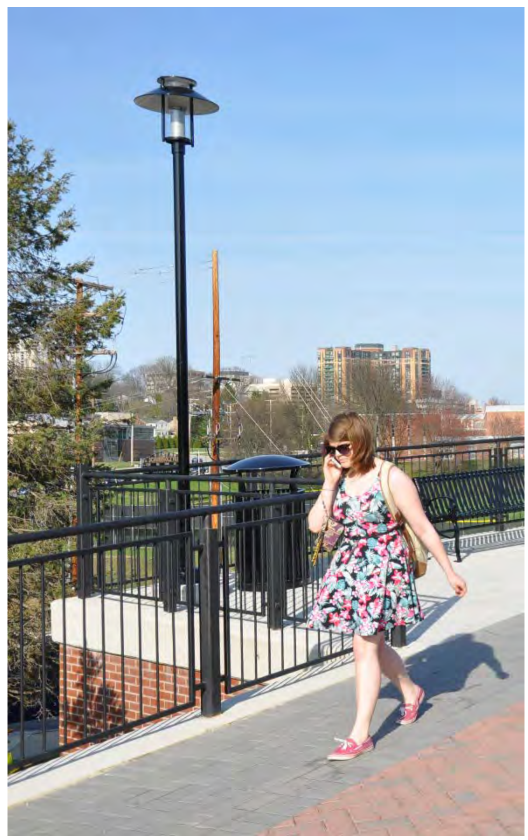
- Site lighting must be designed in coordination with the overall landscape design to minimize conflicts between trees and light coverage.

- Light levels for walkways, parking lots, and building entrances should be designed to light levels as specified in the *Illuminating Engineering Society of North America (IESNA) handbook (latest edition)* for space types & comply with ASHRAE/IES standards for lighting power densities.

- Special accent lighting may be included in special instances plazas, courtyards and special focus areas to accent landscape features and to reinforce these spaces as outdoor gathering areas during the day as well as during evening hours.

- Landscape lighting should be considered for special planting areas to highlight particular landscape environments from areas outside of the campus as well as within the campus. The use of landscape lighting needs to be carefully integrated into the overall design of the space and should not appear as an afterthought. Consideration should be given to how the illuminated landscape works in composition with adjacent buildings and spaces. Particular attention should be given to illuminating landscape features visible from within interior gathering areas that will be used extensively in the evenings. Landscape lighting may include low-level lighting of planting beds or lighting of picturesque trees. For lighting of trees, “moonlighting” is encouraged as opposed to “up lighting” which results in light pollution.

- Lighting of buildings is described in the Architectural Guidelines section.



The ornamental pedestrian light fixture shown above is used throughout the campus.

4.4.3 Planting Beds

Planting beds add a richness to the landscape, providing additional layers of plant material in the form of shrubs, groundcovers, grasses, perennials and annual flowers. Because they require additional maintenance, they should only be used where they make the most impact. Specific Guidelines include:

- The planting bed design should be appropriate to the scale of and activity within the space in which it is located. Beds in intimate courtyards, special gardens and places where people will gather should have a wide variety of species, colors and textures. Conversely, beds in spaces that will primarily be perceived from the automobile or in spaces adjacent to large scale buildings should rely on bold sweeps and massings of a limited variety of species. Residential-scaled planting designs should be avoided.

- Planting beds should utilize plants that provide visual interest throughout multiple seasons of the year.

- Planting beds should be integrated into the overall design of the landscape and should not appear to be an afterthought.


Examples of the effective use of bold masses of plants

4.4.4 Trees

Trees, whether deciduous, evergreen, canopy or ornamental, provide the most impact for the investment made in landscape. They continue to grow as they mature and can play a significant role in defining spaces, providing clarity to circulation patterns, providing shaded comfort and unifying a variety of campus elements into a cohesive whole. Trees need to be used effectively, however, to make the most positive impact. Specific guidelines for using trees include:

- Use the right tree in the right location. Canopy trees should be used where spatial definition, shade and unobstructed sightlines are important. Ornamental trees are appropriate as accents, within courtyard spaces and beneath utility lines. Evergreen trees are appropriate as accents, backdrops and in areas where they won't obstruct important sightlines. Consider the overall landscape value of the tree.

- Where small ornamental trees are required along streets because of overhead utilities, use single-trunk varieties as opposed to multi-stem which can impede pedestrian circulation and sightlines.

- Consider the use of specimen trees as focal points within Front Lawns, Quads and plazas.

- Utilize a predominant tree species throughout the campus to help unify different districts. This predominant species should then be supplemented by a wide diversity of species.

- Utilize "legacy" trees such as oaks and beech that are long-lived and evoke traditional campus landscapes.

- While there should be an emphasis on the use of non-invasive native trees, non-invasive non-natives that are adapted to this climate should also be considered and are, indeed, appropriate.

- Consider the qualities of a tree when determining the selection for a particular space. Below is an outline of a few select trees that should be considered for campus use, however, the list is not exclusive.

- When selecting trees, consider not only hardiness but also habit, rate of growth, texture, bark color, leaf color, flowers, fruit, and susceptibility to diseases and insects.

Select Tree List

The following tree list represents a selection of trees that should be considered for use throughout the campus. Appropriate applications are suggested, however, each site needs to be evaluated carefully for its unique conditions prior to selecting the appropriate tree species. The list is by no means complete and other species should be considered as detail design projects are developed.

Canopy Trees

Acer saccharum, Sugar Maple ('Green Mountain'): Use as lawn specimens, woodland edges

Acer rubrum, Red Maple ('Armstrong' and 'Bowhall' – columnar varieties): Use as street trees, within quads and lawns, woodland edges, in narrow spaces (columnar varieties).

Aesculus hippocastanum, Common Horsechestnut: Use as occasional specimens in large lawn areas.

Carpinus betulus, European Hornbeam ('Fastigiata' –columnar variety): Use in narrow spaces, courtyards and plazas.

Carpinus caroliniana, American Hornbeam: Use for naturalizing along woodland edges and streams.

Carya ovata, Shagbark Hickory: Use for naturalizing along woodland edges.

Fagus grandifolia, American Beech: One of the most noble trees, use this as a focal point specimen tree within large lawns.

Gleditsia triacanthos var. inermis, Thornless Common Honeylocust: Use for street trees and within plazas and courtyards where a light canopy is desired.

Liriodendron tulipifera, Tulip Tree: Use in woodlands, along woodland edges and within large lawns and quads.

Nyssa sylvatica, Black Tupelo: Use along woodland edges and as specimens within lawns.

Platanus x acerifolia, London Planetree: Use for street trees and within quads, plazas and courtyards.

Quercus alba, White Oak: Use in woodlands, along woodland edges and within large lawns.

Quercus coccinea, Scarlet Oak: Use for street trees, along woodland edges and within quads.

Quercus palustris, Pin Oak: Use within lawns and along woodland edges.

Quercus phellos, Willow Oak: Use for street trees and within quads, lawns and woodland edges.

Quercus rubra, Red Oak: Use for street trees and within quads, lawns and woodland edges.

Taxodium distichum, Common Baldcypress: Use as part of specimen groupings within lawns.

Ulmus americana, American Elm: Use as specimens within lawns and quads.

Ulmus parvifolia, Lacebark Elm: Use for street trees, within courtyards and plazas.

Zelkova serrata, Japanese Zelkova ('Green Vase'): Use for street trees, within courtyards and plazas.

Evergreen Trees

Ilex opaca, American Holly: Use as accents and within lawns and along woodland edges.

Pinus strobus, White Pine: Use as backdrop plantings and as specimens within lawns.

Ornamental Trees

Acer buergerianum, Trident Maple: Use single stem varieties as street trees where overhead utilities are present.

Amelanchier Canadensis, Shadblow Serviceberry: Use for naturalizing along woodland edges and as specimens within courtyards and plazas.

Betula nigra, River Birch: Use for naturalizing along streams and as specimens in courtyards and plazas.

Cercis Canadensis, Eastern Redbud: Use for naturalizing along woodland edges.

Chionanthus virginicus, White Fringetree: Use for naturalizing along woodland edges and within courtyards and plazas.

Cornus florida, Flowering Dogwood: Use for naturalizing along woodland edges and as accent plantings.

Hamamelis virginiana, Common Witchhazel: Use for naturalizing along woodland edges.

Magnolia virginiana, Sweetbay Magnolia: Use for naturalizing along woodland edges and as accent plantings in courtyards and plazas.

4.4.5 Water Features

Water features throughout the campus include natural systems (streams and wetlands), as well as storm water management systems such as bioretention areas, rain gardens and grassed swales. The ecological management of these systems is described in the Natural Systems & Ecological Management Guidelines section; however, landscape design considerations for these areas are outlined below. In addition, the Towson University landscape may include ornamental water features as part of an outdoor space. Design considerations for these water features are also described below.

Fountains/Ornamental Water Features:

Ornamental water features (fountains, pools) may be considered throughout the campus, particularly within plazas, courtyards and special places. Regardless of location, the design of the water feature should be integral to the overall design of the space and appropriate to the function of the space. For example, quiet, contemplative spaces and gardens should utilize water features that reinforce the feeling of tranquility. Active, dynamic spaces, however, might utilize water features that encourage interaction or utilize water features that help to mask undesirable noise such as adjacent traffic. Additional guidelines include:

- Water features should be designed so that the design appears complete, even if the water feature is turned off for the season.

- Water features should be designed to minimize regular maintenance requirements. Features should be designed to recycle water within the feature and not require additional use of potable water. Regardless of the design, water features should only be considered if there is adequate funding for on-going maintenance.

4.4.6 Storm Water Management Areas:

Planning for Stormwater Management is a significant component of the Campus Master Plan. Environmental Site Design (ESD) practices will need to be applied throughout the campus to manage stormwater in terms of both quality and quantity. Because of the number of individual facilities that will ultimately be required throughout the campus, the potential impact to the campus open space is significant. It is, therefore, critical to manage not only the quantity and quality of the stormwater, but also the aesthetics and functionality of the facilities themselves. There are numerous types of ESD practices that can be applied, depending upon a number of site considerations. These include bioretention in pervious areas, bioswales, stormwater planters, stormwater tree pits/flow-through planters, terraced bioretention, grass channels, filter strips, infiltration trenches, permeable paving and green roofs.

As each new development project occurs, the design process for that project should evaluate which ESD practices are most appropriate for the site. It will be critical to integrate facilities into the overall site, landscape and even architectural design, rather than develop in a manner where the facilities appear to be afterthoughts. Stormwater management facilities can be developed as focal points within the landscape, integrated with pathways so that pedestrians can be engaged in the unique landscapes, developed with interpretative opportunities and designed as architectural extensions of the buildings to which they are adjacent. Regardless of the type of stormwater facility used, the ESD practices must be responsive to the overall site context. Specific guidelines include:

- For formal landscapes, consider rain gardens or bioretention areas that are more architectural or geometric in design, incorporating native plants in a manner that is appropriate to the formal landscape.
- Utilize bold masses of native plant materials to create a strong landscape design; avoid spotty, unorganized planting designs within bioretention facilities.
- Locate rain gardens, bioretention areas and grassy swales in areas so that water drains away from gathering areas, walkways and building entrances.
- When using bioretention areas with native vegetation adjacent to walkways, parking lots and other high use areas, provide a minimum 18" "mow strip" between the curb/sidewalk and the naturalized bioretention area to provide a neater appearance.
- For bioretention facilities within quads and lawns, locate the facilities near edges so that open flexible use areas can be maximized.
- Where available space and topography present challenges, consider the use of walls and terraced bioretention.
- Where available space is a challenge adjacent to buildings, utilize stormwater planters that are integrated into the overall building design and serve as design features.
- Where possible, integrate pedestrian paths and crossings into the facility design to enhance how one interacts with this features.
- Where appropriate, incorporate interpretive signage to make campus users aware of the importance these features play in the ecological functions of the campus.



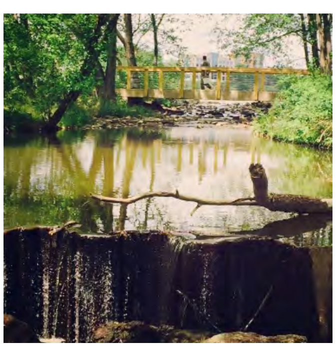


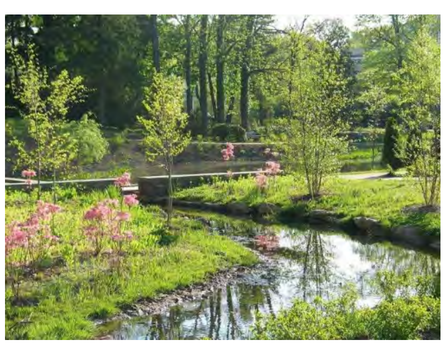

Examples of various stormwater practices that are integrated into the landscape/site/architectural design.

4.4.7 Streams:

A goal of the landscape guidelines is to preserve and enhance the natural stream systems within the campus. In addition, it is also important to draw attention to these natural systems and showcase them wherever possible to build and reinforce an understanding among campus users of their importance. The following design guidelines should be considered for these areas:

- Use rocks and native vegetation to create a stream bed/drainage channel with a natural appearance.
- Use a hierarchy of native grasses, shrubs and trees to transition naturally from a streambed to adjacent landscapes.
- Use rocks and native plant materials to accentuate the appearance and presence of a stream channel, even if the stream channel is dry most of the year.





4.5 Natural Systems & Ecological Management Guidelines

Beyond a change in basic approach, sustainable site design requires holistic, ecologically based strategies to create projects that do not alter or impair but instead help repair and restore existing site systems. Site systems such as plant and animal communities, soils, and hydrology must be respected as patterns and processes of the living world. Components of the Towson University Master Plan should be based on sustainable ecologically based site design principles. The "Valdez Principles for Site Design," developed by Andropogon Associates, Ltd, provides a foundation for the future development of Towson University:

- **Recognition of Context.** No site can be understood and evaluated without looking outward to the site context. Before planning and designing a project, fundamental questions must be asked in light of its impact on the larger community.
- **Treatment of Landscapes as Interdependent and Interconnected.** Conventional development often increases fragmentation of the landscape. The small remaining islands of natural landscape are typically surrounded by a fabric of development that diminishes their ability to support a variety of plant communities and habitats. This situation must be reversed. Larger whole systems must be created by reconnecting fragmented landscapes and establishing contiguous networks with other natural systems both within a site and beyond its boundaries.
- **Integration of the Native Landscape with Development.** Even the most developed landscapes, where every trace of nature seems to have been obliterated, are not self-contained. These areas should be redesigned to support some component of the natural landscape to provide critical connections to adjacent habitats.
- **Promotion of Biodiversity.** The environment is experiencing extinction of both plant and animal species. Sustaining even a fraction of the diversity known today will be very difficult. Development itself affords a tremendous opportunity to emphasize the establishment of biodiversity on a site. Site design must be directed to protect local plant and animal communities, and new landscape plantings must deliberately reestablish diverse natural habitats in organic patterns that reflect the processes of the site.
- **Reuse of Already Disturbed Areas.** Despite the declining availability of relatively unspoiled land and the wasteful way sites are conventionally developed, existing built areas are being abandoned and new development is being located on remaining rural and natural areas. This cycle must be reversed. Previously disturbed areas must be inhabited and restored, especially urban landscapes.
- **Making a Habit of Restoration.** Where the landscape fabric is damaged, it must be repaired and/or restored. As most of the ecosystems are increasingly disturbed, every development project should have a restoration component. When site disturbance is uncontrolled, ecological deterioration accelerates, and natural systems diminish in diversity and complexity. Effective restoration requires recognition of the interdependence of all site factors and must include repair of all site systems - soil, water, vegetation and wildlife.

Natural Resources Management

<u>Woodland Management</u>

Deforestation and resulting forest fragmentation over the past 200 years have upset ecosystem processes, accelerated the spread of invasive species and reduced biodiversity. These impacts have resulted in a decline of indigenous flora and fauna including the diversity of rare, threatened and endangered species. Healthy forests, including woodland patches and corridors in urban areas, can contribute to soil regeneration, nutrient cycling, carbon sequestering, natural water cycling, oxygen generation and biodiversity enhancement. Protecting riparian forests can also ensure the integrity and long-term sustainability of stream ecosystems.

The remaining woodland areas on the Towson University campus are generally small, highly fragmented and extremely susceptible to ecological decline. In order to reverse this trend, the Towson University Master Plan incorporates woodland management initiatives into the development of new building projects along with the day-to-day landscape operations.

Woodland Management Goal – Restore the diversity of native flora and fauna woodland species on campus. This will require specific action items to ensure both the protection of existing woodland communities and the restoration of declining or eliminated woodland areas.

Stream and Wetlands Management

Urban streams and wetlands have been disturbed and degraded by a multitude of human-induced factors including the development of impervious surfaces and associated stormwater run-off, channelization, filling, draining and other modifications. These activities have had a profound negative effect on the ecological functions of wetlands and streams. Healthy streams and wetlands provide a wealth of ecological functions including flood flow attenuation, water quality enhancement, sediment and erosion control, groundwater recharge, nutrient cycling and fish and wildlife habitat.

The remaining wetlands and stream courses on the Towson University campus have been altered through past land uses and site development activities. In order to reverse this trend, the Towson University Master Plan incorporates wetland and stream management initiatives into the development of new building projects along with the day-to-day landscape operations.

Stream and Wetland Management Goal – Restore the natural morphology and ecology of existing streams and wetlands on campus. This will require specific action items to ensure both the protection of existing stream and wetland resources and the restoration of impacted streams and wetlands.

Stormwater Management (SWM)

Stormwater runoff pollution is typically referred to as "nonpoint source pollution" because these pollutants enter streams and wetlands at thousands of different places at intermittent times during and after rainfall. These nonpoint pollution sources contribute to water quality degradation and loss of aquatic habitat and are the major threat to water quality in streams and rivers. Urban runoff is directly related to the amount of impervious surfaces associated with roads, rooftops, parking lots and driveways. Unmanaged stormwater runoff washes soil from the landscape, erodes stream banks, scours channels, increases pollutant loadings, and impacts in stream habitat. Inputs from parking lots, roads, paths and roofs all contribute to stormwater management problems. There are many techniques to reduce stormwater runoff impacts including reducing impervious surfaces, planting additional trees and incorporating various stormwater best management practices. These techniques can be incorporated into both new and existing development.

Much of the stormwater generated from impervious surfaces throughout the campus is unmanaged. In order to manage existing stormwater runoff and to ensure that future stormwater runoff is managed in an ecologically sensitive way, the Towson University Master Plan incorporates stormwater management strategies for retrofitting existing development as well as managing new development projects.

Stormwater Management Goal – Protect receiving waters and aquatic habitats by improving the quality and quantity of stormwater discharges. This will require specific action items to implement stormwater management initiatives for both existing and proposed development projects.

Stormwater Management - State Regulations

As Towson University expands, each new campus development project will prepare site-specific stormwater management plans and will submit those plans to the Maryland Department of the Environment (MDE) for permitting review. The State of Maryland's Stormwater Management Act of 2007 (formally adopted in 2009) places increasing emphasis on the implementation of “Environmental Site Design” (ESD) practices designed to manage stormwater more immediately and more sensitively. This initiative seeks to treat rainwater “where it falls” by using ESD techniques to the maximum extent practicable. Engineers may select from a variety of sanctioned ESD practices such as micro-bioretention filters, landscape infiltration areas, rain gardens, green roofs, permeable pavements, and a number of other options that are designed to keep water slowly percolating through the ground. The sanctioned ESD practices are outlined in chapter 5 of the MDE manual.

The ESD “ethic” is a departure from traditional stormwater management techniques where rainwater is funneled off-site as rapidly as possible through underground conveyance or, in some instances, impounded at the low point of the site in one large detention pond. These “traditional” Best Management Practice (BMP) devices are still available for site designers as a “last resort” when the ESD options have been fully exhausted. For example, “wet ponds,” “micropool extended detention ponds,” and “pocket ponds” are categorized in the MDE manual as “practices that have a permanent pool…” (Section 3.1 in MDE Manual) and for many years these types of impoundments were commonplace installations in large developments. Since a pond with standing water generally requires a sizable area, it is not feasible to recommend such a practice on a campus that needs as much space as possible for architectural programmatic needs. Furthermore, planners are reluctant to recommend a permanent pool facility when it is clear that MDE reviewers expect to see ESD devices that preserve the overall rainfall management intent (“treat it where it falls”). Finally, a “wet pond” may be subject to further regulatory scrutiny, depending upon the ultimate design (NRCS-MD 378 Pond Code Standards and Specifications for Small Pond Design). For these reasons, the master plan analysis does not recommend installing any stormwater practices from the general “wet pond” category.

There are some practices categorized as “Stormwater Filtering Systems,” including surface sand filters, underground sand filters, organic filters, and so on. For years these practices were quite common in urban settings and a tour of Baltimore would reveal ubiquitous installations of underground sand filters in various buildings or parking decks downtown. In the current regulatory environment, however, MDE will occasionally (and rarely) approve these structural filtering devices only if the applicant can demonstrate that an exhaustive attempt to incorporate ESD measures has not completely satisfied the calculated requirements. Even though these traditional stormwater practices remain viable alternatives, MDE rules obligate designers to design ESD practices first. MDE expects to see development proposals that exhaust all environmentally sensitive options before “resorting to” structural filtering systems. Therefore, it would be in Towson University’s best interest to set aside appropriate spaces near each new campus building in order to anticipate stormwater management installations that are proven, MDE-compliant, campus precedents.

Stormwater Management - Quality Control

Stormwater engineers first assess the size of impervious surfaces on an existing project site and then follow MDE guidelines to categorize the project as “New Development” (if the majority of the site is grass/woods) or “Redevelopment” (if most of the site is covered by asphalt or concrete). This “New Development” versus “Redevelopment” determination must occur on a case-by-case basis and has a dramatic impact on the stormwater management plan for each project. In this master plan, each precinct has stormwater facility layouts arranged under the assumption of the “new development” designation. This assumption anticipates more intensive stormwater management needs and thereby creates an allowance for more stringent regulations. However, there are a few specific instances where the existing site features (especially large parking lots) suggest that the “redevelopment” category is possible for that particular proposed building project. In those few instances where redevelopment seems likely, the number of stormwater facilities has been slightly reduced in an effort to be as realistic as possible. Stormwater engineering has many variables that make detailed design practically impossible during the master planning stage, but for long-range planning purposes Towson University should assume that each proposed project in the 2015 study will need an array of sizeable ESD facilities in order to comply with MDE statutes.

The ESD practices espoused in the MDE manual represent efforts to improve the *quality* of stormwater runoff before it reaches nearby waterways. By allowing infiltration through a special soil/mulch bioretention medium (or through the natural earth), water undergoes a filtration process for pollutant removal. Each individual device (micro-bioretention, rain garden, bioswale, etc.) has specific design parameters and drainage area restrictions. These practices are typically selected and tailored for the unique constraints encountered on a per-project basis. For master planning purposes, it is more important to simply designate "placeholder" areas that are generally sized to anticipate the most likely devices that engineers will need to specify. The micro-bioretention practice seems most appropriate for designating stormwater management placeholder spaces throughout Towson University's campus because this practice handles a reasonably-sized drainage area and can be customized to fit a variety of site conditions.

Stormwater engineers want to position ESD facilities as close to new development as possible, but project sites rarely present designers with ideal situations. MDE recognizes the unique nature of a large campus setting and will occasionally allow a "banking" procedure for more regional-scale stormwater management. Towson University maintains a water quality "bank" and has the ability to selectively deduct available credits when necessary. This tally is administered through MDE and any proposed debits from the campus stormwater management bank would require MDE approval. For master planning purposes, it is recommended that the banking system be treated as a secondary, or perhaps tertiary, option to be invoked when a specific project has thoroughly evaluated ESD possibilities and is still encountering site constraints that pose significant hardship.

Stormwater Management - Quantity Control

In addition to managing water quality, Towson University must also take steps to handle "quantity control." The purpose of quantity control is to ensure that stormwater runoff doesn't leave the project site at an accelerated discharge rate (causing scouring and erosion along the way). According to Maryland's Stormwater Management and Erosion & Sediment Control Guidelines for State and Federal Projects (February 2015), "*projects located in designated inter-jurisdictional Flood Hazard Watersheds are required to provide management measures necessary to maintain the post-development peak discharges for the 100-year 24-hour frequency storm event at a level that is equal to, or less than, the 100-year 24-hour pre-development peak discharge rates*" (Section 4.1 - A.7). Since the entire Towson University campus is located in the Jones Falls Watershed, the university will likely need to designate certain spaces for stormwater detention on a per-project basis.

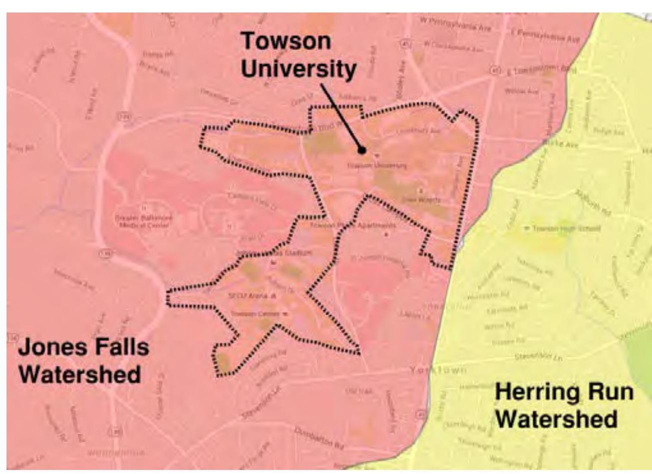


Image: Google Maps

Examples of such detention facilities include large-diameter underground pipe arrays or a subterranean cavity filled with a water storage manufacturer's product. This precedent exists on campus already, as the Public Safety project (north of Towsontown Boulevard) has a series of large-bore thermoplastic pipes for water storage under the parking lot. If underground storage is less desirable, there are at-grade options such as "dry ponds" which are depressions that remain dry until a storm event temporarily fills them with water. Dry ponds are designed to slowly release detained water at a prescribed discharge rate.

Stormwater Management – Facility Selection Rationale

For master planning purposes, the design team crafted a strategy seeking to harmonize regulatory requirements, architectural wishes, topographic realities, and engineering constraints. To accomplish this, designers emphasized certain "tenets" or "design parameters" derived directly from prior experience with MDE preferences and mandates. Some of these design parameters included observations regarding device selection (the reasons why certain ESD practices should be chosen). The rationale for stormwater device selection included the following tenets:

1. Any new project must attempt to incorporate "ESD" practices to the "maximum extent practicable" before considering traditional ("structural") stormwater devices.
2. Three key technical parameters for "ESD" selection are:
    a. Size of the contributing drainage area
    b. Depth of the water table
    c. The soil types in that location
3. Proposed ESD facilities should blend with the natural topography and pedestrian circulation on campus as much as possible.
4. When topography creates a challenging condition, a micro-bioretention facility that is contained between retaining walls (perhaps as part of the exterior architecture) may be selected in lieu of a graded depression with sloped sides. This retaining-wall-style precedent exists in front of Towson Arena.
5. When selecting ESD practices for master planning on the Towson University campus designers should focus on facilities that are commonly utilized in urban spaces.
6. Assume the proposed development will be categorized as "New Development" in order to anticipate a more intensive stormwater layout.

When designers examine these tenets for the Towson University campus, certain ESD practices become less desirable while others emerge as more viable candidates. For example, there are probably not many opportunities to employ the "submerged gravel wetland" practice because that specific device requires a high water table in order to function properly. It is more likely that the university will need to install a series of micro-bioretention facilities of various sizes and in customized configurations around each new building footprint, parking deck enlargement, and parking lot surface.

Stormwater Management – Facility Size and Placement

In addition to selection criteria, there are certain caveats designers observe when deciding about number, size, and placement of ESD facilities. Some of those tenets include:

1. Proposed ESD facilities must be located near the contributing drainage areas. Often the contributing drainage area for each device includes some measure of roof square footage, so the ESD needs to be relatively close to one (or more) downspouts.

2. The estimated number of ESD facilities is based upon potential project disturbance square footages. The placeholders shown in this master plan represent a reasonable approximation of how proposed projects might ultimately look upon completion. The actual number and size of facilities will ultimately depend upon very specific design computations performed on a per-project basis
3. Proposed ESD facilities should ideally be on the same side of the building as the ultimate outfall. This is an engineering constraint driven primarily by soil type. If the soils are poor, then ESD facilities require a perforated underdrain, which, in turn, must have gravity flow to a nearby outfall. With this tenet in mind, it's helpful to arrange the ESD practices so that the drain lines can be linked to efficiently convey runoff toward a lower outfall.
4. Try to locate ESD practices in areas that are less congested with existing utilities. In spaces with unavoidable utilities, the spots with more "minor" electric, telecommunications, or water lines are better candidates. Areas with sanitary lines or a more robust collection of concrete-encased duct banks are less preferable because they would likely be more expensive and disruptive to relocate.
5. Set aside some area for underground detention in order to satisfy the "quantity control" mandate in the MDE regulations.

Invasive Species Management

Non-native invasive plant (NNIP) species pose a major threat to native ecosystems. Because they are usually free of natural controls, such as insects and disease, they often spread rapidly and can take over native communities. These invasions can change the structure and function of native ecosystems. Different methods may have to be employed to eradicate and manage different invasive plant species. With persistent treatment and removal, monitoring and long-term management, invasive plant species can be controlled.

Invasive species are most prevalent on the campus along the edges of existing woodlands and disturbed areas. In some cases, invasive species have been incorporated into landscape plantings surrounding buildings, open space and along pedestrian paths. In order to reverse this trend, the Towson University Master Plan incorporates invasive species management initiatives into the development of new building projects along with the day-to-day landscape operations.

Invasive Species Management Goal – Eliminate all invasive species from the campus and manage new occurrences. This will require specific action items to ensure the long-term success at eliminating and controlling invasive species.

5.0 Sustainable Project Planning

Site Layout and Building Footprint

Planning for site development is the first step in ensuring ecological sustainability of a proposed project. Site layout and footprint planning has the potential to save ecological, cultural and economic resources. Choosing the location and approach for situating buildings and associated amenities has potential impacts on natural resources in the site vicinity and the success of the project function. Proper location of buildings and supporting infrastructure can not only protect and preserve existing ecological resources such as streams, wetlands and woodlands, but also can minimize potential erosion, flooding, aesthetic, access, operation and maintenance impacts.

The objective of planning for site layout and footprint in sustainable design is to:

Site Layout and Building Footprint Goal – Protect *natural resources and maximize the effectiveness of the site design.* This will require specific action items for the siting and development of new infrastructure and buildings.

Regulated Resource Protection

Site construction plans not only go through a myriad of environmental regulations, but also often have a number of other natural resource considerations. Proper site planning allows for the consideration of all ecological impacts, as well as regulation and code requirements. For a construction project to be progressive and innovative in sustainability and regenerative aspects, it may need to go beyond regulatory requirements and deviate from many traditional practices.

Regulated Resource Protection Goal – Use each project opportunity to restore and rejuvenate natural ecological processes. Most federal, state and local environmental regulations protect existing conditions but very rarely do they promote the restoration and rejuvenation of ecological processes. Towson University now has an opportunity to move beyond the regulations and demonstrate that economically sensible growth can occur simultaneously with the restoration and rejuvenation of healthy ecosystems.

mde Together We Can Clean Up
Maryland Department of the Environment

5.1 Green Building Systems and Materials

In general, the Master Plan embodies a green building design philosophy that includes the following principles:

- Be subordinate to the ecosystem and cultural context;
  - Respect the natural and cultural resources of the site and absolutely minimize the impacts of any development;
- Reinforce/exemplify appropriate environmental responsiveness;
  - Educate visitors/users about the resource and appropriate built responses to that environment;
  - Interpret how development works within natural systems to effect resource protection and human comfort and foster less consumptive lifestyles;
  - Use the resource as the primary experience of the site and as the primary design determinant;
- Enhance appreciation of natural environment and encourage/establish rules of conduct;
- Use the simplest technology appropriate to the functional need and incorporate passive energy-conserving strategies responsive to the local climate;
  - Use renewable indigenous building materials to the greatest extent possible;
- Avoid use of energy intensive, environmentally damaging, waste producing, and/or hazardous materials;
- Use cradle-to-grave analysis in decision making for materials and construction techniques;
- Strive for "smaller is better" . . . optimizing use and flexibility of spaces so overall building size and the resources necessary for construction and operation are minimized;
- Consider "constructability" . . . striving for minimal environmental disruption, resource consumption, and material waste, and identifying opportunities for reuse/recycling of construction debris; and
- Provide equal access to the full spectrum of people with physical and sensory impairments while minimizing impacts on natural and cultural resources.

Also, the design process will consider:

- Phasing the development to allow for monitoring of resource impacts and adjustments in subsequent phases;
- Allowing for future expansion and/or adaptive uses with a minimum of demolition and waste;
- Materials and components should be chosen that can be easily reused or recycled; and
- Making it easy for the occupants/operators to recycle waste.

More specifically, Towson University will incorporate the following strategies into future campus development projects:

Green Utilities

Just as a site has primary natural and cultural resources, it has primary renewable energy resources, such as sun, wind, and biogas conversion. Solar applications range from hot water pre-heat to electric power production with photovoltaic cells. Wind-powered generators can provide electricity and pumping applications in some areas. The biogas conversion process reduces gas or electricity costs and eliminates the release of wastewater effluent into water resources. With known technologies, the intelligent use of primary renewable energy resources can benefit any development.

A wide range of economically feasible technologies have been developed to use renewable resources for the generation of power, as well as to increase the efficiency of power sources including heating and cooling systems, lighting and ventilation. In addition, new technologies have been developed for solid and sanitary waste disposal that use natural ecological processes. Towson University now has an opportunity to incorporate these technologies into all new construction and renovation projects.

Green Utility Goal – Incorporate utility systems that use renewable energy systems and natural ecosystem processes on all new construction and renovation projects.

Regenerative and Low-embodied Energy Materials

Another significant component of ecological sustainability is the use of materials that do not perpetuate the continued destruction of the global environment. This includes using materials that do not destroy the landscape or damage water and air quality during their acquisition. Another important element is not using materials that generate pollutants during extraction, processing, use in finished goods or upon disposal. Materials are preferred that do not require a high degree of embodied energy, such as mineral mining, that require large amounts of fossil fuels during extraction and processing. An emphasis should also be placed on products that do not require significant fuel use for long distance transport.

*Regenerative and Low-embodied Energy Materials Goal - U*se materials and products that are recycled, recyclable, low-embodied energy, are locally derived and produced, and do not generate toxic releases during use and disposal.

5.2 Operations, Maintenance and Management

Resource Consumption and Waste

One major ecological sustainability factor is the resources we consume and the way in which waste products of the development community are generated, sorted, transported and committed for recycling and re-use. Recycling of consumer packaging and container, including writing paper, aluminum, plastic, glass and cardboard should be the minimum starting point for recycling efforts.

Resource Consumption and Waste Goal - Adopt a 'cradle to cradle' approach to resource consumption and waste. This goes beyond a cradle' to grave' approach that looks at merely reducing or minimizing impacts associated with product manufacturing, consumption and disposal. The 'cradle to cradle' approach considers the source of raw materials and the contribution of recycled materials in manufactured products, and ensures that at the end of the product life the raw materials are recycled or re-used again to create a closed-loop cycle. Other types of recycling and regeneration include computer and other electronic equipment recycling, light fixture reclamation, salvaging wood and plumbing (copper pipes) from demolition, etc.

Facility and Landscape Maintenance

Facility and landscape maintenance and operations should be part of an ongoing long-term management system that plans, guides, and supports visitor services, natural and cultural resource protection, and facility management. The purpose of the system is to provide guidelines that define acceptable maintenance and operational practices, employee training and strategies for sustainably designed developments. The facility should operate and be maintained at the same or higher level as was designed and constructed, continuing the use of sustainable design concepts.

One very important issue that influences site sustainability is landscape management. This includes plant care such as fertilization, liming, mowing, tree care, pest management, watering, seeding, planting and mulching. Historically, landscape maintenance has developed as a high-input of non-renewable resources including commercial fertilizer applications, extensive watering/irrigation systems, and pesticide and weed killer/herbicide applications. Additionally, there has been extensive planting of ornamental, primarily non-native (and too often invasive) exotic plant species. The environmental effects of these applications have had negative effects on water quality (groundwater and surface water) in a region where extensive efforts have been undertaken to try to stem the negative impacts of urban run-off into the Chesapeake Bay and its tributaries. Other impacts have included soil contamination, air pollution, impairments to fish, birds and other wildlife, and in some instances creating toxicity concerns for human health. A long-term maintenance goal is to adopt alternative methods to reduce the inputs of potentially persistent and toxic synthetic compounds into the natural environment with the intent of reducing maintenance burdens and saving money.

Facility and Landscape Maintenance and Operations Goal - To consistently maintain quality user experiences without the depletion of resources and to promote environmental and cultural resource awareness and education.

Project Planning, Design, Resource Management & Specific Initiatives

Resource Management & Specific Initiatives

Specific Woodland Management action items include:

- Protect existing woodlands from future impacts;
- Develop and implement a woodland protection and restoration program that targets specific recommendations for each woodland community;
- Develop and implement an age-tree replacement program;
- Develop and implement an invasive species management program;
- Restore and enhance riparian woodland buffers along Towson Run and its tributaries;
- Identify and close or reduce forest corridor gaps (including planting street & pathway trees);
- Identify and protect areas of native soil that are relatively undisturbed;
- Reduce and eliminate local sources of soil contamination;
- Develop and implement a monitoring program to assess changes in woodland processes; and
- Develop an Adaptive Management Plan that provides recommendations for adjusting restoration and management initiatives based on the monitoring results.

Specific Stream and Wetland Management action items include:

- Daylight and restore a section of Towson Run north of the University Union;
- Remove the concrete channel from the Towson Run west of Osler Drive and restore this reach using natural channel design techniques;

- Develop and implement a program to enhance riparian buffers along Towson Run and its tributaries;
- Develop and implement an invasive species management plan for the riparian areas along Towson Run, Glen tributary and Auburn House tributary;

- Develop and implement a monitoring program to assess changes in stream and wetland processes; and
- Develop an Adaptive Management Plan that provides recommendations for adjusting restoration and management initiatives based on the monitoring results.

Specific Stormwater Management action items include:

- Reduce the total acreage of impervious surfaces by a minimum of 20 percent and the corresponding total site impervious surface area by 5 percent;
- Incorporate the planting of native trees to provide a minimum of 50% canopy closure over all paved surfaces and to reforest a minimum of 50% of all open space surrounding existing and proposed buildings; and
- Develop and adopt a new Comprehensive Stormwater Management Plan that incorporates the current MDE guidelines and considers the proposed redevelopment in this Master Plan

Existing Infrastructure and New Construction

- Reduce and eliminate all excess impervious surfaces;

- Develop and implement a five-year plan to retrofit all of the existing parking lots that are to remain with water quality best management practices in accordance with Maryland Stormwater Management guidelines; and
- Develop and implement a ten-year plant to retrofit all existing applicable building rooftops with green roofs.
-

Specific Invasive Species Management action items include:

- Develop and implement an invasive species management program that emphasizes multiple year control and management;
- Prohibit the future planting of known invasive plants;
- Replant native species in areas where invasive species are removed;
- Develop and implement a monitoring program to assess changes in invasive species control and infestation; and
- Develop an Adaptive Management Plan that provides recommendations for adjusting control and management initiatives based on the monitoring results.

Specific Site Layout and Building Footprint action items include:

- Redevelop sites with existing impervious surfaces before considering sites without;
- Avoid impacts to ecological resources and mitigate unavoidable impacts; and
- Create development footprints to avoid fragmenting existing woodlands.

CENTER FOR WATERSHED PROTECTION

Specific Regulated Resource Protection action items include:

- Develop buildings and infrastructure projects that support and simultaneously restore ecological processes

- Protect all high quality native forest stands onsite and retain all large, healthy native trees at a minimum size that is smaller (e.g., 24-inch DBH) than the FCA 30" specimen standard set by the Maryland Forest Conservation Act
- Protect and enhance Works Progress Administration stone structures in the Glen, and explore the historic significance and enhancement potential for the cistern and stone bridges in the woods adjacent to the athletics complex
- Further investigate the campus for potential RTE species and habitats and restore plant community types increasingly rare to the region (e.g., wet meadows)

Maryland Department of Natural Resources Wildlife & Heritage Service

Specific Green Utility action items include:
- Identify the availability, potential and feasibility of primary renewable energy sources such as solar, wind, biogas and geothermal to satisfy the justifiable energy needs of the development
- Commit to providing a minimum of 15 % of all energy needs from renewable resources in 10 years
- Develop and implement a long-term plan to convert to locally produced solar and wind powered energy for a minimum of 20% of the campus' needs
- Develop and implement a plan to treat a minimum of 20% of the sanitary waste stream with on-site self-contained biological wetland systems
- Develop and implement a plan to incorporate into all new buildings and to retrofit all existing buildings with flush-less or low-flow toilets and low-flow showerheads within the next 5 years
- Develop and implement a plan to incorporate into all new buildings and to retrofit all existing buildings with high-efficiency lighting fixtures and bulbs within the next 5 years
- Make energy production and use a visible component of development. Broaden student and faculty experiences by awareness of energy use issues and the use of efficient appliances, conservation methods and renewable energy sources. Install energy meters to monitor and illustrate energy consumption.

Specific Regenerative and Low-embodied Energy Materials action items include:
- Prioritize the use of natural materials which are less energy-intensive and polluting to produce, and contribute less to indoor air pollution
- Prioritize the use of local materials which have a reduced level of energy cost and air pollution associated with their transportation, and can help sustain the local economy
- Prioritize the use of durable materials which can save on energy costs for maintenance as well as for the production and installation of replacement products

Specific Resource Consumption and Waste action items include:
- Use products that minimize waste and are nontoxic
- Compost or anaerobically digest biodegradable wastes
- Re-use materials onsite or collect suitable materials for offsite recycling
- Provide recycling containers for a variety of materials in public spaces
- Purchase a BulbEater® fluorescent light bulb recycling container that eliminates landfill waste and captures the associate mercury material preventing soil and water contamination
- Incorporate a landscape waste (leaves, limbs, grass) onsite composting operation and re-use materials for site landscaping and woodland restoration
- Procure copier and printer paper that incorporates a minimum of 70% post-consumer material

- Conduct an environmental audit of campus resource use and develop a long-range plan to eliminate the use of non-renewable resources and waste
- Set campus product, services and construction procurement standards with ecological sustainability in mind

Specific Facility and Landscape Maintenance and Operations action items include:

General

- Understanding and interpretation of original design elements that must be repaired or replaced over the life of the facility
- Development of a maintenance management system for daily and long-term operations that minimizes environmental impacts
- Training and development of a local work force
- Use of skilled artisans who provide, or instruct maintenance employees in traditional methods of construction to reflect and enhance local cultural values

Recycling

- Make visitors and operation aware of recycling opportunities and environmental benefits
- Provide programs to recycle glass, plastic, paper, aluminum/tin, oils, etc. for both visitors and staff (this includes providing separate bins for recycling materials and using generators that recycle their own waste oils)
- Recycle appropriate building materials resulting from construction, rehabilitation, and demolition activities
- Search out and retain markets for recyclable materials-if recycling markets are distant, additional storage space should be provided onsite for short-term storage of recyclable materials awaiting efficient means of transport; or alternate products and materials should be considered that have longer life spans or can be recycled locally

Waste Management

- Separate composting materials from other trash for soil enhancement (the main maintenance facility should include composting facilities for a vegetative material generated by pruning or storm damage)
- Consider conventional underground and spray irrigation systems for wastewater
- Use discharge of gray water for irrigation purposes and avoid discharge into lakes or streams
- Develop waste management systems within the capabilities of operators

Toxic Waste

- Substitute nontoxic materials (numerous nontoxic building materials, household cleaners, and water-based paints are widely available e.g., substitute hydrogen peroxide for hypochlorite as a disinfectant; substitute solar battery rechargers and rechargeable batteries for disposable batteries, which accelerate placement of toxic compounds into the waste stream).

o Avoid use of toxic materials as a substitute for physical cleaning or when required less intensive routine maintenance of equipment has been deferred

- Use minimum amount of nontoxic materials to accomplish task
- Plan to avoid wasted materials
- Use care in handling to avoid spillage
- Train all workers about safe use

- Find opportunities for offside recycling (many toxic materials can be recovered and redefined for future use, including automobile oil, car batteries, lead storage batteries, and tires)
- Provide onsite control
    - Design handling area for spill control and recovery
    - Pave and dike all areas to ensure that spilled toxic materials do not enter the environment
    - Build enclosures to prevent runoff
- Collect and segregate remaining toxic waste for offsite disposal (a small accumulation of toxic waste that cannot be re-used or recycled can be caused by limits in product availability and lack of control over materials brought in by visitors and employees-e.g. batteries, photographic products, pest repellents, fuel products, light bulbs, degreasers)
    - Keep in aboveground storage to prevent undetected release into the environment
    - Ship to offsite facility for disposal (landfill or incinerator)

Landscape

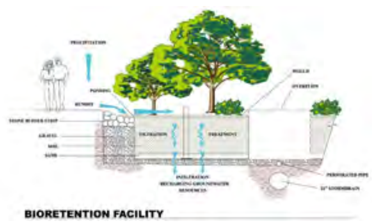
- Develop an integrated pest—total organic management plan
- Use on-site composted yard waste for soil amendments and mulching
- Keep highly-maintained lawn areas of the site to a minimum (e.g., <10% of the land surface)

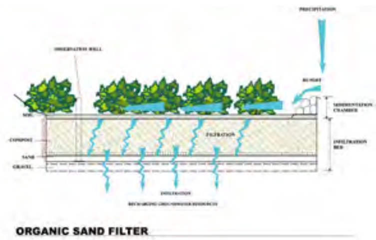
IPM MARYLAND
INTEGRATED PEST MANAGEMENT

Project Planning and Design Guidelines

Project planning and design guidelines related to Natural Resources include the following:

- Use native tree and shrub species in landscape plantings
- Regenerate and supplement woodland soils when impacted
- Protect existing stream and wetland resources from impacts
- Do not disturb or develop lands within the 100 –year floodplain
- When the option exists, re-use existing impervious surfaces in lieu of developing undisturbed ground
- Incorporate the planting of native trees to provide a minimum 50% canopy closure over all paved surfaces and to reforest a minimum of 50% of all open space surrounding proposed buildings
- Minimize impervious surfaces on all new construction
- In accordance with Maryland Stormwater Management guidelines, incorporate stormwater management into all building and infrastructure projects
- Incorporate additional stormwater management techniques into each building project including disconnected roof leaders, cisterns and rain barrels, green roofs and pervious landscaping surfaces. Emphasize small, redundant infiltration-based BMPs in a series including:
    - Bioretention areas/rain gardens
    - Grassed swales/wetland swales
    - Infiltration trenches
    - Sand filters
- Do not plant non-native invasive plant species
- Replant native species in areas where invasive species are removed





Project planning design guidelines related to Sustainable Project Site Planning include the following:

- Redevelop sites with existing impervious surfaces before considering sites without
- Perform a comprehensive ecological characterization and assessment of the area proposed for development
- Avoid impacts to ecological resources and mitigate unavoidable impacts
- Create development footprints to avoid fragmenting existing woodlands
- Preserve or replicate the natural hydrologic cycle
- Preserve and regenerate native soil profiles
- Retain and protect all healthy mature trees
- Strive to meet the requirements for a Leadership in Energy and Environmental Design (LEED) Silver Rating.
- Develop buildings and infrastructure projects that support and simultaneously restore ecological processes
- Employ redundant stormwater best management practices in a series that routinely exceed pollutant loading reduction requirements (e.g., by 10%)
- Employ redundant erosion and sediment control practices that protect and rejuvenate soil productivity and receiving waters
- Employ measures to ensure that all discharges to streams and wetlands work to restore and rejuvenate ecosystem processes

Project planning and design guidelines related to Green Building Systems and Materials include the following:

- Identify the availability, potential and feasibility of primary renewable energy sources such as solar, wind, biogas and geothermal to satisfy the justifiable energy needs of the development.
- Apply the best principles of siting and architectural design to reduce energy demands and to minimize the need for energy-consuming utilities (air-conditioning, water heaters, high-level artificial lighting).
- Strive to meet the requirements for a Leadership in Energy and Environmental Design (LEED) Silver Rating.
- Make Energy Star-rated products the design standard for heating and cooling
- Make use of passive natural breezes for cooling
- Orient buildings and align windows for ambient 'daylighting'
- Incorporate flush-less or low-flow toilets and low-flow showerheads into all new buildings.
- Incorporate high-efficiency lighting fixtures and bulbs in all new university buildings.
- Make energy production and use a visible component of development; Install energy meters to monitor and illustrate energy consumption.
- Prioritize the use of natural materials which are less energy-intensive and polluting to produce, and contribute less to indoor air pollution.

- Prioritize the use of local materials which have a reduced level of energy cost and air pollution associated with their transportation, and can help sustain the local economy.
- Prioritize the use of durable materials which can save on energy costs for maintenance, as well as for the production and installation of replacement products.
- The complete life-cycle energy, environmental and waste implications of each building material should be examined. This "cradle-to-grave" analysis is the tracing of a material or product and its by-products, from its initial source availability and extraction, through refinement, fabrication, treatment and additives, transportation, use, and eventual re-use or disposal. This tracing includes the tabulation of energy consumed and the environmental impacts of each action and material.

Project planning and design guidelines related to Operations, Maintenance and Management include the following:

- Use products that minimize waste and are nontoxic
- Provide recycling containers for a variety of materials in public spaces
- Incorporate onsite composted landscape waste into new site landscaping

Building Material

- Use quality materials compatible with sustainable design to provide environmentally sensitive, yet easily maintained facilities (quality materials provide durability and reduce lifecycle resource and maintenance costs, thereby enhancing sustainability and visitor appreciation)

Site Architecture

- Use low-maintenance native vegetation for landscaping and incorporate natural features (rocks, trees, etc.) for defining paths, walkways, etc.
- For natural areas, use stabilized trails, boardwalks and rope or wood railings, etc. when intensive visitor use threatens to degrade the site and subsequently increase maintenance and operational costs
- Limit use of signs to minimize visual clutter

Landscape

- Emphasize native plantings in all landscaping and stormwater BMPs
- Do not use non-native invasive plant species
- Use on-site composted yard waste for soil amendments and mulching
- Keep lawn areas of the site to a minimum (e.g., <10% of the land surface)

Part 2

Construction Standards

PART 2 – CONSTRUCTION STANDARDS

02/26/20

BASIC DESIGN REQUIREMENTS

1. BASIC REQUIREMENTS

   A. PURPOSE:

      1. Responsibility: Towson University's Department Of Facilities Management is responsible for all components of the built environment on the campus - buildings, open spaces and infrastructure.

      2. Building Goals: The Department of Facilities Management is entrusted with providing Towson University with buildings which incorporate a high degree of:

         a. Functional efficiency
         b. Innovative, but appropriate, design
         c. Contextual harmony with the site
         d. Appropriately selected materials and systems
         e. Health and safety requirements
         f. Accessibility for the disabled
         g. Life-cycle value

      3. Applicability: These Architectural and Engineering Design Standards have been compiled to establish general and, in some cases, specific design policies as a guide to Towson University staff and to consultant architects and engineers (A/E) for designing new facilities, as well as the alteration or renovation of existing structures. ANY DEVIATION FROM THESE STANDARDS SHOULD BE SUBMITTED AND APPROVED IN WRITING BY THE APPROPRIATE PROJECT MANAGER OR FACILITIES DIRECTOR.

      4. Supersedure: These Design Standards supplement the job-specific Facility Program. Should the Facility Program and these Design Standards conflict, the design consultant or contractor should identify the conflict and request clarification.

   B. DESIGN PRINCIPLES:

      1. General: Towson University buildings, new and renovated, must provide the functional, aesthetic, environmental, and safety needs of the using-agency "client" and the requirements of governing authorities, with a reasonable balance between initial cost and life-cycle value. Towson University is dedicated to improving the quality of its campus and buildings through architectural, planning

and engineering services which must:

a. Ensure the highest degree of professionalism from the A/E Team to develop and implement innovative and functional design concepts, in harmony with the campus environment, and appropriate to the project needs.
b. Implement reliable procedures for controlling project estimates, construction costs, life-cycle factors, and time schedules.
c. Establish thorough quality-control coordination during all phases of the A/E Scope of Services
d. Respond to governing codes and standards ensuring environmental health and safety.
e. Assume that design concepts for repair, alterations and renovations are executed with the same professional consideration as that for new facilities.

C. CODES, STANDARDS, REVIEW AGENCIES:

1. Applicability: Design and construction on Towson University facility projects are subject to the following codes, standards, and review agencies, to the extent noted:

a. Major projects are subject to compliance with the following internal standards:

1. Towson University Facilities Master Plan, and Towson University Architectural and Landscape Plan Design Guidelines – 2015
2. Towson University General Conditions of the Construction Contract, latest edition; Under the General Conditions the entire project is guaranteed for two (2) years. Therefore, unless a longer guarantee time is required, it need not be addressed.
3. Towson University Design Standards, latest edition
4. UMB Procedure Manual for Professional Services, Latest Edition, as amended

b. For all projects to be completed at Towson University; the following apply as minimum:

1. International Building Code (IBC) 2018 with the Department of Housing and Community Development (DHCD) modifications

2. International Existing Building Code (IBEC) 2009

3. International Energy Conservation Code (IECC) 2018

4. International Residential Code (IRC) 2018 with DHCD modifications

5. National Standard Plumbing Code (NSPC) 2018 illustrated with the Department of Labor Licensing and Regulation (DLLR) modifications

6. 2018 Supplement to the National Standard Plumbing Code with the DLLR modifications

7. International Mechanical Code (IMC) 2018

8. National Electrical Code (MAC) 2017

9. Maryland Accessibility Code (MAC) 2012, Including 2010 ADA Standards for Accessible Design

10. Maryland State Fire Prevention Code, incorporating the NFPA 101, Life Safety Code 2018 with State Fire Marshal Modifications

    Office of the State Fire Marshal
    106 Old Court Rd. - Suite 300
    Pikesville, Maryland 21208-0892

11. National Fuel Gas Code (NFGC), ANSI Z223.1, NFPA 54, 2018

12. Liquefied Petroleum Gas Code (LPGC), NFPA 58, 2014

13. Elevators and Conveying systems requirements as per International Building Code 2018 in addition to DLLR requirements

14. Safety Glazing requirements as per International Building Code 2018 in addition to the DLLR requirements

15. Maryland Occupational Safety & Health Administration (MOSHA)

    Department of Licensing and Regulation
    Bureau of Labor and Industry
    501 Saint Paul Place
    Baltimore, Maryland 21202

16. ANSI/ASHRAE/IES Handbook and Standard 90.1-2010: Standard for Energy Conservation in Building Design

17. Annotated Code of Maryland, Sections 4-802 and 4- 808, relative to "Procurement-Solar Power"

c. For projects which contain animal facilities:

American Association for the Accreditation of
Laboratory Animal Care (AAALAC)
9650 Rockville Pike
Bethesda, Maryland 20814

d. For projects which require excavation and/or storm water management:

Maryland Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224

e. For all Maryland state-funded capital construction projects:

The State Architectural Review Board
Department of General Services
301 W. Preston Street
Baltimore, Maryland 21201

f. For projects which impact Baltimore County Streets:

Department of Traffic Engineering
Baltimore County
Towson, Maryland 21204

g. For projects utilizing Baltimore Gas and Electric Co. direct service:

BG&E Middle Department Inspection Agency
3610 Milford Mill Road
Baltimore, Maryland 21208

D. INFORMATION FURNISHED TO THE A/E:

1. Information furnished to the A/E: Towson University's OFM will make available, at the request of the A/E, any existing utility plans, topographic plats, and "Record Drawings" construction documents (drawings and specifications) on file. No assurances, however, are given that these record drawings are accurate or complete. See attached Supplemental General Conditions.

Current Adopted Building-Related Codes in the State of Maryland				
Building Codes Administration, Dept. of Labor (LABOR)				10/29/2019
Type of Code	**Adopting Agency**			
Scope		**All Bldgs Except Modular & State-owned Bldgs**	**Modular Bldgs**	**State-Owned Bldgs**
Building	LABOR (Div of Labor & Industry)	2018 IBC (MBPS)	2018 IBC (MPC)	2018 IBC (MPC)
Residential	LABOR (Div of Labor & Industry)	2018 IRC (MBPS)	2018 IRC (MPC)	2018 IRC (MPC)
Energy	LABOR (Div of Labor & Industry)	2018 IECC (MBPS)	2018 IECC (MPC)	2018 IECC (MPC)
Existing Building	LABOR (Div of Labor & Industry)	2015 IEBC (MBRC)	2015 IEBC (MBRC)	2015 IEBC (MBRC)
Livability	LABOR (Div of Labor & Industry)	2012 IPMC	n/a	n/a
Accessibility (1)	LABOR (Div of Labor & Industry)	2012 MAC	2012 MAC	2012 MAC
Accessibility (2)	local jurisdiction	2015 IBC (optional)	n/a	n/a
Plumbing (1)	LABOR (Div of Labor & Industry)	n/a	2018 IPC (MPC)	n/a
Plumbing (2)	LABOR (Maryland Board of Plumbing)	2015 National Standard Plumbing Code Illustrated (see note #1)	n/a	2015 National Standard Plumbing Code Illustrated (see note #1)
Plumbing (3)	local jurisdiction	(locally adopted)	n/a	n/a
Mechanical (1)	LABOR (Div of Labor & Industry)	n/a	2018 IMC (MPC)	2018 IMC (MPC)
Mechanical (2)	LABOR (Maryland Board of Heating, Ventilation, Air Conditioning and Regfrigeration Contrcators	2018 IMC (MPC) w/ HVACR amendments	n/a	n/a
Mechanical (3)	local jurisdiction	(locally adopted)	n/a	n/a
Electrical (1)	LABOUR (Div of Labor & Industry)	n/a	2017 NEC (MPC)	2017 NEC (MPC)
Electrical (2)	State Fire Marshal	2017 NEC (State Fire Prevention Code)	n/a	n/a
Electrical (3)	local jurisdiction	(locally adopted)	n/a	n/a
Green Construction	LABOR (Div of Labor & Industry)	2012 IgCC (voluntary)	2012 IgCC	2012 IgCC w/ 2014 supplements (see note #2)
Fire Prevention	State Fire Marshal	2018 NFPA 1 and 2018 NFPA 101 (not applicable to dwellings for not more than two families and buildings located in Baltimore City; see State Fire Prevention Code)	2018 NFPA 1 and 2018 NFPA 101 (not applicable to dwellings for not more than two families and buildings located in Baltimore City; see State Fire Prevention Code)	2018 NFPA 1 and 2018 NFPA 101 (not applicable to dwellings for not more than two families and buildings located in Baltimore City; see State Fire Prevention Code)
Safety Glazing	LABOR (Div of Labor & Industry)	2018 IBC and COMAR 09.12.55	2018 IBC and COMAR 09.12.55	2018 IBC and COMAR 09.12.55
Elevator/Conveying System	LABOR (Div of Labor & Industry)	2018 IBC and LABOR requirements	2018 IBC and LABOR requirements	2018 IBC and LABOR requirements
Fuel Gas	LABOR (Maryland Board of Plumbing)	2015 National Fuel Gas Code, ANSI Z223.1, NFPA 54	2015 National Fuel Gas Code, ANSI Z223.1, NFPA 54	2015 National Fuel Gas Code, ANSI Z223.1, NFPA 54
Liquefield Petroleum Gas	LABOR (Maryland Board of Plumbing)	2014 NFPA 58	2014 NFPA 58	2014 NFPA 58
note #1	Maryland Board of Plumbing plans to adopt 2018 IPC as the State Plumbing Code; effective date is not available as of today			

note #2	All new or significantly renovated fully State funded buildings, K thru 12 public schools and new community college buildings over 7,500 gross square feet shall be constructed as High Performance Buildings. A High Performance Building is one which achieves a Silver rating or better under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system, a two Green Globes rating or better under the Green Building Initiative's Green Globes rating system, or which complies with the Maryland Green Building Council's supplement to the International Green Construction Code (IgCC) enacted in November 2014.

SECTION 00800
FRONT END DOCUMENTS
SUPPLEMENTAL GENERAL CONDITIONS
10/01/15

Attached are the current September 2015 Supplemental General Conditions for all construction documents to be used for Towson University construction projects. An electronic copy of the current Supplemental General Conditions may be obtained from AEC prior to the final document submission.

SUPPLEMENTAL GENERAL CONDITIONS

1. The following supplements modify, change, delete from, or add to the General Conditions and Specifications Sections as provided in these contract documents. Where any Article of the General Conditions, Paragraph, Subparagraph, Clause or Specification Sections are altered or modified by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph, Clause or Specification Sections shall remain in effect. Where discrepancy exists between these Supplementary General Conditions and the General Conditions, it is the sole responsibility of the contractor to get clarification on the issue.

    A. Storage of Materials - all materials and supplies required for the project are to be stored within the limits of work as indicated on the drawings. The University does not provide storage space for any materials or equipment. Materials required for the project may be stored "off site" with verification by the University. In addition, insurance certificates for warehoused materials must be submitted to the Project Manager and the University's Procurement Office <u>prior</u> to acceptance.

    B. Parking - Parking is limited throughout the entire campus and must be coordinated prior to the commencement of construction. Construction related vehicles (including Project Manager and executive vehicles) may only park in designated parking areas as approved by the University's Project Manager and Office of Facilities Management. The University will make every effort to provide adequate parking within or adjacent to the job site. However, projects that require a large workforce may necessitate using remote parking with carpool to the construction site. Remote parking may also be provided by the University on other campus parking lots. <u>Parking of any contractor vehicles in adjacent residential neighborhoods is strictly prohibited</u>. Vehicles other than construction related vehicles are absolutely not permitted on campus and will not be tolerated. Vehicles such as boats, trailers, campers, etc. will be towed from campus immediately with all associated cost to be borne by the owner of the vehicle. All vehicles must be registered with Office of Facilities Management and must display a university issued hang tag at all times. Failure to register or display the appropriate hang tag will result in vehicle citations and towing, with all cost borne by the Contractor.

    C. Inspections - Inspections will be performed by the appropriate agencies as specified in these documents. For the most part, Towson University, University of Maryland at Baltimore and independent inspection agencies as required under each Section will perform the required inspections. Other agencies that may be required for inspection are:

        - Maryland Department of the Environment (MDE)
        - State Fire Marshall
        - Maryland State Department of Health

    D. Asbestos - The Contractor is responsible for training and equipping all personnel concerning work in <u>asbestos</u> environments as applicable. All new employees must be trained within 30 days after they are hired by the Contractor. This is to be accomplished at <u>no additional cost</u> to this contract or the University. An initial report on all employees as to their asbestos training will be presented to the Project Manager within the first 90 days of the Contract and updated on a monthly basis. Thereafter, failure to comply with this requirement would place the Contractor in a default status.

E. Fire Safety - The Contractor agrees to comply with and follow all local, state, federal, and University regulations regarding fire safety. It is the contractor's sole responsibility to become familiar with all of the applicable regulations and policies. Copies of the University's policies and procedures are available from the University's Department of Environmental Health and Safety.

The Contractor will be responsible for the following:

1. To provide all of its employees with sufficient training to ensure that they are fully aware of all pertinent regulations and policies in effect regarding fire safety.

2. To ensure that all of its employees are aware of and react to University Emergency Procedures including, but not limited to, fire drills and evacuations. All employees must be instructed on the proper personnel to call to report an emergency.

3. All portable electrical devices including extension cords should be disconnected at the completion of work assigned. All electrical equipment must be approved by Underwriters Laboratory and maintained in good working order. Under no circumstances should damaged electrical equipment be utilized on this campus.

4. After pulling the fire alarm, evacuate the building to a safe location and contact the University Police by dialing extension 2133 immediately. If using a pay phone, dial 911 direct.

5. SMOKING IS NOT ALLOWED ANYWHERE ON CAMPUS. Any employee of the contractor who wishes to smoke during a designated break, must do so off-campus.

F. Hot Works Permits - The Contractor is responsible for fully complying with Towson University's Hot Works Permitting Program. A Hot Works permit is required any time a Contractor is doing any work on campus involving an actual or potential source of ignition (e.g., arc or gas welding, torch cutting, brazing, open flame soldering, grinding, fired space heaters, etc.); or may potentially cause the activation of a building fire alarm system; or may cause building occupants to notify emergency response agencies about the smell of smoke, heat, etc.

Hot Works Permit are issued prior to the start of work by the TU Department of Environmental Health & Safety at 410-830-2949.

The Contractor assumes all responsibility for any work delays associated with non-compliance with the Hot Works Permit Program.

G. Blood Borne Pathogens - The Contractor will be responsible for providing the required training dealing with occupational exposure to blood-borne pathogens. Employees who have received this training may be required to perform services in area where they may be at risk of exposure to blood or other potentially infectious materials. Some responsibilities will include collection of domestic trash in areas that generate special medical waste, regular cleaning in these areas and spill response for accidents that occur on campus that involve blood. Employee must be informed on the potential hazards present in these areas and the proper protective measures that can be taken to prevent exposure. EH&S is available to provide more information concerning the areas on campus where personnel are at risk of exposure.

H. Confined Space Entry - The vendor/contractor agrees to comply with all local, state and federal regulations pertaining to the entry into confined spaces. The Contractor is responsible for contacting the TU Contract Services Manager in the Department of Facilities Management for the locations of all campus confined spaces and for responsible for ensuring his workers and any sub-contractors are adequately trained in confined space entry procedures in accordance with OSHA 1910.146, <u>Permit Required Confined Spaces for General Industry</u>.

The Contractor will provide the TU Department of Environmental Health & Safety a written copy of their Confined Space Entry Plan (CSEP) for review and approval at least 5 working days in advance of the planned entry. Prior to work commencements, the Contractor will also certify in writing that all of his workers and sub-contractors have been trained in accordance with OSHA 1910.146, <u>Permit Required Confined Spaced for General Industry</u>. The certification will list all employees working on campus by name and social security number.

If the contractors CSEP is approved, the contractor/vendor may utilize his CSEP for entering into campus confined spaces. If disapproved, or if the contractor does not have a written CSEP. <u>Until such time as the contractor provides written certification that all of his employees and sub-contractor employees working on campus have been adequately trained in confined space entry procedures, entry in TU confined spaces is strictly forbidden</u>. Questions concerning TU's CSEP should be directed to the TU Department of Environmental Health & Safety.

The contractors assumes all responsibility for any work delays associated with non-compliance with confined space regulations.

I. A.D.A. Compliance - all work performed shall be in compliance with current Americans with Disabilities Act regulations. Where the contractor is knowledgeable of deficiencies in design regarding compliance, immediately notify the Owner for direction prior to commencement of work.

J. Vehicular Access - Under no circumstances are contractors allowed to park or ride motor vehicles on grassy or otherwise landscaped areas. Contractors shall only use the vehicle access routes as approved by OFM in advance of commencement of the project. Individuals found using unauthorized routes or damaging university property by driving on grass or other landscaped areas will not be permitted on university property and all cost associated with repair or replacement of the damaged area shall be borne solely by the contractor.

K. Contractor Motor Vehicles - Under no circumstances shall a contractor vehicle exceed 15 mph while on university property. Pedestrians have "right of way" at all times, with no exceptions. Any contractor vehicle over 1 ton shall have operational "back-up" signals. Flat beds, box trailers and all eighteen wheel vehicles shall be accompanied by an assistant during the back-up process to ensure the safety of pedestrians and property in the path of the vehicle.

L. Contractor’s Employee Behavior - The contractor is responsible for his employee’s behavior at all times. "Cat Calls", "stares" and other unprofessional behavior will not be tolerated and will be cause for immediate removal of the employee(s) from campus property. The university requests that the contractor and his employees refrain from unsolicited conversation with the general campus public.

M. Respiratory Protection - The vendor/contractor agrees to comply with all local, state and federal regulations pertaining to the use of respiratory protection equipment. It is the contractor’s responsibility to ensure their workers are provided and wearing the appropriate respiratory protection device suitable to the hazard.

The Contractor will provide the TU Department of Environmental Health & Safety a written copy of their Respiratory Protection Plan (RPP) for review and approval at least 5 work days in advance of the planned entry. If approved, the contractor/vendor may utilize his RPP while on campus. If disapproved, or if the Contractor does not have a written RPP, the Contractor will comply with the TU RPP. Questions concerning TU’s RPP should be directed to the TU Department of Environmental Health & Safety.

N. Waste & Safety - The Contractor is responsible for the removal and disposal of all non-hazardous solid/liquid waste products generated from his/her work on campus. Non-hazardous solid waste may be disposed of in dumpsters located throughout the campus. All liquid non-hazardous waste materials generated by the Contractor shall be removed from the campus and disposed of in accordance with all applicable Federal, State, and County laws and regulations. The University reserves the right to require the use of a TU Non-Hazardous Waste Manifest for transport off campus of any University non-hazardous liquid waste.

The University also reserves the right to approve or disapprove the facility(ies) the Contractor utilizes for disposal of any University non-hazardous solid/liquid wastes. Any questions concerning the disposal of hazardous or non-hazardous waste should be directed to the TU department of Environmental Health and Safety at 410-830-2949.

<u>Under no circumstances is any Contractor’s generated hazardous waste to be disposed of on campus</u>. The Contractor is responsible for the removal and proper disposal of all his/her hazardous waste, in accordance with all applicable Federal, State and County laws and regulations. Contractor’s generated

hazardous waste is waste resulting from their operations/equipment on campus when using contractor owned/supplied material/chemicals. Disposal costs for this will be borne solely by the Contractor. The University is responsible for the hazardous waste generated from University operations or equipment.

O. The Control of Hazardous energy Sources (Lock Out/Tag Out) - The Contractor agrees to comply with all local, state and federal regulations pertaining to the control of hazardous energy sources. The Contractor is responsible for insuring his workers and any sub-contractors are adequately trained in lockout/tag out procedures in accordance with OSHA 1910.147, <u>The Control is responsible for the hazardous Energy Sources (Lock Out/Tag Out)</u>.

The Contractor will provide the TU Department of Environmental Health & Safety a written copy of their Lock Out/Tag Out policy (LO/TO) and/or procedures for review and approval at least 5 working days in advance of the commencement, the Contractor will also certify in writing that all of his workers and sub-contractors have been trained in accordance with OSHA 1910.147. the Certification will list all employees working on campus by name and social security number.

If the Contractor's LO/TO is approved, the Contractor may utilize their LO/TO for work on hazardous energy sources. If disapproved, or if the Contractor does not have a written LO/TO, the Contractor will comply with TU's LO/TO Policy/Procedures. <u>Until such time as the Contractor provides written certification that all their employees and sub-contractors working on campus have been adequately trained in LO/TO procedures, work on hazardous energy sources is strictly forbidden</u>. Questions concerning TU's LO/TO Policy/Procedures shall be directed to the TU Department of Environmental Health and Safety.

The Contractor assumes all responsibility for any work delays associated with non-compliance with the control of Hazardous Energy Sources regulations.

P. Noise Restrictions - Due to the close proximity of the surrounding community to the university property, noise limitations are imposed during certain hours. Work hours are 7:00am -4:00pm with no restrictions except as may be specified in regards to the adjacent classroom schedules. Where it is anticipated that the contractor will be working before or beyond the aforementioned hours, prior approval must be obtained from the university. Verify with the university's Project Manager that the type of work to be accomplished is within acceptable noise levels.

Q. Electrical/Mechanical Connections - All electrical and mechanical connections must be coordinated through the university's Project Manager. The contractor is not permitted to enter any electrical panel, for inspection, installation or otherwise, without the consent of the Project Manager. Anticipated connections must be coordinated at least seventy-two (72) hours in advance. Where mechanical connections are anticipated, verify with the owner that the existing valves and other control systems are functional. Drain down of all plumbing systems shall be coordinated with the university's plumbing shop. This work shall be coordinated through the university's Project Manager.

R. Work Hours - Normal work hours shall be as follows:

- Weekdays: 7:00am - 4:00pm
- Weekends: 7:00am - 4:00pm with written authorization
- Holidays: only with advanced authorization

Deviations from the "normal" work hours shall be authorized by the university's Project Manager at least seventy-two (72) hours in advance of the anticipated work.

S. Radios - Playing of radios, tape players, CD players, etc. <u>is not</u> permitted on any construction site.

T. Maintenance of Property – The General Contractor is solely responsible for maintaining all properties within the Limit of Disturbance (L.O.D.) or the established construction fence, which ever has the greater perimeter. Maintenance shall be accomplished at the contractors expense and includes:

- Keeping grass cut and trimmed (edged) to a maximum 4". Where a construction or safety fence exist, trim both sides.

- Establish and maintain safety fence at the drip line of all trees and shrubs marked to remain.

- Maintain clean walkways and entrances to site trailers used as site offices.

U. Contract and Administrative Protocol - The contractor and all of the contractor's representatives shall clearly understand the university's standards for protocol prior to work commencement. Protocol as follows shall be strictly adhered to:

- All coordination between the contractor and the owner shall be through the university's designated Project Manager. This may be for scheduled outages or a simple door to be unlocked. At no time shall the contractor request, demand support or assistance from the university's maintenance department, trades shops or grounds department. Deviation from this protocol shall result in dismissal of the contractor's superintendent from the site.

- Coordination for submission of administrative and contractual documents shall be as outlined in the "Pre-Construction" meeting.

V. Key Policy - (Reserved)

W. No Smoking – Towson University is a smoke free campus. No smoking is permitted anywhere on campus property.

END OF SECTION

PART 2
CONDENSED SECTIONS
8/01/13

PART 1. GENERAL

1.0 A/E/Consultant: Provide specifications based on CSI Masterformat, in individual sections for all projects

SECTION 01010 - SUMMARY OF WORK

A. Identify work covered by Contract Documents; contract type (single prime, C.M., design-build, etc.); work under other contracts, owner-furnished products listed; Contractor's use of premises; occupancy requirements (as may be specified under the Owner's "Supplemental General Conditions".

SECTION 01021 - ALLOWANCES

A. Identify and schedule cash and quantity allowance provisions; define contractor's costs included and administrative procedures involved. Towson University recommends limited use of cash allowances or quantity allowances; clear proposed allowances with Towson University Project Administrator.

SECTION 01021 - UNIT PRICES

A. Identify, schedule and coordinate unit prices, units of measurement, estimated quantities, and administrative procedures involved. Unit prices are particularly useful for portions of contracts where the nature of the work is well defined but the extent of the work is not known or is likely to change (e.g., excavation and rock removal, temporary cold weather provisions for masonry or concrete installation, etc.). A/E is to provide Towson University Procurement Office a description of any unit prices and/or alternates in sufficient time for inclusion on the bid price form which is to be contained in the procurement specifications.

SECTION 01100 - ALTERNATES

A. Identify and coordinate provisions for Alternates. Alternates primarily help to assure that a project may be constructed within budget by providing some latitude in project scope and resultant cost. Towson University recommends conservative use of alternates. A/E is to provide Towson University Procurement Office with a description of any unit prices and/or alternates in sufficient time for inclusion on the bid price form, which is to be contained in the procurement specifications.

SECTION 01040 - PROJECT COORDINATION

A. Specify administrative requirements for coordination of various parts of work - site, architectural, structural, mechanical, electrical and specialty disciplines.

SECTION 01045 - CUTTING AND PATCHING

A. Describe special procedures for cutting and patching one portion of work to accommodate another; provide where project work scope necessitates.

SECTION 01050 - FIELD ENGINEERING

A. Specify contractor's survey work, laying out building, profile staking and other field engineering responsibilities.

SECTION 01421 - REFERENCES

A. Provide definitions, terminology, and names, addresses, acronyms of trade/code organizations; may also include list of reference standards used.

SECTION 01200 - PROGRESS MEETINGS

A. Identify administrative and procedural requirements for preconstruction conference, regularly scheduled progress meetings, recording and distribution of minutes, and other related administrative procedures involved.

SECTION 01300 - SUBMITTALS

A. Specify general procedures and requirements for submittals. Coordinate with Towson University Standard General Conditions of Construction Contract, or modify same by Amendments to Standard General Conditions.

   1. Refer to specific 'Submittals' portion elsewhere in these A/E Design Standards.

SECTION 01400 - QUALITY CONTROL

A. Identify requirements for Contractor's quality control of products and workmanship, inspection and testing laboratories, mock-ups and field samples at site for review and quality standards.

SECTION 01500 -CONSTRUCTION AND TEMPORARY FACILITIES

A. Establish parameters for temporary utilities, controls, support security, facilities, construction aids, job mobilization, and requirements for installation, maintenance and removal of same.

SECTION 01700 - CONTRACT CLOSEOUT

A. List specific administrative end-of-project procedures, closeout submittals, and forms for substantial completion and final completion.

   1. Refer to specific standards for contract (project) closeout elsewhere in these Standards.

SECTION 01720
RECORD DOCUMENTS
10/01/15

PART 1. GENERAL

1.0 Summary:

A. The Construction Services Office, within the OFM Department is charged with maintenance of all project record documents. Historically, these documents are kept as hard copy and have been requested on various medium types, such as mylar, vellum, etc. As technology has advanced and archive and storage space are reduced, it is imperative that final documents be submitted both hard copy and electronic medium.

1.1 Contractor Record Keeping:

A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Architect.

B. Accuracy of records:

1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.

1.2 Maintenance of Job Set:

A. Immediately upon receipt of the job set, identify each of the Documents with the title, "Record Documents - Job Set".

B. Preservation:

1. Considering the contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be preformed, devise a suitable method for protecting the job set to the approval of the Architect.

2. Do not use the job set for any purpose except entry of new data and for review by the Architect, until start of transfer of data to final Project Record documents.

3. Maintain the job set at the site of work.

1.3 Final Project Record Documents:

A. The purpose of the Final Project Record Documents is to provide factual information to the owner regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.

B. Final submitted project documents shall consist of the following:

1. Electronic - provide to the Owner, a portable storage device or CD, with final contract documents attached, in AutoCad version 14 or higher format and as outlined in Part I. Basic Requirement in the Introduction to these Standards. Documents shall indicate all revisions, clarifications and "As Built" conditions as recorded by the Contractor and as reviewed and approved by the Architect. Changes shall be clearly marked by "clouds" and in the appropriate spaces within the title block.

2. Hard Copy - a full clean set of contract documents, in hard copy, shall be submitted with the same criteria as outlined above.

SECTION 02220
EXCAVATING, BACKFILLING AND COMPACTING
8/01/15

PART 1. GENERAL

1.0 Summary:

A. Due to the extent of underground utilities on the campus at Towson University, it is imperative that the Consultant and the contractors be fully aware of existing underground conditions, lineation of lines and depth of service, before designing or commencing the proposed work.

B. While the University makes every attempt to have excavation work accomplished during the summer months (off peak), quite often it is necessary to do this work during the academic calendar. This requires great sensitivity from the consultant/contractor regarding the methods, scheduling and means of excavation. Consideration must be given to the massive pedestrian traffic encountered during the academic year. The University's unwritten policy is to make every attempt to accomplish the work <u>without</u> rerouting pedestrians if possible. In addition, class schedules and noise impact need to be considered when excavating in close proximity to classroom and administration buildings.

1.1 Existing Drawings:

A. Towson University maintains a substantial archive of construction drawings and project documents within the AEC department. These drawings are available for review by both the Consultant and the contractor, by appointment. Drawing and specifications will not be released from the department. However, upon request, up to ten sheets will be sent out for reproduction. The time required for these reproductions should be considered when developing design schedules. All cost of reproduction shall be borne by the requestor.

1.1 Regulations:

A. All excavations and trenching shall be accomplished in strict accordance with applicable OSHA regulations, in particulars, OSHA CFR 1926 "Trenching". In addition, all federal and state regulations regarding "confined spaces" will be strictly adhered to.

1.2 Miss Utility/Utility Locators:

A. Miss Utility <u>will not</u> enter Towson University property for utility scoping, regardless of the requestor. All utility locating for the A/E and contractor must be performed by an independent locator contractor using the latest technology. The university will not dispatch in house electrical staff to perform utility locating.

1.3 Existing Utilities - Damage:

A. The contractor is completely responsible for all utilities damages as a result of excavation. No excavation is permitted without expressed consent from the Project Manager and a filed report from the independent locator contractor scoping the intended area. All proposed excavation and existing utilities shall be clearly marked prior to commencing work.

B. Where underground utilities cannot be clearly identified, dig appropriate "test pits" by hand to verify location and depth. Test pits shall not be dug without prior consent from the University's Project Manager.

1.4 Existing Conditions:

A. Do not excavate within twelve (24") of any building wall, column, pier, etc. Where excavation is required next to an existing building, excavate up to twenty four (24") inches and allow the balance of soil to "fall away". Take great care to not damage existing waterproofing systems. Unless otherwise noted in the documents, the contractor is fully responsible for all damages incurred as a result of excavation work, with level of repairs or replacement at the discretion of the owner.

B. Landscaping:

1. The A/E shall make provisions in all documents for the replacement "in kind" of the landscape materials disturbed during the excavation process. This includes soil, grass, shrubs, mulching, etc. Where grass is disturbed, replace with new locally grown sod as described below.

1.5 Sodding:

A. The Contractor shall provide sod in all <u>disturbed</u> areas of the project and up to 12' beyond any sidewalks and building construction <u>if</u> <u>required</u> by the owner. A minimum of 6' on each side of pavements is mandatory.

B. Sod shall be "Turf-type Tall Fescue", locally grown, State Certified. Submittal of certificate shall be received by the Project Manager with shipment of sod.

C. Placement of sod shall be in strict accordance with the M.S.H.A. Standard Specifications for Construction and Materials, Section 707 - "Solid Sodding."

D. Exception to the above reference codes shall be 707.03.01 "Sod Placement". There shall be no restrictions for placement of sod except when the Project Manager deems weather conditions unsatisfactory for placement.

1.6 Sediment and Soil Control:

A. The Contractor shall submit for, and provide to the Owner an approved method of controlling soil erosion and sediment control on this project.

B. The approved method shall be as directed by Maryland Department of the Environment, Water Resources Administration or other agencies having jurisdiction, including all applicable codes and restrictions deemed necessary for the project.

C. Reference: Latest edition of the Maryland Standards and Specifications for Soil Erosion and Sediment Control, published by and under the direction of the Maryland State Water Resources Administration.

D. The Contractor shall provide and maintain all approved methods of control throughout the entire project.

E. Controls shall be "set-up" and approved by the Owner prior to work commencement.

F. Controls shall be maintained until new sod or other approved vegetation is in place and taken root. If necessary, the contractor shall return at his own cost to remove controls.

1.7 Outcroppings, Rocks, and Obstructions:

A. The A/E shall provide a "Rock Clause" in all contract documents that required excavations. The “Rock Clause” will clearly define “rock” and establish a unit cost for its removal.

B. Use of explosives are only permitted under special circumstances and require written approval from the Owner. Use of explosives should <u>not</u> <u>be</u> assumed.

1.8 Disposal of Excavated Materials:

A. Unless otherwise requested by the Project Manager, and when not determined as acceptable for fill or backfill, all excavated materials shall be removed from University property and LEGALLY disposed of. All cost associated with dumping shall be part of the base bid.

B. Burning of debris is not allowable.

1.9 Protection of Existing Trees:

A. Prior to all excavation, the contractor shall visit the job site with the University’s Project Manager and determine which if any existing trees are to be preserved. Trees determined to be preserved shall be protected by installation of safety fence at the drip line of the tree. The fencing shall be maintained throughout the project. No materials of any type shall be permitted inside of the fencing.

B. The A/E shall determine in the field the proximity of excavation to existing trees. Determine root extents and design for excavation beyond those extents.

1.10 Finish Grading:

A. The Contractor shall provide at least two inches of topsoil of a friable, fertile, loamy character containing an amount of organic matter normal to the region, and capable of sustaining healthy plant life, and reasonably free of subsoils, roots, clay, weeds, sticks, brush or stones to allow for healthy productive growth of the proposed sodding.

B. Enough topsoil shall be allowed to provide a smooth, positive grade away from new work at least twelve feet (12'), and in all disturbed areas.

1.11 Pedestrian Protection:

A. All excavations shall be protected by safety fence at all times during the excavation and backfill process. The A/E should provide alternate routes of pedestrian travel, when required, which are acceptable to the owner. Additionally, provide adequate directional signage for alternate pedestrian routes.

PART 2. MATERIALS

NA

PART 3. EXECUTION

3.0 Site Preparation:

A. Excavation shall not begin until all required materials are on site. This includes stone, backfill, filter cloth, and all materials required for the intended utility work.

B. Equipment:

1. The contractor must supply and maintain, in good operating condition, all required equipment for the timely excavation and backfill of the proposed work. Mechanical tampers, dewatering devices, pumps, etc. shall be available at all times.

3.1 Length of Open Trenches:

A. Excavation of all trenches shall be fully complete at least 40 feet in advance of duct laying, unless otherwise authorized.

B. Only excavate the length of trench for which the duct work can be completed on one day and backfilled no later than the next day.

3.2 Inspections:

A. Towson University required that the Project Manager or his designated representative be on site during the backfill process. This means that the contractor must gain approval of this excavation prior to the commencement of backfill.

3.3 Communications:

A. The contractor shall provide a source of immediate telephone communication during any excavation activities for use by the excavator or other responsible person within fifty (50) yards of the excavation. Emergency telephone numbers including university police, county police and fire rescue, university maintenance department and the university's designated Project Manager shall be maintained by the individual responsible for on site supervision.

SECTION 02513
MIX ASPHALT PAVING
8/01/15

PART 1. GENERAL

1.0 Summary:

A. This Section is to provide *general* asphalt paving standards at various locations on campus for both pedestrian walkways and vehicular parking and traffic surfaces. It is the preference of the university to *not* use asphalt paving on pedestrian walkways. However, there are circumstances where asphalt pavements are more practical for ice melting during the winter months. This would typically exist in wooded areas where a long section of tree canopy does not allow for sunlight penetration. Confirm pavement preference with the university prior to specifying.

1.1 Quality Assurance:

The contractor that performs the work must have a minimum of five (5) years continuous and successful experience in the work specified. The contractor must provide at least ten (10) references and contacts for similar work that was performed and within similar dollar ranges. The designated field superintendent must also meet all aforementioned requirements.

In addition, the contractor's employees must be qualified and skilled persons who have been employed in the referenced trades for a minimum of two years.

1.2 Project Conditions:

A. The A/E is responsible for existing conditions detrimental to the proposed work. Where subgrade conditions are not known or are suspect of being unacceptable, thoroughly investigate utilizing a licensed geotechnical firm to verify suitable, acceptable conditions. Where suitable conditions do not exist, provide design for replacement of the subgrade down to suitable conditions.

1.3 Construction Standards:

A. All Hot Mix Asphalt paving shall be accomplished referencing the Maryland Department of Transportation, State Highway Administration, Standard Specifications for Construction and Materials (latest edition).

B. A.D.A. Compliance:

1. All new asphalt concrete work shall fully comply with current applicable federal and local accessibility requirements.

2. Consideration of grades for new work:

a. The A/E should always consider the existing grades prior to design of new walks or replacement of existing pavement. Coordinate with the university for lineation of work. Although not always achievable, it is highly desired to make <u>all</u> walks accessible to people with disabilities. As a minimum for design, wherever possible, all new walks should be constructed to be A.D.A. compliant.

PART 2. MINIMUM DESIGN REQUIREMENTS

2.0 Parking and Roadway Overlays:

A. Parking lot overlays shall be 1-1/2" minimum, band SF or SN with tack coat.

2.1 Pedestrian Sidewalks:

A. Pedestrian sidewalks shall be designed using the following *minimum* criteria:

1. Base aggregate: 4" compacted CR-6 with fines.
2. Wearing course: 2" minimum, Band SF.

2.2 New Parking Lot and Roadway Paving:

A. New parking pavements shall be designed using the following *minimum* criteria:

1. Base aggregate: 8" compacted CR-6 with fines.
2. Base Course: 3" Band BI
3. Wearing Course: 1-1/2" Band SF.

PART 3. EXECUTION

3.0 Existing Pavement Repairs for Overlays:

A. Asphalt overlays shall only be accomplished over <u>sound</u> existing pavement, base and sub-base. Where alligatoring, cracks or depressions exist, remove in their entirety and at least 16" adjacent to the damaged area. Provide patch materials similar and compatible to existing materials and in accordance with the referenced specifications.

3.1 Mechanical Pavers:

A. All asphaltic paving shall be accomplished using mechanical paving equipment only. Pavers are to be the largest size available to allow for single pass whenever possible. Hand screeding is only permissible where mechanical pavers are not practical (e.g.; wooded areas). Only those areas approved by the OFM may be hand screeded.

3.2 Placing Asphalt Paving:

A. Asphalt paving is to be placed in continuous motion, without interruption, throughout the work period. Cold joints are unacceptable except where previously approved by OFM.

B. All edges of asphalt walkways will have chamfered edges.

3.3 Safety:

A. The contractor shall provide sufficient manpower to safely control construction vehicle access and operations and to limit the effect of the work on the campus pedestrian and vehicular traffic. The contractor shall at all times provide control to prohibit pedestrian and vehicular traffic through or into the construction zone.

END OF SECTION

SECTION 03 30 00
CAST IN PLACE CONCRETE
5/17/18

PART 1. GENERAL

1.0 Summary:

A. This Section provides *general* standards to concrete sidewalks, pads, parking pavements and other non-structural concrete applications. Refer to Section 02513 Asphaltic Paving, under Division 2 when considering the applications referenced above.

1.1 Quality Assurance:

A. Work specified under this Section shall be accomplished by qualified, skilled tradesmen who have continuously and successfully performed the required tasks for a minimum of five (5) years.

1.2 Project Conditions:

A. The Consultant or contractor is responsible for existing conditions detrimental to the proposed work. Where subgrade conditions are not known or are suspect of being unacceptable, thoroughly investigate utilizing a licensed geotechnical firm to verify suitable conditions. Where suitable conditions do not exist, provide design for replacement of the subgrade down to suitable conditions.

1.3 A.D.A. Compliance:

A. All new concrete work shall fully comply with current applicable A.D.A. requirements.

B. Concrete Curb Cuts (Ramps)

1. Wherever an existing concrete pavement is removed and replaced, or where new concrete pavement is to be placed at adjacent road intersections or corners, install concrete curb ramps compliant with A.D.A. and local governing regulations having jurisdiction.

2. New curb ramps shall be exposed aggregate surface meeting minimum criteria for accessibility compliance.

C. Consideration of Grades for Sidewalks:

1. The A/E should always consider the existing grades prior to design of new walks or replacement of existing. Coordinate with the Owner for lineation of work. Although not always achievable, it is highly desired to make <u>all</u> walks accessible to the disabled. As a minimum for design, all <u>new</u> walks must be A.D.A. Compliant

1.4 Concrete Sidewalks/Pads:

A. Minimum Design Criteria:

1. 4”” stone base (CR6 w/fines)
2. 4” thick concrete
3. 6”x 6” ww fabric
4. Concrete sealer
5. Width standard: 6’
6. Light broom finish, tooled edges

B. Design Considerations:

1. Where concrete sidewalks are to be placed adjacent to roadways, and where possible, provide a five foot (5’) wide grass filled area between back of curb and sidewalk edge. Deviation from this standard must be reviewed and approved by AEC.

1.5 Concrete Steps

A. Minimum Design Criteria: Concrete steps are typically as wide as the adjoining concrete or bituminous sidewalk. Consult with Towson University AEC office prior to design for requirements other than those listed here.

1. 6” cheek walls w/steel reinforcement
2. 5/8” coated reinforcement at all nosings
3. Light broom finish
4. Confirm rise/run requirements with the owner for each application.

1.6 Concrete Curb and Gutter

A. Minimal Design Criteria: Curb and gutter shall be designed per Baltimore County Standard Specifications and Details for Construction, latest edition. A standard sloping 7” combination curb and gutter is typical for campus applications except where reverse slope is required and approved by the Owner..

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Concrete:

A. Comply with the following as <u>minimums</u>:

1. Portland cement: ASTM C150, type I or II, low alkali.
2. Aggregate, general:
   a. ASTM C30, uniformly graded and clean;
   b. Do not use aggregate known to cause excessive shrinkage.
3. Aggregate, coarse: Crushed rock or washed gravel with minimum size between ¾" and 1-1/2", and with a maximum size number 4.

4. Aggregate, fine: Natural washed sand of hard and durable, particles varying from fine to particles passing a 3/8" screen, of which at least 12% shall pass a 50-mesh screen.
5. Water: Clean and potable.
6. Compressive strength for each application are as required by the Structural Engineer.

B. Concrete Sealers:

1. Manufacturer: Hydrozo
Type: 30M Penetrating Sealer, Clear

PART 3. EXECUTION

3.0 Placement of Concrete:

A. Scheduling:

1. It is the desire of the University that all concrete be placed before 12:00 p.m. whenever practical. The purpose of this is to avoid vandalism and have adequate cure time before the job site is abandoned for the day.

2. Only schedule concrete when favorable weather is forecast. Pour concrete in accordance with weather parameters as established in the latest edition of Maryland State Highway Design and Construction Standards.

3.1 Inspections:

A. The University's Project Manager is an integral part of the inspections prior to the placement of concrete and during the placement operation. No concrete shall be placed without prior approval from the University's Project Manager.

3.2 Soda and Acid Wash:

A. Soda and Acid Wash at formed surfaces is not permitted for any work at Towson University. Only non-caustic, environmental friendly products as approved by the University's Environmental, Health and Safety Office are permitted.

3.3 Concrete Sealers:

A. All concrete sidewalks, paths and other horizontal wearing surfaces shall have a <u>penetrating</u> sealer applied after the concrete is fully cured and as specified by the manufacturer. Sealers selected shall be capable of rejecting chloride ion intrusion with 90% minimum reduction at 1". It is imperative that sealers be deep penetrating and <u>not</u> a surface sealer.

3.4 Finish:

A. All concrete sidewalks and all other horizontal wearing surfaces shall have a light broomed finish. Broom to be drawn perpendicular to the traffic direction.

3.5 Concrete Protection:

A. Due to a history of vandalism at Towson University, the contractor shall fully protect all new concrete work for a minimum of forty-eight hours. Concrete should be placed prior to 12:00 p.m. A representative of the contractor shall remain on site at least three (3) hours after the last section of concrete is placed. In addition, the contractor shall fully protect the concrete with plastic sheeting or matting. Plastic sheeting shall be installed so that it cannot pull or blow away under windy conditions.

END OF SECTION

SECTION 04 22 00
CONCRETE MASONRY UNITS
5/17/18

1.0 Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

2.0 Product Handling:

A. Storage: Stack block on wood pallets located on a well-drained area of the site. During freezing weather, protect block stacks with a heavy watertight covering securely weighted or tied in place.

B. Protection: Protect block against chipping, breakage, staining (mud, grease, rust, etc.) and other damage. Do not use blocks showing damage.

3.0 Quality Assurance:

A. Source Quality Control: Obtain each type masonry unit from only one manufacturer. Each type unit shall be uniform in texture and color for the entire project, unless specified otherwise.

4.0 References:

A. American Society of Testing and Materials (ASTM)ASTM C 90 Load-Bearing Concrete Masonry Units

5.0 Materials – Load Bearing Block: ASTM C 90

A. Grade N, 1900 psi (avg. 3) compressive strength; Normal Weight: 125 lbs./cf or more

B. Shrinkage control and curing, Type I: Moisture controlled, auto claved or air dried 28 days

C. Cells: Optional (Cells to align for vertical reinforcing)

D. Size: Thickness as indicated on drawings; and special shapes; Modular Block Face: 7-5/8 inches x 15-5/8 inches

E. Color and Texture: Fine grain, uniform light gray

F. Location: Unless indicated otherwise

G. Mortar: Type S

6.0 Materials – Special Shapes – Concrete Block

A. Grade, Type, Color and Texture: Same as hollow and solid load bearing unit

B. Shapes: As required to minimize field cutting and eliminate patching, piecing out and make-shift transitions or joints.

7.0 Materials- Wire reinforcement: ASTM A951, hot-dipped galvanized, carbon steel.

8.0 Cleaning compounds

A. Masonry Detergent:
   1. Manufacturer : ProSoCo – Sure Klean 600 or VanaTrol

B. Other solutions required for cleaning in accordance with BIA #20, subject to review by the Architect.

C. Use only environmentally friendly products as approved by the Director of Environmental Health and Safety.

9.0 Installation – Preparation and Protection

A. Protection of other work: Protect against defacement or other damage resulting from masonry construction.

B. Protection of the work: Cover the top (and one foot down each side) of exposed walls and partitions (except when the masons are actually working on them) with strong, non-staining, waterproof paper, sheet plastic, or tarpaulins.

C. Cutting: Use a carborundum saw in order to ensure true, sharp corners neatly. Use full units wherever possible.

D. Joining: Where fresh masonry joins partially or totally cured masonry, remove any loose masonry units or mortar and clean exposed surfaces of cured masonry to obtain good bond with new work.

10.0 Installation – Workmanship

A. Joints: Lay masonry units in full mortar including cross webs on beds which are clean and properly wetted. Make exposed joints uniform in width. Tool joints neat without mortar spread on unit faces. Lay masonry accurately spaced, level, square, plumb, and true. Assure uniform color in successive courses. Lay exterior masonry from outside scaffolding.

SECTION 05 52 00
EXTERIOR METAL RAILINGS
5/17/18

PART 1. GENERAL

1.0 Summary

A. This Section only addresses exterior railings. In general, only the railings of the type specified in PART II of this Section and as depicted in the photographs are acceptable for exterior railings and guard rails.

1.1 Code Compliance

A. All railing shall be installed in strict accordance with applicable Life Safety and Building codes. Where code dictates design other then that shown here, provide alternate design for approval by the university.

1.2 A.D.A. Compliance

A. Rails for accessible ramps shall conform to the applicable federal guidelines and regulations, in particular, A.D.A.A.G. Ramp railing materials shall be as specified below.

PART 2. PRODUCTS

2.0 Railings:

A. All railings shall be 1-1/2" O.D. formed from primed and powder coated steel – painted black.

B. Railing accessories shall be primed and powder coated metal to match railings.

C. Dimensions: Typical rail height is 2'- 10" with mid rail equally spaced and 12" extensions.

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SUPPLEMENTAL INFORMATION

The following information is provided to supplement the construction standards contained in the previous section. This may include additional graphic information on products listed in the standards, or information on additional products or materials that have been used successfully on other campus projects, but may not be applicable to all projects. Consult with Facilities Management about the applicability of any particular products for specific projects.

SECTION 06 41 00
CASEWORK
5/17/18

Reserved

SECTION 07 50 00
MEMBRANE ROOFING
5/17/18

PART 1. GENERAL

1.0 Summary

A. Towson University has several different types of existing roof systems used throughout the campus. These roofs range from four ply built up, modified bitumen, foam and single ply systems. The majority of existing roofs are four ply built up with stone ballast. However, different building types may dictate different roof systems. For this reason, the consultant should consult AEC prior to the Schematic Design Phase to clarify the type of roof proposed for renovation projects. Preferred roofing types for new construction are indicated below.

1.1 Roof Types

A. The following roofing system types are acceptable to Towson University for new construction applications to low-slope (min. 1/4": 1' - 0") roofs.

B. It is the consultant's responsibility to select the roofing system most appropriate for the building. The consultant shall provide the necessary drawings, details, and specifications to provide Towson University with a sound, watertight, long lasting roofing system. All roofs must comply with insulation requirements of the International Energy Conservation Code (IECC) 2015.

C. References: National Roofing Contractors Association

D. Acceptable roofing systems:

1. 2-ply modified bitumen granulated cap sheet, unballasted, over light weight concrete insulation system. Basis of design is Siplast NVS system.
2. Interlocking standing seam 24-gauge (minimum) commercially pure aluminum coated steel (aluminized type II) roof
3. Unballasted, fully adhered fastened, single-ply EPDM roofing system with a (minimum) sheet thickness of 0.045 inches
4. Monolithic Rubberized Asphalt Membrane System – basis of design – Hydrotech 6125 EV.

E. Walkway systems shall be installed to and around all mechanical equipment. Typical walkway systems are lightweight concrete pads. Granulated modified bitumen sheet is not preferred but may be acceptable under certain conditions such as when built-up modified systems are used. Consult AEC for acceptable materials.

F. Indicate on the drawings the following information as required relating to roofing systems.

1. Roof plan for each area of roofing, clearly indicating extent of each type roofing, including slopes, including insulation and vapor retarders (if any)

2. Detailed pattern lay out of taper insulation showing numerical sequence of installation.

3. Required thicknesses and taper of insulation. All roofs shall comply with minimum requirements of 2015 IECC – International Energy Conservation Code 2015 (IECC) (Ref: COMAR 05.02.07). In general a minimum R value of R30 is required.

4. Taping of substrate or insulation joints, where required

5. Flashing, stripping, sealants, cants, tapered edge trips nailers, reglets, etc. at terminations of roofing; Show nailers where required

6. Areas of extra aggregate surfacing course, if any waterways, walkways, etc. include both locations and dimensions.

7. Details of roof drains and other waterways and drainage facilities

8. Locations and dimensions of walkways (if any), and how they are supported

9. Color of surfacing

10. Areas of special UL rating, if any (other than rating specified). UL: Class A fire hazard (UL790) FM: Roof Assembly Classification, meet wind uplift requirements for I-90 windstorm
NFPA: Current Edition adopted by State Fire Marshall's Office

11. Locations and large-scale details for sheet metal roofing accessories, and type metal if several specified

12. Locations and large-scale details of roof expansion joints, curbs, penetrations, equipment supports, etc. (Use NRCA details as guide)

1.2 Warranties

A. Guarantee by the manufacturer shall include but not be limited to roofing, insulation, base flashing system and shall be for a term of 20 years with no dollar limit (NDL) and no penalty sum.

B. Contractors guarantee shall be five (5) years.

PART 2. PRODUCTS

2.0 Fascia, Copings, Metal Edges

A. All exposed metal such as fascia, metal edges and copings shall be .040 ga., minimum with Kynar paint finish.

B. Color selections of metals to be coordinated with FM, AEC Department.

C. All metals to be installed utilizing <u>continuous</u> cleats. Continuous cleats are to be one gauge heavier metal than fascia, metal edges and coping specifications.

PART 3. INSTALLATION

3.0 Metals

A. Do not fabricate and install fascia metal wider than 6". "Oil canning", dents, buckles, etc. are not acceptable.

3.1 Bleed Out

A. The contractor will minimize bleed out of bitumen *where the roof is normally exposed to view*. Where bleed out of bitumen is required, broadcast granular materials matching the granular roof system into the bitumen.

3.2 Flood Test

A. At the completion of all roof work, the contractor shall perform a flood test in the presence of the owner. Areas of the roof that exceed manufacturers tolerances for standing water will immediately be removed and corrected prior to final payment.

END OF SECTION

SECTION 08 11 13
METAL DOORS & FRAMES
07/16/18

PART 1. GENERAL

1.0 Summary

A. This section pertains to interior and exterior metal entrance doors and frames to be provided for all contracts unless specified otherwise in these standards. While these standards are minimum, the consultant is encouraged to maintain "heavy duty" for all specified products.

1.1 Labeled Doors and Frames

A. Specify or note where required, UL labels with the appropriate fire resistance and temperature rise ratings for the class of opening indicated.

B. Verify all openings and requirements with the State Fire Marshall during design.

1.2 ADA Compliance

A. Consider ADA requirements when specifying frames and doors including:

1. Pull resistance requirements including negative air spaces
2. Latch side clearances
3. Appropriate accessible hardware

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Metal Doors

A. Typically, metal doors are full flush without lites. This should not be interpreted as being the only solution for design. Where the consultant desires metal doors with lites or other face types coordinate with the owner for approval. Metal doors shall have the following *minimal* characteristics.

1. Interior Doors
   a. Level 2 and Physical Performance Level B (Heavy Duty)
   b. Cold rolled steel face sheets
   c. Seamless
   d. Door silencers
   e. Shop primed/Alkyd field finished

2. Exterior Doors
   a. Level 3 and Physical Performance Level A (Extra Heavy Duty)
   b. Metallic coated steel sheet or galvanized steel sheet (consult owner)
   c. Seamless

d. Weather-stripped
e. Shop primed/Alkyd field finished

2.1 Metal Frames

A. Materials
1. For Level 3 doors– 14 gauge
2. For Level 2 doors– 16 gauge

B. Construction
1. Welded frames for all new construction with ground smooth surfaces
2. Mitered knock down type permitted for replacement when walls *are not* removed, and in some new construction situations when specifically approved.
3. Shop primed with rust inhibiting primer
4. Minimum Reinforcement:
a. 11 ga. steel hinge reinforcement plates for 4 ½" hinges.
b. 14 ga. strike reinforcement plate
c. 12 ga. closer reinforcement plate
5. 12 ga. Closer reinforcement
6. 6 ga. Hinge reinforcement
7. 14 ga. Lock reinforcement
8. Preformed rigid polystyrene core
9. Factory cleaned and primed, field finished

2.2 Galvanized Option: For exterior doors and frames, and elsewhere required, specify ASTM A60 hot dipped galvanized coating at 0.6 oz., mill treated for proper adhesion.

PART 3. EXECUTION

3.0 Installation

A. The door/frame contractor is fully responsible for checking the prepared opening prior to setting the frame. Openings that are not plumb, square or have irregularities should not have frames set. Frames that are set in unacceptable openings will be removed by the door/frame contractor and replaced, without cost to the owner, after the opening is corrected.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS
07/16/18

PART 1. GENERAL

1.0 Summary

A. This section pertains to flush wood doors to be provided, where said doors are required, for all new and alteration work. While many classrooms and office suites use solid core wood doors, some buildings were designed using horizontal grade plastic laminate. Alterations in those buildings allow for doors “in kind.” All new construction should typically use finished solid core, hardwood veneer doors as outlined below. Alteration and renovations would allow for matching existing conditions in academic buildings.

1.1 Quality Assurance

A. Work specified under this section shall be accomplished by qualified, skilled tradesmen who have continuously and successfully performed the required tasks for a minimum of five (5) years.

1.2 Labeled Doors

A. Specify or note where required, UL Labels with the appropriate fire resistance and temperature rise ratings for the class of opening indicated.

B. Verify all openings and requirements with the State Fire Marshall during design.

1.3 ADA Compliance

A. Consider ADA requirements when specifying:

1. Pull resistance requirements including negative air spaces
2. Latch side clearances
3. Appropriate accessible hardware

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Selection of Doors

A. Coordinate with AEC to determine the type of each door and the finish required for each application.

2.1 Veneers

A. Specify <u>only</u> solid core wood doors with hardwood veneers. Doors are to be top quality only.

B. Hardwood veneers are typically "stain grade", Birch or Maple.
Where the design calls for oak veneer, use only top quality materials. For doors slated to receive paint finish, "paint grade" veneers are acceptable.

C. Crossband: Hardwood veneer, nominal 1/16" thick

2.2 Dimensional Data

A. Typical doors are 6’8" x 3’0" x 1¾". However, where existing adjacent doors exist, match those doors in face dimension.

2.3 Finishes

A. See Section 09900 Painting for Finish requirements

2.4 Frames: See Section 08100 Metal Doors and Frames

PART 3. EXECUTION

3.0 Protection/Storage of Wood Doors

A. The contractor shall be fully responsible for the protection and storage of wood doors after delivery. Specify that doors are to be maintained in door racks until needed for use.

B. Maintain new doors in a stable environmental condition until needed for use. Do not allow doors to be stored in a humid environment.

C. All wood doors shall be immediately sealed after cutting of tops and bottoms.

3.1 Installation

A. The door/frame contractor is fully responsible for checking the prepared opening prior to setting the frame. Openings that are not plumb, square or have irregularities should not have frames set. Frames that are set in unacceptable openings will be removed by the door/frame contractor and replaced, without cost to the owner, after the opening is corrected.

END OF SECTION

SECTION 08 41 13
ALUMINUM ENTRANCE AND STOREFRONTS
7/16/18

PART 1. GENERAL

1.0 Summary

A. This section provides minimum construction standards for all aluminum/storefront entrances. These entrances must be specified as "best quality" and "heavy duty" for all components and construction.

1.1 Quality Assurance

A. Work specified under this section shall be accomplished by a qualified vendor, whose skilled tradesmen who have continuously and successfully performed projects of equal size and complexity for a minimum of five (5) years.

1.2 Storefront Configuration

A. Coordinate with the owner for storefront door configuration. The preferred configuration provides all doors hinged from the same direction. However, the purpose for this is to accommodate the specified hardware. The consultant still has the flexibility of utilizing other configurations if the specified hardware can be accommodated.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 System Requirements

A. Doors

1. Manufacturers standard 1-¾” thick glazed door with minimum 0.125 inch thick extruded tubular rail and stile members.

2. Stiles: Typically, doors are designed as Wide stile. Wide stile doors are acceptable where existing, adjacent wide stile doors exist. This selection is due to high volume of student traffic and abuse. Narrow stile doors are not acceptable except where approved by FM.

3. Finish: The trend at Towson University is to use clear anodized or bronze duronodic door finishes. Two and three coat high performance paint finishes can be an acceptable alternative with similar warranty and performance requirements. Verify the desired finish with AEC.

4. Weather Stripping: Manufacturer’s standard replaceable weather-stripping as follows:

a. Compression weather stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.

b. Sliding weather stripping: wool, polypropylene, or nylon woven pile with nylon fabric or aluminum strip backing with AAMA 701 requirements.

c. Weather sweeps: manufacturers standard weather sweep for application to exterior door bottoms and with concealed fasteners on mounting strips.

5. Fasteners and accessories: manufacturers standard corrosion resistant, non bleeding fasteners and accessories compatible with adjacent materials.

6. Finishes: Class I, anodic finish: AA-M12C22A42/A44 (mechanical finish: non specular as fabricated; chemical finish: etched, medium matte; anodic coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018mm or thicker complying with AAMA 606.1 or AAMA 608.1.

7. Construction

a. Mechanically fastened, SIGMA deep penetration welded corners.

b. Integral weatherstrip system as supplied by the manufacturer, including integral sweeps as required.

8. Hardware

a. Except as noted below, refer to section 08710 for this information.

b. Hinges: use only heavy-duty Roton or Select Continuous door hinges. Butt Hinges should be used when applicable. Type and offset of hinges must be adapted to the opening and approved by AEC prior to submission.

c. Exit Devices: Von Duprin 99 Series- Rim

d. Locks: All lock cylinders as determined under Section 08710 must be accompanied by a BEST construction core.

e. Pulls: (reserved)

f. Push Plates: (reserved)

2.1 Manufacturer: Following are acceptable manufacturers of aluminum storefront:

A. Special – Lite SL15 W/SL 484 mid panel /W SL84 Flush Pull or owner approved Equal with comprehensive 10 yr. parts and labor warranty.

PART 3. EXECUTION

3.0 Building Security

A. The contractor shall at all times provide for a secure entrance to the facility under construction. Where existing storefront has been removed, reinstall new work including locks within one (1) workday. When new systems cannot be installed in the same day, provide adequate means of securing the facility as approved by the university's project manager.

3.1 Construction Safety

A. The storefront contractor is solely responsible for providing adequate protection to pedestrians during installation of storefront materials. Do not allow pedestrians to enter the building through the construction area. Barricade area directly in front of the installation area and provide directional signage to alternate entrances.

END OF SECTION

DOOR HARDWARE
SECTION 08 71 00
07/16/18

PART 1. GENERAL

1.0 Summary:

A. Towson University, through its in-house lock shop, is required to maintain, repair and interchange many locks, cylinders, exit devices and assorted other finish hardware on an ongoing basis. For this reason, it is imperative to maximize the value and economics of a standardized hardware system. As described in the attached "Spec Section", all materials specified are proprietary with no consideration for substitutions.

1.1 Attached Specification Section:

A. Attached is a Specification Section 08710 available for the A/E to use directly in the proposed documents.

1.2 Related Documents:

A. All drawings and general provisions of the contract including General and Supplementary General Conditions, Division I and other documents Sections required for interface with this Section.

1.3 Quality Assurance:

A. Work specified under this Section shall be accomplished by qualified, skilled tradesmen who have continuously and successfully performed the required tasks for a minimum of five (5) years.

B. Experience for tradesmen stated above must include the types, models and functions of the specified products.

1.4 Finish Hardware:

A. This Section specifies those items collectively referred to as "Finish Hardware" or "Architectural Finish Hardware". Section encompasses those items of hardware essential to operation, control, and weatherstripping of swinging and sliding doors as normally used throughout a building, namely wood and hollow metal doors. At present, this portion of these Standards will focus on hardware for swinging doors, interior and exterior, including storefront.

1.5 Finish Hardware Schedule::

A. Provide a "Finish Hardware Schedule" listing each of the proposed contents of each Hardware Group.

1. Show the quantity of each type of item proposed to be supplied within each Hardware Group.
2. Show the dimensions, when pertinent, and the manufacturer’s catalog number;
3. Show the finish of each item;
4. Show the manufacturer’s name by a suitable legend.

10-1-2020

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: Finish hardware except as otherwise specified or specifically omitted herein.

B. Related Sections:

1. Section 06200 - Finish Carpentry: Installation of finish hardware.
2. Section 08100 - Standard Steel Doors and Frames.
3. Section 08210 - Wood Doors.

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows
2. Cabinets of all kinds, including open wall shelving and locks.
3. Signs, except as noted.
3. Toilet accessories of all kinds including grab bars.
5. Installation.
6. Rough hardware.
7. Folding partitions, except cylinders where detailed.
8. Sliding aluminum doors.
9. Angle sill threshold.
10. Corner guards.

1.02 SUBSTITUTIONS & SUBMITTALS:

A. Requests for substitutions must be made in writing to the Architect 10 days prior to the bid date. All request for substitution are to be made in accordance with Division 1, General Requirements, and section # 01631 Substitutions. In addition to the General Requirements, if proposing a substitute, submit that product data along with physical samples showing the proposed item and a detail cost breakdown of savings. No substitutions will be allowed after the project has been awarded to a to a General Contractor.

1. Items listed with NO SUBSTITUTE have been requested by Owner to match existing products. No alternate products will be considered for review, provide products as specified.

B. SUBMITTALS: Submit, for review, six (6) complete copies of the finish hardware schedules within three (3) weeks after the purchase order is received by the hardware supplier. Organize schedule into “Hardware Sets" with an index of doors and heading, indicating complete designations of every item required for each door or opening. Include the following information:

1. Type, style, function, size, quantity and finish of each hardware item.
2. Name, part number and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of hardware set cross referenced to indications on drawings both on floor plans and in door schedule.
5. Explanation of all abbreviations, symbols, and codes contained in schedule.
6. Mounting locations for hardware.
7. Door and frame sizes and materials.
8. Submit manufacture's technical data and installation instructions for the electronic hardware.
9. Catalog cuts.
10. Submit any samples necessary, as required by the Architect/Owner.

C. Templates: Where required, furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware.

1.03 QUALITY ASSURANCE:

A. Qualifications:

1. Obtain each kind of hardware (latch and locksets, exit devices, hinges, and closers) from only one manufacturer, although several may be indicated as offering products complying with requirements.

2. Hardware supplier to be a qualified, Factory Authorized, direct Contract Hardware Distributor of the products to be furnished. In addition, the supplier to have in their regular employment an certified Architectural Hardware Consultant (AHC) who will be made available at reasonable times to consult with the Owner, Architect, and/or Contractor regarding any matters affecting the finish hardware on this project.

3. The hardware supplier shall maintain a office and warehouse within a sixty-five (65) miles radius of the job and maintain an inventory and field service staff in order to service the project properly.

4. Pre-Installation Conference for Finish Hardware and/or Electronic Hardware: Prior to installation of the hardware, the hardware consultant shall arrange a conference between the contractor, installers and related trades to review materials, procedures and coordinating related work.

B. Schedule Designations: Except as otherwise indicated, the use of one manufacturer's numeric designation system in schedules does not imply that another manufacturer's products will not be acceptable, unless they are not equal in design, size, weight, finish function, or other quality of significance. See 1.02 A for substitutions.

C. Exit Doors: Openable at all times from the inside without the use of a key or any special knowledge or effort.

D. Fire-rated openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80. This requirement takes precedence over other requirements for such hardware. Provide only such hardware which has been tested and listed by UL for the type and size of door required, and complies with the requirements of the door and the door frame labels. Latching hardware, door closers, ball bearing hinges, and seals are required whether or not listed in the Hardware schedule.

1. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label on exit device indicating "Fire Exit Hardware."

1.04 DELIVERY, STORAGE, AND HANDLING:

A. Acceptance at the Site: Individually package each unit of finish hardware complete with proper fastening and appurtenances, clearly marked on the outside to indicate contents and specific locations in the Work.

B. Deliver packaged hardware items at the times and to the locations (shop or field) for installation, as directed by the Contractor.

1.05 PROJECT CONDITIONS:

A. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.

B. Upon request, check the Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.06 WARRANTY:

A. Provide written guarantee from hardware manufacture, as well as hardware supplier, as follows:

1. Locksets: Three (3) years
2. Exit Devices: Three (3) years
3. Closers: Ten (10) years
4. Electronic closers: Two (2) years.

5. All other Hardware: Two (2) years.

Warranty shall commence with substantial completion of the project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.02 A, except for items marked No Substitute.

Item: Approved	Manufacturer:	Approved:	
	Hager	Lawrence	
Hinges Stanley			
Locks	Best	No Substitute	
Cylinders / Cores	Best	No Substitute	
Keying / Keys	Best	No Substitute	
Closers	LCN	No Substitute	
Exit Devices	Von Duprin	No Substitute	
Keyed Removable Mullion	Von Duprin	No substitute	
Pulls	Rockwood	Hager	Ives
Silencers	Rockwood	Hager	Ives
Kick plates	Rockwood	Hager	Ives
Stops	Rockwood	Hager	Ives
Thresholds	National Guard	Zero	Pemko
Seals/Sweeps	National Guard	Zero	Pemko

B. Furnish all items of hardware required to complete the work in accordance with specifications and plans.

C. Carefully inspect Project for the extent of the finish hardware required to complete the Work. Where there is a conflict between these Specification and the existing hardware furnish finish hardware to specification.

2.02 MATERIALS:

A. Locksets and Latches, 93K at RETROFIT openings shall be extra-heavy-duty cylindrical with Best 7-pin interchangeable core. Lockset and Cores to be of the same manufacturer to maintain complete lockset warranty. Locks to have solid shank with no opening for access to keyed lever keeper. Lock chassis must be through-bolted (outside of the lock chassis prep to prevent rotation of chassis after installation. Lock manufacturer shall provide a three-year warranty, in writing, to the Owner, along with three copies of the lock service manual. Strikes shall be 16 gauge curved brass, bronze or stainless steel with a 1" deep box construction, and have sufficient length to clear trim and protect clothing.

1. <u>Lock Series and Design Best 93K7 15D Lock function to match each location</u>

(storeroom, entrance, etc.). at existing construction

2. Cores / Cylinders: Best 7-Pin with "Premium" Keyway to match existing system

B. Mortise type Locks and Latches, series 40H at NEW CONSTRUCTION, shall be heavy-duty with hinged, anti-friction, 3/4 inch throw latch bolt with anti-

friction piece made of self lubricating stainless steel. Functions and design as indicated on the hardware groups. Deadbolt functions shall be 1 inch projection made of hardened stainless steel. Both deadbolt and latch bolt are to extend into the case a minimum of 3/8 inch when fully extended. Furnish locksets and latchets with sufficient curved strike lip to protect door trim. Provide locksets with 7-pin Best interchangeable core cylinders. All mortise cylinders shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal set screw will be accessible only by removing the core from the cylinder body. Locksets and latchets to have self-aligning, thru-bolted trim. Auxiliary dead latch to be made of one-piece stainless steel, permanently lubricated. Lever handles must be of forged or cast brass, bronze or stainless steel construction. Spindle to be such that if forced it will twist first, then break, thus preventing forced entry.
Levers to be operated with a roller bearing spindle hub mechanism.

1. Lock Series and Design: Best 40H7 15H (Rose Trim) at new construction
2. Lock series and Design: Best 15J Trim (Escutcheon Trim) at existing construction; (Full Escutcheon)
3. Cores / Cylinders : Best 7-Pin with "Premium" Keyway to match existing system

4. 45H 7AT 15H – Classrooms, Office's

5. 45H 7R 15H – Laundry and Trash Rooms

6. 45H 7D 15H – Mechanical, Storage and Closets

7. 45H OL 15H – Privacy – Single Bathroom/ Different Locations as requested use 45H 7T 15H VIN (visual indicator with cylinder and key)

8. 48H R S1 Mortise deadlock: Public Rest Rooms – cannot lock from inside

9. 45H ON 15H - Passage

C. Hinges: Out swinging exterior doors shall have non-removable pin hinges? Exterior hinges to be brass, bronze or stainless steel material. Hinges to be extra heavy weight for high frequency openings or doors 36" and over in width. All hinge open widths shall be minimum, but of sufficient size to permit door to swing 180. Furnish hinges with three knuckles and concealed bearing.

1. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.

2. Provide hinges as listed in schedule.

D. Exit Devices: Furnish all sets at wood doors with sex bolts unless otherwise specified in Wood Door
Section/ Hardware blocking. Trim of exit devices to match trim of locksets.
Provide rim devices at single doors. At pairs of doors with low visibility provide two rim devices with key removable mullion. No concealed Rods. Depending on location, at exterior openings provide two surface vertical rod devices or two rim devices with key removable mullions.

1. Exit Device Series: Von Duprin 99 Series
2. Exit Trim ; 99L-NL or if other wised requested different

E. Surface Door Closers: Full rack and pinion type with removable non-ferrous cover. Provide sex bolts at all wood doors unless otherwise specified in Wood

Door Section/Hardware blocking. Place closers inside building, stairs, and rooms. Closers shall be non-handed, non-sized and adjustable.

1. Closer Series: LCN 4040XP RWPA only
2. Provide multi-size 1 through 6 at all doors rated or not.
3. Exterior and high frequency openings to receive 4041 Series.
4. Interior and low frequency openings to receive 1461 Series. All Closers can be 4040XP **unless replacing existing.**
5. All closers shall be cast iron.
6. Flush transom offset brackets shall be used where parallel arm closers are listed for doors with fixed panels over.
7. Drop brackets are required at narrow head rails.
8. Set exterior doors closers to have 8.5 lbs. maximum pressure to open, interior non-rated at 5 lbs., rated openings at 12 lbs. and meet all ADA requirements.

F. Kick plates: Provide with four beveled edges, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors unless otherwise specified.. Furnish Type "A" screws to match finish.

G. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.

H. Screws: All exposed screws shall be Phillips head.

I. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs.
Omit where any type of seals occur.

2.03 FINISH:

A. As selected by Architect and /or Owner.

1. Protection Plates, Push, Pulls shall be selected by Architect.

C. Spray door closers to match other hardware, unless otherwise noted.

C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.04 KEYING REQUIREMENTS:

A. Provide Best brass construction cores and keys during the construction period. Black plastic construction cores will not be permitted. Construction control and operating keys and core shall not be part of the Owner's permanent Best keying system or furnished on the same keyway (or key section) as the Owner's permanent Best keying system. Permanent Best cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner (by the local Best factory representative) prior to occupancy.

B. <u>All cylinders shall be Best 7-pin, interchangeable core "Premium" Keyway to match existing key system.</u>

C. Permanent Best keys and cores shall be stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped <u>"Do Not Duplicate."</u>

D. Grand Masterkeys, Masterkeys and other Security keys shall be transmitted to the Owner by Registered Mail, return receipt requested.

E. Furnish keys in the following quantities:

0 each Grand Masterkeys and Control key to be furnished by Towson University 4

each Masterkeys per set

4 each Change keys each keyed core

9 each Construction Masterkeys

1 each Construction Control keys

F. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Best Access Systems Factory Representative. All Construction cores and keys remain the property of Best Access Systems.

G. Keying schedule: Submit three copies of separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

PART 3 - EXECUTION

3.01 HARDWARE LOCATIONS:

A. Hinges:

1. Bottom Hinge: 10 inches from door bottom to bottom of hinge.
2. Top Hinge: 5 inches from door top to top of hinge.
3. Center Hinge: Center between top and bottom hinge.
4. Extra Hinge: 6 inches from bottom of top hinge to top of extra hinge. B. Lock:

   38 inches from finished floor to center of lever or knob.

5. Storefront/Entrance Doors; New Replacement will be Special – Lite SL 15 W/SL

   484 Mid Panel W SL*$ Flush Pull or Handicapped equivalent recessed Pull ;

   Continuous Hinge 780 – 112 HD – Select or Hagar

6. Keyed Removable Mullion; Von Duprin KR9954

C. Push Bar: 44 inches from bottom of door to center of bar.

D. Push Plate: 44 inches from bottom of door to center of plate.

E. Pull Plate: 42 inches from bottom of door to center of pull.

F. Exit Device: 39-13/16 inches from finished floor to center of pad.

G. Deadlock Strike: 44 inches from floor, centered.

H. Kick Plates – typically installed on all bathroom and janitorial closet doors. Design team shall confirm for individual projects.

I. Coat Hooks – typically installed on the inside face of all office doors.

3.02 INSTALLATION:

A. Hardware is to be installed by experienced finish hardware installers only.

D. Install finish hardware in accordance with the approved hardware schedule, the manufacturers' printed instructions and in accordance with Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute. Prefit hardware before finish is applied; remove and reinstall after finish is complete and dry. Install and adjust hardware so that parts operate smoothly, close tightly, and do not rattle.

C. Installation shall conform to local governing agency security ordinance.

3.03 ADJUSTING:

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.

B. Inspection: Hardware supplier shall inspect all hardware furnished within 10 days of contractor's request and include with his guarantee a statement that this has been accomplished. Inspector or Contractor shall sign off the hardware as being complete and correctly installed and adjusted. Further corrections of defective material shall be the responsibility of his representative.

3.04 SCHEDULE OF FINISH HARDWARE:

A. Legend of listed manufacturers:

HA Hager
BE Best
VD Von Duprin
LC LCN
NG National Guard
RO Rockwood

B. The items listed in the following "Schedule of Finish Hardware" shall conform throughout to the requirements of the foregoing specification. The last column of letters in the Hardware Schedule refers to the manufacturer abbreviation listed above.

C. The Door Schedule on the Drawings indicates which Hardware Set is used with door.

SECTION 08 71 13
AUTOMATIC DOOR OPERATORS
7/16/18

PART 1. GENERAL

1.0 SUMMARY

A. Section includes: Besam Swingmaster automatic swing door operator consisting of electro - mechanical microprocessor controlled swing door operator, housing, electronic control and connecting hardware. Besam Program Module to be for adjustment and tuning. Installation shall be performed by the local Besam Distributor, Besam – MD, 2140 Priest Bridge Court, Suite 19, Crofton, MD 21114, and Phone (443) 270-3600 EX 103, Mr. Tom Epke.

1.1 RELATED SECTIONS

A. Section 08410 – Aluminum Entrance and Storefronts
B. Section 08710 – Finish Hardware
C. Section 08720 - Access Control System
D. Section 08800 - Glazing

1.2 SUBSTITUTIONS AND SUBMITTALS

A. Only products specified under Part II of this section are acceptable. Make no substitutions.

B. Product Data: Submit manufacturer’s product data and standard details for specified automatic operator.

C. Shop Drawings: Submit shop drawings for the fabrication and installation of the specified automatic operator and associated components of the work. Include anchors, hardware and other components not included in manufacturer’s standard data.

D. Operation and Maintenance Data: Submit manufacturer’s spare parts list and owner’s manual.

1.3 QUALITY ASSURANCE

A. Local certified Besam distributor to install operator in accordance with current **ANSI/BHMA** 156.10 American National Standard for Power Operated Pedestrian Doors and local applicable codes.

1.4 WARRANTY

A. Provide written two – year guarantee from automatic door operator manufacturer.

B. Warranty shall begin with substantial completion of the project, not installation.

PART 2. PRODUCTS

2.0 AUTOMATIC DOOR OPERATOR

A. Besam Swingmaster 455 Series electro – mechanical operator, housing, microprocessor control, wire harnesses and connecting hardware. The following features are required of this device:

1. Electronic Controls: A self-contained, solid state integrated circuit with microprocessor controls, directs the operations and switching of the swing power operator. The electronic control provides low voltage power supply for all means of actuation. No external or auxiliary low voltage power source will be allowed. The control includes adjustable time delay (1 to 30 seconds) for normal cycle, as well as the following built in features:

    1. Torque limiting for controlled forces on opening
    2. Acceleration control for smooth starts and recycle
    3. Special circuitry for reducing power to the motor when door is in HOLD-OPEN mode, extending longevity and assuring reliability.

2. Connecting Hardware: Overhead concealed operator is connected to the door by means of an electroplated case hardened steel door arm. The door arm is secured to the top rail of the swing door using one piece threaded tubular inserts for aluminum doors. The door arm is broached for positive engagement with the splined drive shaft and requires no additional linkage, side blocks or tracks. Top rail of the swing door shall be modified in order to attach the door arm.

3. Power Open: The automatic door operator powers the door open by forces transmitted mechanically to the drive shaft and maintains a constant engagement throughout the opening cycle. The operator is designed to counteract most normal exterior wind conditions and/or interior stack pressure without the need for additional power assist mechanisms. The automatic door system functions as a manual door closer in the event of a power failure. The automatic door system is electro–mechanical in design requiring no remote pumps or compressors.

4. Spring Close: Automatic door operator is spring closed. Spring is designed to counteract most normal exterior wind conditions and return the door to full close. Closing forces are regulated by utilizing the motor and gear assembly as a dynamic brake. The spring is compression type to ensure longevity. Clock type torsion springs will not be allowed.

5. Push Plate Control Device: Actuation device is Besam part #10 PBS451B – radio controlled, 4 1/2”square stainless steel push plate switches engraved with blue handicap logo. Control causes door to open instantly when press switch is pushed. Door can be used as a manual door with no damage to the operator. Exterior push plate control device to be installed on Besam 10 BOLLARD with Dark Bronze finish. Remaining three push plate control devices to be mounted on storefront framing at Smith Hall power operated doors.

6. Electrical Characteristics and Components: Electrical is 120V, 60 Hz, 10 amp electrical power supply to the operator. Nominal current draw 222 watts (1.85 amps at 120 VAC). Overload Protection: Motor stall 672 watts maximum. Electric motor is equipped standard with a built-in thermal overload protection and cannot exceed 10 amps current draw.

7. Security access interface: BEA Inc., Model MC – 25 Control Module.

8. Finishes: All exposed aluminum surfaces are dark bronze anodized (AAC23A44).

PART 3. EXECUTION

3.0 EXAMINATION

A. Verify the openings are plumb and are dimensioned properly. Insure adequate support has been provided at the operator header. Proceed with the installation only after conditions are deemed satisfactory.

3.1 INSTALLATION AND ADJUSTMENT

A. Install equipment in accordance with Besam installation instructions. Adjust equipment per instructions and current **ANSI/BHMA** 156.10 American National Standard for Power Operated Pedestrian Doors. The power supply for these devices should be tied into Emergency or Standby Power when possible.

END OF SECTION

SECTION 08 71 53
ACCESS CONTROL SYSTEM
7/16/18

PART 1. GENERAL

1.0 SUMMARY

A. This section includes all labor and material associated with the alteration of the existing Smith Hall access control system to accommodate the replacement of existing aluminum entrances and storefronts as described herein and as shown on the Contract Drawings.

B. The work in this section includes the installation and connection of new door hardware and card access readers to the existing access control system. The existing access control system is a **BASIS ET 605** and is maintained by Stanley Security Solutions. The General Contractor for this project will be responsible for contacting Stanley Security Solutions, 8555 Henkles Lane, Annapolis Junction, Md. 20701, through their local Account Representative, Mr. Brian Piccolo, Phone (301) 725-4590, Fax (301) 725-6187, Mobile (410) 952-4978, to coordinate completion of the required work.

C. Related Sections:

1. Section 08410 – Aluminum Entrance and Storefront

2. Section 08710 – Finish Hardware

3. Section 08716 – Automatic Door Operators

1.1 SUBSTITUTIONS AND SUBMITTALS

A. Only products specified under Part II of this section are acceptable.

B. Product Data: Submit manufacturer's product data and standard details for Specified products.

C. Shop Drawings: Submit shop drawings for the fabrication and installation of the specified magnetic card access reader, reader interface module, magnetic door contact and associated components of the work. Include anchors, hardware and other components not included in manufacturer's standard data.

D. Operation and Maintenance Data: Submit manufacturer's spare parts list and owner's manual for each product.

1.2 QUALITY ASSURANCE

A. Stanley Security Solutions to install all products of this section and shall coordinate with the general contractor to connect and complete the required work. All work to be governed by applicable codes.

1.3 WARRANTY

A. Provide written two-year guaranty from all product manufacturers.

B. Warranty shall begin with substantial completion of the Project, not installation.

PART 2. PRODUCTS

2.0 MAGNETIC CARD READER

A. Magnetic Card Reader shall be the **BAS-2005**

B. Reader Interface Module shall be the **BAS-1320** Dual Reader Interface. The **BAS-1300** Single Reader Interface shall not be acceptable.

C. Magnetic Door Contact shall be the **GE Security Series 1078, 1078C, 1078CT** or approved equal.

D. Request to Exit Motion Detectors shall not be used. The electrified exit devices specified for this Project have Request To Exit switches installed which shall be used for this function.

PART 3. EXECUTION

3.0 INSTALLATION AND ADJUSTMENT

A. Wiring associated with the existing Magnetic Locks shall be reused to connect the new electrified exit devices to the appropriate system outputs. This will require the rearrangement of connections in the control cabinet and the rerouting of power supply feeds associated with the Magnetic Locks being removed.

B. Two locations require the addition of new Card Readers where currently only Magnetic Locks and Door Contacts are installed. The existing wiring supporting these devices can be reused. The door contacts will be replaced with new door contacts and the wiring supplying power to the existing magnetic locks shall be rearranged to supply control for the new electrified exit devices. Wiring for the new Card Readers is required.

C. Where accessible doors (ADA access) are involved, the card readers shall be arranged so that the operation of the door is inhibited when the access control system is locked. The use of a valid card shall allow the use of the accessible door when the building is secured.

END OF SECTION

SECTION 08 80 00
GLAZING
7/16/18

PART 1. GENERAL

1.0 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary General Conditions and Division I Specification Sections, apply to this Section.

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Aluminum Entrances and Storefronts.

1.2 RELATED SECTIONS

A. Section 08410 – Aluminum Entrance and Storefronts

B. Section 08710 – Finish Hardware

C. Section 08716 – Automatic Door Operators

D. Section 08720 – Access Control System

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating – glass unit that contains dehydrated air or a specified gas.

C. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, “Minimum Design Loads for Buildings and Other Structures “, Section 6.4.2, “Analytic Procedure”, based on heights above grade indicated on Drawings.

b. Specified Design Snow Loads: As indicated, but not less than snow loads applicable to Project, required by ASCE 7, “Minimum Design Loads for Buildings and Other Structures”: Section 7, “Snow Loads”.

c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

(1) Load Duration: 60 seconds or less.

d. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.

(1) For monolithic-glass lites heat treated to resist wind loads.
(2) For insulating glass.
(3) For laminated- glass lites.

e. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer’s published test data, as determined according to procedures indicated below:

1. For laminated–glass lites, properties are based on products of construction indicated.

2. For insulating- glass units, properties are based on units with lites 6 mm thick and a nominal ½ inch wide interspace.

3. Center of glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/sq. ft. X h X deg. F.

4. Center of Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.

5. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch-square Samples for glass.

1. Insulating glass for each designation indicated.

2. For each color (except black) of exposed glazing sealant indicated.

C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

E. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified

F. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:

1. Tinted float glass.

2. Insulating glass.

3. Glazing Sealants.

G. Warranties: Special warranties specified in this section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Clear Glass: Obtain clear float glass from one primary glass manufacturer.

C. Source Limitations for Tinted Glass: Obtain tinted, heat absorbing, and light reducing float glass from one primary glass manufacturer for each tint color indicated.

D. Source Limitations for Insulating Glass: Obtain insulating glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.

E. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

F. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

G. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to those publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines."

I. Insulating-Glass Certificate Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:

1. Insulating Glass Certification Council.
2. Associated Laboratories, Inc.
3. National Accreditation and Management Institute.

J. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division I Section "Project Meetings."

1.7 DELIVERY, HANDLING, AND STORAGE

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating glass units that will be exposed to substantial altitude changes, comply with insulating glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating glass manufacturer agreeing to furnish replacements for insulating units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2. PRODUCTS

2.0 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in schedules at the end of Part III.

2.1 INSULATING GLASS

A. Insulating Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating – Glass Schedule at the end of Part III.

1. Provide Kind HS (heat strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.

B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating – Glass Schedule at the end of Part III is nominal and the overall thickness of units is measured perpendicularly from outer surfaces of glass lites at unit's edge.

C. Sealing System: Dual seal, with primary and secondary sealants as follows:

1. Manufacturer's standard sealants.

D. Spacer Specifications: Manufacturer’s standard spacer material and construction.

1. Desiccant: Molecular sieve or silica gel, or blend of both.

2. Corner Construction: Manufacturer’s standard corner construction.

2.2 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of materials, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.3 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Grind smooth and polish exposed glass surfaces.

PART 3. EXECUTION

3.0 EXAMINATION

A. Examine framing glazing, with installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Presence and functioning of weeping system.

3. Minimum required face or edge clearances.

4. Effective sealing between joints of glass – framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.1 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.2 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish Substantial Date of Completion. Wash glass as recommended by glass manufacturer.

3.3 INSULATING – GLASS SCHEDULE

A. Low – E Insulating Glass (Exterior Storefront): Where glass of this designation is indicated, provide low-emissivity insulating glass units complying with the following:

1. Products: Available products include the following:

    a. Viracon Solarscreen 2000 Low-E, VE 3-2M.

2. Overall Unit Thickness and Thickness of Each Lite: 25 and 6 mm.

3. Interspace Content: Air.

4. Indoor Lite: Type I (transparent glass, flat), Class I (clear) float glass.

    a. Annealed, Kind FT (fully tempered), Condition C (other coated glass) where noted.

5. Outdoor Lite: Type I (transparent glass, flat) float glass.

   a. Class 2 (clear, heat absorbing, and light reducing).

   b. Annealed, Kind FT (fully tempered), Condition C (other coated glass) where noted.

6. Low-Emissivity Coating: Pyrolytic on third surface suspended in the interspace.

7. Visible Light Transmittance: 35%

8. Winter Nighttime U-Value: .29

9. Shading Coefficient: .27

10. Outdoor Visible Reflectance: 6%

11. Storefront glass in transoms above doors shall be tinted to match duronodic color of storefront and doors, and to mask door closers and operators.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES
7/16/18

PART 1. GENERAL

1.0 Summary

A. This section identifies standard framing and gypsum wallboard products to be used at Towson University. Products specified for framing are for conventional applications and do not include materials required for unusual or other specific purposes such as those dictated as a result of structural restrictions or acoustic requirements.

The consultant should be sure to include in the documents appropriate language concerning gypboard finishes. Visibility of undulations at vertical gypboard installations when natural or artificial light is cast on it should be avoided. The consultant should identify these areas of concern when determining class of finish and final paint colors and finish.

1.1 Project Conditions

A. The consultant should confirm with the owner what the HVAC conditions will be during construction. Where conditions dictate that the contractor provide supplemental or interim climate control to maintain the integrity of the product, or as demanded by the manufacturer, include such language in the specifications. In addition, verify and coordinate with the owner the availability and use of existing utilities for temporary climate control equipment.

1.2 Interior Wall Design

A. All walls should be typically constructed from floor to the deck above. Floor to ceiling is not a preferred application and should be avoided when possible. When new walls are required in existing construction, and a plenum ceiling exists, attempt to construct walls full height with transfer grills sized for HVAC requirements. When this method is not a practical approach, consult AEC for remedy.

B. Walls shall only be constructed of steel framing unless otherwise approved by AEC.

C. Walls with acoustic requirements should have full sound blankets the entire height of the wall.

D. Acoustical sealant should be applied at all perimeter joints.

PART 2. MATERIALS – TYPICAL MINIMUM REQUIREMENTS

2.0 Steel Framing for Walls and Partitions

A. ASTM C 645

B. Thickness: 20 ga.

C. Depth: 3-5/8"

D. Spacing: 16" o.c.

2.1 Steel Rigid Furring Channels

A. ASTM C 645

B. Hat shaped with depth and thickness as follows:

1. Thickness: 0.0329 inch or higher

2. Depth: 7/8"

2.2 Gypsum Board Products

A. Standard Installations – ASTM C 36 and as follows:

1. Dimensions: 1/2"x 48”x longest lengths available to minimize butt joints.

2. Fire Resistant - Rated assemblies:

a. Type "X"

b. Thickness: 5/8" or as required by code.

2.3 Sound Attenuation Blankets

A. Unfaced mineral fiber blanket comply with ASTM C 665 for Type I (without membrane facing)

PART 3. EXECUTION

3.0 The following are minimum installation standards for this section:

A. Steel Partition Framing

1. Provide bracing at lock locations

2. Provide double studs at all doorframe locations

3. Provide backer boards at <u>all</u> interior corners, vertically and horizontally

B. Metal Trim Corners

1. Plastic and vinyl trim is <u>not</u> acceptable.

2. Reveal type "J" beads, with exposed return flange, requiring no finishing compound (such as USG #400) are <u>not</u> acceptable in any location that remains visible upon completion of work. Specify, in lieu thereof, products similar to USG #200 or #800 series trim.

3. All corner beads are to be mechanically fastened.

C. Gypsum Board

1. Install gypsum board only in longest sections possible, with tapered edges horizontal.

2. Single piece vertical applications of gypsum board are acceptable in wall spaces under twelve (12') linear feet and within closed offices.

3. All gypsum board to be glued and mechanically fastened.

4. Neatly cut around wall outlets, switches and other devices that penetrate the face of the panel. Do not over cut and fill. Over cut panels will be rejected.

5. Sanding of finish gypsum board shall be done in a controlled environment. Where work is not remote and is adjacent to existing occupied spaces, the contractor shall thoroughly seal all doors, windows, cracks and HVAC systems to ensure <u>no</u> <u>dust</u> <u>migration</u>. The contractor is responsible for coordination of HVAC outages with FM during sanding operation.

6. No painting will be allowed until a dust free environment has been established. Gypboard face must be thoroughly cleaned prior to painting. Obtain the owners approval to complete the required painting tasks after the prime coat has been applied.

D. Finishes

1. All walls shall be Level 4 finish minimum. Higher level finishes may be required in some areas.

END OF SECTION

SECTION 09 30 13
CERAMIC TILE
7/16/18

PART 1. GENERAL

1.0 Summary

A. This section describes the minimum requirements for typical applications of ceramic tile. The university's preference is to have floor tile that will allow a matching or contrasting dark grout. Wall tile is typically lighter with matching grout color.

1.1 Quality Assurance

A. Work specified under this section shall be accomplished by qualified, skilled tradesmen who have continuously and successfully performed the required tasks for a minimum of five (5) years. In addition, the individual must have a thorough knowledge of acceptable substrate conditions and acceptable remedy for failed systems.

1.2 Consultant Subsurface Investigations

A. It is the responsibility of the consultant to thoroughly investigate existing substrate conditions prior to design. Where there is conflict between the university's drawings and a historical record of substrate conditions, field verify by selective demolition. In some circumstances, the university's in-house trades can accomplish minor work to verify substrate conditions.

B. Where existing substrate conditions are suspect in part or whole, include removal and replacement in the design. Patching is only acceptable where adjacent substrate is structurally sound and capable of maintaining a monolithic system when complete.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Only ceramic tile of the "Best Quality" shall be specified for use.

2.1 Ceramic tile colors are typically a neutral shade that would be adaptable to a variety of adjacent wall finish colors. Coordinate color selections with the owner early in the design phase.

2.2 Ceramic floor tile

A. Darker grouts are preferred.

B. Ceramic floor tile shall be "non-slip" surface only, where wet conditions exist. Provide manufacturers literature regarding coefficient and friction.

C. As a part of the ceramic floor tile system, provide marble thresholds at entrances. Thresholds to have proper tapers to conform with ADA Standards. Install widest thresholds for minimal rise.

D. Floor tile should be through body color.

2.3 Ceramic Wall Tile

A. Provide ceramic cove base, bull nose corners and Wainscot caps at appropriate locations.

2.4 Grout

A. Epoxy – Portland Cement Grout

1. Unsanded grout for joints 1/8" and less

2. Sanded grout for joints 1/8" and larger

PART 3. EXECUTION

3.0 Ceramic floor tile is typically placed in standard sheet supplied pattern. Alternative patterns are to be submitted to AEC office for approval during the Design Development Phase.

3.1 Wall tile is typically placed in stacked pattern.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS
7/16/18

PART 1. GENERAL

1.0 Summary

A. Most ceilings found at Towson University are the acoustical type specified in this section. For this reason, it is imperative that all new or renovated areas receive the type specified to maintain consistency. To maintain a higher level of sound attenuation and to have mechanical systems access, the consultant should refrain from specifying gypboard ceilings except in specific areas where an exception is appropriate.

1.1 Structural Investigations

A. Historically, the university has found that certain activities and programs within a building *may* affect the integrity of the new ceiling system. Buildings that allow dances or other large crowd activities may cause exceptional deflections in the support structure above the new ceiling. New ceilings in areas of excessive movement should be properly designed to provide adequate and long life support. Coordinate with AEC for the programmatic use of each facility.

1.2 Project Conditions

A. The consultant should confirm with the owner what the anticipated HVAC conditions would be during construction. Where conditions dictate that the contractor provide supplemental or interim climate control for tile installation, include such language in the specifications. In addition, verify and coordinate with the owner the use of existing utilities for temporary climate control equipment.

1.3 Fire Rated Ceilings

A. It is the consultant's responsibility to determine if the products identified herein are suitable and acceptable for the required fire rating. Where a conflict exists, coordinate with AEC for determination of an acceptable product.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Tile and Grid

A. All Spaces

1. Acceptable Tile No. 1 (for grid type no. 1)
2'x 2', USG - Eclipse Climaplus SLT

2. Acceptable Tile No. 2
2'x 2' Armstrong Cirrus – Beveled Tegular Edge # 584

3. Grid Type No. 1: USG Standard - 15/16" white

4. Grid Type No. 2: Armstrong Prelude XL 15/16” Reveal, white

2.1 Extra Stock

A. Provide 2% of the total tile amount installed as extra stock. Materials are to be delivered and stored in a location designated by the AEC office.

PART 3. EXECUTION

3.0 The following are minimum installation standards for this section:

A. Ceilings Tiles

1. Typically, equally spaced tiles with perimeter tile dimensions that are constant are preferred.

2. Tiles shall be neatly "cut in" at perimeters so that the cuts are not visible.

3. Provide drop in cuts at perimeters and all cut tiles.

4. Tiles damaged during installation must be replaced, not repaired (as with touch up paint).

B. Grid

1. Ceiling systems over 4,000 sq. ft. (assuming a single wall exceeds 60 lin. ft.) are to be installed utilizing a laser line technology.

2. Minimal length for power activated fasteners for suspension wires is 1" or better as required by the structural engineer.

3. The preferred method for attachment of suspension systems utilizes the existing structural system above ("I" Beams, etc.), where possible.

4. No exposed ″pop-rivets″ on grid are permitted without approval from the university’s project manager.

END OF SECTION

SUPPLEMENTAL INFORMATION

The following information is provided to supplement the construction standards contained in the previous section. This may include additional graphic information on products listed in the standards, or information on additional products or materials that have been used successfully on other campus projects, but may not be applicable to all projects. Consult with Facilities Management about the applicability of any particular products for specific projects.

CIRRUS®

Square Lay-in
medium texture

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 94%

CLOSED LOOP RECYCLED CONTENT
CEILING-2-CEILING™
HRC items contain 15% or greater post-consumer recycled ceilings

UP TO 86% RECYCLED CONTENT | EPD AVAILABLE

LEED® — acoustics, energy, daylight & views, indoor air quality, renewable materials, recycled content, waste mgmt, local* materials

Calculate LEED contribution at armstrong.com/greengenie *LOCATION DEPENDENT

$$ $$


Cirrus Square Lay-in with Prelude® 15/16" suspension system (Pg. 248)

KEY SELECTION ATTRIBUTES

- Refined visual
- Excellent sound absorption
- Ceiling-2-Ceiling™ Post-consumer Recycled Content options: Items 574HRC and 533HRC. 71% Pre-consumer; 15% Post-consumer
- 94% Biobased content (see page 331)

TYPICAL APPLICATIONS

- Offices
- Healthcare – Assists in addressing HIPAA and FGI acoustical requirements
- Conference rooms
- Lobbies
- Public spaces/areas
- Department stores/retail


Visit Armstrong.com Photo Gallery to view more installation photos
SEARCH: cirrus

COLOR

White

VISUAL SELECTION

PERFORMANCE Dots represent high level of performance.

Edge Profile	Susp. Dwg. Pgs. 273-277 armstrong.com/catdwgs	Item No.	Dimensions (Inches)	Acoustics NRC	Acoustics CAC	Fire Rating	Light Reflect	Anti-Mold & Mildew	Sag Resist	Certified Low VOC Emissions	Durability	Primary (Embodied) Energy	Recycled Content◆	Recycle Program	Warranty†
CIRRUS Square Lay-in				UL Classified				BioBlock+	Humi-Guard+			Below 11MJ/SF		Yes	No. of Years
15/16" Square Lay-in	1	**574** **574HRC**	24 x 24 x 3/4" 24 x 24 x 3/4"	0.70 •	35	Class A	0.86 •	•	•	•	Std	•	High	•	30
	1	**533** **533HRC**	24 x 48 x 3/4" 24 x 48 x 3/4"	0.70 •	35	Class A	0.86 •	•	Std	•	Std	•	High	•	10
	1	NEW **FastSize™**	W: 4" - 24" / L: 4" - 60" 3/4" Thick	0.70 •	35	Class A	0.86 •	•	Std	•	Std	•	High	•	10

SUSPENSION SYSTEMS

15/16"
Prelude®

PHYSICAL DATA

Material
Wet-formed mineral fiber

Surface Finish
Factory-applied latex paint

Fire Performance
ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less. (UL labeled)

ASTM E1264 Classification
Type III, Form 1, Pattern E I
Fire Class A

Sag Resistance
HumiGuard® Plus – superior resistance to sagging in high humidity conditions up to, but not including, standing water and outdoor applications. Excludes items 533, 533HRC, and large sizes.

Anti Mold/Mildew & Bacteria
BioBlock® Plus contains an anti-microbial treatment and provides guaranteed resistance against growth of mold/mildew and Gram-positive and Gram-negative odor/stain-causing bacteria for 30 years.

VOC Emissions
Third party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010. This standard is the guideline for low emissions in LEED, CalGreen Title 24, ANSI/ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol.

Primary (Embodied) Energy
See all LCA information on our EPD's.

High Recycled Content◆
Contains greater than 50% total recycled content. Total recycled content based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Insulation Value
R Factor – 1.9 (BTU units)
R Factor – 0.33 (Watts units)

30-Year Performance Guarantee & Warranty†
When installed with Armstrong Suspension System. Details at armstrong.com/warranty

Weight; Square Feet/Carton
533 – 1.21 lbs/SF; 48 SF/ctn
574 – 1.10 lbs/SF; 48 SF/ctn

Minimum Order Quantity
1 carton

Metric Items Available
574M, 533M – Metric items are subject to extended lead times and minimum quantities. Contact your representative for more details.

MINERAL FIBER

CIRRUS®

Tegular

medium texture

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 94%

10-YEAR Availability Items 584, 589

Cirrus Beveled Tegular with Suprafine® 9/16" suspension system (Pg. 266)

Visit Armstrong.com Photo Gallery to view more installation photos

SEARCH: cirrus

KEY SELECTION ATTRIBUTES

- Refined visual
- Excellent sound absorption
- Ceiling-2-Ceiling™ Post-consumer Recycled Content options: Items 589HRC, 539HRC, 584HRC, 535HRC. 71% Pre-consumer; 15% Post-consumer
- 94% Biobased content (see page 331)

TYPICAL APPLICATIONS

- Offices
- Healthcare – assists in addressing HIPAA and FGI acoustical requirements
- Conference rooms
- Lobbies
- Department stores/retail
- Public spaces/areas

COLOR SELECTION

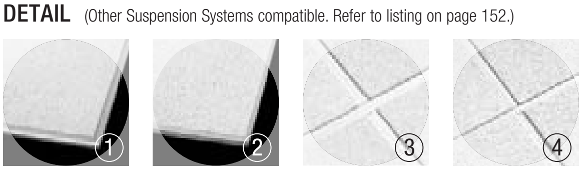
Due to printing limitations, shade may vary from actual product.

White (WH) | Cream (CR) | Haze (HA) | Camel (CM) | Platinum (PL)

Items 584, 589 are available in colors. All other items are available in White only. Colored ceilings are dye-lotted and should be segregated by dye lot. Do not mix.

DETAIL

(Other Suspension Systems compatible. Refer to listing on page 152.)



1. Cirrus Angled Tegular
2. Cirrus Beveled Tegular
3. Cirrus Angled Tegular with Prelude® 15/16" suspension system
4. Cirrus Beveled Tegular with Suprafine 9/16" suspension system

CIRRUS®
Tegular
medium texture

HRC items contain 15% or greater post-consumer recycled ceilings

CLOSED LOOP RECYCLED CONTENT
CEILING-2-CEILING™

UP TO 86% RECYCLED CONTENT

EPD AVAILABLE For select items only

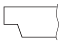
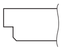
LEED® acoustics | energy | daylight & views | indoor air quality | renewable materials | recycled content | waste mgmt | local* materials

Calculate LEED contribution at armstrong.com/greengenie *LOCATION DEPENDENT

$$

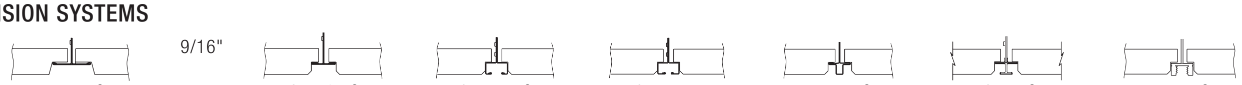
VISUAL SELECTION / PERFORMANCE

Dots represent high level of performance.

Edge Profile	Susp. Dwg. Pgs. 273-277 armstrong.com/catdwgs	Item No.	Dimensions (Inches)	Acoustics NRC	Acoustics CAC	Fire Rating	Light Reflect	Anti-Mold & Mildew	Sag Resist	Certified Low VOC Emissions	Durability	Primary (Embodied) Energy	Recycled Content◆	Recycle Program	Warranty†
CIRRUS Tegular				UL Classified				Bio-Block+	Humi-Guard+			Below 11MJ/SF		Yes	No. of Years
15/16" Angled Tegular	13	**584_ _◆◆** **584HRC** **584M**	24 x 24 x 3/4" 24 x 24 x 3/4" 600 x 600 x 19mm	0.70 •	35	Class A	0.86 •	•	•	•	Std	•	High High High	•	30
	13	**578**	24 x 24 x 3/4"	0.35	35	Fire Guard	0.86 •	•	•	–	Std	–	Std	•	30
	13	**534****	24 x 24 x 7/8"	0.70 •	38 •	Class A	0.86 •	•	•	–	Std	–	High	•	30
	13	**572****	24 x 24 x 7/8"	0.70 •	40 •	Class A	0.86 •	•	•	–	Std	–	High	•	30
	13	**581****	24 x 48 x 7/8"	0.70 •	40 •	Class A	0.86 •	•	Std	–	Std	–	High	•	10
	13	**535** **535HRC**	24 x 48 x 3/4" 24 x 48 x 3/4"	0.70 •	35	Class A	0.86 •	•	Std	•	Std	•	High High	•	10
	13	NEW **FastSize™**	W: 4" - 24" / L: 4" - 60" 3/4" thick	0.70 •	35	Class A	0.86 •	•	Std	•	Std	•	Std	•	10
9/16" Beveled Tegular	29, 44, 48, 52, 56, 60	**589_ _◆◆** **589HRC** **589M**	24 x 24 x 3/4" 24 x 24 x 3/4" 600 x 600 x 19mm	0.70 •	35	Class A	0.86 •	•	•	•	Std	•	High High High	•	30
	29, 44, 48, 52, 56, 60	**538****	24 x 24 x 7/8"	0.70 •	38 •	Class A	0.86 •	•	•	–	Std	–	High	•	30
	29, 44, 48, 52, 56, 60	**577**	24 x 24 x 3/4"	0.35	35	Fire Guard	0.86 •	•	•	–	Std	–	Std	•	30
	29, 44, 48, 52, 56, 60	**576****	24 x 24 x 7/8"	0.70 •	40 •	Class A	0.86 •	•	•	–	Std	–	High	•	30
	29, 44, 48, 52, 56, 60	**583****	24 x 48 x 7/8"	0.70 •	40 •	Class A	0.86 •	•	Std	–	Std	–	High	•	10
	29, 44, 48, 52, 56, 60	**539** **539HRC**	24 x 48 x 3/4" 24 x 48 x 3/4"	0.70 •	35	Class A	0.86 •	•	Std	•	Std	•	High High	•	10
	29, 44, 48, 52, 56, 60	NEW **FastSize™**	W: 4" - 24" / L: 4" - 60" 3/4" thick	0.70 •	35	Class A	0.86 •	•	Std	•	Std	•	Std	•	10

◆◆ Add 2-letter color suffix to item number when specifying or ordering (e.g., 584 C R).

SUSPENSION SYSTEMS



15/16": Prelude® / Prelude XL / Fire Guard

9/16": Suprafine® / Suprafine XL / Fire Guard; Silhouette® 1/4" Reveal; Silhouette 1/8" Reveal; Interlude®; Sonata®; Trimlok®

PHYSICAL DATA

Material
Wet-formed mineral fiber

Surface Finish
Factory-applied latex paint

Fire Performance
ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less. (UL labeled) Fire Guard™: A fire resistive ceiling when used in applicable UL assemblies

ASTM E1264 Classification
Type III, Form 1, Pattern E I
Fire Class A

Sag Resistance
HumiGuard® Plus – superior resistance to sagging in high humidity conditions up to, but not including, standing water and outdoor applications. Excludes items 535, 539, 581, 583.

Anti Mold/Mildew & Bacteria
BioBlock® Plus contains an anti-microbial treatment and provides guaranteed resistance against growth of mold/mildew and Gram-positive and Gram-negative odor/stain-causing bacteria for 30 years.

VOC Emissions
Third party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010. This standard is the guideline for low emissions in LEED, CalGreen Title 24, ANSI/ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol.

Primary (Embodied) Energy
See all LCA information on our EPD's.

High Recycled Content◆
Contains greater than 50% total recycled content. Total recycled content based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Insulation Value
R Factor – 1.9 (BTU units)
R Factor – 0.33 (Watts units)

30-Year Performance Guarantee & Warranty†
When installed with Armstrong Suspension System. Details at armstrong.com/warranty

Weight; Square Feet/Carton
534, 538, 572, 576 – 1.38 lbs/SF; 40 SF/ctn
535, 539, 581, 583 – 1.21 lbs/SF; 48 SF/ctn
577, 578 – 1.25 lbs/SF; 48 SF/ctn
584, 589 – 1.06 lbs/SF; 48 SF/ctn

Minimum Order Quantity
1 carton

Metric Items Available
584M, 578M, 534M, 572M, 581M, 535M, 589M, 538M, 577M, 576M, 583M, 539M – Metric items are subject to extended lead times and minimum quantities. Contact your representative for more details.

MINERAL FIBER

Armstrong®

Eclipse™ *ClimaPlus*™

10 **Year Availability**
76575, 76775, 76975, 78575, 78775

HRC **High Recycled Content**

Eclipse Panels with *ClimaPlus* Superior Performance/
Donn Fineline DXF™ Suspension System

LEED Credits
Total Recycled Content: 77% – 85%
LEED Recycled Content Contribution: 39% – 50%
ClimaPlus Superior Performance for Mold and Mildew

MR				EQ		
Waste Reduction[1]	Recycled Content	Regional Materials[2]	Rapidly Renewable Materials	Low-Emitting Materials	Daylight and Views	Acoustical Performance
●	●	●	●	●	●	●

Features and Benefits
- Elegant, fine-textured visual
- Excellent noise reduction (NRC - .70)
- Optional Firecode™ formulation
- Available in Optimized Recycled Content formulations to help maximize LEED recycled content contribution
- *ClimaPlus* 30-year lifetime system warranty against visible sag, mold and mildew

Applications
- Offices
- Conference Areas
- Healthcare – HIPAA Requirements
- Retail Stores

Substrate
- X-Technology mineral fiber

Fine-textured panel

To order samples, go to usg.com
See individual items for color availability.

White

Standard Colors

Parchment 103, Manila 246, Beige 142, Straw 143, Sandstone 090, Taupe 107, Silvertone 052, Mist 053

Eclipse™ *ClimaPlus*™

To order samples/literature:
– Web: usg.com
– E-mail: samplit@usg.com
– Fax: 888 874.2348
Technical Services: 800 USG.4YOU

Web Sites: usg.com
usgdesignstudio.com
sustainableceilings.com
seismicceilings.com

See usg.com for the most up-to-date product information.

30 Year System Warranty
– No visible sag
– Mold/mildew protection

Product	Edge	Panel Size	Class	Item No.	NRC (UL Classified)	CAC Min.[3] (UL Classified)	LR[4] (UL Classified)	Color	Grid Options	VOC[8] Emissions	Anti-Mold & Mildew	Recycled Content Total	PC	PI	LEED RC	Panel Cost
ECLIPSE *CLIMAPLUS* Panels	SQ	2'x2'x3/4"	Class A	76575	.70	35	.86	White	A, B, C	Low	●	77% HRC	0%	77%	39%	$$
		2'x2'x3/4"	Class A	76575HRC	.70	35	.85	White	A, B, C	Low	●	82% HRC	18%	64%	50%	$$
		2'x4'x3/4"	Class A	78575	.70	35	.86	White	A, B	Low	●	77% HRC	0%	77%	39%	$$
		2'x4'x3/4"	Class A	78575HRC	.70	35	.85	White	A, B	Low	●	82% HRC	18%	64%	50%	$$
	SLT	2'x2'x3/4"	Class A	76775	.70	35	.86	White	D	Low	●	77% HRC	0%	77%	39%	$$
		2'x2'x3/4"	Class A	76775HRC	.70	35	.85	White	D	Low	●	82% HRC	18%	64%	50%	$$
		600x600x19	Class A	ME76775	.70	35	.86	White	D	Low	●	77% HRC	0%	77%	39%	$$
		2'x2'x3/4"		76779	.60	35	.86	White	D	Low	●	62% HRC	0%	62%	31%	$$
		2'x4'x3/4"	Class A	78775	.70	35	.86	White	D	Low	●	77% HRC	0%	77%	39%	$$
		2'x4'x3/4"	Class A	78775HRC	.70	35	.85	White	D	Low	●	82% HRC	18%	64%	50%	$$
	FLB	2'x2'x3/4"	Class A	76975	.70	35	.86	White	E, F, G, J	Low	●	77% HRC	0%	77%	39%	$$
		2'x2'x3/4"	Class A	76975HRC	.70	35	.85	White	E, F, G, J	Low	●	82% HRC	18%	64%	50%	$$
		600x600x19	Class A	ME76975	.70	35	.86	White	E, F, G, J	Low	●	77% HRC	0%	77%	39%	$$
		2'x2'x3/4"		76975	.60	35	.86	White	F, I	Low	●	62% HRC	0%	62%	31%	$$
		2'x4'x3/4"	Class A	78975	.70	35	.86	White	E, F, G, J	Low	●	77% HRC	0%	77%	39%	$$
		2'x4'x3/4"	Class A	78975HRC	.70	35	.85	White	E, F, G, J	Low	●	82% HRC	18%	64%	50%	$$
ECLIPSE *CLIMAPLUS* Tile[7,8]	BESK	12"x12"x3/4"	Class A	70073	.60	40	.86	White	K	Low	●	77% HRC	0%	77%	39%	$$$$

Legend

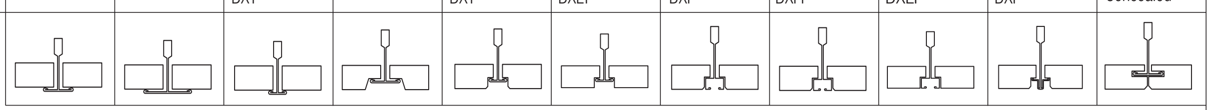
Low Emissions (VOC Class)
Classified as low-emitting per standards established by the Collaborative for High Performance Schools (CHPS), following California Specification 01350 testing methods.

***CLIMAPLUS* Superior Performance[9]**
Contains a broad-spectrum antimicrobial treatment on the face and back of the panel that provides guaranteed resistance against the growth of mold and mildew.

HRC High Recycled Content
Classified as containing greater than 50% total recycled content. Total recycled content is based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Grid Profile Options

A	B	C	D	E	F	G	H	I	J	K
DX®/DXL™	DXW™	CENTRICITEE™ DXT	DX/DXL	CENTRICITEE DXT	CENTRICITEE DXLT	FINELINE® DXF	FINELINE 1/8 DXFF	FINELINE DXLF	IDENTITEE™ DXI™	DX/DXL Concealed



Physical Data/ Footnotes

Product literature
Data sheet: SC1812

ASTM E1264 classification
Type III, Form 1, Pattern EI

ASTM E84 surface burning characteristics
Class A
Flame spread: 25
Smoke developed: 50

Imperial weight
.97 lb./sq. ft. (Class A panels and tile)
1.2 lb./sq. ft. (FIRECODE panels)

Metric weight
5.07 kg/m2 (Class A panels)

Thermal resistance
R-2.0 (Class A)
R-1.9 (FIRECODE)

Maximum backloading
See Warranty for details.

Maintenance
Can be cleaned easily with a soft brush or vacuum.

Footnotes
1. Applies when USG acoustical ceilings recycling program is utilized.
2. For details, see LEED report generator at usgdesignstudio.com.
3. Metric available in white only.
4. Fire-rated items: see UL design details.
5. LR values shown as averages.
6. See Colors selector for more information. Metric: white only.
7. Contact USG for adhesive recommendations for 12"x12" glue-up applications.
8. Not UL Classified for acoustics.
9. Panel face and back surfaces treated with a proprietary, broad-spectrum antimicrobial standard formulation that inhibits and retards the growth of mold and mildew. For details, see *Ceiling Systems Limited Warranty Commercial Applications* (SC2102) and *CLIMAPLUS Ceilings Certification of Performance* (SC2451).
10. No formaldehyde is added to any ingredient or during the manufacturing process for all mineral fiber acoustical ceiling products manufactured by USG Interiors, LLC.

SECTION 09 65 00
RESILIENT FLOORING
7/16/18

PART 1. GENERAL

1.0 Summary

A. Resilient flooring and carpet are the soft flooring products most used on campus. Sheet materials are typically not desirable and vinyl composition tile (VCT) has typically been the standard in the past. While the consultant is free to design spaces with non-standardized patterns, including field and border patterns, the manufacturer and types listed below should be considered for all classroom and non-executive office spaces. *All* products included in the design must meet the minimum criteria listed below.

B. Where new resilient flooring meets existing ceramic coved wall base, indicate method of terminations on the drawing with large-scale details.

C. Provide specific written methodology and drawings for vinyl cove base radius attachment. See Part 3 of this section.

1.1 Quality Assurance

A. Work specified under this section shall be accomplished by qualified, skilled tradesmen who have continuously and successfully performed the required tasks for a minimum of five (5) years.

1.2 Existing Asbestos Containing Materials

A. Some buildings at Towson University may have asbestos containing materials. In regards to this section, asbestos tile and mastic may exist throughout campus. This should be considered when preparing documents for new resilient flooring installation. The university maintains records of known existing ACM locations. The consultant should confirm those locations with the AEC office. Where tile or mastic is suspected, the material must be tested for ACM by the university's Environmental Health and Safety Office.

B. See Demolition under this section

1.3 Climate Control

A. The contractor is responsible for providing an installation environment in accordance with the manufacturers recommendations. Materials that are installed in an environment not acceptable to the manufacturer will be rejected and reinstalled at no cost to the owner.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Extra Stock

A. Specify not less than 5% for fewer than 100 sq. ft. and 3% for over 100 sq. ft. for each type, color, pattern and size installed.

2.1 Vinyl composition Tile (VCT)

A. Standard size and gauge for VCT is 12" x 12" x 1/8"

B. Manufacturer/Type:

1. Armstrong, Standard Excelon
2. Armstrong, Premium Excelon

2.2 Sub flooring/Underlayments

A. Specify underlayments over existing *wood* floors or sub floors as 1/4” smooth surfaced plywood. Masonite is not an acceptable underlayment.

2.3 Vinyl Cove Base

A. Vinyl Cove Base: 4" high, except where pre-existing conditions dictate a higher cove, coved over resilient flooring, toeless at carpet flooring. Colors selection from manufacturers standard range of colors.

PART 3. EXECUTION

3.0 Demolition

A. Contractor is responsible for removing all materials from campus as a result of demolition, including sub-flooring materials, <u>except for materials containing asbestos.</u>

B. Where asbestos containing materials are found to exist, coordinate with the owner for removal. All removals shall be accomplished by the university through the Environmental Health and Safety office. Include coordination in the documents to include persons responsible for removal, dates of removal and interface with the contractor.

3.1 Tile Installation

A. Preparation: Provide only sound substrate for VCT installation. Flash patch or solid fill voids and other irregularities prior to placement of underlayment. Where underlayment is installed, use a nailing pattern into sound substrate acceptable to the manufacturer, 6” o.c. minimum.

B. Typically, VCT is installed with the grain constant in one direction. Where the consultant desires a deviation from the normal, coordinate with the AEC office for acceptable alternative patterns.

3.2 Vinyl Cove Base

A. Proper installation of vinyl cove base is critical to a complete and acceptable flooring project. Use only best methods for attachment.

1. Do not use nails or other fasteners for temporary or permanent attachment.

2. Do not apply vinyl cove base over unsound substrate.

3. Provide temporary bracing as required until mastic is fully set and support vinyl cove base in its intended position.

4. Apply mastic in neat uniform beads using a notched spreader as recommended by the manufacturer. Do not allow mastic to "bleed- out." Use a hand roller to roll out the base, working in the direction of the next joint.

5. For projects requiring in excess of 100 lin. ft. use only continuous roll materials.

6. For outside corners: Mark the base where the corner will be positioned. Shave a strip approximately ¼" wide and ¼ the thickness from the back of the base where the corner is marked. Use a solvent based contact adhesive 4" in each direction away from the corner to provide maximum adhesion.

END OF SECTION

SECTION 09 68 00
CARPET
7/16/18

PART 1. GENERAL

1.0 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division I Specification Sections, apply to this Section.

1.1 Summary

A. This Section includes the following:

1. Broadloom Carpet

2. Carpet Tile

B. Related Sections include the following:

1. Division 2 Section “Selective Demolition” for removing existing floor coverings

1.2 Submittals

A. Product Data: For each type of product indicated, Include manufacturer’s written data on physical characteristics, durability and fade resistance. Include installation recommendations for each type of substrate required.

B. Seaming Plan: Towson University requires a seaming plan for all broadloom carpet to be installed. No carpet shall be installed without approval of that plan by the Project Manager in charge.

C. For carpet tiles a mock up shall be installed that is not less than 12’ x 12’ for approval prior to proceeding with full installation. The mock up shall confirm the orientation and layout of carpet tiles.

D. Samples: For each of the following products. Label each sample with the manufacturer’s name, material description, color, pattern, and designation indicated on the drawings and schedules.

1. Broadloom Carpet: 36 inch square sample.

2. Carpet Tile: Provide a minimum of 4 full size carpet tiles.

3. Transition strips: Provide a 12” sample of each type specified or required.

E. Source Quality Control

1. Manufacturer shall be an integrated mill (tufting, dyeing and backing in house) with a formal Quality Improvement Process or equivalent quality initiative in operation. Manufacturer shall provide verification when requested.

2. Manufacturer shall be a member of the Carpet and Rug Institute (CRI) and specified product shall comply with the CRI's Indoor air Quality Testing Program (Green label).

3. Testing

a. Carpet supplier shall furnish test results by an independent testing laboratory made for each of the performance criteria listed herein.

b. The owner, at his option, may request additional tests from an independent test lab at his own expense on any portion of furnished fabric for conformance with his criteria.

c. Tests, if ordered, shall be at the expense of the owner if material is in compliance with this section. If material is not in compliance with this section, the carpet supplier shall bear testing costs.

1.3 Quality Assurance

A. Work specified under this section shall be accomplished by qualified, skilled tradesmen who have continuously and successfully performed commercial carpet installation for a minimum of five (5) years.

B. Qualifications of Installers: All work shall be done by installation firms specializing in commercial carpet installation. The preferred contractor shall be a member of the Floor Covering Installation Contractors Association (FCICA) or certified by the Floor Covering Installation Board (FCIB).

C. Carpet manufacturer shall certify by register and roll numbers that carpet shipped for this project complies with all requirements of this section subject to normal manufacturing tolerances. Only materials with the same dye lot number will be accepted.

1.4 Mock Up

A. As a condition of bidding, and where multiple rooms are slated to be installed, the university *may* require a room mock up of all potential qualified carpets. The sample will be approximately 12' x 12' and may be required prior to selection of the successful carpet supplier. *Verify this requirement with the Owner prior to bidding.*

1.5 Project Conditions

A. General: Comply with CRI 104, Section 6.1, “Site Conditions; Temperature and Humidity.”

B. Environmental Conditions: Do not install carpet until wet work in the space is completely dry and ambient temperatures and humidity conditions are maintained at the levels required by the manufacturer.

1.6 Warranty

A. Provide a written warranty by the carpet manufacturer agreeing to replace carpet that does not comply with the requirements or for product that fails within the specified warranty period. Warranty *does not* include failure due to unusual traffic, failure of the substrate, vandalism or abuse. Failures do include, but are not limited to more than 10 percent loss of face fiber, edge raveling and snags.

1. Minimum warranty period: 10 years from acceptance of installation by the Owner.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 General

A. Following is performance data to be considered as a basis of design for a typical application at Towson University. Upgrades or exceptions may be required for specific applications. Coordinate requirement with the owner.

1. CLASSROOMS, FACULTY/STAFF LOCATIONS

a.	Pile Fiber	100% 6.6 Branded Nylon
b.	Yarn Construction	Bulked Continuous Filament
c.	Dye Method	Solution or Piece as required
d.	Manufacturing Process	Tufted
e.	Pile Surface	Dense Loop
f.	Gauge	1/10 or better
g.	Tufted Stitches Per Inch	9 minimum
h.	Tufted Yarn Weight	22 oz./SY min typical
i.	Special Treatment	Flourochemical
j.	Backing System	Life Span or approved equal

k.	Static Generation	3.0 kv or less (AATCC-134)
l.	Width	12 ft. for broadloom; 24” minimum for carpet tiles
m.	Flammability Rating	
	a. Flooring Radiant Panel	Class I (ASTM E 648)
	b. NBS Aminco Smoke	450 or less (ASTM E 662 Flaming Mode)
n.	Lightfastness	Rating of not less than 3 on International Grey Scale after 300 SFU’s (AATCC Test Method 16E0)
o.	Crockfastness	Minimum stain rating on International Grey Scale of not less than 4 wet and dry (AATCC Test Method 165)
p.	Colors	As selected from manufacturer’s standard color palette.

2. RESIDENTIAL FACILITIES

2.1 HYBRID TUFTED SHEET CARPETING WITH CUSHION

A. Description: A heterogenous construction of nylon and closed-cell cushion fused together.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Tandus Powerbond Ethos, or approved equal.

B. Color, Style and Pattern: As indicated on Drawings

C. Fiber to contain carbon-core filament for permanent static-control

D. Fiber Content: 100 percent nylon 6, 6.

E. Pile Characteristic: Level-loop pile.

F. Primary Backing: Nonwoven, polypropylene or polyester with recycled content

G. Secondary Backing: Recycled PVB closed cell polymer

1. Compression Force Deflection at 65 Percent: 29 lbs/sq.in. according to ASTM D 3574.
2. Thickness: 0.10 inch (2.5mm)
3. Density: 32 lbs/cu.ft.

H. Roll Width: 6 feet (1.8 m).

I. Total Product Weight (range): 85.0 to 101.0

J. Applied Treatments:

1. Applied Soil-Resistance Treatment: Manufacturer's standard material.
2. Antimicrobial Treatment: Manufacturer's standard material.

a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

K. Performance Characteristics: SHEET CARPETING

1. Sustainable Product Certification: Gold level certification according to ANSI/NSF 140.
2. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" testing program.
3. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
4. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
5. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
6. Tuft Bind: Not less than 6.2 lbf (28 N) according to ASTM D 1335.
7. Delamination: Not less than 3.5 lbf/in. (0.6 N/mm) according to ASTM D 3936.
8. Noise Reduction Coefficient (NRC): 0.20 according to ASTM C 423.
9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
10. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
11. Electrostatic Propensity: Less than 3 kV according to AATCC 134.

2.1 Accessories

A. Leveling and Patching Compounds: Latex modified, hydraulic cement based formulation provided by the carpet manufacturer.

B. Adhesives: Water resistant, mildew resistant, non-staining type to suit products and the existing substrate conditions that comply with flammability requirements for the proposed carpet and as recommended by the carpet manufacturer.

C. Seaming Cement: Hot melt adhesive tape or similar product recommended by the carpet manufacturer for taping seams and butting cut edges at backing to form secure seams.

D. Carpet Edge Molding: Extruded heavy duty vinyl carpet edge (minimum 2” wide) of the size and profile needed to protect the carpet and provide a smooth transition to the adjacent flooring.

PART 3. EXECUTION

3.0 Existing Conditions

A. Examine substrates to ensure they meet requirements for maximum tolerances for moisture content, ph range and other conditions that can affect the carpet installation.

B. Concrete: Verify that concrete slabs are compliant with ASTM F 710 and the following:

1. Slab is dry and free of curing compounds, sealers, hardeners and other materials that may not provide a permanent adhesive bond. Perform adhesive test as recommended by the manufacturer.

3.1 Preparation

A. General: Comply with CRI 104, Section 6.2, “Site Conditions; Floor Preparation”, and carpet manufacturer’s written installation instructions for preparing substrates indicated to receive carpet installation.

B. Use trowelable leveling and patching compounds, according to manufacturer’s written instructions, to fill cracks, holes, and depression in substrates.

C. Remove coatings, including curing compounds, and other substrates that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the following :

1. Carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

A. When using Direct-Glue-Down Installation: Comply with CRI 104, Section 8, “Direct Glue-Down Installation”.

B. Comply with carpet manufacturer’s written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

1. Level adjoining border edges.

C. Do not bridge building expansion joints with carpet.

D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

E. Extend carpet into spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use non-permanent, non-staining marking device.

G. Install pattern parallel to walls and borders.

H. Carpet to be installed in one direction. That direction is to be consistent on each floor.

3.3 Damage

A. Any damage done to paint, walls, woodwork, floors, and/or similar finishes as a result of this work, shall be the responsibility of the carpet contractor.

B. Required repairs shall be made by the proper trade contracted on the work for this project, who shall make the necessary repairs and shall be paid by the carpet subcontractor for the repair work.

3.4 Cleaning and Protection

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.

2. Remove yarns that protrude from carpet surface.

3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 15, “Protection of Indoor Installations”.

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

3.5 Extra Stock

A. Upon completion of installation, deliver a minimum of 5% of each type, color, and pattern of carpet, exclusive of material required to properly complete installation or of usable pieces described previously in this section.

B. Furnish accessory components as required

C. Furnish replacement materials from the same production runs as installed materials

D. Package replacement materials with protective covering with identifying labels

END OF SECTION

SECTION 09 90 00
PAINTING
7/16/18

PART 1. GENERAL

1.0 Summary

A. The university, through its in-house paint shop, has established paint standards as listed below, for each application. For other applications not provided in this section, coordinate with AEC for approved products.

1.1 Project Conditions

A. The consultant should confirm with the owner what the HVAC conditions will be during construction. Where conditions dictate that the contractor provide supplemental or interim climate control, include such language in the specifications. In addition, verify and coordinate with the owner the use of existing utilities for temporary climate control equipment.

1.2 Finishes

A. The consultant is responsible for determining the right paint for the right application (i.e. ferrous metals, gypboard assemblies). Areas that receive large amounts of sunlight should be given special consideration to minimize irregularities in the wall finish.

1.3 Low Odor Paint

A. Where painting is required in an occupied building, use only low odor paint as specified below.

1.2 Warranty

A. All paint materials and workmanship are subject to the Towson University standard 2-year (24 months) period from the date of final acceptance as noted in Towson University Standard General Conditions.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Following this section is a complete Towson University paint schedule. This schedule does not prohibit the use of other paint types required for a specific use by the consultant. However, finishes other than those shown here must be approved in advance of design by the director of Architecture, Engineering and Construction.

2.1 Colors

A. A list of 25 standard colors are on file in the Facilities Management department. These standard colors are generally the *preferred* colors used throughout the campus. This <u>does not</u> exclude the use of other colors as may be appropriate for a specific project.

2.2 Materials

A. Low Odor Paint – Duron Genesis odor free paint or equal.

PART 3. EXECUTION

3.0 Controlled Climate Environment

A. All painting, regardless of type, shall be accomplished in a controlled climate environment. Where work is not remote and is adjacent to existing occupied spaces, the contractor shall thoroughly seal all doors, windows, cracks and HVAC systems during the painting process.

B. All areas slated to be painted shall be ventilated to the outside using mechanical means (i.e. fans, ventilators, exhausters.) The contractor shall submit, in detail, plans for properly ventilating the space to AEC as part of the submission requirements of the contract.

3.1 Finish

A. All walls and ceilings, new or existing shall receive at least two *finish* coats of the specified paint.

B. Apply paint using brushes and rollers of high quality grade and as appropriate for the task. <u>DO NOT THIN PAINT</u>. Lap marks, holidays, sags, brush marks, runs and other imperfections in the paint application will not be accepted.

3.2 Protection

A. The paint contractor is responsible for protection of all adjacent surfaces. The contractor shall at all times protect those surfaces with approved materials.

B. Protection of horizontal surfaces must utilize materials that will not cause tripping hazards. When providing floor protection in areas being used by the public, temporarily tape drop cloths and paper sheet to the flooring.

C. When working in areas of electronic equipment, especially computers, make provisions for complete protection including shutting down or relocation of equipment if possible.

D. Provide adequate “Wet Paint” signs. When possible, provide “Caution” taped areas to avoid interference with the paint operation.

3.3 Clean Up

A. The paint contractor is responsible for a complete and thorough clean up of the areas and items painted. Over paint, splatter and spills will be completely removed prior to inspection of the work.

END OF SECTION

SECTION 10170
PLASTIC TOILET PARTITIONS/SOLID SURFACE PRODUCTS
8/01/13

PART 1. GENERAL

1.0 Summary

A. Until recently, the university has specified metal and phenolic materials for toilet partition systems. These systems have proven to be somewhat vandal-resistant, but not vandal-proof. The new systems specified under this section have to date stood up to the punishment incurred in the university's academic facilities. For this reason, exceptions to the products listed below should be pre-approved.

B. Only solid surface products similar to those specified here are to be specified for use as lavatory, vanity top and other adjacent sanitary tops.

1.1 Submittals

A. Specify required submittals under this section to include:

1. Shop drawings in sufficient detail to show fabrication, installation, anchorage and interface of the work of this section with the work of adjacent trades.

2. Manufacturer's written installation procedures.

3. HDP toilet partition product samples of each color or texture required. Samples shall be as supplied by the manufacture, 4" x 4".

1.2 ADA Compliance

A. All toilet room design shall be accomplished utilizing the most current and stringent of ADA regulations and rules. Where structural members cannot be changed to accommodate acceptable compliance design, notify the owner to discuss acceptable alternative methods.

1.3 Support Systems

A. Where horizontal solid surface products such as counters and lavatory tops are to be constructed, use like materials for support in accordance with the manufacturers recommended designs or constructed using HDP products to match adjacent toilet partitions. The consultant should design for worse case abuse when considering structural supports for these materials.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Toilet Partitions

A. Where all new construction is proposed, or where total renovations of a toilet room or other space that required toilet partitions exists, install only the following products.

1. High Density Polyethylene (HDPE) panels – floor mounted.

2. Technical data requirements are based on Santana HDPE products and components.

A. Associated components and fasteners *not* specified by the manufacturers shall be of the best quality.

B. Urinal screens, shower compartments, dressing compartments

1. Where urinal screens, shower compartments or dressing compartments are required, specify products of the same type as the toilet partitions.

2.1 Solid Surface Materials

A. Lavatories, vanity and countertops are to be one-piece monolithic design with integral bowls and splashes in locations as required by the architect.

B. Solid surface products to be Corian, as manufactured by Dupont, or equal.

PART 3. EXECUTION

3.0 Installations

A. Installation procedures shall be based on manufacturers written recommended installation procedures.

3.1 Renovation Work

A. When renovating existing toilet rooms is slated, include repair of existing floor and wall surfaces in the documents. Repairs include any wall and floor surface affected by the work and shall match the existing surface in color, texture and size.

3.2 Clean Up

A. The contractor is responsible for thoroughly cleaning all components of the installed products and any adjacent surfaces affected by the installation. Do not leave pencil marks.

END OF SECTION

SECTION 10 14 00
SIGNAGE
7/16/18

PART 1. GENERAL

1.0 Summary

A. The Towson University campus signage standards have been established to ensure a consistent level of identification which is familiar and readily recognizable in all buildings, and to ensure a quality which is appropriate for the institutions' image. As such, the standards utilized are thought to be neither too elaborate nor modish; insubstantial or inadequate. Consistency is to be maintained throughout all facilities and is to be modified in part only as necessary for coordination with local conditions, as approved by FM.

B. Signage systems are customarily installed as part of a capital improvement or facilities renewal project. A new or renovated building will be fitted with a new signage system, and renovation of a single floor or a large department may require a new signage system. However, a single suite or room renovation requiring new signage is provided with signs which match the remainder of the building. Changes on directories and individual signs match the system within the building.

Signage systems design shall be in accordance with the Towson University Interior Sign Program, the individual building program, and include building identification, room identification, directory and way-finding systems. Certain building programs may have requirements for additional exterior signage including ADA required signage. If the design program is nonspecific to these requirements, then the requirements shall be developed in conjunction with the Department of Facilities Management. The proposed color of interior signs and directories shall be consistent with these standards and shall be submitted for approval with the interior design materials and colors submittal. Variations of the standards shall be developed with the Facilities Planning department.

1.1 Towson University Brand Mark Standards

A. Towson University’s "Brand Mark Standards" are available for review through FM. The sign design should be developed in stages coordinating with FM and the Facilities Planning department.

1.2 Interior and Exterior Sign Standards

A. See Appendix B for Towson University’s Interior Sign standards.

END OF SECTION

SECTION 10 28 13
TOILET ROOM ACCESSORIES
10/10/18

PART 1. GENERAL

1.0 Summary

A. Towson University has generally standardized toilet room accessories campus wide. This has been accomplished by use of a single source housekeeping vendor under contract with the university. Through the Housekeeping Contract, the vendor supplies certain toilet room accessories as listed in Part 2. Products of this section. The consultant/contractor should be familiar with the products listed and properly plan for their inclusion with the project design. The contractor may find economy in purchasing these products through the university's vendor. Contact the AEC representative for contact.

1.1 Related Sections

A. All drawings and general provisions of the contract including General and Supplemental General Conditions, Division 1 and other documents sections required for interface with this section.

1.2 Submittals

A. Specify required submittals under this section to include:

1. Shop drawings in sufficient detail to show fabrication, installation, anchorage and interface of the work of this section with the work of adjacent trades

2. Manufacturers written installation procedures

3. Provide manufacturers written product data showing compliance with the requirements specified under this section

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Following are products standard for use under this section. Some products listed <u>may</u> be proprietary and are indicated with a <u>bullet</u>. Other products listed are shown as performance criteria only.

2.1 Owner Supplied Accessories

The following products will be supplied by the university unless otherwise directed by the Department of Facilities Management. The products listed <u>are</u> proprietary and shall be included in the documents, but noted as "owner supplied". All installations are to be accomplished by the contractor. The consultant should consider these proprietary products when associating other products <u>not</u> supplied by the owner.

A. Paper Towel Dispenser

1. Manufacturer: Torkmatic

2. Model: Generation II

B. Toilet Paper Dispenser

1. Manufacturer: Kimberly Clark

2. Model: JRT Jr. Escort In Sight or
   Model: JRT Jr. In Sight Twin Jumbo

C. Wall Mounted Soap Dispenser

1. Manufacturer: GOJO

2. Model: FMX-12 Dispenser 1250 ML

D. Toiler Seat Cover Dispenser

1. Manufacturer: Kimberly Clark

2. Model: Health Guards Toilet Seat Cover Dispenser

2.2 Other Accessories

A. Grab Bars

1. Material: 1 1/2" diameter, satin texture stainless steel

2. Construction: Concealed plates with no exposed fasteners

3. Length: As required by ADA

4. Weight requirements and configuration as dictated by ADA

B. Soap Dish (When Required)

1. Material: Heavy gage stainless steel

2. Construction: Seamless

3. Mounting: Recessed

C. Paper Towel Disposal

1. Material: 22-gauge stainless steel

2. Construction: Same as "a" above

3. Capacity: 5.75 gal. minimum

Note: Combination units with "a" or "b" above are acceptable

D. Feminine Napkins Disposal

1. Material: Stainless steel
2. Construction: Welded, self-closing doors secured with full-length stainless steel piano hinges; tumbler locks
3. Mounting: Recessed

E. Towel/Robe Hook

1. Material: Heavy gauge stainless steel
2. Construction: Concealed wall plate, no exposed fasteners

F. Shelf

1. Material: Heavy gauge stainless steel, projects 8 inches from wall
2. Construction: Rolled formed edges; concealed mounting
3. Mounting: Surface

G. Framed Mirror

1. Material: ¼ inch clear polished plate mirror with 20-gauge galvanized steel back and stainless steel retainer angle
2. Mounting: Concealed wall hanger and theft resistant locking screws
3. Size: 18 inches wide x 24 inches high

H. Shower Rod and Hooks

1. Material: 18-gauge, 1-1/4 inch diameter, stainless steel tubing
2. Mounting: 2-1/2 inch square flange

I. Shower Curtain

1. Material: 8 mil white vinyl, opaque with heat sealed grommets
2. Size: Variable
3. Mildew resistant

J. Electric Hand Dryers – Basis of Design

1. Dyson Airblade V

2. EcoDri Automatic Hand Dryer by Workplace Essentials

PART 3 EXECUTION

3.0 Installations

A. ***<u>All</u>*** installations are to be accomplished by the contractor, regardless of the source of supply.

B. Installations to be in accordance with manufacturers written instructions.

END OF SECTION

Tork Matic® Hand Towel Dispenser - In-wall Recessed

Article	461023
Material	Metal/Plastic
System	H1 - Hand towel roll system
Height	20.6 in
Width	17.6 in
Depth	7.9 in
Color	Stainless

The In-Wall Recessed Tork Matic® Hand Towel Dispenser in beautiful stainless steel can be mounted directly into your wall. Get excellent function and reduced towel consumption with one-at-a-time dispensing, while giving your guests a hygienic, no-touch hand drying experience. Part of the Tork Image Design™ line.

www.torkusa.com

High capacity serves more customers with fewer rolls. Viewing windows make it easy to see when to refill. Intuitive refilling saves time. Semi-recessed design is ADA compliant.

Shipping data

	Consumer unit	Transport unit	Pallet
SCC	10073286631234	10073286631234	7322540872279
Items	1	1	0
Consumer units	-	1	0
Height	-	14 in	84 in
Width	-	19.4 in	39 in
Length	-	23.4 in	47 in
Volume	-	3.7 ft3	89 ft3
Net weight	-	14.1 lb	-
Gross weight	-	20.7 lb	-
Packing material	Box	Carton	-

Refill Options

Tork Advanced Matic® Hand Towel Roll, 1-Ply **290089**

Tork Premium Soft Matic® Hand Towel Roll, 2-Ply **290096**

Alternative products

771828

771820

461002

Contact

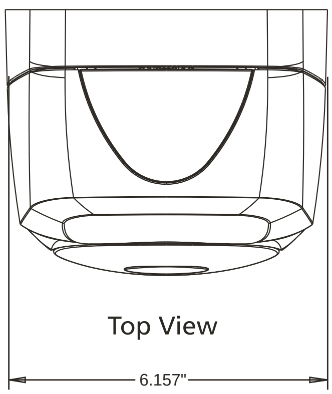
Essity Professional Hygiene North America LLC

Cira Centre, Suite 2600
2929 Arch Street
Philadelphia, PA 19104

Phone: (866-722-8675)

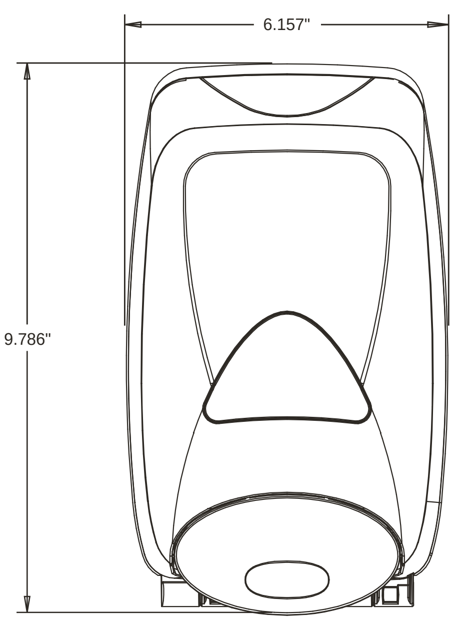
GOJO FMX-12™ DISPENSER DIMENSIONS

These dimensions apply to GOJO®, PURELL®, PROVON® and MICRELL® brand FMX-12 dispensers.

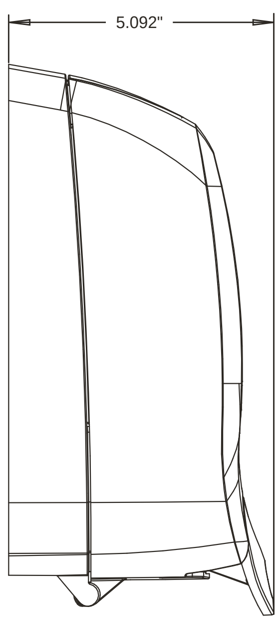


Top View

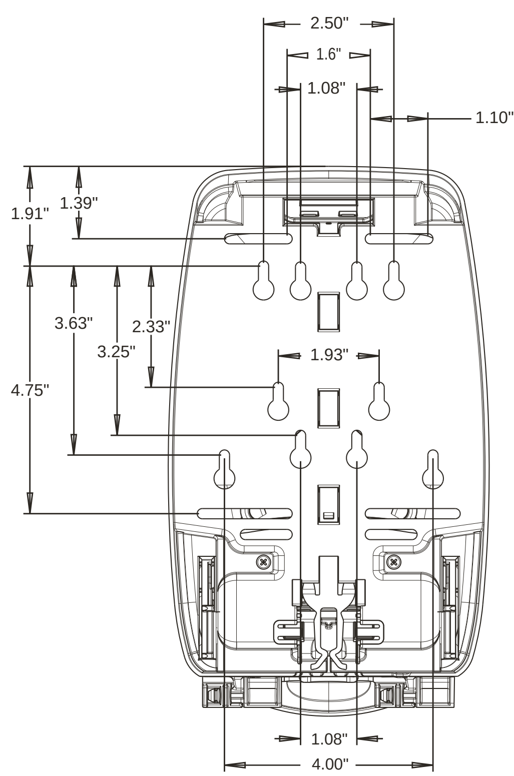
Use the dimensions provided to ensure adequate wall spacing and clearance for the unit.



Front View



Side View



Back View

GOJO Industries, Inc.
One GOJO Plaza, Suite 500
P.O. Box 991 • Akron, OH 44309-0991
Tel: 1-330-255-6000 • Toll-free: 1-800-321-9647
Fax: 1-800-FAX-GOJO

SECTION 32 46 00
BUS SHELTERS
7/16/18

PART 1. GENERAL

1.0 Summary

A. Where shelters of the type described herein are part of the program, verify the preferred locations and vehicle/pedestrian approach with the university representatives prior to final location determination.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Use only the products/manufacturer as described in this section.

2.1 Bus Shelters

A. Manufacturer: Brasco International

B. Features:

1. Black anodized aluminum structures – three sided
2. 1/4" Clear tempered safety glass
3. Barrel vault style roof, black with fascia and integral gutter
4. Two schedule holders
5. Full-length aluminum bench with backrest
6. 4' fluorescent light fixture with CW ballast and photocell

C. Standard Size: 6’ x 9’

2.2 For further information on these products, go to http://www.brasco.com/

END OF SECTION

SECTION 28 16 00
SECURITY ACCESS AND SURVEILLANCE
7/16/18

PART 1. GENERAL

1.0 Summary: Towson University requires all new building construction, including additions and renovations, to have s*ecurity access systems* for perimeter entrances.

All new buildings considered for *surveillance systems* will be identified during the *Programming Phase* of design.

Towson University is always in the process of identifying the requirements and needs of interfaced proximity cards, specifically for use by people with disabilities. Consult Towson University for current requirements when designing security access systems.

1.1 Quality Assurance

A. The products and manufacturers specified below are proprietary. Use only the products and associated components from the manufacturer shown. Where components of other manufacturers are capable of interface with the specified systems specified below, consult the university for acceptance of that product.

1.2 Security Access Systems

A. Existing Access Systems Overview

At the present, two independent security access systems are deployed throughout the campus. The first system is the Auxiliary Services system. This system is controlled by a server located in the Burkshire.

The second system is dedicated to academic and administrative facilities and will be hereafter referred to as the “Administrative” system to differentiate it from the Auxiliary Services system. The system is controlled by a server located in the University Police’s Communication Center in General Services.

Communications between all devices, e.g., workstations, controllers, readers, etc., is handled via TCP/IP over Ethernet using a dedicated portion of the campus-wide data network.

B. Existing Access System Software

Both the Auxiliary and the Administrative Systems use software manufactured by Lenel Systems International, Inc., specifically Lenel OnGuard 2000 Access Control.

Because the systems were separately designed and installed, the software version and licensing differs between the two. The Auxiliary System is running OnGuard 2000, Revision 5.8.211 with a license for 128 card readers, while the Administrative System is running OnGuard 2000, Revision 5.8.405 with a license for only 64 card readers. Both systems are using MicroSoft SQL Server 7.0 as an operating system.

1.3 Surveillance Systems (Security Cameras)

A. Camera Deployment

Camera locations will be selected based on input from Towson University Office of Public Safety and Facilities Management considering: (1) operational outcome desired; (2) type of equipment to be used, and (3) infrastructure and maintenance costs and budget constraints.

The following general locations and operational guidelines may be considered:

Building Interiors

1. Located at building entrances

2. Placement and lens selection to capture full body height images of persons entering and exiting entrances (2 cameras) with ability to discern facial features of individuals for identification purposes through digital zoom

3. Fixed camera versus pan-tilt-zoom in most cases as the economical selection

4. Camera able to adjust to varying lighting and backlighting situations

5. Camera in vandal-proof housing and mounted in ceiling vs. wall

General Grounds and Building Exteriors

1. Located on building roof edges or off structures with a wide-angle perspective and a view distance from close in to distant
2. Placement of cameras to observe events or persons in the context of a large area view
3. Pan-tilt-zoom cameras versus fixed lens cameras to give the capability of an observer to specifically direct the camera to a specific location/person or to use an automatic sweeping pattern of surveillance
4. Locations selected and cameras mounted in a location and manner that will allow easy access for maintenance activities

Parking Garages

1. Located at garage vehicle entrances, pedestrian entrances, and in proximity of emergency phones

2. Placement and lens selection at garage vehicle entrances to capture video images of vehicles entering and departing garage entrances (2 cameras), specifically driver and front passenger images, and license plate. Cameras shall be fixed lens type.

3. Placement and lens selection at garage pedestrian entrances to capture full body images of persons entering and leaving garage with ability to discern facial features of individuals for identification purposes through digital zoom; Cameras shall be fixed lens type.

4. Placement and lens selection at locations in proximity of emergency phones to be able to view individual using emergency phone; Cameras shall be pan-tilt-zoom type and optimally placed to survey more than one emergency phone in a general area to save equipment costs; Video software shall be integrated with emergency phone so that camera is programmed to fix on person/phone once alert is activated.

B. Systems Infrastructure

1. General Overview - Camera systems within buildings and structures will consist of analog video capture transmitting over coaxial cable back to a building central Digital Video Recorder (DVR). The DVR shall be connected to the campus network for remote access from any network computer.

2. Cabling Infrastructure - Power wiring and data cable must be run in electrical metal tubing (EMT) where cabling must be run in inaccessible walls, ceilings, floors, etc. Otherwise, data cabling and low voltage cable may be plenum-rated and placed in cable trays. A hybrid cable with conductors carrying both low voltage power and data may be used. Data cable shall be Category 5. Cabling shall terminate in junction boxes shall be concealed within walls and above ceilings in the general vicinity of the final camera installation at approximately 10-feet above finished floor. Where ceilings are hard surfaces (not lay-in acoustical type), a 12-inch square access door shall be provided in the ceiling. The conduit installation shall be done in accordance with Division 16 specifications covering electrical conduit installation for electrical wiring and reflected on as-built drawings.

3. Reliability Requirements - Video systems will be connected to the emergency/standby power source. Network connections will use CCTV-dedicated network fiber optic cable for security purposes and to maximize capability of running multiple cameras at optimum frame and compression rates. Video recording shall take place in the building or structure prior to transmission over the campus network.

4. Video Capture - Video cameras shall be analog type with a variety of lens selections available.

5. Video Recording, Playback and Storage - Video recording shall employ digital technology for recording, playback, and storage. Video recording shall take place in the building or structure using DVRs. DVRs shall be capable of recording 16-32 cameras simultaneously with frame and compression rates adjustable for individual camera video inputs. Storage media shall employ internal hard disk storage of sufficient size to guarantee 30-days of video storage, assuming good video management practices are employed to minimize storage requirements, i.e., 4 frames per second during non-alarm events. Hard disk shall have a RAID 5 configuration. All images recorded

shall be digitally watermarked for authentication purposes for use in a court of law. The DVR shall have full media search capabilities for archiving, restoring, and playback operations. Search capabilities shall include filters for start/stop dates and times and alarm occurrences.

6. Video System Software - System software shall be Lenel International to allow the full integration of new equipment into the university's legacy video and electronic access systems. The software will allow secured access from any network PC to the system for the purposes of viewing live video, playback and search of recorded video, and the archiving of recorded video unto other media such as compact discs.

C. DVR/Server Locations

1. Space for DVRs and servers shall be provided for, in security rooms programmed by the university. Where such rooms are not programmed, provide adequately sized, climate controlled and secured closet space.

D. Closed – Circuit Television (CCTV) system design standards for new construction:

1. The CCTV system shall include only system infrastructure components, including panelboards, electrical conduit, junction boxes, etc. The university will supply and install cameras, power conductors, and communications/data wiring at the time of occupancy. The infrastructure shall be continuous and complete from electrical closets and main hub rooms to all camera locations.

2. All camera power systems shall be connected to the standby electrical service; hence, all power infrastructures must originate from and be connected with this service. A floor area 36-inch square for full wall height shall be reserved for installation of CCTV power transformation equipment, etc. within this electrical closet.

3. Video and signal/data distribution shall be by means of a single coaxial cable with ISDN transmission. Provide floor space within a communications/data closet for a 36-inch square full-height rack housing electronic equipment.

4. Cabling Infrastructure - Power wiring and data cable must be run in electrical metal tubing (EMT) where cabling must be run in inaccessible walls, ceilings, floors, etc. Otherwise, data cabling and low voltage cable may be plenum-rated and placed in cable trays. A hybrid cable with conductors carrying both low voltage power and data may be used. Data cable shall be Category 5. Cabling shall terminate in junction boxes and be concealed within walls and above ceilings in the general vicinity of the final camera installation at approximately 10-feet above finished floor. Where ceilings are hard surfaces (not lay-in acoustical type), a 24"x 24" square access door shall be provided in the ceiling. The conduit installation shall be accomplished in accordance with applicable NEC requirements and as indicated on the drawings.

PART 2. PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Lenel Systems International-OnGuard ET. No Substitutions shall be permitted.

2.2 PRODUCTS AND EQUIPMENT

A. General: The system components shall be of modular design to allow ease of installation, service, future expansion, upgrades and additions to the system.

B. The system shall consist of the interface of two levels of intelligent controllers with distributed architecture. These controllers shall have operating environments to allow complete functionality at q temperature range of 0^0 to 50^0 C and a relative humidity of 90% (non-condensing).

2.3 INTELLIGENT SYSTEM CONTROLLER (ISC)

A. The Intelligent System Controller (ISC) shall be microprocessor based with on-board time and date generation with a lithium battery to allow a minimum of 48 hours data integrity. The ISC shall be responsible for maintaining the data communications between the field panels and the LENEL Access Control Application installed on the Command Center CPU. The ISC shall communicate upstream at 38.4 Kbps via the existing TOWSON UNIVERSITY Ethernet TCP/IP network. The ISC shall have a minimum 1 MB onboard memory (expandable to 4 MB) to store up to 175,000 cardholders and 1 million events on-line and shall also maintain a buffer for a minimum of 4,000 event transactions for the off-line operations or in the event of lost communications with the CPU. Each ISC will allow the configuration of 64 card access readers or 32 downstream devices.

B. The Intelligent System Controller shall provide for the management and supervision of anti-pass back across terminal controllers and additionally for the management of Input to Output linking across terminal controllers.

C. Intelligent System Controllers(s) shall be mounted in the telecomm/security room to accommodate the specified card readers. General contractor shall provide 4’x8’x3/4” fire-rated plywood in each room to mount Access Control equipment. TOWSON UNIVERSITY shall be responsible for supplying dedicated IP addresses (RJ45 network connections) to the general contractor. General contractor shall Install network jacks in each of the telecom/security closets.

D. The acceptable power supply for each ISC is a UL Listed 12VAC continuous supply current with enclosure, lock, open frame transformer, UPS capable and 12- Volt battery back up.

2.4 READER INTERFACE MODULE (RIM)

A. The Reader Interface Module (RIM) provides a vital link between the Intelligent System Controller (ISC) and the card reader attached to the interface. As many as 32 RIM's can be multi-dropped using RS-485 2-wire communication up to 4,000 feet per port away from the ISC, use twisted pairs with a minimum of 24 AWG and a shield for the communications. Each RIM is individually addressed for increased reporting capabilities. The RIM can be either a Single Reader Interface Module (SRI) or a Dual Reader Interface Module (DRI).

B. Each SRI includes two inputs that support normally open, normally closed, supervised and non-supervised circuits. In addition, two output relays support fail-safe or fail-secure operation.

C. Each DRI includes eight inputs that support normally open, normally closed, supervised and non-supervised circuits. In addition, six output relays support fail-safe or fail-secure operation.

D. Each RIM supports most access control card readers, keypads, or readers with keypads that use standard Wiegand Data1/Data0 or Clock/Data communications. Lock, unlock, and facility code offline access modes are supported on all readers connected to the RIM. Each RIM supports up to eight different card formats as well as issue codes for both magnetic and Wiegand card formats.

E. Each RIM shall be microprocessor based with on-board time and date generation with lithium battery to allow a minimum of 48 hours of date integrity.

F. The acceptable power supply for each RIM is a UL Listed 12VAC continuous supply current with enclosure, lock, open frame transformer, UPS capable and 12-volt battery back up.

2.5 INPUT CONTROL MODULE (ICM)

A. Each Input Control Module (ICM) provides the access control system with high-speed acknowledgement of critical alarm points in monitored areas. The ICM communicates directly to the ISC via RS-485 2-wire or 4-wire communication up to 4,000 feet per port away from the ISC, use twisted pairs with minimum of 24 AWG and a shield for the communications.

B. Each ICM has 16 configurable input control points and 2 output control relays. It supports normally open, normally closed, supervised and non-supervised circuits.

C. The input circuits are scanned using an analog to digital converter. The digitized input status signal is software monitored and controlled, so that each input point can be programmed as a supervised or non-supervised alarm point. The output relays can also be configured for fail-safe or sail-secure operation. Each relay supports “On”, “Off” and “Pulse” software commands.

D. The acceptable power supply for each ICM is a UL Listed 12VAC continuous supply current with enclosure, lock, open frame transformer, UPS capable and 12-volt battery back up.

2.6 ETHERNET LAN CARD

A. Micro Serial Server for Ethernet, Flash ROM, DB25 serial port RJ45 (10/100 base T) Ethernet interface, diagnostic LED's External power 120VAC (includes cable HOC-ETHLAN). The Ethernet LAN card shall be LNL-ETHLAN.

2.7 POWER SUPPLY

A. UL Listed Power Supply – 12VDC or 24VDC, 4A output (switch selectable), 120VAC input, continuous supply current with enclosure lock and open frame transformer, UPS capable. Each power supply is to receive a back-up battery kit with a 12 VDC, 12 AH battery.

2.8 MAGNETIC CARD ACCESS READER (WALL MOUNTED)

A. Wall mounted card readers shall be provided as specified in the hardware sets under Division 8 Section “Finish Hardware.” The Magnetic Stripe reader must be able to connect to access control panels, which accept the popular clock/data and Wiegand signals. The reader must accept low or high-coercivity magnetic stripe cards with standard track 2 encoding (optional track 1 or track 3 may be required). A red/green bi-color LED and a beeper should be standard. The LEDs may be operated in one-wire or two-wire mode. Card data is sent using common clock/data or Wiegand pulses. The LED and the buzzer are controlled using standard TTL voltage levels. All signal lines are protected from Electrostatic Discharge (ESD). The nominal distance between the card reader and the reader interface is 500 ft. The die cast metal housing must first be treated with an anti-corrosion film and then coated with a tough, abrasion resistant finish. The reader must have a bi-directional card swipe. The reader must have at least a 1 million card pass head. The reader can be mounted with all stainless steel hardware. The reader shall be rated for operation from -40^0 C to $+75^0$ C and be suitable for both indoor and outdoor use.

2.9. PROXIMITY CARD ACCESS READER (WALL MOUNTED)

A. HID Proximity Readers: The SYSTEM shall provide the ability to support HID Proximity Card Readers, as specified in hardware sets Division 8 Section “Finish Hardware.” Each card reader shall offer a low profile, rugged, weatherized polycarbonate sealed enclosure with multi-color LEDs and a sounder for access granted and denied indications. Each shall be mountable indoors or outdoors as noted on the contract drawings. Proximity card access reader shall integrate with the owners on-line system and utilize the same function cardholder database as specified under this section.

1. HID MiniProx Card Reader shall be a 6” x 1.7” unit, designed to allow mounting directly to a door mullion. It shall have a card read range of 4-5.5 inches.

2. HID ProxPro Card Reader shall be a 5”x5” low profile wall-mounted unit, having a read range of 5-8 inches. If specified, the ProxPro unit also shall offer an integrated keypad for PIN entry.

2.10 ELECTROMECHANICAL CARD READER LOCKSETS (BEST IDH-MAX0

A. Self-contained hardwire electromechanical card reader locksets shall be provided as specified in hardware sets under Division 8 Section “Finish Hardware.” Electromechanical card reader locksets shall integrate with the owners on-line system and utilize the same function cardholder database as specified under this section. No substitutions shall be permitted.

2.11 RECESSED DOOR CONTACTS

A. The contact contains a hermetically sealed magnetic reed switch. The reed shall be potted in the contact housing with a polyurethane based compound. Contact and magnet housing shall snap-lock into a ¾” or 1” diameter hole. Housings shall be molded of flame retardant ABS plastic. Color of housings shall be off-white, gray or mahogany brown. The magnet shall be made of Alnico V. Rare Earth Magnet shall be made of neodymium iron boron. Snap-lock insulation busing for tight fit and maximum gap in steel. Both contact and magnet plastic housings are constructed of one piece of thick-walled ABS plastic for maximum strength and durability. Recessed door contacts shall be provided as specified in hardware sets under Division 8 Section “Finish Hardware.” All doors and frames requiring door contacts shall be prepared at the manufacture’s facility, prior to delivery to the jobsite.

2.12 NETWORK WIRING

A. The Controller communications network shall be made up of a primary main controller bus and secondary terminal controller bus. The communications protocol used shall be RS485. The primary bus and secondary bus shall use a shielded, dual twisted pair, 20 AWG or equal. Both bus networks shall be capable of a distance of 4,000 ft. total wire. In addition, any point(s) between either the primary and/or secondary bus, shall have the capability of being connected using Fiber Optics Repeaters. Fiber Optics Repeaters shall provide network wiring capability of a minimum of 4,000 feet between controllers using 62.5 micro-Fiber Optic Cable. The system shall also have the capability of utilizing a standard Static UIP address for LAN/WAN communication capabilities on the Primary Bus.

B. The system communications shall be supervised for integrity. If communications is detected as failed, the system shall report the loss and automatically enable the affected controllers buffer. Systems that require Site Codes, Facility Codes, degrade to these codes and/or do not buffer event information in the event of lost communications are not acceptable.

C. All reader cabling shall use an overall shield, 6 conductor wire for card reader. Refer to paragraph “E” for specific wire/cabling requirements. A reader shall be wired a minimum of 500 feet without wire size change. Readers requiring a wire size change or special adapters to drive signal this distance are not acceptable.

D. Input and Output wire and cable requirements shall be application specific and shall use the proper shielded cable as required by the specific application and/or code.

E. Wiring/Cabling shall be E11871 /CMP/CL3P 24AWG 2PRS Foil + Braid Shield +16AWG no shield-“UL”listed, No substitute, and shall be furnished under this section. All wiring/cable shall be labeled, tagged and color-coded. At minimum and as required by code, the general contractor shall provide 1” conduit with pull string from specified electric exit devices, electric card reader locks, electric power transfer, card reader, power supplies, reader interface modules and intelligent system controllers. Note: All power requirements, receptacles, junction boxes, conduit and pulling of wire/cable for a complete access control system shall be provided under the electrical contractors scope of work under Division 16.

2.13 LENEL ACCESS CONTROL APPLICATION SOFTWARE

A. General: This section details the minimum requirements necessary for the application software. The software shall be a Microsoft Windows 2000/XP 32-bit application engineered as an Access Control and Alarm Point Monitoring program. Applications that use FAT are unacceptable. It shall provide an integral solution for incorporating optional Video ID verification and Photo ID Badging and Badge design. The application must, as a standard feature, allow for attaching a photo ID to each cardholder record. The application must additionally allow for Closed Circuit TV Control, Time and Attendance, Paging and other third party linked Microsoft compliant applications.

B. The applications shall be Microsoft ODBC compliant and shall provide a SQL relational database for export of Archive History and cardholder data to third party software and applications. Of primary importance, the system shall be a graphical user interface using standard Microsoft Windows list boxes, option buttons and check boxes and mouse support.

C. The application shall provide and easy to use Graphical User Interface (GUI) with Icons for Event Monitor, Card Holder Database, Reports, System Administration, Installer and Administrator Setup, Operator Action, Alarm Response, Scheduled Reminders, Time Zones, Groups, Events and Operators.

D. At a minimum, the Event Viewer shall allow for four separate viewing screens with TOWSON UNIVERSITY selectable events vectored to each screen. Each event line shall contain at a minimum, an event number, a date and time, and event type and event description. It shall be possible for TOWSON UNIVERSITY to select with components of the event lines shall appear in any event viewer screen. It shall be possible for an operator to select viewing on only one viewer screen, two viewer screens, three viewer screens or four viewer screens at any one time. It shall be possible to select and/or restrict, through filters, which events are present any and all viewers based upon the operator currently logged on to the system. It shall also be possible to use standard Windows sizing of the columns for event number, a date and time, an event type and event description.

E. The application shall provide on-screen help to insure an operator's ability to receive online informational context sensitive help when required. The system points will be identified in English text with TOWSON UNIVERSITY assignable definitions of Door, Reader, Keypad, Input and Output points. The application shall allow easy understanding of any event transaction in the system.

2.14 TIME ZONES

A. The application shall provide a minimum of 64 time zones. Time Zones One and Two shall be fixed as Time Zone Never and Time Zone Always respectively. The additional Sixty-two (62) of these time zones shall be TOWSON UNIVERSITY definable and have a minimum of 8 definable intervals and shall allow a TOWSON UNIVERSITY assigned Time Zone description. These intervals shall be programmable for starting and stopping times assignable to individual days of the week. The intervals shall also define holiday usage. Time zones shall be assignable to doors, readers, cardholders, outputs, inputs and selected system events.

B. Holidays: The application shall provide for enrolling a minimum of 32 holidays annually. Holidays, in conjunction with time zones, shall be assignable to doors, readers, cardholders, outputs, inputs and selected system events. TOWSON UNIVERSITY assigned Holiday description shall be possible.

2.15 DOOR ACCESS GROUP PRIVILEGE LEVELS

A. The application shall have the capabilities to relate cardholders to readers for door access by time. It shall be possible to restrict any single cardholder or group of cardholders through the use of access levels. The application shall have a minimum of 256 access group levels and shall allow a TOWSON UNIVERSITY assigned description of each. The application shall have the ability to create a privileged cardholder group. This group shall be assignable to any or all reader(s) in the system and those cards assigned shall have 24 hours a day access every day of the year. There shall be a minimum of 8 cardholders assigned privileged group per reader in the system. These privileged groups shall not diminish the 256 access level minimum in the application. The applications shall provide the ability to generate a report on all 256 levels and their TOWSON UNIVERSITY assigned definitions.

2.16 GROUP LEVELS

A. Each cardholder in the system shall be assigned at least one of the 256 Access Level detailing the times, days of the week and holidays that cardholder shall be granted or denied access to each Reader/Keypad within the system. Additionally, any cardholder or group of cardholders may be assigned a second and/or third access level from the list of 256, for access to other groups of readers/keypads. The assigning of a second and/or third level access shall not negate the access granted in the primary access level.

2.17 DOOR AND READER CONFIGURATION

A. The application shall allow all 128 doors and 128 readers to be configured for their own unique requirements. Each door shall be identified in TOWSON UNIVERSITY defined text form. Each reader shall be identified in TOWSON UNIVERSITY defined text form. The door strike unlock time and door propped open time are to be assignable independently for a minimum of 1 second to up to a maximum of 120 minutes. All door unlocks shall be time zone configurable and once unlocked, shall be configured to report state change at TOWSON UNIVERSITY's discretion. It is understood that the Request-To-Exit device will be capable of unlocking its related door; additionally, all doors shall be unlockable by a minimum of 2 auxiliary input configured overrides. These inputs shall be described in TOWSON UNIVERSITY defined text form and overrides reportable based on an assigned time zone.

B. Each access-controlled door in the system shall have the ability to generate a local alarm output in the event of that door being forced or left open beyond an allowable time. This local alarm output shall be configured to any of the following states: latched or timed. In the event of the output being latched, it shall only be reset through operator intervention or the passing of a valid card at that door's reader. The reporting of these two events shall be time zone definable.

C. The door status shall be configurable to report the physical state of the door based on time and condition. The system shall provide a t a minimum Door/Reader/Cardholder status events: Door Left Open, Door Forced, Door Opened and Door Closed, and Admitted, Admit in, Admit Out, Entered, Exited, Expired, Inactive, Is In, Is Out, No Access, Not Time, and Unknown Code. The system shall be capable of reporting by TOWSON UNIVERSITY assigned time zone, valid and/or invalid code presentations on a "per" reader Lenel. The system shall also provide for a "False Count" setting of zero to seven invalid code presentations prior to reporting the invalid code event. This feature is necessary when using numeric keypads as reader devices.

D. The application shall allow TOWSON UNIVERSITY to program a message unique to each door and each reader in the system. This message shall appear automatically under alarm conditions for that door or that reader when any status event is set as an Alarm Level event.

2.18 ANTI-PASS BACK

A. The system shall provide enforcing "Anti-Passback" on doors controlled by an In Reader and an Out Reader. The system shall have a minimum of three methods for anti-Passback forgiveness. The first method allows the system to forgive anti-Passback at the controllers by time. The second method allows the system to forgive anti-Passback by door groups or individual door(s). The third method allows a privileged operator to forgive anti-Passback by cardholders an operator so privileged may invoke any method.

2.19 REQUEST-TO-EXIT

A. Each Request to Exit (REX) device shall be assignable to unlock its door on a time zone/holiday Lenel. If the device is not programmed to unlock the door, the door contact shall still be shunted upon activation of the request to exit device. Additionally, reporting and archiving of the REX device event shall be time zone/holiday assignable.

2.20 INPUT AND OUTPUT CONFIGURATION

A. The application shall allow for a minimum of 256 monitored Input points and a minimum of 512 controlled Output points to be configured for their own unique requirements. Each input and/or output shall be TOWSON UNIVERSITY defined in text form.

B. Each of the input points shall have four (4) state supervision capabilities, i.e., secure, active, short, cut. Any input in the system shall have the ability to report a state change of Secure/Active and Cut/Short. The reporting by these four events shall be TOWSON UNIVERSITY definable by time zone.

C. It shall be possible to shunt any input or group of inputs by an operator so privileged. A system status Reminder shall be stored in the Reminders window, indicating that a shunt action has been instituted and is in effect. The system Reminder shall only reset upon all inputs being in an Un-Shunted state. It shall be possible to trigger the Reminder of this condition on a minute-by-minute, hour-by-hour, or day-by-day, week-by-week, month-by-month, year-by-year Lenel, as well as to vector this Reminder to selected workstations(s).

D. Each output shall allow for any of the following states to be programmed. Outputs shall be configured to latch, close momentarily (selectable for a minimum of 1 second to a maximum of 120 minutes) or set to follow the state of the corresponding input or inputs. These states shall work in conjunction with outputs being managed under time zones and/or selected events as well. It shall be possible for an operator so privileged to control outputs from any workstation in the network. Privileged operators may activate outputs individually or in groups, on a momentary Lenel or latch outputs on or off using the mouse or menu driven commands.

E. It shall be possible for any input in the system to activate any output or group of outputs in the system. The relationship shall be Local (any input activates any output under its same terminal controller), Regional (any input activates any output under is main controller on any other terminal controller) and Global (any input activates any output under any main controller on any other terminal controller). It shall also be possible for any event, i.e., Log In, Log Off, Failed, Modified, Traced, etc. to activate any output in the system.

F. It shall be possible for any access level to activate any output(s) under a terminal controller thus providing (but not limited to) TOWSON UNIVERSITY required Elevator Floor Button control, HVAC control and Alarm shunting.

G. The application shall allow a TOWSON UNIVERSITY programmed message unique to each input and each output in the system. This message shall appear automatically under the alarm condition for that input or that output when any status event is set as an Alarm Level event.

2.21 DEVICE CONFIGURATION AND COPY FEATURE

A. The application shall provide the ability to display a controller, door, reader, input and/or output configuration of any device in the system. While displayed, a privileged operator may modify the configuration if necessary. All or any portion of the configuration of a device may be copied onto any other like device using the time saving Copy Feature of the application.

B. It shall be possible to display a “Tree” of the devices configured and their related addresses at positions within the Threshold controller network. It shall be possible to “Drag and Drop” configured devices from the inactive list to the active list and vice versa.

2.22 OPERATOR INTERFACE, ALARM HANDLING AND OVERRIDES

A. Operator Actions: The application shall provide for an operator so privileged, the ability to take action on Doors, Inputs and/or Outputs. Selected “Operators” shall be granted ability to or restricted from Locking, Unlocking, Momentarily Unlocking or Query Status of any door or group of doors in the systems. Selected “Operators” shall be granted ability to or restricted from, Turning On, Turning Off, Momentarily Turning On/Off or Query Status of any Output or group of Outputs in the system. Selected “Operators” shall be granted ability to or restricted from, shunt or query any Input or group of Inputs in the system. Selected “Operators” shall be granted ability to or restricted from, refreshing or query any controller or group of controllers in the system.

B. It shall be possible to perform operator actions after a simple mouse click on any event displayed in the Event Viewer screen, without additional menu call-ups.

C. Alarm and Status Events – Priorities: The application shall provide TOWSON UNIVERSITY, the means to prioritize alarm status events. These events shall be generated from any of the nine event origins. These origins shall be as follows: System Events, Main Controller Events, Terminal Controller Events, cardholder Events, Door Events, Reader Events, Input Events, Output Events and Diagnostic Events.

D. These events shall be configurable to any one of sixteen (16) priority levels, which will display in unique corresponding colors. The color assignment shall permit selections from a basic color chart having samples and shall also provide for the user to configure custom colors down to the hue, saturation, and luminosity level.

E. It shall be possible to route events for display in any one or more of the four event display quadrant screens, and/or printing on any or all display and event printer and event printer devices on the system, based on event type. Each individual device event shall have the ability to be assigned different alarm priority levels in accordance to the needs of the TOWSON UNIVERSITY, i.e., Not

Time event on Reader One may be assigned Alarm Level Two, but the identical event, Not Time on Reader Two, may only require an Alarm Level six response.

F. Alarm and Status Events-Operator Response: The system shall also be capable of satisfying the operator of designated alarms, set over a specific priority level, while the operator is in other access control screens or in other applications.

G. Events set as “Alarm Events” shall also have the ability to be designated as “Breakthrough,” “Flash ICON Notification,” or “Audible.” Alarms for the security operator of the system shall be displayed and made interactive via an Alarm Annunciation screen.

H. “Breakthrough” alarms shall interrupt the operator’s program being run and present the alarm notification box in priority color, at the center of the screen. “Flash ICON Notification” and/or “Audible” alarms shall not breakthrough but will blink or flash the alarm alert ICON to draw the attention of the security operator for response and disposition or sound the internal computer audible device.

I. Alarms shall be displayed based on priority. For each alarm priority queue, there shall be a minimum of 256 unacknowledged alarms. All alarms displayed shall have the ability to be acknowledged singularly or as a group based on priority, by an operator so privileged. The application shall provide the ability to enter an operator response documenting action taken. The application shall provide annunciation of alarm events at any or all workstations as allowed by the Windows 2000/XP network; based on priority.

J. A simple click of the mouse on any selected “Event” shall bring up a “Detail” window with complete information regarding that particular event.

K. An alternate method of operator response using Icons shall be through the use of facility maps and graphics.

L. Operator restrictions to devices and points: It shall be possible to “partition” the devices, doors, readers, inputs and outputs so as to restrict operators from performing actions on any device their operator privilege levels do not specifically authorize. It shall be possible to “partition” the card holder records so as to grant access to only specific card holders in a selected group or groups.

2.23 FACILITIES MAPS AND GRAPHICS

A. The application shall be capable of allowing the creation of dynamic and linkable TOWSON UNIVERSITY created graphic maps. Applications using a separate video display screen to generate or display maps shall not be acceptable. The application shall be capable of using imported ACAD files, provided by TOWSON UNIVERSITY, for the creation of floor plans.

B. The application graphics shall be able to represent system devices by use of “Icons.” The icons shall be dynamic and reflect real time status of the device it represents. The application shall provide a library of icons per device type in the system as well as allow for unique TOWSON UNIVERSITY defined icons. Any icon can be oriented and moved to reflect the actual installation of the device it represents. By selecting an icon in alarm, the application shall display text and alarm message in the same screen as the original map. Applications not able to display alarm text and message in the graphics screen are unacceptable. The application shall be able to allow operators to acknowledge the alarm represented by the chosen icon. Applications that cannot acknowledge the alarm from graphic map shall not be acceptable.

C. The application shall be capable of linking together graphic maps to provide multiple and expanded views of any system device and/or TOWSON UNIVERSITY area. The application shall provide links, each being numbered to represent the map connected to that link. The application shall also allow the TOWSON UNIVERSITY to provide a text description for the linked map.

D. These links, like the maps they are associated with, are dynamic and shall display the highest priority color of any device associated with the graphic map the link represents.

E. System graphic map screen format shall allow the display of an alarm queue for all 16-alarm priority levels. This alarm queue shall be real time and each level will increment any changes to alarms in the application at each level. As alarms are acknowledged, the corresponding alarm priority will decrement its queue accordingly. Applications that do not give the system alarm overview as part of graphic map screen are not acceptable.

2.24 CARD HOLDER DATALINE CONFIGURATION

A. The application shall provide an ODBC Microsoft compliant SQL relational database. The application shall have the ability to support at a minimum 50,000 cardholder records. These records shall have at a minimum the following fixed fields: cardholder last name, cardholder first name, cardholder identification number, cardholder PIN, cardholder access group levels, cardholder activation or deactivation status, card/PIN activation and expiration dates and individual cardholder TRACE or LOCATION status, and cardholder classification, i.e., Employee, Visitor. For ease of use, the application shall provide alphabetical TABS for selecting cardholders by name.

B. The application shall also support 32 TOWSON UNIVERSITY configurable data fields on eight restricted pages. These fields are necessary for maintaining but not limited to, vehicle license plate numbers, phone numbers, departments, addresses, etc.

C. The application shall provide TOWSON UNIVERSITY configurable report capabilities that allow selection; search and sort combinations of any and all fields to be used to create desired reports. These reports once generated shall be displayed and/or printed at TOWSON UNIVERSITY's discretion. Additionally, it shall be possible for an operator so privileged to perform a "Quick Search" of cardholder extended date information, example, "Quick Search" an automobile license plate number.

D. The application shall provide the ability to set a validity period on the cardholders. This feature allows a cardholder to be activated and/or deactivated based on specified dates. The application shall provide the ability for cardholders to be placed in a minimum of two classes. These classes shall include visitors and standard. It shall be possible to generate a report based on visitor cardholders only. It shall be possible to place any cardholder in a Trace status mode. A traced cardholder shall generate a separate event that may be displayed and/or printed when any traced cardholder presents their card at any reader in the system. The traced event shall allow tracking of selected individuals throughout a facility.

2.25 SOCIAL SECURITY NUMBER AND ANSI STANDARD FORMAT CARDS

A. It shall be possible to set the application software to identify 12 digits of the 48-digit ANSI standard numbering format. This will allow for using Dorado magnetic stripe cards and ICI bar code cards that have been programmed with a cardholder's social security number plus personal ID number.

2.26 PERSONAL IDENTIFICATION NUMBER

A. It shall be possible to set the application software to require selected entry points to grant access only when a valid cardholder presents a valid card in conjunction with a valid Personal Identification Number (PIN). The PIN shall be selectable from one to six digits. It shall be possible to enforce a card/PIN combination by time zones on a "per" reader Lenel, thus allowing card only entry during selected hours.

2.27 DURESS CODE

A. It shall be possible to set a system-wide Duress code that, when entered at any threshold keypad will grant access to that entry point and in addition, alert the Command Center of the Duress situation and entry point.

2.28 OPERATOR PRIVILEGE LEVELS

A. The application shall have a TOWSON UNIVERSITY defined number of operators. Any enrolled cardholder may be assigned operator privileges. The application shall allow the TOWSON UNIVERSITY to distinguish between operator privileges by defining a minimum of 64 levels. Once defined, these levels shall allow an operator to have restrictions placed on them down to the point level. Each of these operator privilege levels shall be named for their group of operators. These operator privilege levels shall be English text definable.

B. The applications shall provide for segregation of the database both in devices, points, doors, readers, inputs and outputs, as well as cardholder records. It shall then be possible to restrict any operator of operators from accessing data not specifically authorized by their operator level. This provided for the feature of allowing a security officer to "momentarily" unlock the "lobby" door, for example, yet not be allowed to unlock any other doors in the system. It also provides TOWSON UNIVERSITY or tenants the ability to add, modify and delete cardholder records for their specific region, department or company yet preventing access to other regions, departments or companies' records.

C. An operator may be assigned an Operator Level of view only and thereby totally restricting those operators from modifying entries. The system shall alert any operator trying to access a restricted menu selection with an onscreen message. The message shall state “Access Denied-See Your System Administrator.”

D. The application shall provide the capability of generating a report outlining operator privilege capabilities per level and a list of operators assigned to each Operator Level.

2.29 REPORTS

A. The application shall provide at a minimum, the ability to generate reports on the following criteria and allow (or restrict) so privileged operators, access to selective reports or all reports. The application shall allow for the creation of report “templates” that may be set to filter a report for specific information. Once created, these templates shall be saved as modified for future and continual use. Report templates may only be modified by operators so privileged.

1. Event History Archive (minimum of 64 report templates)
2. Card Holder Configuration (minimum of 64 report templates)
3. Device Status
4. Cardholder Location Status
5. System Version
6. Time Zone and Holiday
7. Access Level Readers
8. Access Level Outputs
9. Input Output Control
10. Operator Level
11. Event Configuration
12. Class Configuration
13. Network Configuration
14. Graphic Configuration
15. Event Generated Output Configuration

2.30 EVENT ARCHIVES

A. The system shall allow event history to be written to the hard drive disk and accumulated as archives. The hard disk drive shall determine the amount of history archived but must support a minimum of 750,000 recorded transactions. Warning messages shall be standard Microsoft Windows in nature. The system shall have the capacity to off-load the archive files onto any standard medium including 3.5-inch floppy diskettes, tape drives, 10 Mega Floptical or SyQuest.

2.31 EVENT ARCHIVED HISTORY REPORTS

A. The application shall allow reports to be generated from the history accumulated on the system's hard disk drive and/or back up diskettes. The application shall allow any report template to be cleared or modified. Archived templates shall be created through a selection process of event classifications available. This selection allows individual event types to be selected by an all, some or none choice. An operator choosing a "Some" category shall be able to include or exclude any sub-category of any event type. The selection of none excludes the entire type and all corresponding sub-categories. There shall be a minimum of 64 archive report templates in the application.

2.32 WHO'S IN/WHO'S OUT REPORT

A. The application shall have the capacity to generate a "Quick Status Report," giving a status as to who is in and/or who is out of a specified area. The report generated shall provide the following information: cardholder by name, cardholder access level, in/out status. This report shall be able to be created at any time for any group of readers configured as read in and read out. This report shall be printed and/or screen displayed as desired.

2.33 VIDEO HISTORY

A. The system shall provide as a standard feature, the ability to display a Video Image of each cardholder as selected workstations upon a card read. This shall be for the purpose of verifying that the cardholder is the actual cardholder of record. A history of these photos shall also be archived thus allowing an operator or administrator to scroll through the list to see who was admitted at the selected access control point.

2.34 OPERATOR ON-LINE HELP

A. The application shall provide help that is specific to the area of the application being used. The on-line help shall be context sensitive for general help, specific help and glossary of terms. These help screens shall be selectable by a single mouse click of the Help Icon.

2.35 QUERY STATUS OF SYSTEM COMPONENTS

A. It shall be possible to query the status of any or all of the system controllers, access control doors, input and/or output devices. This status shall display dynamically the current state of the device in question. The application shall have the ability to group doors, readers, inputs and outputs into groups. Doors, readers, inputs and outputs shall have a minimum of 256 groups each, for a total of 1,024 groups. Each group shall have the ability to be described in plain English text. Each door, reader, input or output group may contain any number of its system devices and any device may be assigned to more than one group. Group configuration provides a filtering mechanism during report generation and simplifies operator actions.

2.36 FILTERS AND USE OF

A. The application shall provide for setting of Filters. Filters allow for placing doors, readers, inputs, outputs, main controllers, terminal controllers, and system events into a filter or multiple filters. These filters may then be used to easily request information or take action on any device within the selected filter.

2.37 INSTALLATION CONFIGURATION

A. The application shall provide for configuring a “Tree” or “Riser” of system devices consisting of main controllers, terminal controllers, doors, readers, inputs and outputs. These system devices shall then be placed in an Active Tree or Riser or kept in a Maintenance Tree or Riser. Placing a maintenance device into an Active Tree shall be a simple matter of standard Windows “Drag and Drop” into the Active Tree Riser.

2.38 BACKUP AND RESTORATION

A. The application shall provide the ability to archive a minimum of 750,000 events and generate reports, print selectable to how and when. The software shall have the capability to back-up archival data to a standard 350Mb tape media automatically based on the system internal clock and be capable of formatting either a standard 3.5”, 1.44MB diskette or 250 MB tape media in the background. It shall provide the ability to backup and restore archival history, reports, and system configuration database, card and cardholder database.

2.39 ON-LINE MAINTENANCE

A. The application shall provide on-line diagnostics and communications maintenance for adjustment to the operating environment. These diagnostics shall allow for the modification of baud rate, system packet information, and network polling. It shall be possible for the application to adjust the data handshake ability through channel commands and channel response. On-line maintenance providing real-time communications conditions of all system controllers is required.

B. The application shall be required to have ability to generate a version report which notifies the operator of the current software version that exists in all work stations and polls all main and terminal controllers for current firmware versions of all controllers on the network.

PART 3. EXECUTION

3.1 INSTALLATION

A. Security contractor shall provide all additional system design work required, including:

1. Conduit layout and sizing

2. Wiring and cable layout and sizing

3. Point-to-point wiring and equipment connection and hook-up information

4. Equipment mounting details

5. Design of equipment cabinets

6. Other detailed design work as required.

B. Security contractor's design shall conform to all applicable codes and ordinances. All electrical design, including the sizing and placement of conduit, raceways and conductors, shall be in accordance with NFPA 70: National Electric Code, 1993, unless local codes establish more stringent requirements.

C. Security contractor's design work is subject to review and approval by TOWSON UNIVERSITY. In addition, TOWSON UNIVERSITY shall approve all CCTV camera locations prior to installation. Refer to Division 16 for CCTV specifications.

D. Miscellaneous

1. The addition of all wire, cable, conduit, connectors and junction boxes required for system operation.

2. Install conduit as indicated in the drawings at each door.

3. Complete "as-built" documentation of all security systems, including documentation of existing wiring, conduits and raceways.

E. TOWSON UNIVERSITY shall provide all IP addresses to security contractor. General contractor shall install network jacks on each floor in the telecom/security room.

3.2 IDENTIFICATION

A. Identify system components, wiring, cabling and terminals according to Division 16, Section "Basic Electrical Materials and Methods." Use color-coded conductors and apply wire and cable marking tape to designate wires and cables so media are identified in coordination with system wiring diagrams.

3.3 FIELD CONTROL

A. Manufacturer's Field Service: Engage a factory service representative to inspect field-assembled components and equipment installation and connections. Report results in writing. Include the following:

1. Operational Test: Start system to confirm proper operation. Location of equipment shall match location or permanent room numbers. TOWSON UNIVERSITY shall provide permanent room number layout to contractor. Remove malfunctioning units, replace with new units and retest.

3.4 ADJUSTMENT

A. Occupancy Adjustments: When requested within 12 months of date of substantial completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose without additional cost.

3.5 DEMONSTRATION

A. Engage a factory service representative to train owner's maintenance personnel to adjust, operate and maintain services as specified below:

1. Train owner's maintenance personnel on procedures and schedules for starting up and shutting down, troubleshooting, servicing and maintaining equipment schedules.

2. Review data in maintenance manuals. Refer to Division 1, Section "Operation and Maintenance Data."

3. Schedule training with owner, through architect, with at least seven days advance notice.

3.6 INSPECTION OF WORK

A. During the course of system installation, the owner shall periodically inspect the work of the security and electrical contractor to observe the quality of workmanship and progress of the work.

B. The owner reserves the right to reject any material or installation practice which, in their opinion, is not in accordance with these specifications, either before or after installation.

C. Rejected work and materials shall be removed at once at no additional cost to the owner and replace with work and materials acceptable to the owner.]

D. Approval of partial payment applications does not constitute approval of the work by the owner.

E. The owner reserves the right to disapprove partial payment applications if a substantial portion of the inspected work is not in accordance with these specifications or if the work is significantly behind schedule due to delays caused by the general contractor subcontractor.

F. If the owner encounters work that is not acceptable, they will notify the general contractor in writing immediately.

3.7 ACCEPTANCE OF SYSTEM

A. Upon completion of all work specified in the contract documents, the security contractor shall submit as-built documents to the owner for review and shall request scheduling of acceptance tests. The contractor shall not schedule acceptance tests prior to submission of complete as-built documentation. Acceptance tests shall be conducted as follows:

1. The owner, as required to confirm complete and accurate documentation of the installed systems, shall examine all as-built record drawings and technical manuals.

2. The security contractor shall demonstrate the operation of all system components in the presence of the owner.

3. Each field-installed device shall be inspected and activated as required to confirm proper installation and operation as specified.

4. All control, monitoring and processing equipment and all software shall be tested to confirm proper programming and operation.

5. Upon completion of initial acceptance test activities, the owner shall prepare and forward to the general contractor a detailed written punch list which identifies all apparent deficiencies in the operation and/or installation of the systems and the as-built documentations.

6. Upon correction of all deficiencies, the general contractor shall provide the owner with written notification of such and shall request scheduling of a punch list verification test.

7. After the correction of all punch list items has been confirmed, the owner shall certify acceptance of the system and start of warranty period.

3.8 SYSTEM SCOPE REQUIAREMENTS

A. Provide a new client software license for TOWSON UNIVERSITY’s existing LENEL access control security system. All software including the required number of reader licenses, including at least a 64 reader license upgrade, and server/client licenses shall be included as part of this scope of work.

B. Security contractor shall install the LENEL Intelligent System Control panels in the designated security room. Contractor shall provide and install the network device, which shall be connected to TOWSON UNIVERSITY’s existing security network or communication back to the Server. TOWSON UNIVERSITY shall provide a “static IP address” and a network jack for the intelligent system controller. General contractor shall furnish and install network jacks in the designated telecom/security room.

C. Security contractor shall provide and install all Intelligent Control Panels, Reader Interface Boards, Output Boards and Power Supplies inside the designated telecom/security room. All field devices will communicate over a RS485 downstream communication channel.

D. All LENEL components shall be installed in a single custom enclosure as manufactured by Integrator.com. This enclosure will include all PD-8's, terminal strips, panduit, BEST keyed lock cylinder, BEST key, tamper switch, integrated quad outlet for A/C power and standoffs. This enclosure is being specified to ensure standardization and conformity for TOWSON UNIVERSITY. Enclosure shall be mounted inside the designated telecom/security rooms. No substitutions shall be permitted.

E. Security contractor shall provide and install LENEL wall-mounted card readers utilizing magnetic stripe technology, s specified under Division 8 Section "Finish Hardware," which will provide a user friendly, high security method of access control. Magnetic stripe cards shall be provided and programmed by TOWSON UNIVERSITY.

F. Security contractor shall provide and install the required number of single reader interface boards, dual reader interface boards and alarm input/output expansion boards needed to handle the number of card readers, locking devices, and identified alarm inputs as specified under Division 8 Section "Finish Hardware."

G. Fire alarm contractor shall provide the interface and programming required for the magnetic locks (if applicable), which shall be supplied by the door hardware supplier, under Division 8 Section "Finish Hardware."

H. Security contractor shall provide all permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work. All products are to be warranted free from material defects and shall operate in general accordance with their product specifications.

I. Security contractor shall be responsible for programming the doors into the existing LENEL access control system. All user programming is to be done by TOWSON UNIVERSITY.

J. Door and frame supplier shall fabricate all doors and frames to accept the specified access control hardware as specified under Division 8 Section "Finish Hardware," prior to site delivery to jobsite.

K. Electrical contractor shall provide all 120VAC power. This shall include two quad outlets on a dedicated circuit in the telecom/security room and 1 quad outlet above any doors receiving magnetic locks. All electrical back boxes are a part of this security requirement and shall be furnished and installed under the electrical contractor scope of work, under Division 16.

L. Electrical contractor shall supply and install 1” CONDUIT IN ANY OPEN AREA OF THE BUILDING AND ANY AREA WITH FIXED DRYWALL CEILING. In all other areas, wire may be suspended with j-hooks. All wire shall be plenum rated.

M. General contractor shall supply and install a 4’x8’ fire-rated sheet of plywood in the telecom/security room for use by the security contractor to mount the access control equipment.

N. Electrical contractor shall supply and install a cable trough at the top of the fire-rated plywood and pipe from the top of the trough to above the ceiling line.

O. Electrical junction boxes are required above each access controlled or monitored door per plans and specs and shall be furnished and installed by the electrical contractor.

P. It is the intent of this specification to coordinate all of the responsibilities of the interconnecting devices to designate and assign specific responsibilities to the various sub-contractors whom are supplying and/or installing them.

Q. All door hardware, including electric locks, electrified strikes, magnetic locks, door contacts, electrified hinges, door transfer loops, audible sounders and request to exits shall be supplied under Division 8 Section “Finish Hardware” and installed by the door hardware sub-contractor.

R. Electrical contractor shall supply and install conduit between each of the aforementioned devices and between the electrical junction boxes above the door.

S. Door hardware sub-contractor shall provide all cabling connections and terminations from the electrical junction box to these electrical devices.

T. Electrical contractor shall provide conduit between electric junction box to the wall-mounted card reader. The security contractor shall provide and install the cable from the wall-mounted card reader to the electric junction box and make all final terminations of the electronic hardware, supplied under Division 8 Section “Finish Hardware.”

U. Installation Notes:

1. If a wall-mounted card reader is specified under Division 8 Section “Finish Hardware,” the access control equipment will require conduit on the secured side of the door, 44” from the finish floor and 6” from the edge of the frame, stub up above the ceiling.

2. If an electrified hinge is specified under Division 8 Section “Finish Hardware,” the access control equipment shall require conduit on the secured side of the door from the center hinge location, stud up above the ceiling.

3. If an electrified card reader lockset is specified under Division 8 Section “Finish Hardware,” the access control equipment will require to have a raceway through the center of the door that is scheduled to receiving the access control system on the interior side of the building.

END OF SECTION

SECTION 210000
FIRE PROTECTION ENGINEERING
5/15/18

PART 1. GENERAL

1.0 SCOPE

This chapter provides the technical requirements for Towson University facilities. The majority of the fire protection requirements are contained in numerous national codes and standards. Compliance to State of Maryland building and fire codes is explained, and areas where Towson University requirements differ from the referenced State of Maryland codes and standards are ***ITALICIZED.***

1.1 APPLICABILITY

These requirements are primarily directed to the construction of new facilities and repair, renovations and alteration projects. Deviations from established criteria are considered when reviewed by the University's Environmental Health and Safety Office and: (a) equivalent or alternate protection is provided for new construction and/or repair, renovation and alteration projects.

1.2 NATIONAL STANDARD

Most fire protection requirements imposed by the State of Maryland are adopted by incorporation by reference to national codes and standards developed by associations such as the National Fire Protection Association (NFPA), American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), The International Fire Code (IFC), etc. These standards are considered requirements for the State of Maryland to the extent they are referenced or are applicable, except where exceptions are noted.

1.3 BUILDING CODES

Construction, repairs and alterations shall be in compliance with state adopted nationally recognized model fire and building codes and other recognized codes such as electrical, HVAC and plumbing codes. The referenced edition of these code/standards shall be used.

1.4 APPROVED PRODUCTS or TESTS

Many national standards referenced herein specify test methods for determining conformance with the particular standard. This is referred to as a product, material or type of construction as being "listed", "approved", "classified", "acceptable', or "recognized", etc. Towson University documents must allow any nationally recognized approved laboratory to perform these tests even if they were developed by Underwriters Laboratories Inc. (UL) and Factory Mutual (FM).

When laboratory services do not include regular test follow-up service of tested components, contractors must certify in writing that materials and construction are identical to the item(s) tested.

1.5 HAZARD CLASSIFICATION

Towson University bases its *hazard classification* on the applicable NFPA standards.

A. Determination of floor area and building height - These determinations must be based on applicable sections of the International Building Code (IBC) and the NFPA 101 Life Safety Code unless otherwise specified.

B. Area limitations - These limitations must be based on applicable sections of the NFPA standards. Firewalls and fire partitions must conform to NFPA standards and the rating of fire partitions must be as required throughout this part. When more than one hazard classification is housed in a building, the more stringent classification is the determining one (per NFPA).

C. Structural fire resistance rating determination.

1. Building materials, assemblies, members, etc. are required to meet certain fire protection requirements as noted through this specification, which are evaluated by standard fire testing methods. The fire protection performance of these items must be confirmed in either laboratory report forms or in listings provided by nationally recognized test laboratories. The principal fire test used is American Society for Testing and Materials, ASTM E-119, Standard method of Fire Tests of Building Construction. The authority having jurisdiction and Towson University makes the final decision on acceptability of test methods and testing laboratories.

2. Fire resistance ratings of building assemblies and structural elements shall be determined in accordance with the test procedures set forth in ASTM E-119. As an alternate, the fire resistance rating of concrete assemblies and structural elements may be determined in accordance with the procedures of the CRSI book "Reinforced Concrete Fire Resistance", or the PCI book, "Design for Fire Resistance of Pre-cast Prestressed Concrete."

   As an alternate, the fire resistance of protected steel may be calculated in accordance with AISI "Designing Fire protection for Steel Columns" and AISI "Designing Fire Protection for Steel Trusses." The calculations shall be based upon the fire exposure and acceptance criteria specified in ASTM E-119.

3. Assemblies of building construction shall be tested in accordance with ASTM E-119 or be detailed in the Gypsum Association "Fire Resistance Design manual", or Underwriters Laboratories Inc. "Fire Resistance Directory."

D. Integrity of Fire Resistant Floor Separations:

1. Fire resistance vertical openings and shafts penetrating fire resistive floors shall be constructed following the requirements of the NFPA standards.

2. Shaft openings shall be protected with fire doors and/or dampers as required by NFPA 80, 90A, and 101. Openings in vertical shafts containing

exit stairs shall be limited to those required for egress and ingress. Floor penetrations
by ventilating and exhaust systems shall be in accordance with NFPA 90A, 91 and 101 respectively.

1.6 INTERIOR BUILDING SPACE REQUIREMENT:

A. Scope

This section establishes requirements for interior construction features in Towson University buildings, including means of egress finishes and insulation, flammability, fire partitions and hazard segregation.

B. Interior (nonstructural) construction of building spaces

1. National codes and test methods. Unless otherwise specified, interior construction and arrangements shall meet the requirements of the National Fire Protection Association (NFPA) standards and test methods.

C. Exit facilities and arrangements - NFPA 101 shall be followed

D. Partitions

1. Partitions requiring fire resistance ratings shall be constructed of noncombustible/limited combustible (NC/LC) materials approved by NFPA and listed by UL or approved by Factory Mutual Engineering (FM) and listed in their approval guide or materials satisfactory tested to the same standards by an approved testing laboratory. Fire stopping/sealing shall be provided in all penetrations through fire rated partitions to form an effective fire and smoke barrier. Fire doors of rating appropriate to the partition fire resistance shall be installed under the requirements of NFPA 80, with the fire door hardware and frames bearing the labels of Underwriters Laboratory, Factory Mutual or other approved testing laboratories that test under ASTM E-152.

2. Ceiling-high partitions may be constructed of NC/LC materials Interior finish or trim may be combustible to the extent permitted in Chapter 6, NFPA 101 and combustible insulation on electrical installations may be used to the extent permitted by the Towson University authorities.

3. Bank style, acoustical screens, free-standing space dividers and other less-than-ceiling-high partitions must not exceed 5-1/2 feet in height, except along the periphery of the space, and shall meet the fire safety requirements prescribed, the authorities having jurisdiction, Towson University and NFPA 101, including:

   a. Limited combustibility; i.e., flame spread rate and smoke development to meet the requirements of NFPA 101: and,
   b. Flame resistance fabric coverings; i.e., meeting the performance NFPA 701 plus the flame spread rating and smoke contribution and any other requirements of NFPA 101.

One of the easiest means of determining compliance is if the fabric bears a label with the UL classification marking for flammability.

E. Segregation of Hazards

1. General

Rooms or areas containing hazardous occupancies as defined in Chapter 4, NFPA 101 Life Safety Code shall be separated from the remainder of the building by fire resistive separations, per NFPA 101 Life Safety Code.

2. Places of Assembly

Because of the concentration of occupants in auditoriums, cafeterias, and other places of assembly, it may be necessary to provide a greater number of exits and exit passageways to the exterior of the building. Whenever possible, such occupancies shall be located on the grade floor along the perimeter of the building or a floor close to grade adjacent to an egress stairwell.

3. Emergency Control Center

Emergency control centers shall be separated from the remainder of the building by a minimum of 1 hour fire rated construction, whether or not the entire floor is provided with automatic sprinklers.

4. Special Occupancies

Specific fire resistant construction and separation, and automatic fire detection and suppression means are required for essential electronic equipment facilities, including automated data processing, storage facilities, and other specific occupancies.

F. Interior Finish:

1. Interior finish shall comply with the definitions in Chapter 6, NFPA 101 Life Safety Code. Unless otherwise stated herein, the fire safety characteristics of interior finish must include a flame-spread rating, and smoke-development rating as specified per NFPA 101; Chapter 6. (Interior finishes shall be classified based on test results from NFPA 255).

2. Where the use of wood-paneling or other decorative finish is required in unsprinklered executive suites, conference rooms, etc, (Not exceeding 5,000 sq. ft.), materials meeting the minimum requirements of chapter 6, NFPA 101 shall be used.

3. In fully sprinklered-protected buildings, or sprinklered areas within fire-rated enclosures, the interior finish in areas not part of the normal exit shall meet the requirements of Chapter 6, NFPA 101.

4. Interior finish in exits, exit access and enclosed corridors used for exits shall meet the requirements of Chapter 6, NFPA 101.

5. Doors, door frames and trim materials (such as moldings, window frames, chair rails, baseboards, and bulletin board frames) that are not located in exit ways and are not part of fire separations may be of wood or any other material that is no more combustible than wood providing that such materials meet the minimum requirements of Chapter 6, NFPA 101. The area finished with this type of material shall not exceed 10 percent of the aggregate wall and ceiling area.

6. Wallpaper, paint, veneer, fabrics, other thin final finishing materials not more than 0.035- in. and textile materials, must adhere to the substrate under fire conditions and shall meet or exceed the minimum requirements of Chapter 6, NFPA 101.

7. When an airspace exists behind combustible material, the airspace shall be blocked so that no void extends more than 10 feet in any direction. For example, paneling applied to wood furring strips meet the requirement if the distance between strips is no more than 10 feet in both directions both horizontally and vertically.

8. Material composed of combustible substances, such as wood and fiberboard, that has been treated with fire-retardant chemicals by a pressure-impregnation process or other method that treats the material through (as opposed to a surface treatment) to make it firesafe may be used as interior finish under the following conditions:

    a. The treated material shall be installed in accordance with the manufacturer's instructions: and

    b. Where conditions exist that may reduce the effectiveness of the fire retardant treatment (high humidity, for example), the material shall not be installed.

    c. Meets the requirements of NFPA 101. 6 – 5.8 – fire retardant coating.

9. Material composed of combustible substances (such as wood, fiberboard, or paper-base materials treated with a surface treatment such as fire-retardant paint to improve the fire safety) shall not be used.

10. A material shall not be used as an interior finish if it results in higher flame-spread or smoke-development ratings than those permitted by NFPA 101.

11. Flooring materials used as wall sections or wall coverings must comply with NFPA 101.

12. All draperies, curtains and similar hanging materials must be noncombustible or flame resistant fabrics (chemically treated). Flame-resistant means that the fabric shall meet the performance criteria

described for this, small scale or large scale, NFPA 701,101, 260, 261 and 266.

13. Cellular or foamed plastics shall not be used as interior wall and ceiling finish.

G. Flooring

1. Underlayment: Underlayments shall be tested with the carpet or rug samples to provide a rating for the entire floor covering. However, where the underlayment is a separate cushion or pad, it shall meet the requirements of applicable NFPA standards.

H. Fireplaces

Installing fireplaces in new or renovated Towson University spaces is prohibited.

1.7 SMOKE CONTROL AND STAIR PRESSURIZATION SYSTEMS:

A. Scope

This part describes design requirements for smoke control systems and dedicated stairway pressurization systems where required for Towson University buildings.

B. System Requirements

Smoke control systems shall be designed and installed as required by Section 7-3, NFPA 101.

1.8. FIRE SUPPRESSION SYSTEMS ENGINEERING:

A. Scope

This section specifies Towson University's design, installation, and acceptance testing requirements for automatic fire extinguishing systems.

B. General Requirements

1. All Towson University buildings will be protected with some type of automatic fire extinguishing system.

2. National Codes: Unless otherwise specified, extinguishing system installation shall meet the requirements of the following National Fire Protection Association (NFPA) standards (most current issue that has been adopted by the Maryland State Fire Marshall’s Office):

a. Portable Fire Extinguishers (NFPA 10);

b. Carbon Dioxide Extinguishing Systems (NFPA 12);

c. Halon 1301 Fire Extinguishing Systems (NFPA 12A);

d. Wet and Dry Pipe Sprinkler Systems (NFPA 13);

e. Standpipe and Hose Systems (NFPA 14);

f. Water Spray Fixed Systems (NFPA 15);

f. Dry Chemical Fire Extinguishing Systems (NFPA 17);

g. Wet Chemical Fire Extinguishing Systems (NFPA 17A);

h. Centrifugal Fire Pumps (NFPA 20);

j. Water tanks for Private Fire Protection (NFPA 22); and

k. Private Fire Service mains and their Appurtenances (NFPA 24).

(1) The engineer shall incorporate the fire protection specification section to be provided by Towson University. The section shall be edited and formatted by the engineer to suit project requirements.

C. Water Supply Requirements

1. Types of water supplies, including flow and pressure requirements: The water supply system shall provide ample water to meet all needs concurrently. There are two types of fire protection water use: (1) large hose streams from inside building standpipe/fire department hose connections, and (2), automatic sprinkler systems.

2. Fire department (Siamese) connection: At least one fire department (Siamese) connection shall be provided for any building that has a sprinkler system or standpipe system. In new construction, standpipe and sprinkler systems shall be interconnected so that each fire department (Siamese) connection will serve all fire protection needs simultaneously. Large buildings facing on more than one street shall be provided with a second fire department (Siamese) connection interconnected remotely located from the first; each shall be unobstructed and located within 100 feet of a fire hydrant.

3. Deficient available water supplies: If the available water supply lacks the required pressure to meet the applicable codes, a fire booster pump shall be provided. However, the university reserves the right to request a review and waiver from the authority having jurisdiction.

4. Hydrants and mains: When necessary to provide fire hydrants, valves, or underground fire mains, the material, installation and location shall meet the requirements of NFPA 24, and/or Department of Public Works, Baltimore City or Baltimore County.

5. Fire/booster pumps: Fire pumps, booster pumps and their related electrical controllers shall meet the requirements of NFPA 20 and 70. Where fire/booster pumps are required to meet pressure requirements of the sprinkler system, the pump shall be sized for the sprinkler system only, unless other wise directed by either Towson University or the authority having jurisdiction.

6. Public water main connections: Connections to public water mains shall be sized to provide the required water demand for fire protection before the fire department arrives. All connections to public water shall be protected using a reduced pressure type back flow preventer.

7. Sprinkler system devices: Required sprinklers shall be connected to a vertical fire riser system in accordance with NFPA 13. The sprinkler connection shall be equipped with a waterflow alarm connected to the building fire alarm system. An inspector's test constructed as one self-contained unit, and valve tamper devices shall also be provided. Valve tamper devices shall be connected to the trouble side of the building fire alarm system.

8. Fire department hose connections: Provide 2 1/2 inch fire department hose connections at each floor level off the fire main riser. Each connection shall be provided with an easily removed cap. All 2 1/2 inch fire department fire hose connections shall be located inside fire rated constructed stairways. If additional fire department connections are required on any floor due to the square footage of the floor, the connection shall be installed as required by NFPA 14. Threads shall be compatible to the Baltimore County Fire Department hose.

D. Automatic Sprinkler Protection

1. Automatic sprinkler systems shall be provided for the entire project area.

2. Automatic sprinkler systems shall be installed in accordance with NFPA 13, with modifications as required to meet the special needs of the university.

3. All sprinkler system installations shall be of the wet type, except that:

    a. Dry-pipe systems shall be used in areas subject to freezing.

    b. Double Protection Pre-action systems may be used when approved by Towson University in high value spaces (subject to the requirements of paragraph 5).

    c. Deluge systems for fast-developing fires and building exposures may be used to provide water curtains and water spray systems, and to protect cooling towers, transformer vaults, etc. Where high voltage (600 volts or greater) equipment is involved, automatic water fire protection systems shall be designed using NFPA 15.

4. Double Protection Pre-action systems shall be arranged so that:

   a. Both the detection and sprinkler system must actuate before the alarm valve will trip and allow water to enter the sprinkler piping in the area protected;

   b. An alarm signal is transmitted to the building fire alarm control panel when the valve trips;

   c. Supervisory air (or nitrogen) pressure is maintained to ensure piping integrity and low or high pressure sends a supervisory signal to the building fire alarm control panel; and

   d. When the detection system that actuates the pre-action valve is self-contained, it must send all supervisory, trouble, and alarm signals to the building fire alarm control panel.

6. All sprinkler systems shall:

   a. Be hydraulically designed; and

   b. Be based on a performance specification.

   c. Use a minimum of Schedule 40 pipe unless otherwise approved by the university.

E. Portable fire extinguishers shall be chemical ABC type unless otherwise specified, provided and installed in accordance with NFPA 10, and as noted below:

   1. Portable fire extinguishers for laboratories shall be installed just inside the room entrance door and directly under the room light switch(s).

END OF SECTION

SECTION 220000
PLUMBING
5/15/20

PART 1. GENERAL

1.0 Summary

A. This section addresses plumbing requirements for new work, alteration and repair projects.

1.1 General Requirements

A. Sewer System: Provide separate sanitary and storm water systems on the site and throughout the building.

B. All piping that may contain colder than ambient temperature fluids shall be insulated, including all horizontal rain leaders. Insulation shall have a vapor barrier, installed continuous through the hangers. All insulated piping shall have silicon pipe supports of the same thickness as the insulation at every pipe hanger. All insulated pipe to have galvanized steel shields at the hangers.

C. Limitation: Domestic water shall not be used as a condensing fluid unless in a closed loop system. This restriction applies to refrigeration units of any size.

1.2 Electric Water Coolers

A. General: Chilled drinking water shall be provided in buildings at 55 degrees Fahrenheit; provide at minimum one drinking water station with bottle filler per floor, adjacent to or near toilet rooms, but not in entrance lobbies, or where hazardous materials are stored. All units are to be ADA compliant. Type of System: Water shall be chilled by standard packaged self-contained stainless steel, drinking water units (electric water coolers). Ceramic bowls are prohibited.

1.3 Floor Drains

Floor drains shall be installed in boiler and mechanical equipment rooms, kitchen and dishwashing areas, toilet rooms, garages, and similar areas where water supply is a consideration. Coordinate types of floor drains with floor finish material. Submit proposed floor drains, strainers and accessories for Towson University approval Number and locations of floor drains shall be provided in adequate quantity to avoid standing water. Floor drains shall be located near the equipment served to minimize surface water flow and to avoid crossing paths of travel. Floor drains connected to sanitary systems shall be primed. Floors shall be sloped for positive drainage.

1.4 Sanitary Systems

A. Fixture Elevations

1. Traps: Each plumbing and floor drain shall be installed so that the trap invert is not less than 3 feet above the top of the sewer into which it discharges.

B. Cleanouts

1. In finished spaces, the cleanout access cover location shall be approved by TU Operations and Maintenance. Do not install cleanout fittings in floors of toilet rooms. All cleanouts shall be in the wall except where floor runs exceed 50 feet (50’).

C. Grease Traps/Treatment Systems

1. Grease Trap/Treatment systems are to be installed at all buildings where food service operations are being performed. The preferred method is the installation of grease separator tank (similar to a septic tank) outside of the building in the main sanitary sewer line.

D. Sewage Ejectors

1. General: All building sewage systems shall be designed for gravity flow *only*. Sewage ejectors are not acceptable except for special conditions approved in writing by the Owner.

E. Special Wastes

1. Acid wastes: Separate drainage, collection, and vent systems for acid wastes shall be of corrosion-resistant material as submitted to and approved by the owner. Glass pipe is prohibited.

2. Neutralizing device for corrosive wastes. Corrosive liquids, spent acids, or other harmful chemicals that might destroy or injure a drain or vent pipe, create noxious or toxic fumes, or interfere with the sewage treatment process, shall be thoroughly diluted, neutralized, or treated. Provide a properly constructed and acceptable dilution or neutralizing device. Depending on the type of treatment required, the device shall be provided with either, or both, an automatic supply diluting water, or a neutralizing medium so as to make its contents non-injurious before discharge to the drainage system. Discharge of corrosives and methods of treatment shall be approved by local code authorities and Towson University.

1.5 Trap Primers

A. As required by code. Do not use primers connected to the back of flush valve.

B. Trap primers should be used on all floor drains.

1.6 Storm Water Drains

A. Roof Drains

1. Locations: Coordinate locations with architectural requirements and as required by the manufacturer. Ideally, drains are located in accessible chases.

2. Piping Material: Roof drain pipe below the outlet is to be PVC minimum schedule #60.

3. Insulation: Interior rain leaders shall be adequately insulated to prevent condensation.

B. Cleanouts: Provide sufficient cleanouts in storm water lines, as required.

C. Sump Pumps: Prohibited unless approved by owner in special conditions.

1.7 Water Supply System

A. Water pressures required:

1. Fixtures: Minimum water pressure required on the top floor of a building is 60 psi unless otherwise approved by owner. Where cooling towers are located on the roof of the building, the water pressure requirements for that system will dictate design criteria.

2. Fire sprinkler and standpipe systems: Refer to Fire Protection Section of these standards. Do not install fire hoses in buildings.

B. Service Pipe

In large buildings, two sources of water from different mains are desirable as determined by Towson University. Service lines must enter the building in an accessible location, and must never enter fuel rooms, storage rooms, switchgear rooms, or transformer vaults. Provide water strainer and 50 micron bag style (typical) filtering systems at service entrance as required to improve the incoming water quality. Separate domestic and fire services shall be provided. Provide flush valve at all service entrances to building.

C. Interior Water Piping

1. Backflow protection of water piping systems: Protect water distribution systems against backflow (flow of water or other liquids into distributing pipes from a source(s) other than the intended sources) including make-up water systems. The preferred Towson University requirement is to use reduced pressure zone type back flow preventers that can be serviced by certified mechanics. Pipe pressure relief to a floor drain or a splash block at grade.

2. Pressure-reducing valves: These are installed on domestic water mains or branches where pressure in excess of 70 psi is expected. Provide a valved bypass, one pipe size smaller than the main size, around the pressure-reducing valves. Specifications shall state the initial pressure-

reducing valves. Specifications shall state the initial pressure, required flow, and final pressure. These shall be located in mechanical spaces only, and not above ceilings.

3. Exterior Hose Bibs: Install frost-proof wall hydrants so that any part of the building site may be reached with 100 feet of hose without having the hose cross building entrances. Provide internal shut-off valve on piping serving each wall hydrant. The shut-off valve should be accessible through either a minimal 12” x 12” access panel or drop ceiling tile. Pitch piping from shut-off valves to drain through hydrant. Provide air gap type back flow preventer on all hose bibs.

4. Prohibited Locations: Do not place water piping in exterior walls, floor fills, and structural slabs above ornamental suspended ceilings, transformer vaults, or in electric switchgear rooms, except for fire sprinkler system piping. Avoid extended runs of water piping in unheated garages or soffits, as heat-tape applications can result in substantial energy use.

D. Valves

1. Location: Locations and types of valves must be shown on drawings, be accessible, and be identified with suitable markers.

2. On Mains: Install isolation full port ball valves at all branch lines including cold water, hot water, and hot water return circulating mains so that sections of mains may be shut off without disturbing the services to other parts of the building. In addition, a valve shall be provided on the main supply at its entrance to the building and on inlets and outlets of mechanical equipment requiring water connections. During both new construction and renovation design, particular care shall be taken to ensure that there are no dead end piping runs.

3. On Branch Connections: Install a full port ball type shut-off valve close to the main on each branch connection off the main serving more than one fixture. Provide valves at the base of risers. All valves are to have stainless steel balls with Teflon seats.

4. Additional Valves: Install a full port ball type valve on the supply to each toilet room, where the riser supplies more than one toilet room, and on the connection to each wall hydrant, or wherever a break of fixtures occur. Provide drain valves with hose ends at the low points of systems and at the base of risers.

5. Provide two, 1-inch full port ball valves and capped connections per floor in the water distribution system for future expansion. Connections to be in an accessible space conveniently located for expansion.

E. Domestic Hot Water

1. General: For general plumbing and laboratory plumbing use, equipment shall be sufficient capacity to deliver 140 degree Fahrenheit water. Systems shall provide automatic controls or tempering devices to reduce temperature as required.

2. Type of Fuel: Fuel or energy selected for water heating shall be determined by availability and cost. The type selected may be steam, gas, oil fired or electricity. Where oil is the available fuel source, and when practical and feasible for the application, install dual burners to allow for natural gas as a fuel at a later date.

3. Size of Heaters: Heater size should be in agreement with the latest edition of the International Plumbing Code (IPC) and/or as required by the owner.

4. Requirements for kitchen-cafeterias and special areas. Provide a separate domestic water heating system to supply high-temperature water to kitchen equipment and special use areas when required.

5. Re-circulating System: Separate re-circulating domestic hot water systems shall be designed for general plumbing and laboratory plumbing, with hot water produced from separate generators.

6. Provide tempering valves at all residence building shower and lavatories, unless water temperature is reduced at the source.

F. Fire Protection System

1. Fire protection systems will be designed, coordinated and approved by required agency through Towson University Environmental Health and Safety Department.

2. Coordination: Plumbing systems shall be coordinated with requirements of fire protections systems, which may include automatic sprinkler systems, fire pumps, fire standpipes, fire hydrants, mains, water tanks, or fire department connections.

3. Potability: Extreme care shall be taken to ensure that potable water for the domestic system is maintained. The design shall require safety precautions, such as reduced pressure type backflow preventers and other safety devices, to protect the domestic water system when cross-connections are made with other systems.

1.8 Insulation

A. As a minimum, reference the following:
ANSI/ASTM C-195, C533, C547, C552
ASTM C449, E84, B209
NFPA 255
UL 723

B. Minimum Insulation Schedule:

	Insulation Type (Inch)	Pipe Size (Inch)	Minimal Thickness
1. Domestic Hot and Recirc.Water	A	All	1”
2. Domestic Cold Water	A	All	¾”
3. Heating Water Supply and Return	A	All	1”
4. Hot Water Heating Runouts not exceeding 15 feet	A or D	Thru 1-1/2" 8” & larger	½” 2”
5. Chilled Water Supply and Return	A	Thru 6” 8” & larger	1 ½” 2”
6. Steam Condensate Return	A	Thru 2” 2 ½” & larger	1” 1 ½”
7. Auxiliary Water on Chiller	A	All Sizes	1”
8. Horizontal Rain Leaders, Bottom of Roof Drains and Riser to Drain	A	All Sizes	1”
9. Steam	A A A	Thru 2” 2 ½” – 4” 5” or larger	2” 3 ½” 4 “
10. Air Conditioning Condensate Drain	D	All	½”
11. Control Air 15 Feet Downstream of Dryer	D	All	½”
12. Alternator Engine Exhaust	C	All	2” **
13. Fire Pump Exhaust	C	All	2” **
14. Refrigeration Suction and Hot Gas	D	All	½”
15. Outdoor Condenser Water	B	All	1 ½”

1.9 Vacuum, compressed air and laboratory gases. Laboratory gases, including but not limited to, natural gas, compressed air and vacuum systems shall be provided with multiple compressors and pumps for increased reliability. Provide lead/lag starting controls with automatic changeover weekly (adjustable). Arrange pumps and compressors to allow complete isolation mechanically and electrically for servicing of one unit without interruption of operation of the other unit. Space and piping manifolds shall be provided for future expansion.

1.10 A reagent grade water system in the form of distilled or reverse osmosis water shall be designed as a re-circulating distribution loop with no dead end branches. Final polishing will be performed by the end user.

1.11 Ice Makers, Freezers, Walk –in and Ice Boxes – WATER COOLED SYSTEMS ARE PROHIBITED.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

The following are product standards for use under this section. Some products listed may be proprietary.

2.1 Valves

A. Domestic Water Valves – Soldered, screwed, flanged or lug type valves only; wafer or butterfly type valves shall not be used. Valves must be full flow designs.

B. Acceptable Manufacturers

1. Milwaukee
2. Apollo
3. Centerline
4. De Zuric

2.2 Pipe

A. Domestic Water Systems

1. Type “L” copper above ground, 4” and smaller
2. Type “K” below ground.
3. Ductile iron piping (class 50) is also acceptable below grade with mechanical joint fittings only.

B. Sanitary Waste Systems

1. Schedule 80 PVC for interior use.
2. Cast iron piping typical for exterior and underground use. Schedule 80 PVC is permitted for exterior use as long as proper installation and protection is provided where vehicular traffic occurs.
3. Ductile iron piping

C. Condensate

1. Schedule 40 PVC for non steam condensate.

2. Schedule 80 black steel for steam condensate.

2.3 Fixtures

A. Lavatories, Water Closets and Urinals:

Academic and Administrative buildings:

1. Water closets—Floor mounted--American Standard Madera w/ Everclean surface 16 ½" height for accessible options, 15" height for standard units.1.1-1.6 GPF.

2. Wall mounted toilets—American Standard Afwall 2200 series w/Everclean surface, ADA compliant.

3. Flush – Sloan Royal Optima 111 SMO and 186 SMOOTH Series

4. Wall hung urinals---American Standard Lynbrook 6600 series or Statebrook 6200 series.

5. Flush Valves –Faucets—Delta—Model 8DS2529 Commercial unit with paddle handles for ADA compliance—4 inch centers or Delta Model 2172-HP—goose neck unit with paddle handles for ADA applications.

6. Shower heads---American Standard Flo Wise Model 1660710.002 water saving shower head.

7. Water Coolers—Oasis Model P8AC wall mount units—also ADA compliant. The Oasis product also offers an optional bottle filler package Model P8SBF.

8. Countertops and sinks---solid surface material with integral bowls or Silestone counter tops with Kohler Model K2209 under-counter mounted bowl each with a 4 inch minimum back splash. All bowls shall have integral overflow drain.

9. Utility rooms---each room is to have a floor style mop sink with hot and cold water supply with hose bib and sink strainer. Utility rooms should be placed on every floor is possible, but at least on every other floor.

Residential Buildings:

1. Shower Heads—American Standard Flo Wise Model 1660710.002

2. Shower diverter – Symmons S-9601-PLR. Be sure that diverter valves are on outside wall and fully accessible.

3. Water coolers--should be the same listed above in the Academic/ Administrative section #7.

4. Flush Valves— Sloan Royal Optima SMO Series Model 111.1.28 SMO, 1.28 GPF maximum for toilets, 1.0 GPF for urinals. Hard wired or Battery powered units only.

5. Residential kitchen faucets--Delta Model 2100 two handle w/o spray.

6. Residential kitchen sinks – varies by design requirements. Garbage disposals are not permitted.

7. Countertops and sinks—as noted in # 8 above.

8. Residential bathroom faucets—Gerber Model 43-431—two handle faucet with metal pop-up.

9. Toilets—Common areas only—should be the same as #1 or #2 in the Academic/Administrative section dependent upon the mounting structure available.

10. Urinals—Common areas only—should be the same as #3 in the Academic/ Administrative section.

11. Toilets—Toto Drake—Model CST744S—2 piece—1.6 GPF or Kohler Wellworth Classic Model K-3577-T Class 5 flushing technology—1.28 GPF. All toilets shall be floor mounted.

12. Shower enclosures – varies per design requirements. Be sure that diverter valves are on outside wall and fully accessible.

2.4 Insulation

A. Acceptable Manufacturers

1. Owen-Corning

2. Johns Manville

3. Knauf

4. Armstrong

5. Certainteed

6. McCormick

B. Type

1. Type A: Glass Fiber insulation; ANSI/ASTM C547; ‘k’ value of 0.24 at 75 Degrees Fahrenheit; noncombustible---to be used for interior water, steam, condensate, storm and chilled water lines.

2. Type B: Cellular glass (Foam Glas); ASSI/ASTM C552; maximum water vapor transmission rating of 0.2 perms; ‘k’ value of 27 at 75 degrees Fahrenheit—to be used for exterior steam, condensate and chilled water lines.

3. Type C: Hydrous calcium silicate; ANSI/ASTM C533; rigid white in Pre-formed piping sections; asbestos free; ‘k’ value of 0.44 at 300 degrees Fahrenheit, suitable for 1,200 degrees Fahrenheit operation—to be used for interior steam lines

3. Type D: Cellular foam; flexible, plastic; ‘k’ value of 0.27 at 75 degrees Fahrenheit Armstrong Armaflex 2000 or equal—to be used for interior chilled water lines

4. Gilsulate or other powdered products are **not** acceptable for use as an insulator.

C. Jackets

1. Interior Applications

    a. Vapor Barrier Jackets: PVC vapor barrier with self-sealing adhesive joints or tacked. Minimum thickness 20 mils.

2. Exterior

    a. Steel or aluminum jackets minimum thickness .060”

    b. Pitwrap and FoamGlas – Heat sealed

    c. Perma-Pipe or equal for steam or condensate piping.

END OF SECTION

SUPPLEMENTAL INFORMATION

The following information is provided to supplement the construction standards contained in the previous section. This may include additional graphic information on products listed in the standards, or information on additional products or materials that have been used successfully on other campus projects, but may not be applicable to all projects. Consult with Facilities Management about the applicability of any particular products for specific projects.

OASIS INTERNATIONAL

BARRIER-FREE VERSACOOLER® II

P8SBF, PSBF

Suggested Specification

P8SBF shall deliver 8.0 gph of 50° F degree water at 90° F ambient and 80° F inlet water. Model P8SBF shall include P8AC and the VersaFiller Sports Bottle Filler with independent manual activation; unit must have front and side push pads to activate the manual flow of water for the cooler.VersaFiller alcove and activation button contain Freshield, WHICH UTILIZES a silver-based antimicrobial compound that reduces the growth of micro-organisms and mildew to protect the surfaces from discoloration, odors and degradation. Basin shall be designed to eliminate splashing and standing water. Bubbler shall be a Low Flow, one piece construction with flexible guard and operate between 20 and 120 PSI. VersaFiller cabinet finish is Brushed Stainless Steel. P8AC cabinet finish shall be Sandstone Powder Coated paint on galvanized steel or brushed stainless steel. Cooling system shall use R-134a refrigerant.

Models

P8SBF P8AC and PWSBF combination
PSBF PAC and PWSBF non refrigerated combination

Standard Features

> Built-in 100 micron strainer stops particles before they enter the waterway
> Waterways Are Lead-Free In Materials & Construction
> Stainless Steel Top One Piece, Low Flow, Flexible Bubbler Guard
> Heavy Duty Galvanized Steel Frame
> High Efficiency Cooling Tank and Coil
> Refrigerant R-134a
> Four Push Pad Manual Activation on water cooler
> External Stream Height Adjustment on cooler
> Independent Mechanical Activation VersaFiller

Finishes

> VersaFiller Cabinet Finish is Brushed Stainless Steel
> Standard Versacooler (bottom unit) Cabinet Finish: Sandstone Powder Coated Paint on Galvanized Steel
> Optional finishes (at additional cost): Brushed Stainless Steel

Installation

> Prior to roughing consult with local, state, and federal codes for proper mounting height.
> Shipped with complete instructions and wall mounting brackets.
> Removable side and front panels provide easy access for installation

Freshield

VersaFiller alcove is tall enough to accommodate most sizes of refillable water bottles on the market.

Options (at additional cost)

□ 1 Piece chrome plated brass bubbler (036700-001)
□ Oasis Water Filtration System

Powder Coated Finish Warranty (Continental limits of the United States and Canada): Three years on the powder coat finish provided that the water cooler has not been subjected to abuse, misuse, or alteration.

Limited 5-Year Warranty (Continental limits of the United States and Canada): Five years on the sealed refrigeration system and most component parts. Detailed warranty certificate enclosed with each water cooler; sample available upon request.

Export Warranty: One year on component parts. Detailed warranty certificate enclosed with each drinking fountain; sample copy available upon request.

Product Certified to NSF/ANSI Standard 61, Annex G (weighted average lead content of <=0.25%) and is in compliance with California's Health & Safety Code Section 116875 (commonly known as AB1953). Models covered by this specification comply with all known Plumbing Codes. Listed by Underwriters' Laboratories to U.S.and Canadian standards.

ADA Compliant when properly installed.

Components in this fountain are lead free as defined by the Safe Drinking Water Act Amendments of 1986, and the Lead Contamination Control Act of 1988.

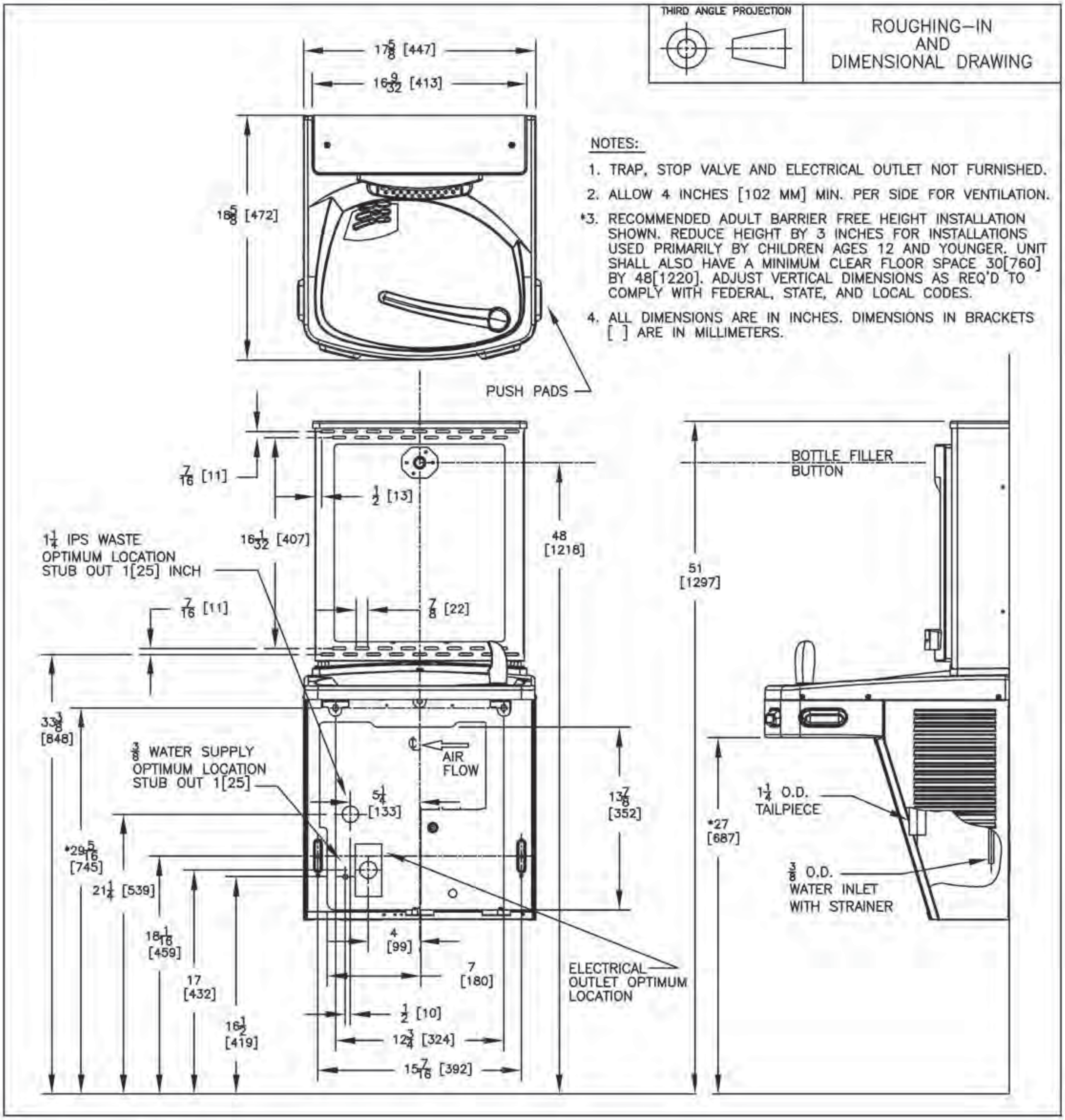
Oasis International Product Certified by NSF to NSF/ANSI Standard 61, G

Model	50° F Drinking Water 90° F Ambient Air Temp*				115 Volts, 60 HZ					
	Rated Capacity GPH	Base Rate GPH	Pre-Cooler	Hot 'N Cold™ Model	Compr. HP	Full Load Amps	Rated Watts	Glass Filler Acc. Option	Cabinet Color Finish	Net Wt. Approx.
P8SBF	8.0	8.0	No	No	1/4	4.6	460	No	Yes	59 Lbs.

* Industry Standard Rating Condition 80° F inlet water temperature. *NSF Pending.

Specifications subject to change without notice

OASIS® P8SBF: Versacooler®II Models PAC, P8AC with VersaFiller



Available Oasis Versacooler® II Models with VersaFiller Combination

P8AC with VersaFiller	P8SBF
P8ACSL with VersaFiller	P8SBFSL
PG8AC with VersaFiller	PG8SBF
PG8ACSL with VersaFiller	PG8SBFSL
PF8AC with VersaFiller	PF8SBF
PF8ACSL with VersaFiller	PF8SBFSL
PV8AC with VersaFiller	PV8SBF
PV8ACSL with VersaFiller	PV8SBFSL
PAC with VersaFiller	PSBF
PACSL with VersaFiller	PSBFSL
PGAC with VersaFiller	PGSBF
PGACSL with VersaFiller	PGSBFSL
PFAC with VersaFiller	PFSBF
PFACSL with VersaFiller	PFSBFSL
PVAC with VersaFiller	PVSBF
PVACSL with VersaFiller	PVSBFSL

Models listed above are Sandstone powder coated paint on galvanized steel. Stainless steel models are available at extra cost.

Form 3992 | Rev. 06/10

Oasis International | 222 East Campus View Blvd. | Columbus, OH 43235
For Customer Service and Technical Helpline assistance call: 800.950.3226
www.oasiscoolers.com

KOHLER®

KINGSTON™

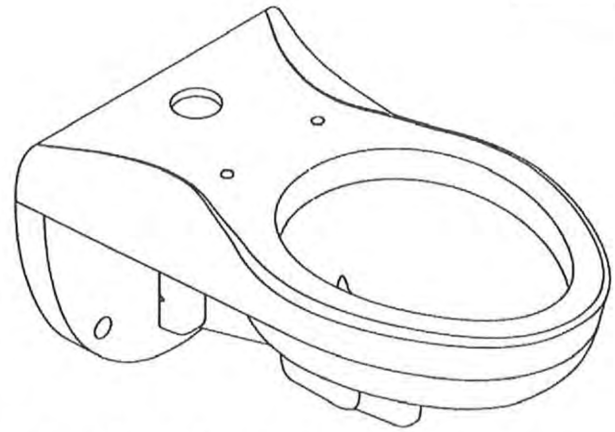
BOWL
K-4325

ADA

815500

Features

- *Vitreous china*
- *1-1/2" top spud*
- *20% water savings over standard 1.6 (6 lpf) model*
- *Wall-mount*
- *1.28 gpf (4.85 lpf)*
- *ADA compliant when installed following installation notes*
- *With bedpan lugs (-L)*
- *Siphon jet*
- *10-1/2" (26.7 cm) x 9" (22.9 cm) water area*
- *26-1/2" (67.3 cm) x 16-1/2" (41.9 cm) x 13-1/4" (33.7 cm)*



Codes/Standards Applicable

Specified model meets or exceeds the following:

- *ADA*
- *ASME A112.19.2*
- *ICC/ANSI A117.1*
- *Energy Policy Act of 1992*
- *CSA B45*

Colors/Finishes

- 0: White
- Other: Refer to Price Book for additional colors/finishes

Accessories

- 0: White
- CP: Polished Chrome
- Other: Refer to Price Book for additional colors/finishes

Specified Model

Model	Description	Colors/Finishes	
K-4325	Elongated bowl toilet	❑ 0	❑ Other_____
K-4325-L	Elongated bowl toilet with bedpan lugs	❑ 0	❑ Other_____

Recommended Accessories			
K-10956	1.28 gpf (4.85 lpf) Touchless™ DC toilet flushometer	❑ CP	
K-4731-C	Stronghold™ open front elongated seat	❑ 0	❑ Other_____
K-4731-SC	Stronghold™ open front elongated seat with integrated handle	❑ 0	❑ Other_____
K-4731-GC	Stronghold™ Quiet Close™ open front elongated seat	❑ 0	❑ Other_____

Product Specification:

The elongated bowl shall be wall-mount with a 1-1/2" top spud. Bowl shall be made of vitreous china. Bowl shall have 10-1/2" (26.7 cm) x 9" (22.9 cm) water area. Bowl shall be 1.28 gpf (4.85 lpf). Bowl shall have 20% water savings over standard 1.6 (6 lpf) models. Bowl shall be ADA compliant (when installed following installation notes). Bowl shall have bedpan lugs (-L). Bowl shall have siphon jet. Bowl shall be Kohler Model K-4325-______

USA/Canada: 1-800-4KOHL
(1-800-456-45
www.kohler.c

KINGSTON™

Technical Information

Fixture:	
Configuration	top spud, elongated
Water per flush	1.28 gallons (4.85 L)*
Spud size	1-1/2″
Passageway	2-1/8″ (5.4 cm)
Water area	10-1/2″ (26.7 cm) x 9″ (22.9 cm)
Water depth from rim	5-1/4″ (13.3 cm)
Seat post hole centers	5-1/2″(14 cm)
* Designed to flush with 1.28 gallons (4.85 L) gallons of water when installed with a 1.28 gallons (4.85 L) flush valve.	
Included components:	
Spud	18357
Flush valve requirements: Refer to manufacturer and local codes.	

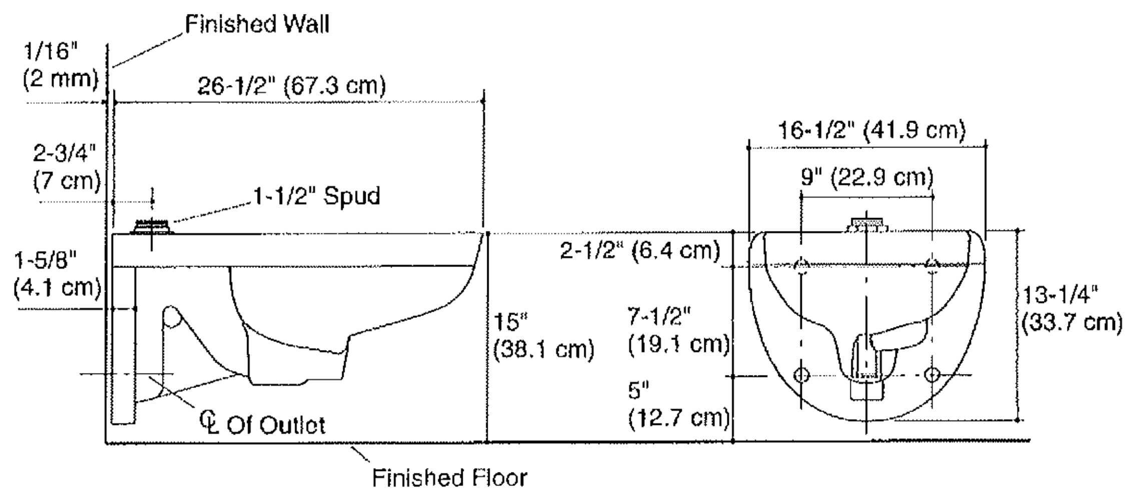
Installation Notes

Install this product according to the installation guide.

Will comply with the American Disabilities Act (ADA) when installed per the requirements of the Accessibility Guidelines, Section 604 Water Closets, of the Act. In addition, the installation of an elongated open-front seat is required.

Section 604 states the required height of the toilet is 17″ (43.2 cm) to 19″ (48.3 cm) from the floor to the top of the seat to meet ADA requirements.

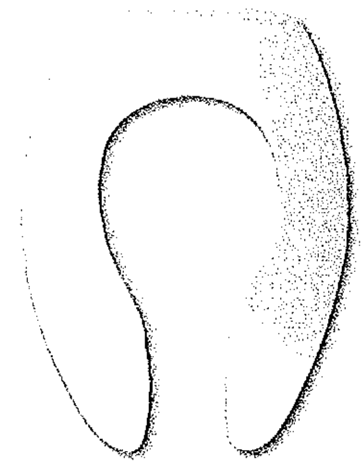
815500



Product Diagram

BEMIS COMMERCIAL

COMMERCIAL HEAVY-DUTY PLASTIC TOILET SEAT



MODEL # COLOR #

1655CT/1655SSCT ______

793972

DESCRIPTION:

Open front less cover, elongated, heavy-duty, injection molded solid plastic toilet seat. Features four molded-in bumpers, non self-sustaining (1655CT) or self-sustaining (1655SSCT) check hinges with non-corrosive 300 Series stainless steel posts and pintles and STA-TITE® Commercial Fastening System™. This seat complies with American National Standard Z124.5 Toilet (Water Closet) Seats as a class Commercial Heavy Duty.

SPECIFICATIONS:

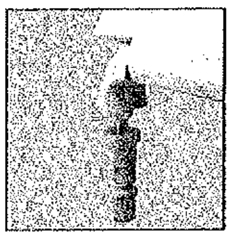
Size:	Elongated
Material:	Plastic
Style:	Open Front less Cover
Bumpers:	Four
Hinges:	Plastic Non Self-Sustaining (1655CT) or Self-Sustaining (1655SSCT) with 300 Series Stainless Steel Posts and Pintles
Fastening System:	STA-TITE® Commercial Fastening System™

FEATURES:

STA-TITE® Commercial Fastening System™

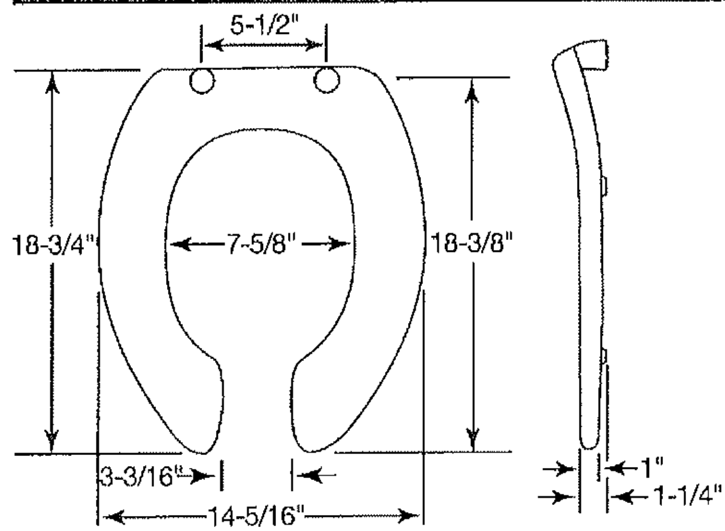
Non-Corrosive 300 Series Stainless Steel Posts and Pintles

PLASTIC HINGES WITH STAINLESS STEEL POSTS AND PINTLES



STA-TITE® COMMERCIAL FASTENING SYSTEM™

DIMENSIONS:



Proudly Made in the USA

Bemis Manufacturing Co., Sheboygan Falls, WI 53085
www.BemisSeats.com

Phone: 920-467-4621 | 800-558-7651 Fax: 920-467-8573

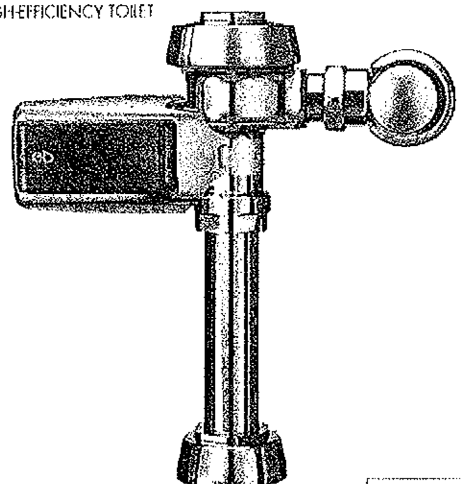
SLOAN®
OPTIMA SYSTEMS
Battery Powered Flushometers

Royal® Optima® SMOOTH™
Side-Mount-Operator-Over-The-Handle

Buy American Act Compliant

111-1.28

HET
HIGH-EFFICIENCY TOILET



Description
Exposed, Battery Powered, Sensor Activated, Royal® Optima® SMOOTH™ Water Closet Flushometer for floor mounted or wall hung top spud bowls.

Flush Cycle
Model 111-1.28 High Efficiency (1.28 gpf/4.8 Lpf)

Specifications
Quiet, Exposed, Diaphragm Type, Chrome Plated Closet Flushometer with the following features:

Flushometer
- PERMEX™ Synthetic Rubber Diaphragm with Dual Filtered Fixed Bypass
- ADA Compliant Metal Oscillating Non-Hold-Open Handle with Triple Seal Handle Packing
- 1" I.P.S. Screwdriver Bak-Chek™ Angle Stop
- Free Spinning Vandal Resistant Stop Cap
- Adjustable Tailpiece
- High Back Pressure Vacuum Breaker Flush Connection with One-piece Bottom Hex Coupling Nut
- Spud Coupling and Flange for 1½" Top Spud
- Sweat Solder Adapter w/Cover Tube and Cast Wall Flange w/Set Screw
- High Copper, Low Zinc Brass Castings for Dezincification Resistance
- Non-Hold-Open Handle, Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation
- Flush Accuracy Controlled by CID™ Technology
- Diaphragm, Handle Packing, Stop Seat and Vacuum Breaker molded from PERMEX™ Rubber Compound for Chloramine Resistance

Optima SMOOTH Unit
- ADA Compliant OPTIMA® SMOOTH™ Battery Powered Infrared Sensor for automatic "Hands-free" operation
- Sensor with Automatic Range Adjustment
- Chrome Plated Metal Sensor Housing
- Mechanical Manual Override Flush Handle
- Four (4) Size C Batteries included
- "Low Battery" Flashing LED
- "User in View" Flashing LED
- 25 to 80 psi Operating Range

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037.

Variations
☐ YG   Extended Bumper on Angle Stop (for seat with cover)

Fixtures

Consult Sloan for Sloan brand matching fixture options.

Made with Renewable Energy

ADA Compliant

Automatic
Sloan SMOOTH™ equipped Flushometers provide the ultimate in sanitary protection and automatic operation. There is no need for AC hookups or wall alterations. The Flushometer operates by means of a battery powered infrared sensor. Once the user enters the sensor's effective range and then steps away, the SMOOTH™ Unit initiates the flushing cycle to flush the fixture. State-of-the-art Technology enables activation of a manual override without "double flushing" occurring as the user departs (locks out sensor for approximately 10 seconds).

Hygienic
The Royal® Optima® SMOOTH™ Flushometer is the next advancement in hygiene. It uses sensor technology to transform manual installations into electronic, hands-free operation. User makes no physical contact with the Flushometer surface except to initiate the Override Handle when required. Helps control the spread of infectious diseases.

Economical
Automatic operation provides water usage savings over other flushing devices. Reduces maintenance and operation costs. Installation and battery replacement does not require turning off water to the valve.

Warranty
3 year (limited)

This space for Architect/Engineer approval

Job Name ______________________ Date ______________

Model Specified ______________________ Quantity ______________

Variations Specified ______________________

Customer/Wholesaler ______________________

Contractor ______________________

Architect ______________________

EPA GREEN POWER PARTNER

The information contained in this document is subject to change without notice.

111-1.28

Description
Exposed, Battery Powered, Sensor Activated, Royal® Optima® SMOOTH™ Water Closet Flushometer for floor mounted or wall hung top spud bowls.

Flush Cycle
Model 111-1.28 High Efficiency (1.28 gpf/4.8 Lpf)

ELECTRICAL SPECIFICATIONS

Control Circuit
6 VDC Input

OPTIMA Sensor Type
Active Infrared with Automatic Adjustment

OPTIMA Sensor Range
Normal Range:
26" - 32" (660 mm-813 mm)
Reduced Range:
20" - 26" (508 mm-660 mm)

Battery Type
(4) Size C Alkaline

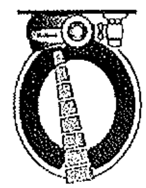
Battery Life
2 Years @ 4,000 Flushes/Month

Indicator Lights
User in View/Low Battery

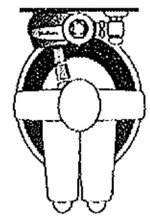
Operating Pressure
25-80 psi (172-552 kPa)

OPERATION

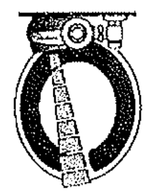
1. A continuous, invisible light beam is emitted from the SMOOTH unit's Infrared Sensor.



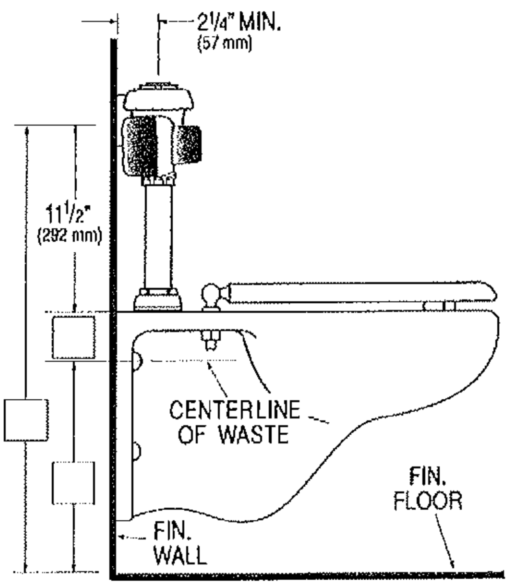
2. When the user enters the sensor's effective range, the Red LED light in the sensor window flashes for eight seconds. After eight seconds of sensing the user, the light will stop flashing and the unit waits for the user to step away before initiating a flush cycle.



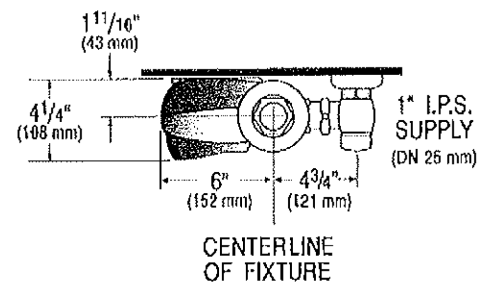
3. When the user steps away, the unit initiates a flush cycle. The unit then automatically resets and is ready for the next user.



DIMENSIONS



Side View



Top View

SLOAN VALVE COMPANY • 10500 SEYMOUR AVENUE • FRANKLIN PARK, IL 60131
Phone: 1-800-9-VALVE-9 or 1-847-671-4300 • Fax: 1-800-447-8329 or 1-847-671-4380 • www.sloanvalve.com

KOHLER®

STANWELL™

URINAL
K-4972-ET

ADA

763881

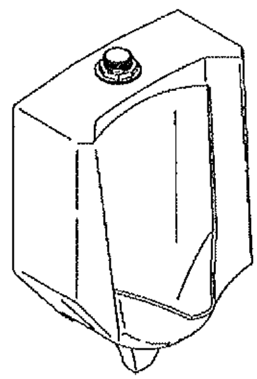
Features

- *Vitreous china*
- *Blow-out*
- *1-1/4" top spud*
- *1 gpf (3.8 lpf)*

Codes/Standards Applicable

Specified model meets or exceeds the following:

- *ASME A112.19.2*
- *IAPMO/UPC*
- *ICC/ANSI A117.1*
- *Energy Policy Act of 1992*
- *CSA B45*
- *ADA Compliant when installed per Section 605 of the act*



Colors/Finishes

- 0: White
- Other: Refer to Price Book for additional colors/finishes

Accessories

- 0: White
- Other: Refer to Price Book for additional colors/finishes

Specified Model

Model	Description	Colors/Finishes	
K-4972-ET	1-1/4" top spud urinal	❑ 0	❑ Other_____

Optional Accessories			
18763	1-1/4" replacement spud	❑ 0	❑ Other_____

Product Specification

The blow-out urinal shall be made of vitreous china with a 1-1/4" top spud. Urinal shall use 1 gpf (3.78 lpf). Urinal shall be Kohler Model K-4972-ET-________.

USA: 1-800-4-KOHLE
Canada: 1-800-964-55
kohler.com

763881

STANWELL™

Technical Information

Fixture:	
Configuration	Top spud
Water per flush	1 gal* (3.78 L)
Spud inlet size	1-1/4"
Minimum running pressure required	25 psi (172.4 kPa)

* Designed to flush with one gallon (3.78 L) of water when installed with a water-saving flush valve.

Included components:	
1-1/4" inlet spud	18759
2" outlet spud	18766
Hanger (2 required)	64512
5/8" drain plug	21403

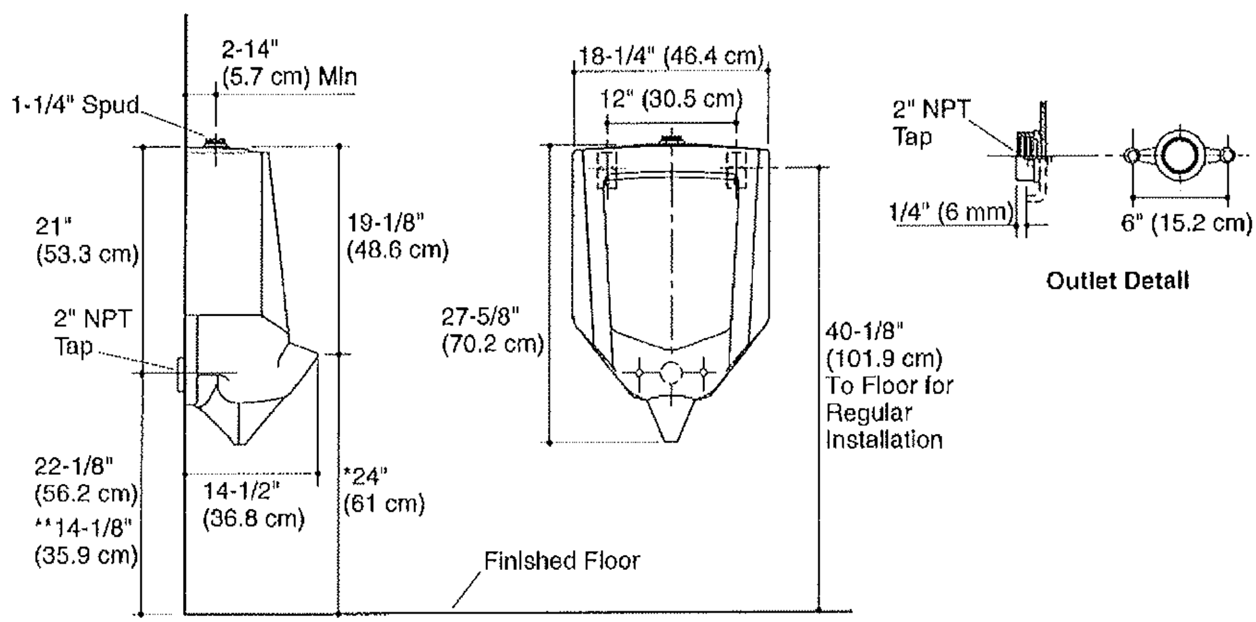
Installation Notes

Install this product according to the installation guide.

Refer to manufacturer's instructions and local codes for flush valve requirements.

*Urinal complies with ADA requirement when rim is mounted no higher than 17" (43.2 cm) from finished floor.

**Maximum outlet height for ADA compliance.



Product Diagram

THE BOLD LOOK OF KOHLER

KOHLER®

CAXTON™

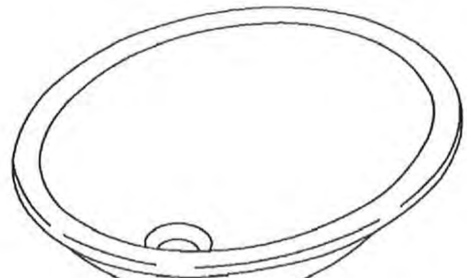
UNDERCOUNTER LAVATORY
K-2209
K-2210, K-2211

ADA

122084

Features

- *Vitreous china*
- *Undercounter*
- *With or without overflow*
- *Includes 52047 clamp assembly, unless specified*
- *15" (38.1 cm) x 12" (30.5 cm)*
- *17" (43.2 cm) x 14" (35.6 cm)*
- *19" (48.3 cm) x 15" (38.1 cm)*



Codes/Standards Applicable

Specified model meets or exceeds the following:

- *ADA*
- *ASME A112.19.2*
- *ICC/ANSI A117.1*
- *IAPMO/UPC*
- *CSA B45*

Colors/Finishes

- 0: White
- Other: Refer to Price Book for additional colors/finishes

Accessories:

- CP: Polished Chrome
- Other: Refer to Price Book for additional colors/finishes

Specified Model

Model	Description	Colors/Finishes	
K-2209	Lavatory, 15" (38.1 cm) x 12" (30.5 cm), with overflow, with clamps	☐ 0 White	☐ Other_____
K-2210	Lavatory, 17" (43.2 cm) x 14" (35.6 cm), with overflow, with clamps	☐ 0 White	☐ Other_____
K-2210-G	Lavatory, 17" (43.2 cm) x 14" (35.6 cm), with glazed underside, without overflow, with clamps	☐ 0 White	☐ Other_____
K-2210-L	Lavatory, 17" (43.2 cm) x 14" (35.6 cm), with overflow, without clamps	☐ 0 White	☐ Other_____
K-2210-N	Lavatory, 17" (43.2 cm) x 14" (35.6 cm), without overflow, with clamps	☐ 0 White	☐ Other_____
K-2211	Lavatory, 19" (48.3 cm) x 15" (38.1 cm), with overflow, with clamps	☐ 0 White	☐ Other_____
K-2211-G	Lavatory, 19" (48.3 cm) x 15" (38.1 cm), with glazed underside, without overflow, with clamps	☐ 0 White	☐ Other_____
K-2211-L	Lavatory, 19" (48.3 cm) x 15" (38.1 cm), with overflow, without clamps	☐ 0 White	☐ Other_____

Product Specification

The undercounter lavatory shall be 15" (38.1 cm) in length and 12" (30.5 cm) in width, 17" (43.2 cm) in length and 14" (35.6 cm) in width, or 19" (48.3 cm) in length and 15" (38.1 cm) in width. Lavatory shall be made of vitreous china. Lavatory shall be available with or without overflow. Lavatory shall include 52047 clamp assembly for all models except K-2210-L and K-2211-L. Lavatory shall be Kohler Model K-_____-_____.

USA: 1-800-4-KOHLE
Canada: 1-800-964-55
kohler.com

CAXTON™

Technical Information

Recommended Accessory			
K-8998	P-Trap	☐ CP	☐ Other_____

ADA compliant		
Fixture*:	Basin area	Water depth
K-2209	15″ (38.1 cm) x 12″ (30.5 cm)	4″ (10.2 cm)
K-2210/ K-2210-L/ K-2210-N/ K-2210-G	17″ (43.2 cm) x 14″ (35.6 cm)	4″ (10.2 cm)
K-2211/ K-2211-G/ K-2211-L	19″ (48.3 cm) x 15″ (38.1 cm)	4″ (10.2 cm)
Drain hole	1-3/4″ (4.4 cm) D.	
* Approximate measurements for comparison only.		

Included components:	
Basin clamp assembly (not included with K-2210-L and K-2211-L)	52047
Cut-out template, K-2209	85838-7
Cut-out template, K-2210	1002975-7
Cut-out template, K-2211	1018997-7

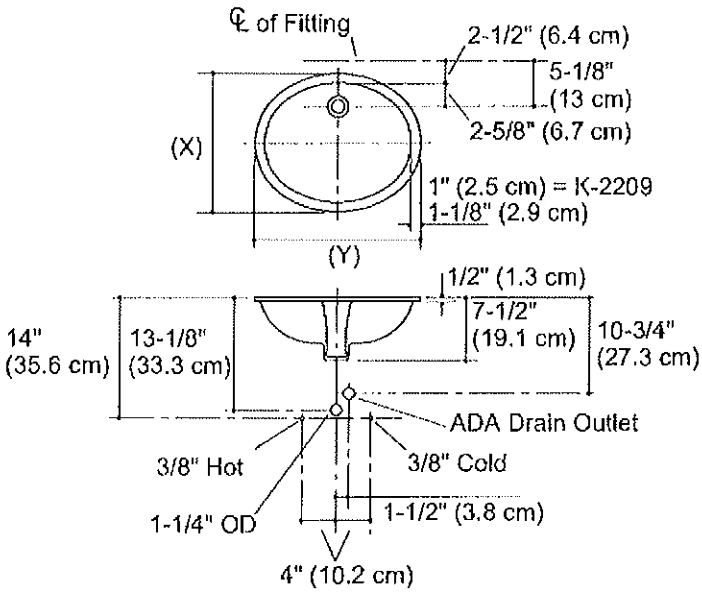
122084

Installation Notes

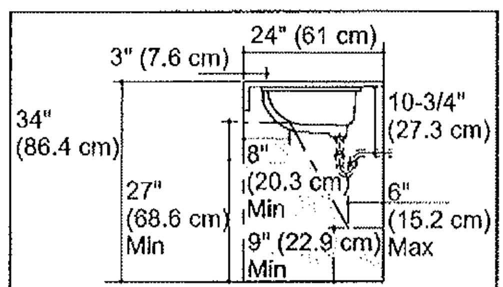
Install this product according to the installation guide.

Supplied basin clamp assemblies require 1″ (2.5 cm) minimum countertop thickness. Installer must supply anchors for thinner countertops.

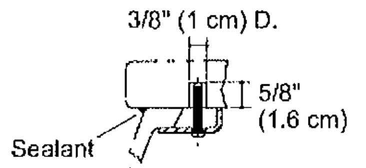
K-2209: (X) = 14" (35.6 cm), (Y) = 17" (43.2 cm)
K-2210: (X) = 16-1/4" (41.3 cm), (Y) = 19-1/4" (48.9 cm)
K-2211: (X) = 17-1/4" (43.8 cm), (Y) = 21-1/4" (54 cm)



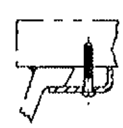
Standard Installation



Recommended ADA Installation



Marble Installation



Wood Installation

Product Diagram

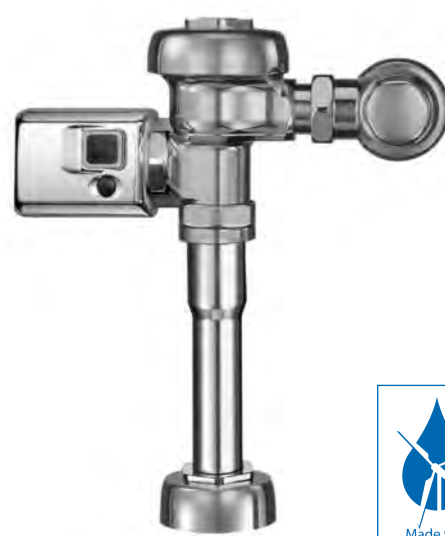
THE BOLD LOOK OF KOHLER

SLOAN®
OPTIMA SYSTEMS

Sloan® Model

OPTIMA® SMO
Battery Powered Flushometers

180-SMO



Description
Exposed, Battery Powered, Side Mount Sensor Operated Urinal Flushometer for 1¼" top spud urinals.

Flush Cycle
☐ Model 180-1.0-SMO Low Consumption (1.0 gpf/3.8 Lpf)
☐ Model 180-1.5-SMO Water Saver (1.5 gpf/5.7 Lpf)
☐ Model 180-SMO Conventional (3.5 gpf/13.2 Lpf)

Variations
☐ **T** 1½" Flush Connection
☐ **DFB** Dual Filtered Fixed Bypass Diaphragm

Specifications
Quiet, Exposed, Diaphragm Type, Chrome Plated Urinal Flushometer for either left or right hand supply with the following features:
- High Chloramine Resistant PERMEX™ Synthetic Rubber Diaphragm with Linear Filtered Bypass and Vortex Cleansing Action™
- ADA Compliant OPTIMA® Battery Powered Infrared Sensor for automatic "No Hands" operation
- Chrome Plated Infrared Sensor Housing
- Angled Sensor Window
- Manual Override Flush Button
- Four (4) Size C Batteries included
- "Low Battery" Flashing LED with Optional Audio Tone
- "User in View" Flashing LED
- Optional 24-Hour Sentinel Flush
- Infrared Sensor Range Adjustment Screw and Reset Button
- 1" I.P.S. Screwdriver Bak-Chek® Angle Stop
- Vandal Resistant Stop Cap
- Adjustable Tailpiece
- Vacuum Breaker Flush Connection
- Spud Coupling and Spud Flange for 1¼" Top Spud
- Sweat Solder Adapter with Cover Tube and Cast Wall Flange
- High Copper, Low Zinc Brass Castings for Dezincification Resistance
- No External Volume Adjustment to Ensure Water Conservation
- Low Consumption Flush Accuracy
- Stop Seat and Vacuum Breaker molded from PERMEX™ Rubber Compound for Chloramine resistance

Valve Body, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance with the applicable sections of ASSE 1037, ANSI/ASME A112.19.2 and Military Specification V-29193. Installation conforms to ADA requirements.

See Accessories Section and OPTIMA Accessories Section of the Sloan catalog for details on these and other OPTIMA® Flushometer variations.

ADA Compliant

Automatic
Sloan OPTIMA SMO equipped Flushometers provide the ultimate in sanitary protection and automatic operation. There is no need for AC hookups or wall alterations. The Flushometer operates by means of a battery powered infrared sensor. Once the user enters the sensor's effective range and then steps away, the Side Mount Unit initiates the flushing cycle to flush the fixture.

Hygienic
User makes no physical contact with the Flushometer surface except to initiate the Override Button when required. Helps control the spread of infectious diseases. 24-Hour Sentinel Flush keeps fixture fresh during periods of nonuse.

Economical
Automatic operation provides water usage savings over other flushing devices. Reduces maintenance and operation costs. Installation and battery replacement does not require turning off water to the valve.

Warranty
3 year (limited)

This space for Architect/Engineer approval

Job Name ______________________ Date __________

Model Specified ______________________ Quantity __________

Variations Specified ______________________

Customer/Wholesaler ______________________

Contractor ______________________

Architect ______________________

180-SMO

- **Description**
  Exposed, Battery Powered, Side Mount Sensor Operated Urinal Flushometer for 1¼” top spud urinals.

- **Flush Cycle**
  ☐ Model 180-1.0-SMO Low Consumption (1.0 gpf/3.8 Lpf)
  ☐ Model 180-1.5-SMO Water Saver (1.5 gpf/5.7 Lpf)
  ☐ Model 180-SMO Conventional (3.5 gpf/13.2 Lpf)

ELECTRICAL SPECIFICATIONS

- **Control Circuit**
  Solid State
  6 VDC Input
- **OPTIMA Sensor Type**
  Infrared Convergence Type
  Object Lock Detection
- **OPTIMA Sensor Range**
  Nominal 8” - 54” (203 mm-1372 mm), Factory Set at 24” (610 mm)
- **Battery Type**
  (4) Size C Alkaline
- **Battery Life**
  2 Years @ 3,000 Flushes/Month
- **Indicator Lights**
  User in View/Low Battery
- **Operating Pressure**
  15-100 psi (104-689 kPa)
- **Operation Features**
  (can be turned on and off)
  24-Hour Sentinel Flush
  Audio Low Battery Tone

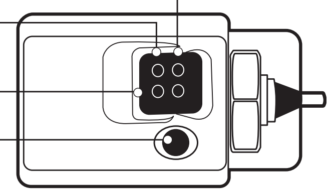
VISUAL INDICATOR GUIDE

USER-IN-VIEW L.E.D. — Green light flashes 3 times after 5 second delay when a user is in view. The green light flashes constantly when a user is in view during the 7 minute start up sequence.

BATTERY L.E.D. — Yellow light flashes indicating it is time to replace batteries with four (4) new Type “C” batteries.

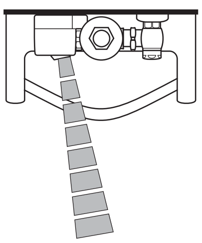
OBJECT LOCK SENSOR — Detects user or object.

COURTESY MANUAL FLUSH BUTTON — Allows manual activation of flush when needed.

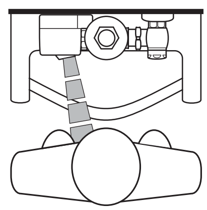


OPERATION

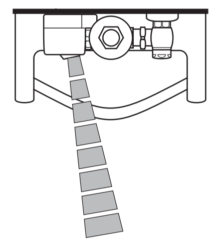
1. A continuous, invisible light beam is emitted from the Object Lock Infrared Sensor.



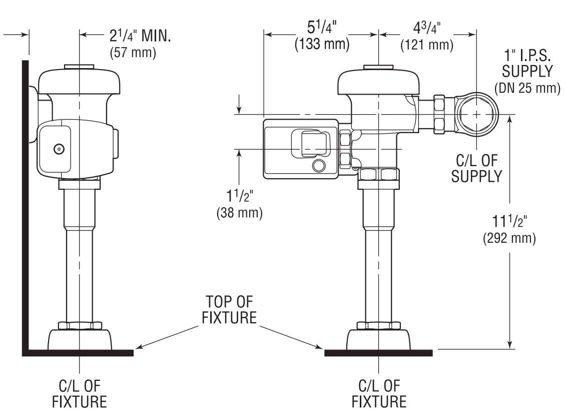
2. As the user enters the beam’s effective range, 8” to 54” (203 mm - 1372 mm), the Object Lock Infrared Sensor senses the user.



3. When the user steps away from the Object Lock Infrared Sensor, the circuit initiates the flushing cycle to flush the fixture. The Circuit then automatically resets and is ready for the next user.

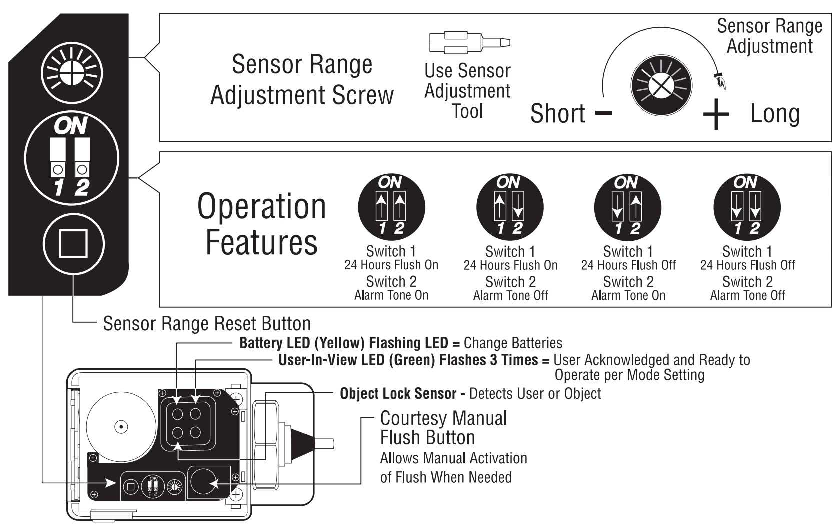


ROUGH-IN



Includes EBV-89-A Side Mount Operator

FUNCTION SETTINGS



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Phone: 1-800-9-VALVE-9 or 1-847-671-4300 • Fax: 1-800-447-8329 or 1-847-671-4380 • www.sloanvalve.com

TOTO®

TET1GA

EcoPower® Toilet Flush Valve, 1.6 gpf

FEATURES

- 1.6 GPF
- Self-powered hydroelectric flush valve system
- No minimum daily usage requirement
- Durable chrome plated body with tamper-proof screws and solid bronze valve body
- Self-cleaning piston valve with 360° filter screen
- Neutral rough-in and adjustable tail piece connection
- True mechanical flush override
- Smart Sensor with self-adjusting detection range
- 6-second detection time to prevent ghost flushing
- For toilet with 1-1/2" top spud inlet
- Exposed flush valve with 1" angle stop and 1-1/2" vacuum breaker set
- ADA compliant

MODELS

☐ TET1GA32#CP
- TET1GA#CP (1.6 gpf flush valve)
- VB9CP-32 (1-1/2" vacuum breaker tube, 1" angle stop)

EcoPower

Auto Functions

Piston Valve

COLORS/FINISHES

- #CP Polished Chrome

OPTIONAL ACCESSORIES

- Z-4000-J - Adapter for ground joint angle stops

CODES/STANDARDS

- Meets or exceeds ASSE 1037, CSA B125.3
- Certifications: IAPMO(cUPC), ASSE, State of Massachusetts, and others
- Code Compliance: UPC, IPC, NSPC, NPC Canada, and others
- ADA compliant

PRODUCT SPECIFICATION

TOTO® Model No. ______________________________
Product shall be 1.6 GPF. Product shall be an automatic infrared sensor-activated, toilet flush valve. Product shall use hydropower, EcoPower flush valve system. Product shall have durable chrome plated body with tamper-proof screws and solid bronze valve body. Product shall have smart sensor with self-adjusting detection range. Product shall have neutral rough-in and adjustable tail piece connection Product shall have smart sensor with self-adjusting detection range. Product shall have true mechanical flush override. Product shall have 6-second detection time to prevent ghost flushing. Product shall have piston with debris screen and solenoid with self-cleaning mechanism. Product shall be ADA compliant.

TET1GA

EcoPower® Toilet Flush Valve, 1.6 gpf

SPECIFICATIONS

• Material	Bronze casting
• Power supply	EcoPower
• Sensor detection time	Factory setting at six (6) seconds minimum
• Sensor detection range	Self-adjusting to environment
• Discharge quantity	Preset to 1.6 gpf/ 6.0 lpf
• Operating temperature	32°-104°F (0°-40°C)
• Water supply pressure	15 psi - 125 psi*
• Water supply connection	1" NPT
• Warranty	Three year limited

*Water pressures over 80 psi are not recommended for most plumbing fixtures. Check your local plumbing code for details.

INSTALLATION NOTES

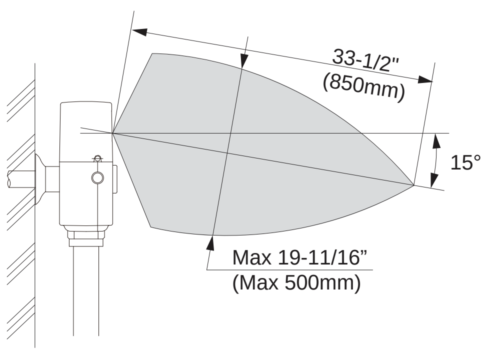
For commercial applications only.
Warning: Failure to properly adjust angle stop to the appropriate level can potentially cause property damage.

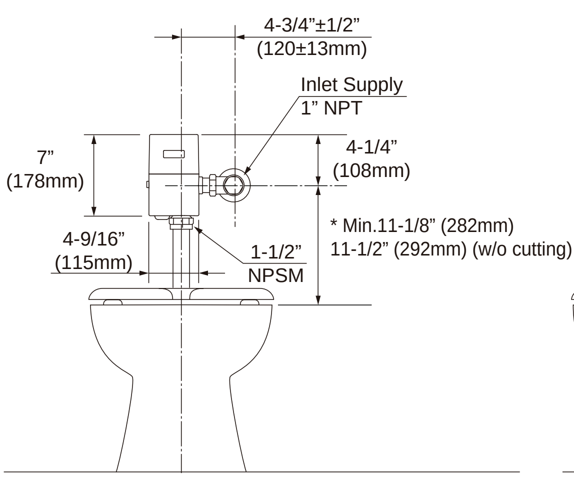
For detailed installation instructions, please refer to the installation manual.

Max flow rate to be used with
TET1GA___________: 1.6 gpf

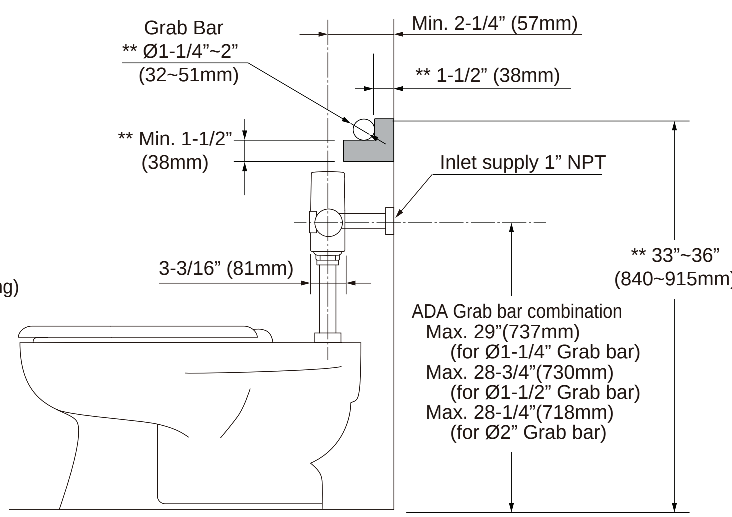
Confirm with local codes and standards for floor drain requirement. Adjust control stop for proper flow rate to the fixture.

DIAGRAM





* Check local codes



** ADA 2010 Section 609

TOTO®

TEU1GA

EcoPower® Urinal Flush Valve 1.0 gpf

FEATURES

- 1.0 GPF
- Self-powered hydroelectric flush valve system
- No minimum daily usage requirement
- Durable chrome plated body with tamper-proof screws and solid bronze valve body
- Self-cleaning piston valve with 360° filter screen
- Neutral rough-in and adjustable tail piece connection
- True mechanical flush override
- Smart sensor with self-adjusting detection range and fuzzy logic control to reduce water usage
- 6-second detection time to prevent ghost flushing
- ADA compliant

MODELS

☐ TEU1GA12#CP
- TEU1GA#CP (1.0 gpf urinal flush valve)
- VB9CP-12 (3/4" vacuum breaker tube, 3/4" angle stop,)

☐ TEU1GA22#CP
- TEU1GA#CP (1.0 gpf urinal flush valve)
- VB9CP-22 (1-1/4" vacuum breaker tube, 3/4" angle stop)

COLORS/FINISHES

- #CP Polished Chrome

OPTIONAL ACCESSORIES

- Z-4000-J - Adapter for ground joint angle stops

CODES/STANDARDS

- Meets or exceeds ASSE 1037, CSA B125.3
- Certifications: IAPMO(cUPC), ASSE, State of Massachusetts, and others
- Code Compliance: UPC, IPC, NSPC, NPC Canada, and others
- ADA compliant

EcoPower

Auto Functions

Piston Valve

PRODUCT SPECIFICATION

TOTO® Model No. ______________________________
Product shall be 1.0 GPF. Product shall be an automatic infrared sensor-activated, urinal flush valve. Product shall use hydropower, EcoPower flush valve system. Product shall have durable chrome plated body with tamper-proof screws and solid bronze valve body. Product shall have neutral rough-in and adjustable tail piece connection. Product shall have smart sensor with self-adjusting detection range. Product shall have true mechanical flush override. Product shall have 6-second detection time to prevent ghost flushing. Product shall have piston with debris screen and solenoid with self-cleaning mechanism. Product shall be ADA compliant.

TEU1GA

EcoPower® Urinal Flush Valve, 1.0 gpf

SPECIFICATIONS

• Material	Bronze casting
• Power supply	EcoPower
• Sensor detection time	Factory setting at six (6) seconds minimum
• Sensor detection range	Self-adjusting to environment
• Discharge quantity	Preset to 1.0 gpf/ 3.8 lpf
• Operating temperature	32°-104°F (0°-40°C)
• Water supply pressure	15 psi - 125 psi*
• Water supply connection	3/4" NPT
• Warranty	Three year limited

*Water pressures over 80 psi are not recommended for most plumbing fixtures. Check your local plumbing code for details.

INSTALLATION NOTES

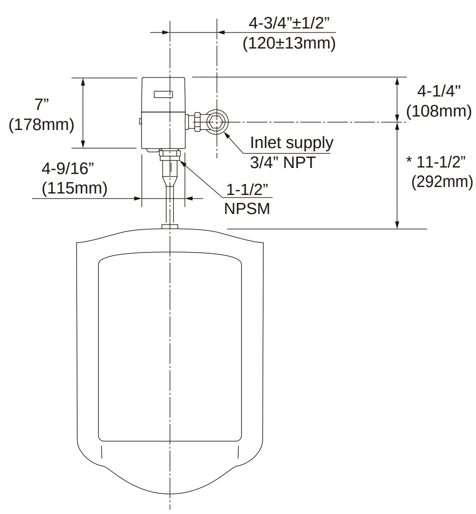
For commercial applications only.
Warning: Failure to properly adjust angle stop to the appropriate level can potentially cause property damage.

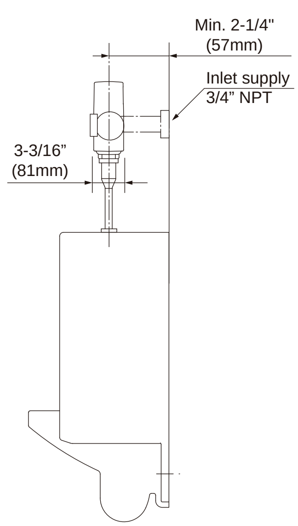
For detailed installation instructions, please refer to the installation manual.

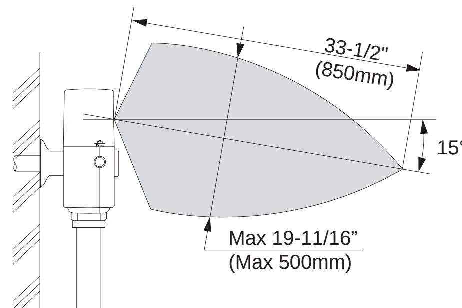
Max flow rate to be used with
TEU1GA___________: 1.0 gpf

Confirm with local codes and standards for floor drain requirement. Adjust control stop for proper flow rate to the fixture.

DIAGRAM







* Check local codes

ELECTRONIC-DC FAUCETS

116.606.AB.1

CHICAGO FAUCETS
a Geberit company

Electronic Faucets

Product Type

Deck Mounted Single Hole E-Tronic® 40 Traditional Sink Faucet with Dual Beam Infrared Sensor

Features & Specifications

• Single Hole
• 0.5 GPM (1.9 L/min) Vandal Proof Non-Aerating Spray
• Single Supply for Tempered Water
• 6 Volt Lithium CRP2 Battery (Included)
• Multiple Field Adjustable Modes and Ranges
• Geberit Commander™ Software Compatible
• ECAST® design provides durable brass construction with total lead content equal to or less than 0.25% by weighted average
• CFNow! Item Ships in 5 Days

Performance Specification

• Rated Operating Pressure: 20-125 PSI
• Rated Operating Temperature: 40-140ºF

Warranty

• Lifetime Limited Faucet Warranty
• 5-Year Limited Faucet Warranty
• 1-Year Limited Finish Warranty
• 5-Year Limited Mechanical Warranty
• 3-Year Limited Electronics and Solenoid Warranty

Codes & Standards

• ASME A112.18.1/CSA B125.1
• Certified to NSF/ANSI 61, Section 9 by CSA
• California Health and Safety Code 116875 (AB1953-2006)
• Vermont Bill S.152
• NSF/ANSI 372 Low Lead Content
• ADA ANSI/ICC A117.1
• CALGreen

Job Name ____________________

Item Number ____________________

Section/Tag ____________________

Model Specified ____________________

Architect ____________________

Engineer ____________________

Contractor ____________________

[ ] Submitted as Shown [ ] Submitted with Variations

Date ____________________

ECAST

ECAST products are intended for installation where state laws and local codes mandate lead content levels or in any location where lead content is a concern.

C US

NSF/ANSI 372 LOW LEAD CONTENT

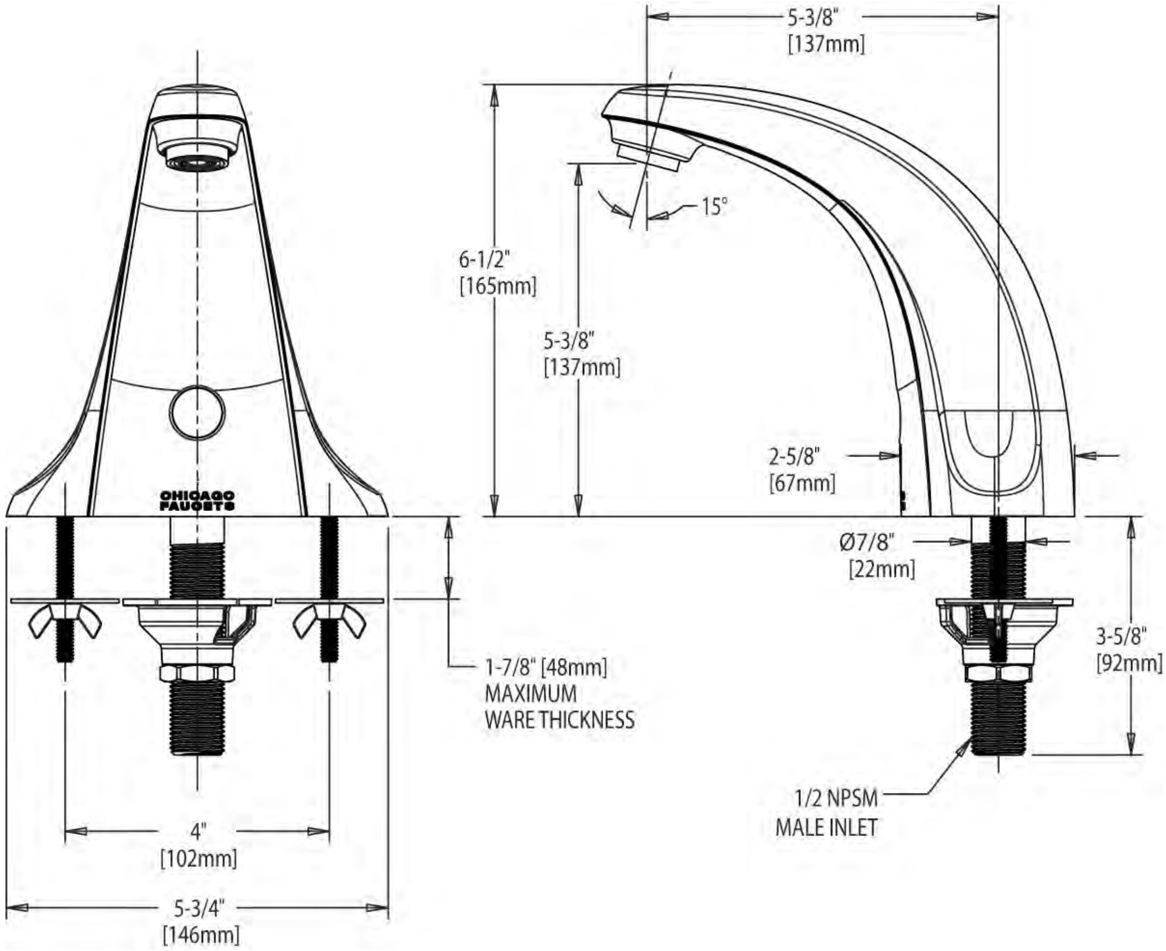
2100 South Clearwater Drive
Des Plaines, IL
P: 847/803-5000
F: 847/803-5454
Technical: 800/TEC-TRUE
www.chicagofaucets.com

116.606.AB.1

Electronic Faucets

Architect/Engineer Specification

Chicago Faucets No. 116.606.AB.1, Deck Mounted Single Hole E-Tronic® 40 Traditional Sink Faucet with Dual Beam Infrared Sensor, Chrome Plated metal construction 0.5 GPM (1.9 L/min) Pressure Compensating Econo-Flo Vandal Proof Non-Aerating Spray. Single Supply for Tempered Water. 6 Volt Lithium CRP2 Battery (Included). Multiple Field Adjustable Modes and Ranges. Geberit Commander™ Software Compatible. ECAST® construction with less than 0.25% lead content by weighted average. CALGreen Compliant. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, Certified to NSF/ANSI 61, Section 9 by CSA, California Health and Safety Code 116875 (AB1953-2006), Vermont Bill S.152, NSF/ANSI 372 Low Lead Content, and California Green Building Standards Code (CALGreen).



Operation and Maintenance

Installation should be in accordance with local plumbing codes. Flush all pipes thoroughly before installation. After installation, remove spout outlet or flow control and flush faucet thoroughly to clear any debris. Care should be taken when cleaning the product. Do not use abrasive cleaners, chemicals or solvents as they can result in surface damage. Use mild soap and warm water for cleaning and protecting the life of Chicago Faucet products. For specific operation and maintenance refer to the installation instructions and repair parts documents that are located at www.chicagofaucets.com.

Chicago Faucets, member of the Geberit Group, is the leading brand of commercial faucets and fittings in the United States, offering a complete range of products for schools, laboratories, hospitals, office buildings, food service, airports and sport facilities. Call 1.800.TECTRUE or 1.847.803.5000 Option 1 for installation or other technical assistance.

2100 South Clearwater Drive
Des Plaines, IL
P: 847/803-5000
F: 847/803-5454
Technical: 800/TEC-TRUE
www.chicagofaucets.com

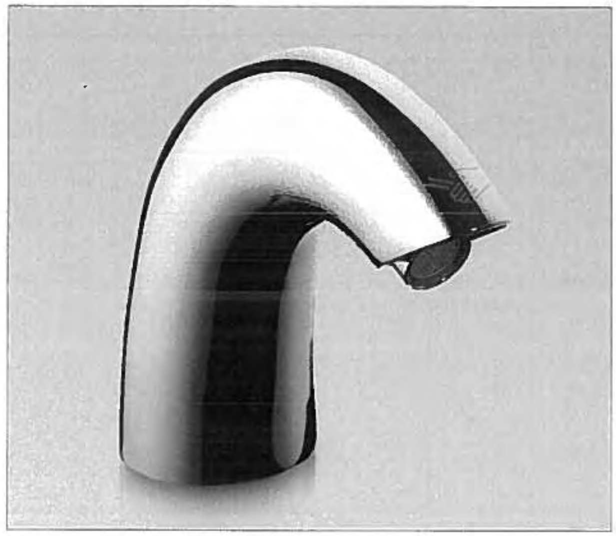
TOTO®

TEL105 Series

Standard EcoPower® Faucet

FEATURES

- Self-generating hydropowered EcoPower system
- No minimum daily usage requirement
- Micro-sensor positioned underneath the spout head for accurate hand detection ensuring smooth and consistent water distribution
- Vandal resistant aerator housing
- Durable chrome plated spout body
- Single-hole mount
- Kit includes spout body, controller box , and mounting hardware - less supply lines
- Equipped with 0.5gpm flow control



EcoPower

MODELS

☐ **TEL105-D10E**
- TELS105 (Standard Spout)
- TELC105-D10E (Controller: 0.09gpc, 10 sec on-demand)

☑ TEL105-D10EM
- **TEL105-D10E** (Standard Spout Kit)
- TLM10 (Mixing Valve)

☐ TEL105-D10ET
- **TEL105-D10E** (Standard Spout Kit)
- TLT10 (Thermostatic Mixing Valve)

☐ **TEL105-C20E**
- TELS105 (Standard Spout)
- TELC105-C20E (Controller: 0.19gpc, 20 sec continuous)

☐ TEL105-C20EM
- **TEL105-C20E** (Standard Spout Kit)
- TLM10 (Mixing Valve)

☐ TEL105-C20ET
- **TEL105-C20E** (Standard Spout Kit)
- TLT10 (Thermostatic Mixing Valve)

COLORS/FINISHES

- #CP Polished Chrome
- #BN Brushed Nickel
- #PN Polished Nickel

OPTIONAL ACCESSORIES

- THP3158#CP - 4" Cover Plate
- THP3159#CP - 8" Cover Plate
- THP3237 - Swivel Coupling

PRODUCT SPECIFICATION

TOTO Model #____________ The faucet shall have hydropowered self-generating, EcoPower System. The faucet shall have maximum of 10 seconds on-demand flow (0.09gpc), or 20 seconds continuous flow (0.19gpc). Product shall have anti-scald shape memory alloy thermostatic mixing valve (-ET models only). The faucet shall have self-adjusting sensor.

CODES/STANDARDS

- Operates below federally mandated consumption limit of 0.25gpc
- Complies to California Green Building Code, CALGreen of 0.20 gpc
- Meets or exceeds ASME A112.18.1M/CSA B125.1, and NSF372-2011
- Certifications: IAPMO(cUPC), State of Massachusetts, and others
- California Green Code and City of Los Angeles Water Efficiency Ordinance
- ADA compliant
- Complies with federal and state statutes as low-lead (contains a weighted average of 0.25% lead or less)

* For codes and standards of mixing valves TLM10 and TLT10, please refer to corresponding product spec sheet

LOW-LEAD UPC

TEL105 Series

Standard EcoPower® Faucet

SPECIFICATIONS

Power Supply	EcoPower
Sensor Detection Range	5-1/8" - 7-7/8" (130 - 200mm) Sensor is self-adjusting
Water Supply Pressure	Min (Dynamic/Flowing) Pressure: 15psi (100kPa) Max (Static) Pressure: 80 psi (551kPa)
Water Supply	G1/2 (1/2 NPSM compatible)
Inlet Temperature Range	32-110°F(0-42°C)
Ambient Temperature	32-104°F(0-40°C)
Humidity	Max. 90% RH
Flow Rate	0.09 gpc* - max 10 second On-Demand** (0.09 gpc = 0.5 gpm x 10/60 sec) Equipped with 0.5 gpm flow control
	0.19 gpc* - 20 second Continuous*** (0.19 gpc = 0.5 gpm x 20/60 sec) Equipped with 0.5 gpm flow control
Warranty	Three years

NOTE

Following the federal mandate for water efficiency outlined in the Environmental Protection Act of 1992, faucets can be rated for water consumption based on two categories: Flow Rate and Water Consumption. TOTO uses the water consumption standard because it is the most accurate method of measuring water use. TOTO faucets also comply with the CALGreen Guideline of water usage.

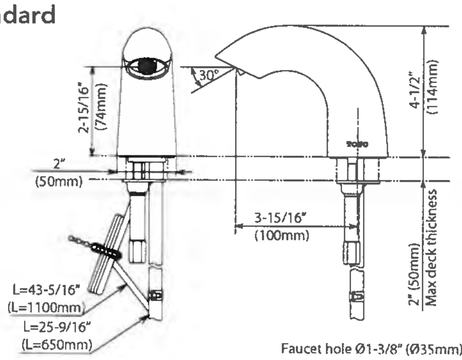
<u>Water Saving</u>

On-Demand [10 sec.] faucet (0.09gpc)
Federal Standard (0.25gpc) – 64% less
CAL Green (0.20gpc) – 55% less

Continuous [20 sec.] faucet (0.19gpc)
Federal Standard (0.25gpc) – 24% less
CAL Green (0.20gpc) – 5% less

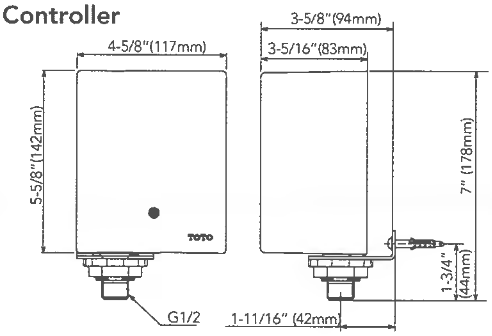
*Gallons per cycle (gpc) is the amount of water per usage cycle .
** On-demand refers to the way in which the water is dispersed (i.e.; water is only dispersed when the sensor is activated by the user as needed).
*** Continuous means that water is dispersed for a continuous 20 second cycle.

Standard

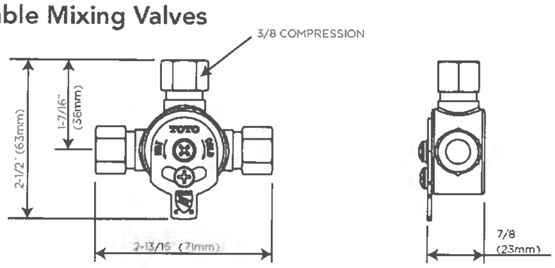


Faucet hole Ø1-3/8" (Ø35mm)

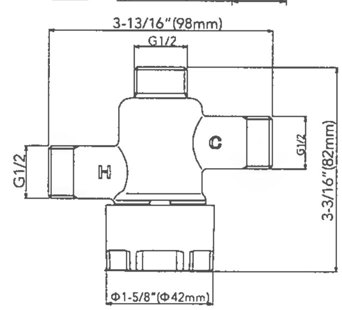
Controller



Available Mixing Valves



Hot/Cold Mixing Tee (TLM10)



G1/2 compatible with ½ NPSM

Thermostatic Mixing Valve (TLT10R)

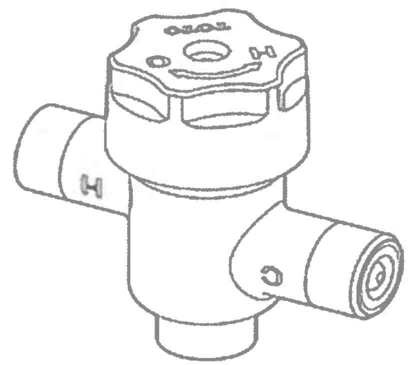
TOTO®

TLT10

Thermostatic Mixing Valve
(For Lavatory Faucets)

FEATURES

- Below deck thermostatic mixing valve allowing fixed ambient water temperature adjustment
- Shape Memory Alloy (SMA) Technology to quickly adjust temperature to effectively avoid the outflow of scolding water
- G1/2 (1/2NPSM compatible) threaded fittings
- Low-lead solid brass construction
- Equipped with integral check valves and debris screens for back flow prevention

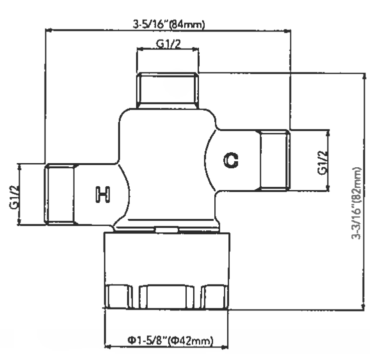


MODELS

TLT10 Thermostatic Mixing Valve
*included in EcoPower® faucet kits ending with –**ET**

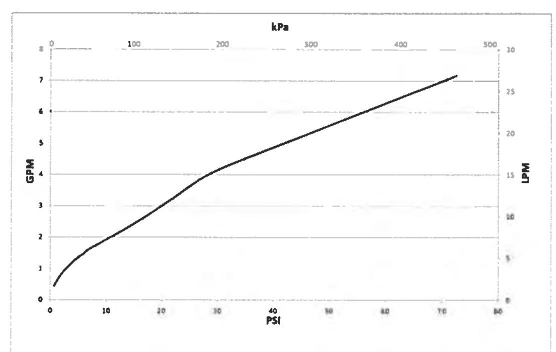
SPECIFICATIONS

Water Supply Pressure	Min (Dynamic/Flowing) Pressure: 15 psi (100 kPa) Max (Static) Pressure: 80 psi (551 kPa)
Water Supply Connection	G1/2 (1/2 NPSM compatible)
Ambient Temperature	32 - 104°F (0 - 40°C)
Humidity	Max. 90% RH
Recommended	Hot supply 120 - 180°F (49 -82°C) Cold supply 39 - 80°F (4 - 27°C)
Temp. Adjustment Range at Outlet	Ambient water temp~110°F (43.3°C)
Factory Default Outlet Temperature	100±4°F (38±2°C) Condition: 30psi (206kPA) Ambient water temp and hot water temp 176°F
Minimum Flow	0.5 gpm (2L/min) Pressure 30 psi
Warranty	Three years



CODES/STANDARDS

- Meets or exceeds NSF372-2011, **ASSE 1070-2004**, and CSA B125.3-12
- Certifications: IAPMO(cUPC), State of Massachusetts, and others
- Complies with Federal and State statutes as low-lead (contains a weighted average of 0.25% lead or less)



TOTO®

These dimensions and specifications are subject to change without notice dyson airblade V

LOW VOLTAGE AND HIGH VOLTAGE TECHNICAL SPECIFICATION

Electrical

Input voltage: Low voltage = 110-127 V, High voltage = 200-240 V

Frequency: 50 or 60 Hz, subject to voltage (85-115 V at 50 Hz); (85-130 V at 60 Hz); (200-240 V at 50 & 60 Hz)

Standby power consumption: Less then 0.5 W

Motor specification: 1,000 W digital brushless motor

Motor switching rate: 5,000 per second

Amp: Recommended dedicated 15 amp circuit. (110V ~10A; 120V ~8.33A; 220V ~4.55A; 240V ~4.17A)

Heater type: None

Construction

Fascia: Polycarbonate

Antibacterial coating type:
HU02 (Sprayed Nickel) contains antibacterial additive in paint.
HU02 (White) contains antibacterial moulded additive.
Can help prevent the growth of bacteria.

Back plate mounting bracket: ABS/PBT Plastic

Exterior screw type: Anti-tamper 4 mm Pin-Hex

Water ingress protection to IP24

Filter

HEPA filter (Glass fiber and fleece prelayer)

Removes 99.97% of bacteria as small as 0.3 microns

Operation

Touch free capacitive sensor activation

Hand dry time measurement: 12 seconds
(Measurement based on NSF Protocol P.335)

Sound power level: 79 dB(A)

Sound pressure level @ 2 m: 63 dB(A)[1]

Operation lock-out period: 30 seconds

Airspeed at aperture: 675 km/h / 420 mph

Maximum altitude: 2,000 metres / 6,561 ft.

Operating airflow: up to 5.28 gal/sec & up to 42.38 CFM

Operating temperature range: 0°C-40°C / 32°F-104°F

Logistics

Single unit order code:
Sprayed Nickel - Low voltage: 307174-01, High voltage: 307172-01
White - Low voltage: 307173-01, High voltage: 307171-01

Unit barcodes:
Sprayed Nickel - Low voltage: 885609009933, High voltage: 885609009797
White - Low voltage: 885609009896, High voltage: 885609009179

Net weight: 2.9 kg / 6.17 lbs

Packaged weight: 4.0 kg / 8.81 lbs

Packaged dimensions:
(H) 146 mm × (W) 454 mm × (D) 273 mm / (H) 5 3/4″ × (W) 17 7/8″ × (D) 10 3/4″

Standard warranty

5 year parts and 5 year limited labor warranty

Accreditations:

Carbon Trust

NSF International

Quiet Mark

Contributes to LEED certification

ADA compliant

UL Listed

[1]Sound pressure measured at 2 m distance, in a semi-anechoic chamber.

Product range (Select one)

HU02 Sprayed Nickel	HU02 White
Part number/SKU	**Part number/SKU**
Low Voltage: 307174-01	Low Voltage: 307173-01
High Voltage: 307172-01	High Voltage: 307171-01

CARBON TRUST REDUCING CO2 · NSF TESTED. CERTIFIED. HYGIENIC · QUIET MARK · U.S. GREEN BUILDING COUNCIL LEED USGBC · UL LISTED

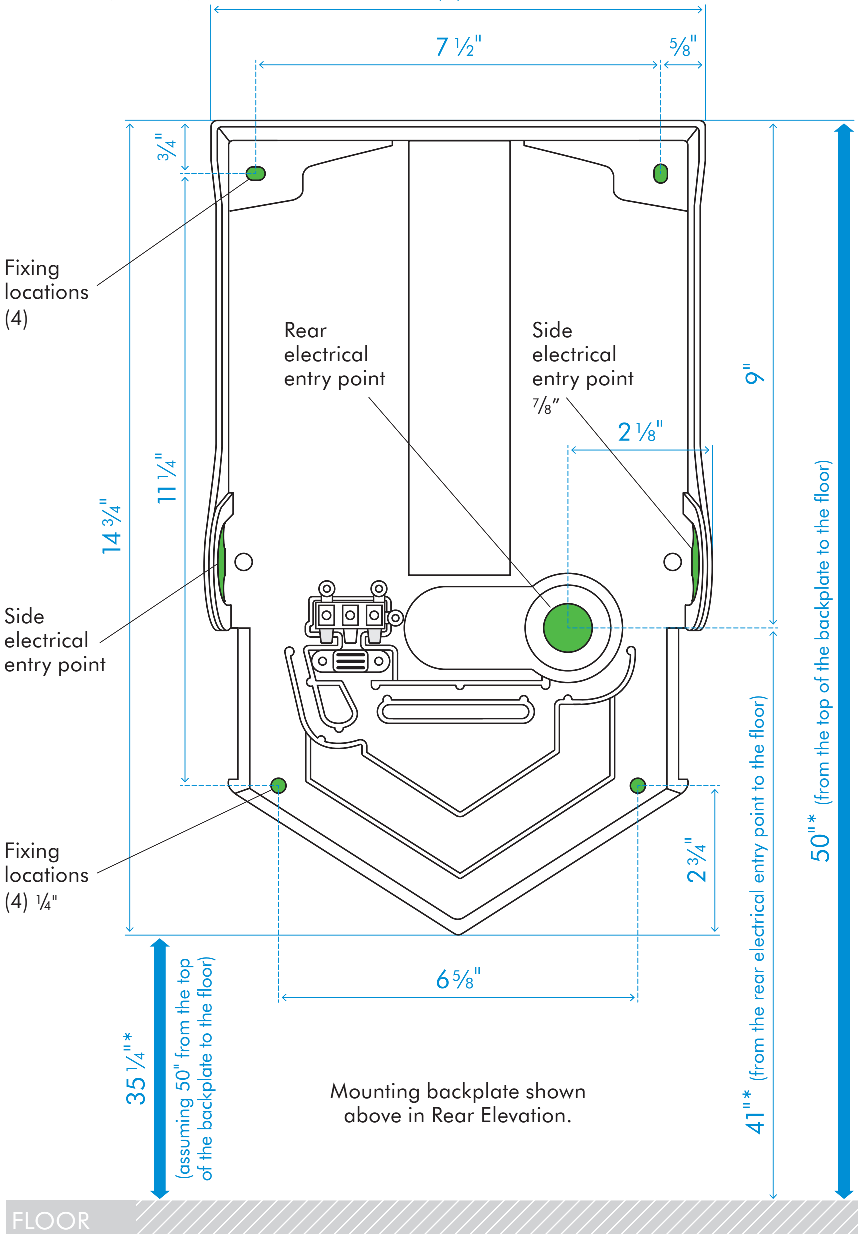
For further information, please contact Dyson: **1-855-720-6169, www.dyson.com/airblade**

dyson airblade **V**

TECHNICAL SPECIFICATION

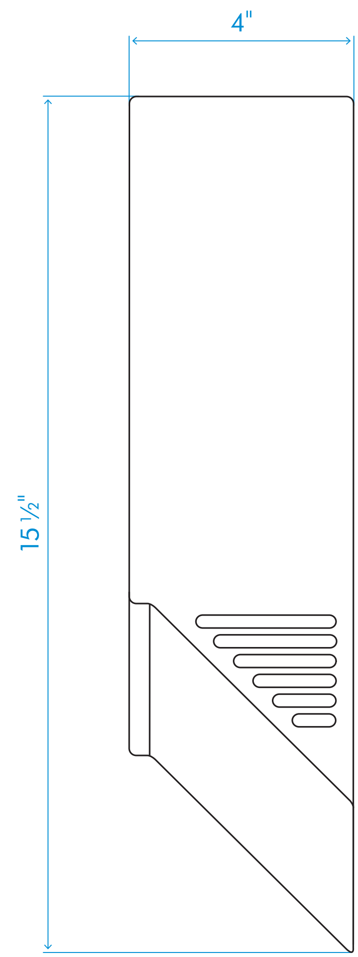
HU 02

REAR ELEVATION



Mounting backplate shown above in Rear Elevation.

SIDE ELEVATION



Machine fascia shown above in Side Elevation.

All dimensions shown in inches (+/– 3/16 inch).

Holes indicated in green are measured to the center of the hole.

Machine dimensions
Height 15½″ Width 9 7/32″ Depth 4″
Minimum clearance
8 11/16″ clearance either side and 1 3/16″ above machine.

*Please look into local guidelines for ADA compliance.

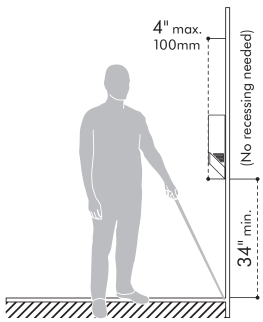
For further information, please contact Dyson: **1-855-720-6169, www.dyson.com/airblade**

ADA guidelines

dyson airblade V

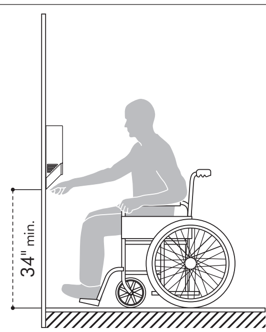
Mobility access within washroom facilities

Because the Airblade V hand dryer is primarily installed in a restroom setting, it must comply with at least two primary accessibility requirements. The first is that the unit be placed on an accessible route but not protrude into any required accessible clear area of other items, such as a door, sink, toilet, urinal or fixed waste receptacle. The second is the mounting height relating to reach range and space requirements to use the unit itself. State or local codes may require more stringent accessibility standards when facilities are newly constructed or altered. An accessible restroom is comprised of an accessible entrance, accessible turning space, and at least one type of accessible dispenser and fixture of each type. The Airblade V hand dryer would be considered a wall mounted unit similar to a towel dispenser. A base height of 34″ AFF would provide a more usable height for children and adults and still would be in the compliant range of accessible use.



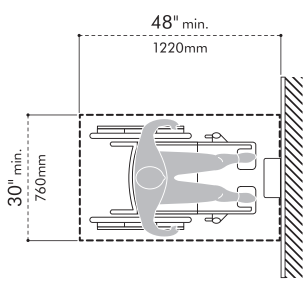
Clearance for wall-mounted protruding objects:

Airblade V is less than 4 inches protruding from the wall. Traditional hand dryers that protrude beyond the 4″ are allowed to be of an unlimited distance by ADAAG as long as they are mounted at 27″ above finished floor (AFF) or lower so that they overlap the cane detection range. Objects mounted with their leading edges at or below 27″ (685 mm) AFF may protrude any amount; however, protruding objects should not reduce the clear width of an accessible route or maneuvering space. Any retrofit installation must comply with the newest and most stringent code standards.



Forward reach:

Often accessibility code concepts are concerned with people in a seated position who use wheelchairs, which naturally limits the height and depth of their reach range. Because of the design of the Airblade V hand dryer, the front approach is the only way the unit can be properly used, therefore the side approach standards should not apply.



Clear floor ground space:

A clear area in front of the unit should be a minimum of 30″ wide by 48″ of length. This area can overlap a circulation path but should not overlap other required accessible areas, for example, a lavatory sink in restrooms with access to more than one user at one time. Single use restrooms can overlap accessible areas due to the fact that they are used by only one person at a time.

Dyson Airblade V accessible installation matrix:	Yes/No	Compliant
Does the unit have the required front approach 30″ x 48″ clear floor clearance?	Yes	Yes
Does the reach range exceed 40″ maximum height above the finished floor surface?	No	Yes
Is the hand dryer mounted at a height where it is considered a protruding object?	No	Yes
Does the front edge project more than 4″ into the path of travel when properly mounted?	No	Yes
Does the unit provide the proper 9″ toe clearance?	Yes	Yes

Conclusion

Based on the review of the Airblade V hand dryer, it appears that if properly installed at the recommended height of 34″ above the finished floor, and the design professional allows the proper front approach clear area with no conflicting overlapping accessible areas, then the unit should comply with accessible requirements. Dyson Airblade V is less than 4″ protruding from the wall, so there is no recessing necessary.

*Source: ADA Accessibility Guidelines for Buildings and Facilities (ADAAG), Section 4. Accessible Elements and Spaces: Scope and Technical Requirements. Note: Diagrams not to scale.

dyson airblade V

LOW VOLTAGE AND HIGH VOLTAGE TECHNICAL SPECIFICATION

Electrical

Input voltage: Low Voltage = 110-127 V, High Voltage = 208 V

Frequency: Low Voltage = 50 or 60 Hz, subject to voltage (85-115 V at 50 Hz; 85-130 V at 60 Hz); High Voltage = 50 & 60 Hz

Rated power: 1400 W

Motor type: Dyson digital motor – V4 brushless DC Motor

Motor switching rate: 6,100 per second

Motor speed: 92,000 rpm

Amp: Recommended dedicated 15 amp circuit,
Low voltage = 11.7 amps at 120V, High voltage = 7.3 amps

Operating temperature range: 32°– 104°F

Heater type: None

Standby power consumption: Less than 0.5 W

Construction

Casing construction: Polycarbonate ABS casing

Antimicrobial coating type: AB12 (Sprayed Nickel) Antimicrobial additive in paint. AB12 (White) Antimicrobial molded additive

Color finish: AB12 Sprayed Nickel molded plastic or AB12 White molded plastic.

Back plate/mounting bracket construction: ABS/PBT Plastic

Exterior screw type: Anti-tamper M4 Pin-Hex

Water ingress protection to IP24

Filter

Double-life HEPA filter (glass fiber and fleece prelayer)

Bacteria removal 99.97% at 0.3 microns

Operation

Touch-free proximity capacitive sensor.

Hand dry time measurement: 12 seconds*

Operation lock-out period: 30 seconds

Airspeed at apertures: 420 mph

Maximum Altitude: 2,000m/6,561 ft.

Operating airflow: Up to 7.39 gal/sec and up to 59.3 CFM

Rated operating noise power: 85 db(A)

Logistics

Net weight: 6.17 lbs.

Packaged weight: 8.81 lbs.

Packaged dimensions: (H) $5\frac{3}{4}$" × (W) $17\frac{7}{8}$" × (D) $10\frac{3}{4}$"

Unit barcodes:
Sprayed Nickel – Low Voltage: 885609001463, High Voltage: 885609004327;
White – Low Voltage: 885609001470, High Voltage: 885609004310

Standard warranty

5 year parts and 5 year limited labor warranty

Accreditations

Carbon Trust

NSF International

ADA compliant

Contributes to LEED certification

Product range (Select one)

AB12 Sprayed Nickel

Part number/SKU
☐ Low Voltage: 301829-01
☐ High Voltage: 301827-01

AB12 White

Part number/SKU
☐ Low Voltage: 301828-01
☐ High Voltage: 301825-01

CARBON TRUST REDUCING CO2

NSF TESTED. CERTIFIED. HYGIENIC

U.S. GREEN BUILDING COUNCIL LEED USGBC

The Carbon Reduction Label is the registered trade mark of the Carbon Trust.
The NSF logo is the registered trade mark of NSF International.

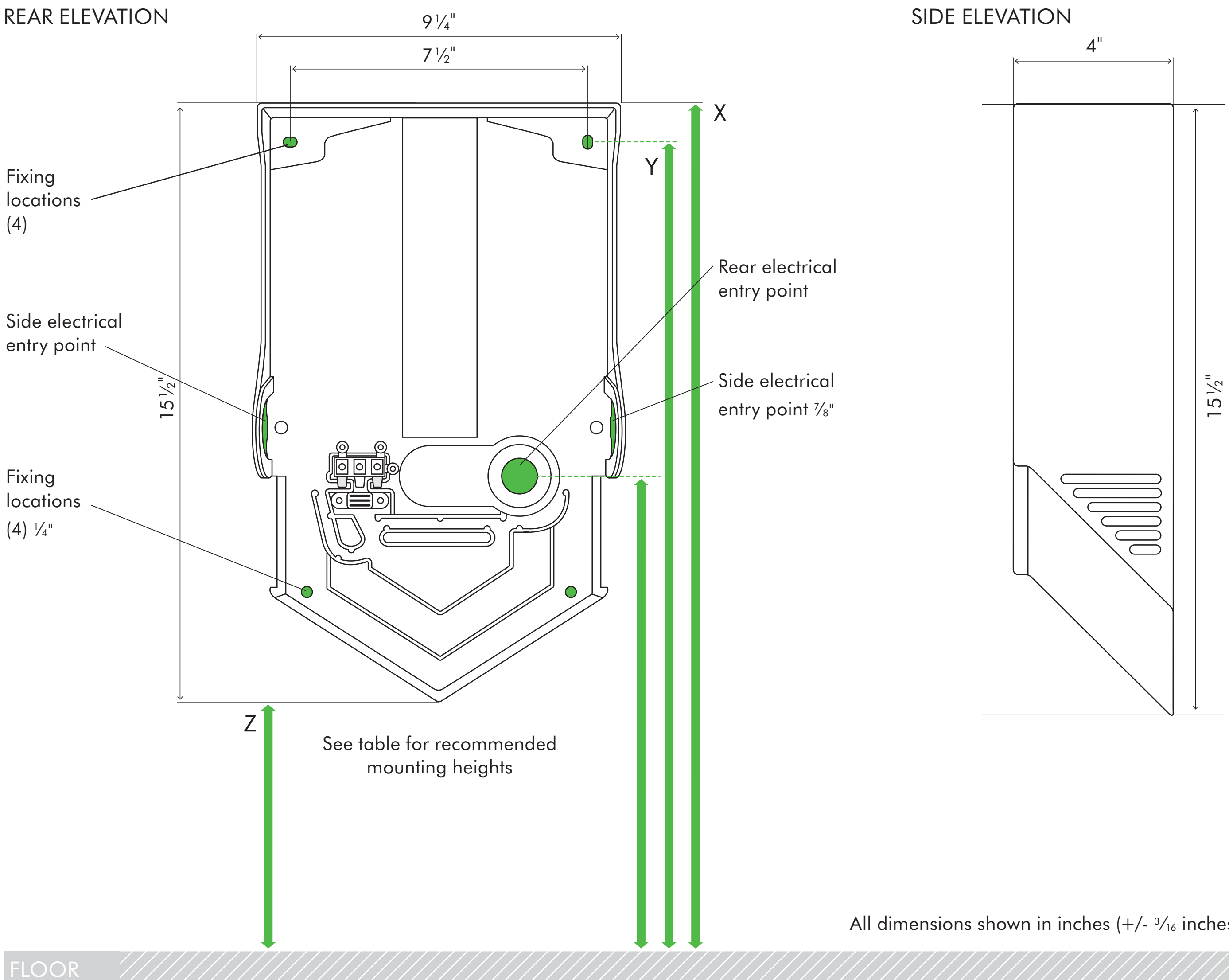
*Dry time measured using Dyson test method 769 based on NSF P335 using a measurement of 0.1g residual moisture.

For more information, please contact Dyson: 1-888-397-6622, www.dysonairblade.com, airbladeinfo@dyson.com

dyson airblade V

TECHNICAL SPECIFICATION

AB
12



Recommended installation heights from floor			
Male	X 52 1/8"	Y 51 3/16"	Z 36 5/8"
Female	X 50 3/4"	Y 49 13/16"	Z 35 1/4"
Child or disabled	X 42 5/16"	Y 41 3/8"	Z 26 13/16"
Child 5-8	X 37 1/2"	Y 36 7/16"	Z 22"
Child 8-11	X 41 7/16"	Y 40 1/2"	Z 25 15/16"

Machine dimensions

Height 15 1/2" Width 9 7/32" Depth 4"

Minimum clearance

8 11/16" in clearance either side and 1 3/16" in above machine.

Cable entry point from floor	
Male	42 7/8"
Female	41 1/2"
Child or disabled	33 3/16"
Child 5-8	28 1/4"
Child 8-11	32 3/16"

For more information, please contact Dyson: **1-888-397-6622, www.dysonairblade.com, airbladeinfo@dyson.com**

Workplace Essentials℠

EcoDri Automatic Hand Dryers

SPECIFICATIONS

Electrical Connection	*Hardwired*
Power Saving	*Auto turns OFF when hands are removed or after 60 seconds*
Dimensions	*5.99" W x 10. 69" L*
Depth	*Surface mounted 4.75"* *Fully recessed 3"*
Weight	*8 Lbs*
Operating Temperature	*15° to 104°F*
Enclosure	*Rugged all metal, rust proof, tamper resistant*
Finish	*White or Chrome plated*
ADA Compliance	*ADA Compliant when mounted accordingly*
Enclosure	*All metal , rust proof, zinc cast enclosure*
Operation	*Automatic touchless operation with IR sensors*

WATT	VOLTAGE	AMP	FREQUENCY	VOLUME (cfm)	SOUND (dB)	SPEED (ft/min)
750	120	6.3	50/60 Hz	177	82	17,000

EA (Energy & Atmosphere)

Prerequisite 2: Minimum Energy Performance
Credit 1: Optimize Energy Performance
** mandatory for all LEED certified facilities*

MR (Materials and Resources)

Prerequisite 1: Sustainable Purchasing
Credit 1: Ongoing Consumables

Prerequisite 2: Solid Waste Management
Credit 6: Waste Stream Audit
Credit 7: Ongoing Consumables

IEQ (Indoor Environmental Quality)

Credit 3.1: Green Cleaning - High Performance Cleaning Program

IO (Innovations in Operations)

Credit 1: Innovation in Operations
Credit 3: Documenting Sustainable Building Cost Impacts

SECTION 230000
HVAC
05/15/18

PART 1. GENERAL

1.0 Summary:

A. The mechanical systems of Towson University are quite diverse among the forty-five buildings that are maintained. Due to alterations and renovations, many buildings have supplemental mechanical systems that are either integral with the pre-existing systems or are stand-alone.

B. When considering the design, the consultant should spend ample time with the University's mechanical engineer and maintenance staff to determine the type of mechanical system(s) which are most desired and energy efficient. General considerations for design are outlined below.

1.1 Scope: This section provides general objectives and criteria for designing mechanical systems. It deals with general purpose office and institutional buildings; however, principles herein shall be followed, where applicable, for special-purpose buildings.

1.2 Design Submissions: The architect-engineer (A/E) shall submit design documents--proposals, drawings, sketches, calculations, specifications, etc.--at various stages in the design process. For mechanical requirements of each submission, refer to this Section.

1.3 Codes and Regulations: All design and construction work performed shall comply, at a minimum, with the most recent edition of the International Building Code (International Code Council – ICC = Building Officials and Code Administrators International, Inc. – BOCA + ICBO + SBCCI), modified to include the technical requirements of all National Fire Protection Association (NFPA) and the Life Safety Code (NFPA 101) and the National Electrical Code (NFPA 70 – NEC), Maryland State Plumbing Regulations, International Mechanical Code (ICC), International Energy Conservation Code (ICC), Maryland Accessibility Code, all applicable NFPA codes, applicable ASHRAE Standards and Guidelines, Procedures for Implementation of Energy Conservation, Maryland Department of Health and Human Hygiene Food Service Requirements, Sheet Metal & Air Conditioning Contractors (SMACNA) HVAC Duct Design & Construction Standards, and American Society of Mechanical Engineers (ASME) Codes. The technical requirements of these codes shall supplement all other standards, codes and regulations imposed by the Department of General Services (DGS) or the University, which may be initiated subsequent to the program submittal. The Towson University Office of Environmental Health and Safety is the appointed campus Occupational Safety and Health Coordinator and the Special Assistant State Fire Marshal and as such will review all schematics and design drawings. When a specific project warrants variance from the governing codes and regulations, a request shall be submitted in writing to Towson University early in the design stage. The latest edition of the codes in effect at the time the design contract is awarded will be used throughout the design and construction of that project.

1.4 Coordination:

A. Mechanical Design: The mechanical design must be coordinated with architectural, structural, fire protection and electrical designs to permit the A/E submissions and reviews by Towson University to be made effectively. It is essential that the work of mechanical engineers keep pace with the work of other disciplines.

B. Site Visits: On an alteration project, the engineer shall make necessary visits to the site to ensure coordination with existing work and verify the accuracy of as-built on record drawings. Drawings marked as-built should only be considered constructions records or record drawings that require verification.

1.5 Economic Design:

A. General: Mechanical systems shall be designed to permit equitable competitive bids. Equipment and systems shall be efficient and economical in construction, operation, and maintenance. Where economic justification is required for mechanical work, the analysis shall be in accordance with lifecycle costing methodologies required by the university.

B. Equipment Selection: Equipment specified should be nonproprietary, except where no other source is available to meet performance requirements. Where a proprietary selection is deemed necessary, a request shall be submitted in writing to Towson University early in the design stage. Materials selected shall be suitable for application and shall be coordinated with other aspects of the project.

C. Fuel Selections: Operating equipment shall use fuels in accordance with the following criteria:

1. Availability/reliability: Consider fuels which are readily available and free of restrictions in supply and use.

2. Selection: Fuel selection shall be made part of the economic selection requirements of the associated equipment. Use actual fuel prices associated with the specific site in lieu of regional or national averages.

a. Type: Consider any available fuel or form of energy if it can be obtained from normal sources of supply and meets air pollution standards. Steam and chilled water generated by the TU Power Plant are commonly used.

1.6 Design Requirements:

A. Submissions: The A/E shall submit design drawings to Towson University hereinafter for review in accordance with the requirements provided.

B. Drawings: The A/E shall prepare drawings to a minimum scale of 1/8 inch per foot for mechanical work floor plans and 1/4 inch per foot for equipment rooms, sections, elevator machine rooms, boiler rooms, toilet rooms etc. Drawings shall be coordinated with the respective trades, and cross-sections and elevations provided.

C. Response to Design Comments: The design team shall provide a response to all Towson University design comments. A conference call or meeting shall be setup to discuss the design team's questions, comments, or disagreement with the Towson University design comments after each phase. An agreement shall be reached to resolve all design comments prior to the subsequent submission.

D. Piping and Duct Location: Ducts and piping shall be shown double line to scale. Piping and duct routing shall be shown in the location where they are to be installed.

E. Interferences: Care shall be taken to avoid structural interference and conflict between different branches of mechanical and electrical equipment.

F. Pipe Sleeves:

1. Coordinate with the structural engineer to ensure that structural working drawings show pipe sleeves for pipes passing through footings, beams, and exterior walls below grade. The elevation of sleeves must be given.

2. All penetrations through floors, walls and roofs shall have sleeves. All sleeves and openings shall be sealed. Specify fire/smoke sealant for penetrations through rated fire/smoke assemblies.

G. Floor Penetrations: All mechanical pits, cleanouts, manholes, trenches, etc., shall be shown on the structural plans. If membrane waterproofing is used, waterproofing under basement toilet rooms shall be dropped far enough to permit running the soil and waste pipes above the waterproofing so as to reduce the number of pipes passing through the membrane. Drainage piping required in connection with pressure slabs, and locations of pipes and sleeves passing through or under pressure slabs, shall be fully coordinated with the structural design.

H. Foundation Drawings: If construction of a foundation is to proceed in advance of completion of the superstructure drawings, separate working drawings of foundations are required. These drawings shall show:

1. Mechanical work that cannot be installed later. This includes piping and conduits below or through foundations, slabs, etc.

2. Later installation of mechanical work. This includes sleeves, openings, chases, and trenches.

I. Submission Requirements:

1. Schematic Design Phase:

a. Include anticipated utility work on site plan.

b. Mechanical Floor Plan indicating single line representation of major systems.

c. Provide narrative description and engineering analysis of proposed mechanical systems reflecting results of coordination with Towson University. Engineering analysis shall address preliminary load calculations, design criteria used e.g. indoor/outdoor conditions, etc., domestic water demand, impact on existing site utilities, fuel analysis, justification for selection of specific HVAC systems including alternatives system comparisons, life cycle cost comparisons, investigation of need for specific life-safety provisions, such as smoke and refrigerant alarm and exhaust systems, and investigation of fire protection requirements.

2. Design Development (DD) Phase:

a. Include anticipated utility work on site plan.

b. Provide mechanical floor plan indicating single line representation of major systems, incorporating review comments from previous submission. Locations and service access shall be shown for all mechanical equipment. Where utility cores are used, indicate planned arrangements of piping and ductwork within cores and provisions for accessibility.

c. Provide a single line layout of ductwork and piping mains.

d. Provide a narrative description of proposed mechanical systems incorporating review comments from previous submission and reflecting further refinements.

e. Provide a cost estimate worksheet for the mechanical systems required.

f. Provide outline specification including format, individual specification sections planned for, and list of equipment and materials to be included each section.

3. 50% Construction Document (CD) Phase:

a. Provide site plan indicating all required utility work, including existing conditions, proposed systems, structures, equipment in sufficient detail to establish location, alignment, grade, inserts and impact on existing structures, systems or utilities.

b. Provide a set of drawings representing a minimum of 50% completion of the final set of construction drawings. Included as a minimum shall be 1/8"/ft. scale floor plans, 1/4"/ft. scale minimum floor plans of mechanical spaces, schedules, sections, elevations, & toilet rooms, and where additional, details, schedules and symbols and abbreviations are necessary to present a clear scope of work.

c. Provide preliminary automatic temperature control diagrams.

d. Provide bound sets of room heating and cooling zone load calculations for every conditioned space. Provide heating and cooling block loads, by system, for every generating and distribution system.

e. Provide a cost estimate worksheet for the mechanical systems required.

f. Provide a draft copy of the final construction specifications.

g. Provide a written response to Towson University review comments from the Design Development Phase, addressing every item individually.

4. 95% Construction Document (CD) Phase:

a. Provide a complete set of drawings including site plan, 1/8"/ft. scale floor plans, sections, 1/4"/ft. scale part plans, sections, elevations, details and schedules (including an air balance schedule), incorporating all previous review comments. The drawings shall include a building load summary for HVAC and plumbing including but not limited to the following: ventilation criteria, design conditions, total heating and cooling loads, fixture units, domestic hot and cold water demand and other, utilities and services required in the project. In addition, substantiating data indicating coordination between the mechanical design team and other disciplines shall be submitted. The use of prints of interdisciplinary, composite floor plans with appropriate highlighting and annotations is an effective method.

b. Provide bound sets of engineering analyses including any additional room heating and cooling zone and block load calculations not provided in the 50% CD phase, and block load calculations supporting the selection of all mechanical equipment.

c. Provide ductwork and piping layouts including mains, branches and sizes that indicate a clear layout and design intent for these systems.

d. Provide complete automatic temperature control diagrams to allow for Towson University comments to be incorporated into the 100% documents.

e. Provide a cost estimate worksheet for the mechanical systems required.

f. Provide completed, typed construction specifications incorporating all review comments from previous submissions and representing all facets of the mechanical work shown on the submitted drawings, including products and execution documentation.

g. Provide a written response to Towson University review comments from the 50% CD phase, addressing every item individually.

5. Final CD submission (100% completion):

a. Provide a complete set of mechanical drawings incorporating all review comments from the 95% CD phase.

b. Provide bound sets of engineering analysis addressing any reselection or revisions resulting from the 95% CD phase review comments.

c. Provide a cost estimate worksheet for the mechanical systems required.

d. Provide complete, typed construction specifications incorporating all review comments from the 95% CD phase.

e. Provide a written response to Towson University review comments from the 95% CD phase, addressing every item individually.

f. The tracings shall be retained during this submission. Final comments received after this submission shall be incorporated into the final design. In addition, provide a written response to Towson University review comments from this phase.

1.7 Specifications:

A. Mechanical Work: A project specification incorporating sections for mechanical work shall be prepared, coordinated with drawings, and submitted.

1.8 Accessibility:

A. Access to machines and equipment. Clearance shall be provided around machines and equipment to remove parts for repair or replacement. The minimum clearances shall be the basis of design equipment manufacturer’s recommended clearances as well as clearances required by code. Door or window openings, removable panels in building walls, and corridors shall be arranged so that large machines or equipment parts can be removed or replaced without structural changes or movement of walls or other equipment. The engineer shall arrange with the architect to provide openings and passageways of sufficient size so that standard equipment can be used. If this is not possible, dimensions of the limiting openings shall be clearly shown on drawings, or specified. Particular attention shall be given to equipment such as boilers, large tanks, refrigerating machines, air handlers, fire/smoke dampers, condensers.

B. The placement of operating equipment over ceilings shall not be used, with the exception of air terminal devices. Requests for variance from this shall be submitted in writing to Towson University early during the design process.

C. Accessible utility core spaces shall be provided for all major mechanical and electric utilities. Access through full-size man doors shall be provided. These spaces shall have adequate clearance for maintenance and future replacement of the equipment, risers and conduits with a minimum of 3 feet between equipment and structural components. Adequate space must be provided for possible future additional duct and pipe risers, conduits and equipment.

D. Parts Handling: A suitable means shall be provided for lifting and moving cooler and condenser heads, fan sheaves, pump casings, strainer covers, motors, gear boxes, compressor casings, and similar parts weighing over 50 pounds. The type of lifting equipment used in each case must be determined on the basis of the number of machines in a group, size and weight of parts, accessibility, and estimated use.

E. Overhead Equipment:

1. High Machine Rooms: Catwalks, ladders, chain wheels, etc., shall be provided, as required, in high machine rooms. Overhead piping and equipment in high rooms shall, if possible, be arranged to permit grouping the maximum number of valves and other operating devices within reach of a short platform, catwalk, ladder, etc., or to permit orderly grouping of valve chains where they will not be hazardous obstructions.

2. Access Panels or Doors: Panels or doors shall be provided for access to valves or other equipment requiring periodic examination above suspended ceilings. The panels shall be a minimum size of 18 in. x 18 in.

3. Water Lines: Water lines on equipment shall not be installed over electrical panels, switchgear, bus duct, conduit or transformers.

F. Demonstration of Access: The 50% submission shall show sketches demonstrating that at least three manufacturers' equipment is accessible as deemed acceptable by Towson University.

PART 2 – HVAC Design Requirements

1.1 Scope

A. This part deals with heating, ventilation, and air-conditioning (HVAC) systems, energy conservation, and design procedures.

1.2 General Requirements

A. All new construction and renovations shall be designed to qualify as a LEED (Leadership in Energy and Environmental Design by the US Green Building Council) Silver certified building and shall comply with the latest edition of ASHRAE Standard 90.1 – Energy Standard for Buildings except Low-Rise Residential Buildings. Design engineers shall co-ordinate with architects and provide input and feedback on designs to achieve these standards and certifications.

B. Economic Analyses

1. In the preliminary analysis, identify alternates that appear sufficiently promising to warrant detailed analyses. Use block loads, unit prices, and engineering judgment in their preparation. This analysis must be included with the AE's design development submission.

C. Equipment

1. Equipment must meet minimum performance criteria in terms of capacity, energy efficiency, acoustics and control tolerance, and they must be able to meet space and installation limitations.

a. Energy and Economic Analysis

1. Life-Cycle Cost Analysis (LCCA). Prepare a life-cycle cost economic analysis for each new building project and for each alteration project requiring a new heating, refrigeration, or air-conditioning system. For new HVAC systems, the AE shall evaluate the requirements for heating and air-conditioning on an integrated basis.

2. Annual energy consumption estimating procedures and equipment sizing. Base energy use projections and equipment sizing on calculation methodologies addressed in ASHRAE handbooks. Towson University shall provide existing energy pricing. Design engineers shall provide detailed estimated annual energy and operating costs.

b. Towson University approved alternates

1. Detailed analysis of Towson University approved alternates shall be submitted with the design development submission. All estimates of first cost, replacement costs,

energy use/costs, maintenance impact/costs, and other issues shall be quantified and evaluated.

1.3 Design Criteria

A. General: Comfort conditions to be maintained are dry-bulb temperature and relative humidity provided in ASHRAE Standard 55 Thermal Environmental Conditions for Human Occupancy. The indoor temperature varies with the activity and intended use of the building. Review the design of walls, floors, roofs, and windows for conditions affecting comfort and condensation.

1. Wall and Roof Construction and Glazing: Walls shall have a maximum thermal transmittance (u-value) of .15 and roofs shall have a maximum u-value of .08. Wall and roof construction and glazing shall provide inside surface temperatures not lower than those in the following table when outside design temperatures and wind velocities prevail. Limits for office space should be used for laboratory and for other spaces where sedentary work is done near outside walls and windows. Limits for shops may be used in all other cases.

Minimum Inside Surface Temperature

	Office Space	Shop Space
Glass	45 deg. F	---
Walls	60 deg. F	45 deg. F
Ceiling/Exposed Roofs	60 deg. F	60 deg. F

2. Slabs on Grade: Make recommendations to the architect following the ASHRAE Handbook of Fundamentals for insulation of concrete slabs on grade. Special consideration is to be taken to prevent cold floors when occupied floors are above unconditioned spaces. This includes, but is not limited to, heated floors, slab insulation, etc.

B. Design Conditions and Calculations

1. Outdoor Air Design Conditions: Base outdoor design conditions for heating and cooling as follows:

   a. Outdoor design conditions to be used shall be 95F db / 78 F wb summer – 7.5 mph wind, O F db winter – 15 mph wind. Equipment operating outdoors on grass surfaces shall be designed for 95 degrees F db ambient air temperature and equipment operating outdoors on concrete, asphalt or rooftop surfaces shall be designed for 105 degrees F db ambient air temperature.

2. Indoor Air Design Conditions: To calculate thermal loads and size of equipment, use the following:

a. Indoor design conditions to be used shall be 72 degrees F db, winter, all areas; 75 degrees F db, summer, for laboratories, offices, classrooms and public spaces. Relative humidity shall be a minimum of 30% during the winter to a maximum of 50% during the summer.

b. Where individual user requirements exceed these limits, appropriate systems shall be provided for localized environmental control. These systems shall be separate and independent from the general building systems.

3. Load Calculations

a. Load calculations and energy analysis shall be based upon established ASHRAE procedures as outlined in the ASHRAE Fundamentals Handbook.

C. Operating Requirements

1. All campus HVAC systems shall be designed to allow simultaneous heating and cooling of separate spaces within the same system. 2-pipe systems shall not be used.

2. Variable flow chilled and heating water pumping shall be used.

3. Campus building systems are operated and monitored by a campus-wide automated energy monitoring and control system (see para. 1.14 this section.) The HVAC system sizing and selection process shall be influenced by operating preferences, campus-wide standardization of systems where possible and optimum maintenance personnel involvement.

4. Unoccupied hours: During unoccupied hours, energy shall not be added to increase space temperature above 55 degrees Fahrenheit (F) dry bulb (db) heating / below 85 degrees F db cooling unless specific program requirements state otherwise. Since this will require heating / cooling the building mass on the next occupied cycle to at least above / below the minimum / maximum inside surface temperature, make provision to increase system capacity to provide this capability within 2 hours. All control systems shall be specified to include programmed occupancy schedules for 7 independent weekday settings with a minimum of 4 set points per day for each HVAC system that is controlled.

D. Ventilation

1. Ventilation rates shall be established initially in accordance with the latest ASHRAE Standard 62 – Ventilation for Acceptable Indoor Air Quality and applicable NIH guidelines for the anticipated occupancies.

2. All HVAC systems shall be designed to allow 100% outdoor air economizer / “free cooling.” Economizer operation shall be based on campus wide controls logic.

3. Outdoor air intakes shall be located at least 20 feet from exhaust outlets or plumbing vents and 30 feet from loading docks.

4. Ventilation for high occupancy spaces, 25 people per 1,000 ft^2 or greater, shall be designed with CO_2 control.

E. Air Distribution

1. All medium pressure ductwork shall be sized for a maximum air velocity of 2,200 feet per minute before applying diversity. All low pressure ductwork shall be sized for a maximum air velocity of 1,500 feet per minute before applying diversity. Ductwork serving classrooms shall be sized for a maximum velocity of 800 feet per minute before applying diversity.

2. All areas shall be provided with an air change rate as required to satisfy heating, cooling and ventilation requirements.

3. Mechanical equipment rooms containing refrigeration systems shall comply with the most recent version of ASHRAE Standard 15 – Safety Code for Mechanical Refrigeration ventilation requirements.

4. Future expansion capability shall be incorporated into the air distribution system design. The degree of expansion shall be coordinated with Towson University.

F. Exhaust

1. General exhaust systems shall be designed for toilet rooms, janitor closets, storage rooms, mechanical and electrical rooms, and utility areas, with rates as established by ventilation requirements. General laboratory exhaust may be included with general exhaust systems where logistically possible.

2. Exhaust air containing toxic material, viruses, radioactivity or undesirable odors shall require special treatment before being released into the atmosphere and should be discharged as far away from air intakes as possible. The proximity of air intake and exhaust to nearby buildings, adequate discharge height, location, wind direction, etc. for exhausted air contaminants shall be determined using ASHRAE standards, NIH requirements, NIOSH requirements, and the International Mechanical Code (IMC).

3. The use of energy recovery systems between exhaust and supply air systems shall be designed where economically feasible or where requested by Towson University. Heat wheel systems shall not be used where contaminated exhausts are present.

G. Noise Levels

1. The mechanical system components shall be selected and/or acoustically treated to meet indoor space requirements. Prior to selection of all equipment and devices, the maximum noise level criteria for all spaces shall be submitted for Towson University approval. Maximum noise level allowed for all air inlets and outlets in occupied spaces is noise coefficient (NC) 30 with effects of multiple diffusers / registers taken into account. Outdoor levels shall be as outlined in ASHRAE Standards.

1.4 Heating Systems: Maintain required design condition spaces by supplying heat adequate to offset heat loss. Provide adequate reserve capacity for morning warm up. Sources may be power plant steam, hot water, natural gas, fuel oil #2, geo-thermal, solar energy or electricity. Electric heating shall only be used as a last resort after all other possible heat sources have been explored. Fuel oil systems shall include the costs for double wall fiberglass underground storage tanks, monitoring and leak detection systems, and annual well monitoring in the initial and operating costs for Life Cycle Cost Analysis. Gas fired heating systems shall have output-to-input energy efficiency ratings of not less than 80 percent at full loading. Systems may be combined with ventilating and air-conditioning if functionally and economically feasible.

A. Hydronic distribution systems shall be capable of operating down to 120°F inlet water temperature based on Towson University’s reset schedule (180°F @ 0°F and 120°F @ 60°F). Hydronic zones should be kept at a minimum.

B. Each zone shall be provided with, at a minimum, a separate circulating pump with standby capability and temperature reset controls.

C. Perimeter Heating System

Since control between interior and exterior spaces may cause lack of comfort as seasons change, provide a perimeter heating system for skin load only. Provide individual zones of control based upon building exposures and building component thermal characteristics. Equipment shall be capable of providing heat with 120 degree inlet water temperature in order to be compatible with heating water reset schedules. The design shall provide perimeter heat below every window or glazing element, as needed, used in the perimeter building envelope.

D. Terminal Reheat and Duct Heating: Provide a minimum 30°F air temperature rise at terminal reheats and duct heaters. .

E. Heating Source and Distribution

1. The Redundancy of heating source shall be provided in the form of multiple primary heating equipment. Where hot water boilers are selected as the primary heating source, at a minimum provide two boilers, each sized for two-thirds of the peak load including morning warm up. Where steam-to-hot water convertors are used, provide one-third – two-third control valve arrangements, and each heating water system shall be

provided with two convertors, each size for approximately two-thirds of the total anticipated load to provide for redundancy and future expansion.

2. Steam condensate from the power plant steam system shall be returned via condensate pumps.

3. Heat recovery methods, such as domestic water preheat and for reheat systems, shall be investigated.

4. Multiple heating water pumps shall be designed for each zone to provide standby potential.

5. Provide a minimum of four zone isolation valves per floor in both the supply and return piping to allow maintenance / repairs on one zone of the system while the remaining system is operational.

F. Insulation: Where heated areas have floors exposed to the outside temperatures, coordinate with the architect to provide sufficient insulation on the underside of the floor to maintain comfort conditions.

G. Entrance Heating: Properly heat all entrance vestibules. Any cabinet unit heaters used shall be located one foot above floor level. Provide areas adjacent to frequently opened doors with adequate heating equipment to prevent excessive cooling when doors are opened in cold weather. All frequently opened doors shall have two sets of doors and a vestibule. Areas near doors intended for occasional use require heating to offset normal heat transmission, infiltration, etc.

H. All hydronic systems shall be piped reverse return wherever possible.

1.5 Heating, Ventilating and Air Conditioning (HVAC) Systems

A. General - HVAC systems shall maintain the conditions required by simultaneously controlling the supply air temperature, humidity and distribution to the space.

1.6 Refrigeration System

A. Refrigerated Units

Selection of type of refrigeration systems shall be coordinated with Towson University. All performance submittal shall relate to achievable temperatures as related to cooling tower capacities (see section 1.6 B). Selection criteria shall address:

1. Peak load coefficient of performance

2. Part load performance

3. Unloading capability

4. Multiple units for redundancy

5. Compliance of refrigerants with current environmental requirements

6. Compatibility with campus-wide energy management and control system

7. Acceptable noise level (indoor and outdoor)

8. Special systems such as hot gas by pass, low ambient controls, etc.

9. Reliability

B. Heat Rejection Equipment

1. Cooling Towers

Cooling tower selection shall be based on performance rating at 80 degrees Fahrenheit wet bulb. Multiple units shall be provided for redundancy. Towers shall match chiller sizes; no tower shall serve multiple chillers. Noise criteria shall be determined and shall influence selection. All cooling tower systems shall be provided with the potential for winter operation. Towson University prefers siting cooling towers on rooftops and discourages locating cooling towers at grade.

2. All other heat rejection equipment shall be selected for an outside air temperature of 95 degrees F db when located on grass-covered surfaces. Equipment located on asphalt or concrete surfaces or rooftops shall be selected for 105 degrees F db ambient air temperature.

1.7 Air Filters

A. Filter efficiency requirements
Space Filter Efficiency
Office areas, general: 35 percent
Laboratory areas: 95 percent
Fume hoods toxic, tissue culture and biological containment: 99.5% (HEPA)
Provide a 2" pleated (throw-away type) as well.

Per NBS dust spot test method or ASHRAE test method

B. Selection of Filters: Select filters for maximum operating velocity of 400 FPM to give an economic combination of static pressure loss and dust-holding capacity.

C. Access Door: Provide hinged access doors on both sizes of filter sections with a minimum width of 18 inches, and sized as necessary for filter removal and replacement. Coordinate with architect to provide access to filter assemblies.

D. Pre-filters shall be used on the inlet of all energy recovery devices.

E. Filter housing shall not be installed above ceilings in labs, or above plaster or inaccessible ceilings.

1.8 Humidification Systems - Where program or user requirements include humidification, it shall be provided on a localized, individual basis using self-contained humidification equipment that is operated / controlled and monitored through the building's energy management control system.

1.9 Piping Systems

A. Refrigerant Piping Installation: All refrigerant piping shall be installed using proper piping practices for refrigerant as designated by manufacturer's instructions for the equipment being installed.

Refrigerant piping test procedures: All refrigerant piping repairs or new installations shall be pressurized with dry nitrogen to pressure as dictated by manufacturer's recommendations for a period of not less than eight hours. This test must be witnessed by TU personnel when applied and again when reviewed. Only after test is witnessed as passed will evacuation and charging proceed. Towson University shall witness vacuum pulldown test less than 1500 microns or manufacturers recommendations, whichever is more stringent. Any system that has been charged without proper testing may be subject to refrigerant removal and proper testing performed at no cost to the university.

B. Arrangement: Design of the heating, chilled and condenser water piping systems shall incorporate the pressure rating requirements of coils, piping, valves and fittings where the combination of system fill pressure, determined by vertical height, and pumps discharge pressure exceed the standard ratings.

Where system is connected to the campus central plant, pressure and vertical height of system shall be taken into account for system pressure ratings.

C. All heating water, chilled water and other pressurized piping systems shall be soldered type 'L' copper pipe for sizes 2-1/2" and smaller and welded schedule 40 black steel piping for sizes larger than 2-1/2". Grooved or victaulic fittings shall not be used except on fire protection systems. Direct buried piping shall be insulated and contained in a PVC carrier pipe equal to perma-pipe or ric-wil. All connections shall be a minimum of 1/2" IPS unless incorporated into equipment as provided by the manufacturer.

All steam, steam condensate and pumped condensate shall be in black steel piping. Steam minimum schedule 40 and condensate minimum schedule 80. Both shall require cast iron fittings on threaded fittings.

D. Water systems: Heating, and chilled water systems shall be of the reverse return type. Dual temperature piping systems shall not be used.

E. Condenser water systems shall be provided with filtration systems.

F. Sizes: Size piping for a maximum friction loss of 4 feet per 100 feet of straight pipe, or a maximum velocity of 6 feet per second, whichever results in the larger pipe size.

G. Layout: The chilled and heated water piping layouts shall be logically designed to provide organized distribution systems which permit the isolation of distinct sections without disruption to the entire building. This includes provision of a major branch to each section and installation of isolation valves at every major branch. Isolation valves shall also be provided at all unit connections. Manual air vents shall be provided and shown on drawings at all high points of piping systems. Hose-end drain valves shall be provided and shown all low points of piping systems. For all chilled water connections to water-cooled equipment for heat rejection, provide hose-end drain valves on supply and return piping for emergency hook-up of domestic water.

H. Piping Expansion: Show locations of expansion joints, loops and anchors on drawings; incorporate acoustical to prevent transmission of vibration and fluid noise. Due to maintenance problems with joints, expansion loops shall be used wherever possible.

I. Flow measurement: Provide suitable devices so flow can be measured in major branches and major equipment such as chillers, cooling towers, boilers, coils, convertors and primary and secondary loops. Provide balancing devices to allow adjustment. Piping layout shall incorporate manufacturer's installation requirements of flow measuring devices to ensure accurate readings. Separate taps shall be provided on the suction and discharge of each pump for installation of energy management monitoring devices. Specify that flow charts and meters be supplied with all flow measuring devices.

J. Expansion and air elimination: Provide an expansion tank and air separator for each closed system including chilled water systems.

K. Makeup connections: Provide each piping system with a makeup water connection for filling purposes that complies with local codes. All makeup water connections to the potable water system shall have a reduced-pressure type back flow preventer located between 3 and 6 feet above the finished floor and piped by gravity to the nearest floor drain. Design shall include determination of fill and relief valve pressures. Provide pressure and temperature relief valves for both heating and cooling systems. Specify that "Dowtherm SR-1" or equal be used for all glycol systems. Extensions of campus loop systems shall include expansion tank and pressure relief but no makeup water.

L. Water treatment: Provide each closed / open recirculating piping system with a three-quarter inch valved connections for Towson University furnished chemical treatment system. Provide a 5 gallon shot feeder system and a 55 gallon liquid chemical feeder system including pump. For glycol filled systems, coordinate water treatment system with Towson University.

1.10 Air Duct Systems

A. Design Requirements

1. Method: Either the equal friction method or the static pressure regain method in the ASHRAE Fundamentals Handbook may be used to determine duct sizes. High velocity duct systems shall not be used. Ducts

shall be sized for a maximum static pressure drop of .1” wg per 100 feet of duct. Maximum duct velocities are 2,200 feet per minute for medium pressure ducts, 1,500 feet per minute for general purpose and low pressure ducts and 800 fpm for ducts serving classrooms or auditoriums.

2. Ductwork: Where ducts are connected to equipment fittings, transition should be smooth, with a transition no greater than 15 degrees for diverging transitions and less than 30 degrees for converging transitions. Avoid transitions in elbows.

3. Access doors or panels: Provide hinged access doors or panels no smaller than 18" x 18" in ductwork for maintenance, inspection, and service for:

   a. Filters

   b. Upstream & downstream of cooling coils and heating coils

   c. Sound absorbers

   d. Fire and smoke dampers

   e. Controls (dampers, switches, relays, sensing devices, etc.)

   Coordinate with architect to provide access openings through finish construction. All final locations shall be reviewed and approved by TU in the field prior to construction.

4. Materials: Use galvanized sheet metal ductwork. Construction shall be per the latest edition of SMACNA HVAC Duct Construction Standards. All ductwork shall be galvanized rectangular designed for a 3:1 aspect ratio. Maximum diverging transition is 15° and maximum converging transition is 30°.

5. Flexible ductwork to air terminal devices, i.e. VAV and constant volume boxes, diffusers, etc., shall be limited to 3 feet in length and shall not change direction.

6. Stainless steel duct systems shall be used for duct systems containing caustic or hazardous substances.

7. Internally lined ductwork shall not be used.

8. Support: Ductwork and related equipment shall be supported from the building structure and shall be isolated from vibration.

9. Air pressure considerations: Design shall include the anticipated operating pressure of every duct system and the calculated pressure drop for system component, e.g. filters, wet coils, plenums, dampers, sound attenuators.

10. Sealing: All ductwork shall be specified to be sealed using mineral impregnated woven fiber tape, and all seams and joints shall be sealed, including longitudinal seams.

11. Testing: All ductwork including low pressure duct over 15 feet in length shall be leak tested using the method prescribed by Towson University.

12. All exterior roof ductwork shall be designed to shed water and shall be insulated and sealed as required to ensure a weatherproof system. Use of self-adhesive membranes that are self-healing by Polyguard or equal are preferred.

B. Dampers: Provide manual volume dampers in every air distribution device branch duct and where it is necessary to obtain proper control, balancing and distribution. Use self-closing, gravity-operated or motor-operated dampers to stop backflows of air. Locate fire dampers in accordance with NFPA; refer to local fire codes for use, location and construction. Show fire dampers on drawings with access doors.

C. Fume Hoods

1. Chemical Fume Hoods and Biological Safety Cabinets

a. Request information from Towson University user of equipment. User shall supply a list of hazardous substances which will or may be used in the hood or cabinet (see attached Hazardous Substances Questionnaire).

b. In conjunction with the Towson University Office of Environmental Health and Safety, evaluate the list and information provided by the user. Determine the best type of ventilation equipment to employ (i.e. standard chemical fume hood, by-pass hood, etc.).

c. Determine if special filtration is needed. If required, this equipment should be arranged with bag-in/bag-out housing on roof.

d. Air supply diffusers shall be installed or adjusted to assure that no air blows on or across the face of the fume hood or cabinet.

e. Duct velocity of 2,000 FPM should be maintained. Duct shall be under negative pressure everywhere inside the building, including in mechanical spaces.

f. Each system shall consist of a utility set suitable for roof top installation and a stainless steel exhaust system.

g. Exhaust discharge shall be upblast through the roof preferably 7 feet to 10 feet above the roofline or prominent structure. A terminal velocity of no less than 2,500 fpm shall be maintained.

h. Exhaust discharge shall be located as far as possible from air intakes in building served, as well as surrounding building. All discharges shall comply with ASHRAE, NIH and NIOSH Standards and International Mechanical Code requirements. All exhausts shall be located at least 20 feet from outdoor air intakes.

i. Horizontal exhaust duct runs should be minimal (generally not greater than 12 feet) and pitched toward the fumehood.

j. Each fumehood or cabinet shall be labeled to indicate location of fan motor. Each fan motor and controller shall be labeled to indicate the location of the fumehood (ie. room number).

k. External exhausting for biological safety cabinets (if required) shall be designed and installed in accordance with the National Sanitation Foundation, Standard No. 49, (NSF # 49).

l. The external exhaust duct for biological safety cabinets must be equipped with isolation dampers to facilitate decontamination.

1.11 Air Distribution Devices

A. Locate supply air outlets to provide proper throw, drop and spread. Air should not blow against obstructions such as beams, columns, lights, or on occupants. Supply air outlets and return / exhaust inlets shall be sized for a maximum of 500 feet per minute neck velocity, a maximum pressure drop of .1” water column and a maximum noise coefficient (NC) of 30. Classroom and auditorium outlets and inlets shall be sized for a maximum NC of 25.

B. Locate supply outlets uniformly and within the range of throw to distributed loads, and coordinate with architectural layout and ceiling grid. If loads are concentrated, locate supply outlets near the load source.

1.12 Air Terminal Units

A. Select air distribution devices for variable air-volume systems (VAV) to be compatible with characteristics of the VAV box, i.e., the outlet must be capable of performing at full and partial load. The flow pattern must be properly evaluated as standard air outlets do not perform satisfactorily with VAV flows.

B. To minimize disruption to occupants during periodic maintenance, locate air terminal units above corridors or other transient spaces wherever possible.

1.13 Thermal Insulation: Provide thermal insulation for piping systems, duct systems and equipment.

1.14 Variable Frequency Drives

A. All motors 5 HP and over shall be provided with a variable frequency drive.

1.15 HVAC Instrumentation and Controls

A. Building Automation System (BAS) - The BAS shall be an extension of the campus standard: Automated Logic WebCTRL, as distributed by ALC, Harrisburg, PA.

Point of contact is Steve Keefer, Account Executive,
4501 Chambers Hill Rd, Harrisburg, PA 17111
Office: 717-909-7000
Direct: Ext.115
Mobile: 717-645-8679
steve.keefer@automatedlogic.com

B. Input / Output Summary Tables shall be provided in the specifications and list by equipment title all analog and digital inputs (shown as measured or calculated), analog and digital outputs, and system features (alarms, programs, etc.)

C. Sequence of operations for all HVAC equipment shall be shown on the drawings and updated for “as-built” conditions following building commissioning.

END OF SECTION

SECTION 23 09 23

ENERGY METERING

01/08/19

1.0 Purpose

A. The following guidelines provide the necessary requirements to assure that project designs meet TU standards for campus utility metering and building automation. The guidelines include general building automation requirements as well as utility meter specifications and meter policy.

All buildings are to include electric metering, chilled water metering, steam metering, and domestic water metering. In some cases such as buildings targeting LEED Certification, additional sub-metering will be required.

2.0 General Requirements

A. All meters shall be integrated into the TU campus building automation system, Automated Logic Corporation (ALC). All meters are to be programmed into ALC WEBCntrol and ALC Energy Reports. Electric meters are to also be connected via Ethernet to the campus Square D Power Management Enterprise Software (PME). All meters to be fully commissioned by the manufacturer. Commissioning of the meters is the responsibility of the installing contractor.

B. Metering system components such as flow meters, temperature or pressure sensors shall be used as a control point for ALC.

C. Meters shall be installed as per manufacturer's specifications.

D. Installing contractor shall validate the performance and accuracy of the meter and provide a report to TU confirming each meter's validation testing.

E. Contractor shall provide manufacturer and calibration documentation to TU. Final acceptance will be by TU and will be based upon the meter operating in the manufacturer's design range and communicating all measured data to TU building automation systems. Meter installation will not be accepted if it is determined it is not operating or reporting data as specified.

F. Piped utility meters shall be installed with isolation valves and drain valves.

G. Meters (center of display units) shall be installed 5'6" above the finished floor unless approved by TU.

H. All metering power and communication wiring/cables to be installed in EMT or threaded conduit.

3.0 Materials & Standards

A. Chilled Water Metering

1. Meter shall be Flexim Fluxus F704 strap-on ultrasonic BTU meters.
    a) Install strap on transducers per manufacturer's requirements. Install meter display units in close proximity to transducers 5'6" above floor.
    b) Provide gauge pressure transmitters on both supply and return lines.

B. Electric Metering

1. Meter shall be a PowerLogic CM4000 for building mains and for substations/large critical loads.
2. Meter shall be a PowerLogic PM8000 for sub-panels, transformers, lighting panels and panels/loads downstream from building mains.
3. Smaller Sub-meters/individual loads, branch circuits, etc., are to be Power Logic PM5000.
4. All Electric Meters to have Ethernet and Modbus communication capabilities.
5. Meter shall be capable of accepting up to four (4) input pulses.

C. Domestic Cold Water Metering

1. Meter shall be:
    a) Neptune Compound Truflo for variable flow, 2" pipe and above.
    b) Neptune Turbine for constant flow, 2" pipe and above.
    c) Neptune Positive Displacement for smaller than 2" pipe.
2. Meter shall record water usage in units of gallons.
3. All domestic water meters will be equipped with the necessary components and will be programmed into ALC.
4. Water meters shall be provided for systems that may make-up water including but not limited to cooling tower or domestic hot water make-up Include a bypass with isolation valves.
5. Meter shall be programmed to output both flow and totalization.

D. Steam / Steam Condensate Metering

1. All steam flow meters to be V-Cone McCrometer. Display units to be installed 5'6" above floor. Units to measure lbs/hr and totalize gallons. Unit to be connected to ALC/Energy Reports.

E. Sub-metering Policy

1. Sub-metering shall be installed for major systems such as building additions, Chiller Plants, and major departments. In some cases, additional sub-metering will be required for billing needs.

2. Meters shall be installed to monitor whole building loads for chilled water, steam, electricity and domestic water.

F. Meter Removal Requirements

1. TU Energy Department or HVAC Controls Specialist must be contacted <u>prior</u> to any meter removals due to new construction, renovation or demolition. TU Energy will retrieve critical energy/consumption data before meter is disconnected.
2. A meter shall not be powered down or removed without first recording a final reading.

END OF SECTION

SECTION 26 00 00
ELECTRICAL
5/15/18

PART 1. GENERAL

1.0 Summary

A. Because of the complexity of the electrical systems required and encountered at Towson University, this division includes supplemental design criteria to be considered. Due to the broad scope approach of this division, the information is not in a standard CSI format. Instead, Part 2 will provide supplemental design information while Part 3 will provide information specific to Towson University for design and construction. Part 3 includes information on:

1. Raceways, cable trays, underground duct, manholes and hand holes
2. Wire and cable, fiber optics, power cable
3. Service entrance, substations (medium voltage)
4. Switchboards, switchgear (low voltage)
5. Metering
6. Transformers
7. Panel Boards
8. Emergency Power Systems
9. Fire Alarm System
10. Security System
11. Telecommunication Wiring Standards

PART 2. SUPPLEMENTAL DESIGN INFORMATION

2.0 Engineering design work consists of these elements:

A. Investigation of field conditions and investigation of existing equipment name plates

B. Ascertaining data from manufacturers

C. Establishing reliability required based on consultation with Towson University and incorporation of the reliability levels in the design.

D. Field measurements of:

1. physical sizes

2. power, current voltage, transient voltage, etc., all recorded and all over sufficient time to establish a trend

E. Examination of data

F. Calculation, tabulations, making graphs

G. Listing of maintainability and servicing features of proposed equipment

H. Preparation of cost estimates and comparisons

I. Listing of advantages and disadvantages

J. Study of equipment and apparatus operating methods to ascertain the applicability and comparison of advantages and disadvantages

K. Coordination with architects and other engineering disciplines to see that equipment and light fixtures will fit and that power sources are provided where needed

L. Preparation of and submission of reports to Towson University including the aspects of engineering previously listed

M. Participation in discussions with Towson University project managers, clients and architects to select/choose the various systems, methods, equipment, etc.

N. Preparation of design phase reports, drawings and specifications

O. Preparation of construction drawings and specifications

P. Participation in and the conduct of a sequence of acceptance tests, to be performed as soon as system or piece of equipment is installed

Q. Preparation in the development of lists of important equipment or installations which must be witnessed by Towson University representatives and identification of the particular installation and inclusion of these requirements in the specification; An example would be the witnessing of factory testing of synchronizing switchgear for the emergency power system.

The inspections should list the testing required with specific details. In general, the purpose is to identify problems as early in construction as possible, so corrections can be made while other work proceeds and so all punch list items are not left to the end of the project and consequently hold up completion of the building.

R. The preparation of a coordination study including a short circuit current study and determining of the protective device settings before distribution equipment is purchase and before start up of power equipment is allowed. **This information is required to be submitted with shop drawings.**

S. Specify reliability requirements for each system, where Towson University has identified the need in the program or in design review.

T. Approach to system design, each system:

1. Review of current equipment available to accomplish the need

2. Establish the needed reliability required of the system in consultation with Towson University

3. Establish the maintainability required of the system in consultation with Towson University

4. Identify and discuss advantages and disadvantages of available types of equipment with Towson University

5. Select type of equipment to accomplish the need in consultation with Towson University and to satisfy reliability and maintainability requirements

6. Identify configuration of the system in consultation with Towson University; justify by reasoning, application, performance, maintenance reliability and value considerations

7. Establish the capacity to be included in the system for future growth in consultation with Towson University

8. Make calculations to establish component sizes, primary and related systems

9. Establish routing of wiring or other interconnecting requirements

10. Make drawings, schematic, wiring diagrams and details that establish and define the installation, as established by prior consultation with Towson University

11. Provide specifications to describe the installation and equipment involved as established with Towson University

2.1 Codes and Standards:

A. Baltimore County codes are not in force on Towson University (State of Maryland) property.

B. The basis for design shall be the latest editions including amendments and revisions of these codes:

1. National Electrical Code (NEC) (NFPA 70) and all applicable National Fire Protection Association (NFPA) Code(s)

2. National Electrical Manufacturers Association (NEMA)

3. Institute of Electrical and Electronics Engineers (EEE)

4. Edison Electric Institute (EEI)

5. Electronic Industries Application (EIA)

6. Insulated Power Cable Engineers Association (IPCEA)

7. Certified Ballast Manufacturers Association (CBM)

8. American National Standards Institute (ANSI)

9. American Society of Mechanical Engineers (ASME)

10. American Concrete Institute (ACI)

11. Underwriters Laboratories, Inc. (UL)

12. Illuminating Engineering Society of North America (IES)

13. Rules and regulations of the Baltimore Gas and Electric Company

14. ANSI/ASME Elevators and Escalators Safety Code A17.1

15. EPA regulations

2.2 Architectural Considerations:

A. Exterior and interior exposed electrical items shall be shown or indicated and their use shall be coordinated with the architectural design by calling the attention of the architect to the item involved.

2.3 Phases of work and submissions:

A. The requirement stated here are intended to define, for the electrical engineer, the level of development at which the electrical design should be at each of the **four submissions** required by the standard A/E contract. These requirements are intended as a further definition of the contract requirements which are more general since they pertain to all disciplines.

B. Schematic Design Submission

The engineer shall show the following items on drawings or on text which accompanies the drawings:

1. Source of power

2. Source of telephone, data, fiber optics, fire alarm and security cabling

3. Locations of buildings to which underground cabling will be required for fire alarm, building management, security, etc.

4. The approximate size, preferred location and number of stacks of electrical/telephone/data distribution room

5. Probable location for entrance into the building of underground feeds for power, telephone, data, fiber optics, fire alarm, and security cabling

6. Rough 1-line diagram of power, fire alarm, telephone, data cabling risers

7. Emergency generator and fuel tank location

C. Design Development Submission

1. Firm locations for:

   a. Electrical/telephone/data room stacks and building entrance

   b. Emergency generator and fuel tank

   c. Cable tray/ladder system for distribution of telephone/data/security systems

2. Coordination and short circuit study – calculations, impedance diagram

3. One-line diagram of power systems showing sizes of feeders transformers, distribution panels, switchboards, motor control centers and protections schemes

4. Description of the sequence of operation, approved by the user, project manager, Towson University Operation and Maintenance, police and Environmental Health and Safety, for card access, building security, and fire alarm systems

5. Lay out of substation, emergency generator rooms and electrical/telephone/data rooms

6. Calculations to support the number and spacing of lighting fixtures to achieve IES lighting levels

7. Calculations to show compliance with energy conservation requirements for lighting (watts/square foot for corridors, offices, labs, etc.)

8. Description of sequence of operation, approved by Towson University electrical engineer and Operations and Maintenance representative for substation automatic throw over or emergency power systems.

D. 50% Construction Documents Submission

1. 50% construction documents should be accurate and coordinated with other disciplines, showing sizes, locations, connections and detailing materials, equipment and methods so the contractors understand what is intended, and can select and install equipment to satisfy the intended purpose.

E. 95% Construction Document Submission

1. 95% construction documents should be essentially complete and coordinated by the consultant. The drawings shall include all circuiting and wiring.

2.4 Drawing requirements:

A. Floor Plans

1. Provide a minimum of two plans for each floor. Normally, the first plan should show lighting requirements; the second plan should show the floor system, power system, and the communication and signaling systems. A third plan will be necessary in locations where power, telephone, data, security and fire alarm systems cause overcrowding and poor legibility.

B. Floor Plans include the following:

1. Scale: Indicate the scale by note and by graphic scale on each drawing.

2. Plan sheets: Provide column lines and numbers and use north arrow indications on plan sheets.

3. Section symbols: Note the sheet location of detail involved.

4. Details: On details other than standard details, note the sheet number and drawing location of detailed features.

5. Key plan: Where a portion of a plan or elevations appears on a sheet, provide a key plan that shows the location of that portion with respect to the other portions.

6. Cross-references: Indicate the relationship of details, plans, elevations, and sections by cross-reference.

7. Room title and number: Show room title and number on all plans.

8. Specifications information: Write all specification information on working drawings. Do not repeat drawing information on plans, elevations, and

details; do not repeat general specifications from the project specifications document.

9. Abbreviations: When possible, use standard abbreviations.

10. Equipment capacities: Show equipment capacities.

11. Delineation of work: Carefully delineate all drawings to distinguish between new, existing, and replacement items of work.

12. Expansion space: Indicate possible future expansions (both vertical and horizontal) by dotted lines on site plans, architectural floor plans, and engineering floor plans and in elevations and sections.

    a. Scale plans: Clarify congested areas on enlarged scale plans, or by additional normal scale floor plans. Include features that affect construction or interfere with the construction contractor’s work in floor plans. These includes: expansion joints, structural beams located below the ceiling line, sky-lights, special panels, grills, air-conditioning outlets, ducts, piping, etc.

    b. Plot plan: Indicate exterior electrical work on a plot plan, which shall be complete and clearly delineate the extent of the contractor’s responsibility. Plans shall also show all other underground utilities.

    c. Electrical layouts: Indicate layouts on drawings to define specific requirements for each raceway, conductor, cable, outlet, wiring device, lighting fixture, switching arrangement, equipment item, etc.

    d. Symbols: Electrical symbols required to define specific system components shall conform to IEEE standards; they may be supplemented by additional symbols, which shall be indicated on project drawings.

    e. Raceway layouts: Indicate raceways required for each electrical system in their entirety on each floor plan; include specific identification on associated conductors or cables. Indicate branch circuits from outlet to outlet, including switch legs, but associated home runs may be symbolically designated. Indicate feeders in their entirety from points of origin to termination; include all intermediate takeoffs, pull boxes, etc. Arrange raceways so they are not installed in elevator hoist ways, duct spaces, stairwells, etc.

    f. Supplementary diagrams: Include in drawings a one-line diagram for each major electrical system, and a riser diagram for each electrical, communications and signal system; these shall include schedules and supplementary information that completely define the several systems. Electrical schedules required shall include each medium-voltage or low-voltage switchgear assembly, transformer, motor control center, and panelboard; these shall designate system characteristics and parameters for each protective device and motor controlled, including current limiting fuses, circuit designation, equipment served, and the connected load.

g. Equipment rooms: Provide enlarged scale drawings for each room required for medium-voltage and low-voltage switchgear assemblies, and for transformers. Show auxiliary systems equipment arrangement, grounding requirements, and DC and supervisory systems on drawings.

h. Equipment rooms: Provide enlarged scale drawings for each room required for medium-voltage and low-voltage switch-gear assemblies, and for transformers. Show auxiliary systems equipment arrangement, grounding requirements, and DC and supervisory systems on drawings.

C. Detail drawings

1. Architectural and other drawings: Architectural or other drawings may be used to show exact locations of electrical or lighting work, but on electrical drawings show complete requirements.

2. Cross-references: Include in drawings suitable notes which cross-reference diagrams, schedules, symbol list, general notes, etc., with associated floor plans.

3. Detail drawings: Provide detail drawings, as described below in subpars; (1) thru (4); Use a minimum scale of ¼ - inch equals 1 foot.

a. Front elevations: Provide front elevations for each supervisory control panel, motor control center, and medium-voltage and low-voltage switchgear assembly. Provide front elevations for a typical transformer at each substation with the cabinet containing current transformer and secondary disconnecting switch. Provide front elevations for each type of services entrance, including the associated conduit bank and other significant details. Requirements shall be coordinated with utility companies.

This is essential, as some require reinforced conduit bank construction for filled areas and a conduit bank support or saddle that must be cast in the building wall.

b. One line diagrams: Delineate elevator control transfer scheme, control transformer arrangement, potential and current transformer ratings, relays, device numbers indicated by ANSI, etc., on these diagrams on associated one-line diagrams.

c. Grounding diagram: Provide a system-grounding diagram with the required layout also indicated on associated floor plans.

d. Enlarged plans, elevations, and details: Provide these for each typical and special electric and telecommunications closets.

e. Service entrance profiles for all utilities.

PART 3 TOWSON UNIVERSITY SPECIFIC DESIGN & CONSTRUCTION STANDARDS

3.0 Raceways, Cable Trays, Underground Ducts, Manholes and Handholes

A. Galvanized Steel Electrical Metallic Tubing (EMT) up to 2" in diameter shall be used for feeders, communication cables and branch circuits unless:

1. The NEC requires intermediate (IMC) or rigid galvanized steel conduits (RGSC) because of voltage class.

2. There is a risk of physical damage to the feeder and IMC or RSGC is appropriate.

3. No aluminum conduit may be used. Mechanical rooms must have compression fittings couplings.

B. PVC schedule 40 conduit shall be used outside buildings, but only on roofs or underground and encased in concrete. PVC conduits shall not be used in interior of buildings.

C. No exposed conduit shall be run on exterior walls.

D. Size conduits in accordance with the NEC, minimum ¾ inch for branch circuits.

E. Cable tray (ladder type with 9" rung spacing) is preferred for vertical and horizontal cable runs.

F. The entrance of cable trays into electrical/telephone rooms shall be via fire stops designed to use removable pillow type fire stops.

G. Conduits for the campus standard combination telephone and data communications outlets shall be two 1" EMT conduits extending from one 4" square box to above the lay-in ceiling or to the local distribution backboard if gypsum ceilings are used.

H. Provide a pull line, 200 lbs. minimum tensile strength, in each data/telephone conduit.

I. All branch circuits for power, telephone, communications, fire alarm, etc. shall be distributed from the same floor which they serve. For example, an electrical panel located on the 3rd floor shall serve only the 3rd floor.

J. Romex is unacceptable. No exceptions.

3.1 Wire, Cable, Fiber Optics, Power Cable

A. All cable shall have copper conductors. Aluminum conductors are not permitted.

B. Primary Cable System (15KV Systems)

1. Feeders shall consist of grounded neutral single conductor, Class B copper , covered with an extruded semicon strand screen wall of flexible thermosetting dielectric, based on ethylene-propylene rubber triple extruded insulation, copper shielding tape and an oil resistant thermoplastic jacket overall.

2. Cable shall conform to the latest IPCEA-S-68-516, AEIC-6-75 and UL 1072 standards.

3. Conductor shall be bare stranded soft copper. Stranding shall be Class B, stranded per ASTM B-8 or B-231 and it shall meet the requirements of Part 2 – IPCES S-68-516.

4. Conductor screen shall be an extruded layer of semiconducting thermosetting compound per UL 1072 paragraphs 13 thru 14 IPCEA S-68-516.

5. The insulation shall be ethylene-propylene rubber (EPR). The percentage of ethylene in the EPR compound shall not exceed 75%. The wall thickness shall be 220 mils.

6. The insulation screen shall be a triple extruded semi-conducting compound.

7. The metallic shield shall be non-magnetic 5 mil copper tape applied helically with a 25 percent minimum overlap.

8. Jacket shall be polyvinylchloride. The minimum +

- Bus “A”: Black

- Bus “B”: Yellow

9. A permanent marking on the cable jacket shall indicate the cable type, size, conductor type and rate voltage.

10. Cable by Okonite Company (or approved equal), Okoguard – Okoseal, type MV-105, 15 kV, shielded power cable, one copper conductor 90ºC at rating, 220 milts, 133% insulation level.

11. Provide 2/0 AWG bare copper stranded soft copper ground conductor and install with feeder cable along same routing. Ground cable at each cable pulling point.

12. Factory testing shall be performed on completed cable in accordance with ICEA S-68-516 and AEIC CS6 as follows:

• Conductor Resistance:	ICEA, Para. 1.2
• A.C. Withstand (5 min.)	33 KVAC
• IR Constant (at 15.6ºC), min	50,000 megohms – 1,000 ft.
• D.C. Withstand (15 min.)	80 KVDC
• Corona Level	AEIC CS6, 5 percent Max. at 4 times Rated voltage

Manufacturer shall submit quality control procedures to insure against defects in the product. Copies of certified test shall be submitted to the project manager or Towson University representative for approval on all cable manufactured for this contract before cable is shipped from the factory.

13. Cable manufacturer shall be Okonite, Kerite or Pirelli.

C. For 600 volt and other conductors, splices shall be as follows:

1. #12 and #10 solid conductors: wire nuts

2. #8 through #3 stranded conductors shall be by compression type fittings

D. Communications cabling is addressed in the Telecommunications Wiring Standard, however, an understanding of communications signal flow must be obtained before application of the standard is useful. This can be done by meeting with Towson University telecommunications and data systems representatives.

3.2 Electrical Identification:

A. All equipment and feeders shall be identified with durable, commercially manufactured labeling materials intended for the purpose.

B. The panel directories of all panels which are affected by this work shall be brought up-to-date with every circuit new and existing, identified correctly. The directory shall be neatly typed.

C. Each circuit breaker shall be numbered and marked with proper markers in the spaces made available by the manufacturer of the panel board.

D. Each receptacle shall be neatly marked on the inside of the cover plate with indelible marker identifying the panel and breaker from which it is fed.

E. All panels, safety switches, motor controls, etc. shall be correctly identified as to the feeder, motor or circuit controlled with black phenolic nameplates with minimum 1/2" high etched white letters and beveled white trim.

F. Color code insulated grounding conductors in accordance with NEC 210-5 (B)

1.

	208/120 Volt System	480/277 System
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

2. No. 12 thru No. 6 conductors shall have continuous insulation color.

3. Color code conductors larger than No. 6 which do not have continuous insulation color by application of at least two laps of colored tape on each conductor at all points of access including junction boxes.

G. Number code all control and instrumentation wiring at all points of access including junction boxes.

3.3 Primary Electrical Service:

(**RESERVED)**

3.4 Building Electrical Distribution:

A. Primary electrical service is available from the Towson University 13.2KV distribution system.

B. Available fault current at the Master Switching Station (MSS) bus is 460 MVA at 13.2KV

C. Typical primary service is via two feeders, two air load interrupter switches and one fuse compartment. The fuse compartment is key interlocked so that both switches must be open in order to gain access to the fuses.

D. Campus standard is S&C switchgear. Sectionalizing switches used in the distribution of 15 KV electrical service shall be as manufactured by S&C Electric Company, Model PMH-10, 14.4 nominal kilovolt rating, Catalogue #55242R3-B5B7C1J2K8-S286, and provided with a key interlock and inner barrier panel.

E. 100% Spare fuses are required

F. Spell the following out: F.I.L. rating is 95KV

G. The whole substation assembly shall be on a housekeeping concrete pad of approximately 3-1/2" high above the room floor.

H. The following items shall be furnished with each substation:

    1. One line riser diagram of the complete electrical system framed and covered in plexiglas

3.5 Transformers:

A. 13.2KV primary transformers shall only be ventilated dry type with 115ºC temperature rise and of the appropriate voltage secondary.

B. Characteristics & features:

    1. Hot spot temperature gauge with output for remote monitoring

    2. 5.75% impedance ± 7.5% tolerance

    3. 95 K.V. B.I.L.

    4. NEMA standard sound level

    5. 2, 2-1/2% taps above rated voltage and 2, 2-1/2% taps below rated voltage

    6. Provide forced air cooling

C. Primary and distribution transformers shall be grounded to the building's substation grid in addition to any NEC requirements.

3.6 Distribution Switchboard and Panelboards (Low Voltage)

Square-D Main Breaker and Square-D I-Line Panelboards

A. Main Breakers:

Main breakers shall be molded case with:

Ground fault protection;
Solid state trip units;
Ground fault pickup & delay;
Adjustable long time pickup & delay;
Short time pickup & delay settings

B. Panelboards:

Circuit breaker type distribution panelboards with circuit breaker branch circuit devices;
Nema 1, dead front enclosures;
Molded case, thermal magnetic breakers;
Adjustable magnetic trip for all breakers 225 amps and above

C. Accessories:

Permanent ID plates for each breaker

D. Copper bus is standard

E. All feeder lugs shall be copper and UL approved.

F. All circuit breaker trip devices shall be coordinated.

G. All circuit breaker trip devices shall be set in accordance with the coordination study by the contractor before placing the feeder in service.

H. Circuit breaker trip operation shall be tested and adjusted as required to comply with the coordination study by an independent electrical testing company.

I. Computer/laboratory power should be separated from mechanical and lighting systems where possible.

3.7 Metering

A. Metering Panels:

1. Meter with sensors to monitor parameters of entire switchboard including all main breakers and connected loads; Square-D QED-2 Power Style Switchboard

2. True RMS metering to 31st harmonic

3. Min/max readings for all meter parameters

4. 0.2% accuracy class

5. Metered parameters (not limited to):

   a. Ammeter, 3 phases & neutral
   b. Voltmeter, L-L and L-N
   c. Wattmeter
   d. Varmeter
   e. Va meter
   f. Peak demand of above
   g. Power factor
   h. THD voltage
   i. THD current
   j. Min/max for all values
   k. Date/time for each min/max
   l. Alarm/relay functions
   m. On-board data logging

3.8 Panel Boards

A. Unless specific written permission is given, all panelboards for power distribution and power and lighting branch circuits shall use bolt-on circuit breaker protective devices. Fused switches are not to be used.

B. Provide additional spare conduits from flush mounted panels stubbed out above the lay-in ceiling for future use. The number of 3/4" conduits should be half the number of on-pole spaces left for the future to a maximum of six.

C. All panels installed in electrical rooms and mechanical rooms shall be surface mounted.

D. Provide a minimum of 20% spare circuit breakers for future use.

3.9 Emergency Power System

A. The emergency power system shall have a status monitoring system with annunciation at the building management system. In addition, several summary alarms will be transmitted to the energy management system.

   Example of parameters follows:

   1. Water temperature
   2. Oil pressure
   3. Mode switch in other than automatic
   4. Over speed
   5. Over crank
   6. Battery voltage status
   7. ATS status
   8. L.V. main circuit breaker status
   9. Reverse power
   10. Fail to synchronize
   11. Engine running

12. Low fuel level
13. Ground fault

B. The transfer switches and engine controls shall be insolated from the engine generator by a partition with a glass observation window. A room shall enclose the engine generator set to prevent noise from being present at the transfer switch and engine controls.

C. The engine generator day tank shall have a sight glass. The main fuel tank shall have a fuel gauge. Both tanks shall have gauges with outputs for use with emergency power system monitor.

D. All engine generator transfer switches and engine-sensing devices for correct system operation shall have contacts for remote monitoring. The contacts shall be for anticipatory high water temperature and low oil pressure. Additional alarm contacts shall be provided for generator called on to start, mode switch not in "Automatic", over speed, over crank, battery alarm, transfer switch in emergency position, transfer switch in normal position, ventilation fan and louver on/off, and closed/open, and fuel pump for day tank malfunction, and engine heater not working.

E. Provide sufficient fuel to fill main and day fuel tanks.

F. The generator set shall be diesel fueled with automatic start and transfer upon loss of normal power. Automatic transfer switches shall have manual by-pass switches to permit maintenance and repair of automatic switches without interrupting the load being served.

G. Provide a manual bypass for the transfer switch so the transfer switch can be maintained while de-energized, yet emergency power still in service.

H. Engine generator sets should be located close to the normal power switchboard to permit paralleling with the normal power substation for demand peak-shaving and curtailing load operations. Provide a tie circuit breaker and tie feeder between the emergency power bus and appropriate substation secondary.

I. Engine generator sets and emergency-normal power tie circuit breaker should be equipped with synchronizing and paralleling equipment and instrumentation including wattmeters with pulse output, ammeters, voltmeters and synchroscope, and reverse power and other protective relaying required by BG&E.

J. The emergency engine generators are to be sized using as a criteria motor starting with 15% maximum voltage drop at the motor.

END OF SECTION

SECTION 26 51 00
LIGHTING (INTERIOR)
1/25/2019

PART 1. GENERAL

1.0 Summary

A. The consultant will find many different types of lighting systems on the interior and exterior of buildings on Towson University (TU) campus. This standard, however, establishes specific guidelines to the types and makes of interior light systems required by the university for new and alteration work. The university does not necessarily desire to match existing lighting systems for new work adjacent to existing spaces. Instead, new spaces and renovated spaces should be treated as separate spaces using the guidelines listed below.

B. For the most part, this section applies to ceiling mounted general purpose lighting fixtures and illuminated exit signs. Systems that require special design or alternative lighting must be approved by TU.

C. All lighting systems are to comply with the latest IECC/ASHRAE 90.1. All lighting power densities must meet energy code. All foot-candle levels shall meet IES recommendations unless specified by TU.

1.1 Quality Assurance

A. Work specified under this section shall only be accomplished by qualified, skilled tradesmen who have continuously and successfully performed the required tasks for a minimum of five (5) years. In addition, these individuals shall be licensed electricians, holding the license in the State of Maryland, for a minimum of two (2) years.

1.2 Lighting System/Supply Voltages

A. The consultant is responsible for thoroughly investigating the existing building electrical systems to establish the proper voltage of the specified fixtures.

B. The consultant is responsible for thoroughly investigating the existing building electrical systems to establish ample service availability for the addition of or replacement of new lighting systems.

1.3 Lighting levels shall be in accordance with IES recommendations. In general, classrooms and offices shall be average 30-40fc, halls, corridors, lobby’s, restrooms, to be maximum average 15-20fc.

1.4 All lighting systems are to be LED. Non LED systems must be approved by TU. All fixtures in offices, classrooms, meeting rooms and conference rooms shall be either continuous dimming or step dimming to comply with energy code requirements.

Stairways fixtures to be dimmed at 50% upon no-occupancy. All fixtures are to be DLC listed or Energy Star listed.

1.5 All fixtures will be controlled by occupancy/vacancy sensors. Exceptions are special areas such as certain mechanical rooms where obstructions exist. (Additional detail on sensors listed in Part 2 below).

1.6 Incandescent lamps are <u>not</u> to be installed on campus.

1.7 Fluorescent fixtures/ CFL lamps are <u>not</u> to be installed on campus.

1.8 Day-lighting sensors are to be used in all perimeter offices, classrooms, meeting rooms, lobbies, etc., where natural light exists. In perimeter offices, occupancy/vacancy/day-lighting combination devices can be used. All Daylighting controls/design to meet the latest IECC/ASHRAE 90.1 requirements.

1.9 Electrical Service

A. Wiremold or other surface mounted raceways (SMR) should not be used to feed light system, including wall-mounted fixtures unless approved by TU.

B. All wiring to light fixtures shall be in EMT except the following:

1. MC Cable may be used from the light fixture to a junction box or between light fixtures located <u>no more than</u> ten feet (10') in length; provide ample cable to push light fixtures up and out of ceiling bay for inspection.

2. MC Cable may be used in existing walls to feed new light systems, providing a transition to EMT occurs above the ceiling line or below the floor deck as required.

3. Light fixtures are not to be used as junction boxes. If necessary, set junction box above light fixtures.

1.10 Light Switching

A. Minimize the use of three and four way switching. In existing construction and where additional switches are required by the client, make every attempt to install wiring in walls without the use of SMR. Where SMR are required, verify their use with TU.

B. Occupancy/vacancy sensors shall be used in all locations. This includes offices, classrooms, labs, gymnasiums, auditoriums, restrooms, corridors, locker rooms, most mechanical rooms, residence halls, etc. Use the appropriate technology of passive infrared, ultrasonic, or dual technology as warranted by the design/application. In stairways, 50% dimming shall be used per energy code. (See Part 2 of this document for Occupancy/Vacancy Sensor

Manufacturer's/Model.) In some mechanical rooms where multiple obstructions exist, occupancy sensor not required.

1.11 Extra Materials

A. Furnish extra materials that match the products installed and are packaged with protective covering for storage.

PART 2. LUMINARIES/SENSORS

2.0 Grid mounted fixtures (troffers)

The Basis of Design for general lighting for all Classrooms, Corridors, Suites, Offices, Labs, Conference Rooms, and Rest Rooms shall be recessed 2x2 LED grid mounted fixtures. 2x4 fixtures are <u>not</u> to be used.

<u>All 2x2 LED fixtures are to meet ~120 lumens per watt minimum.</u>

Accepted models:

1. Cooper Encounter LED (120 lpw models only), Lithonia BLT LED (120 lpw models only), Columbia (120lpw models only)
2. Color: White
3. Kelvin: 4000
4. Lumen package: select per application to meet required foot candle levels. Do <u>not</u> select higher lumen package than necessary. Do not over-light space.

2.1 LED down light fixtures must be Eaton (Cooper), Lithonia (Acuity), Gotham (Acuity), or Hubble (Columbia). Others must be approved by TU. Select lumen package for proper foot candle levels. Avoid over-lighting.

2.2 Exit Signs to be LED

A. Signs will meet the requirements of UL 924 and NFPA Life Safety Code and be UL listed.

B. Light source will be Light Emitting Diodes (LEDs) with a life expectancy in excess of 20 years.

C. LED lamps will provide 100% illumination in normal and emergency operation.

D. Fixture will have a green lens and will be from Lithonia or an approved equivalent.

E. LED lamps will be mounted inside the housing, not on the face.

F. A color rich prismatic diffuser will be mounted in front of the LEDs to provide a full ¾" letter stroke with even illumination.

G. Minimum brightness will be equivalent to an exit sign legend illuminated at seven (7) foot candles.

H. Exit sign frame, back plate, faceplate, and mounting canopy will be UV-stable thermoplastic that will not yellow with age.

I. Where necessary, signs will be provided with a stem suspension system.

K. Self-powered models will prove 90 minutes of battery powered emergency illumination.

L. Batteries in self-powered models will be completely sealed maintenance free nickel cadmium.

M. Battery chargers in self-powered models will be fully automatic, solid state and current limited.

N. Circuitry will include a combination LED pilot light and test switch and brownout protection. A filtered and regulated power supply will protect LEDs from power surges.

O. All models will be 120/277 dual voltage and have a maximum 3-watt power draw.

P. Self-powered models will flash during emergency conditions.

Q. Battery Exit units will only be used in buildings that do not have standby generator systems. All Exit lights will be connected to building emergency circuits.

2.3 Occupancy Sensors

A. Occupancy sensors shall be Cooper, Sensorswitch or Lutron. Ceiling mounted, wall mounted, or switchbox mounted sensors shall be permitted. Sensor selected shall be appropriate for application. In all areas, occupants shall have the ability to turn off lights regardless of sensor configuration. Exception will be corridors, stairways, lobbies and restrooms. In no case shall wall switch deactivate or change the function of occupancy sensor. Occupancy sensor will always turn off lights when room is not occupied regardless of switch position.

A. Restrooms will <u>not</u> contain wall switches unless key type switches are used (requires maintenance key to turn off). All lights in restrooms will be controlled by occupancy sensors. At least one luminaire in rest room will be on emergency or night light circuit.

2.4 LED Screw in Lamps

A. All LED screw in lamps must be approved by TU. Approved manufactures are TCP, Toshiba, and Sylvania.

PART 3. LIGHTING CONTROL SYSTEMS

3.0

A. All lighting control systems to be Lutron, nLight or approved by TU.

PART 4. MISC. LIGHTING

4.0 Fixture Support

A. All fixtures shall be supported independently of ceiling grid with tie wires at four corners, and as required by the manufacturer. Power activated fasteners for concrete shall be a minimum of 1", buried. Utilize structural steel, purlins, etc. whenever possible using appropriate beam clamps or other approved fasteners for this type of application.

4.1 Disposal of Fluorescent Light Bulbs & PCB Contaminated Light Ballasts

A. The contractor will provide all labor, materials, equipment, transportation, documentation and services necessary for the environmentally responsible disposal of PCB containing light ballasts and mercury containing fluorescent light bulbs removed from existing campus lighting fixtures associated with the lighting retrofit project.

B. Upon removal from light fixtures, all ballasts will be placed into steel, DOT approved shipping containers provided by the contractor and transported to an EPA permitted PCB Ballast Recycling Facility approved in advance by the owner. Fluorescent light bulbs will be disposed of intact as much as reasonably possible and, upon removal, will be packaged in DOT approved shipping cartons provided by the university.

END OF SECTION

SECTION 26 56 00
LIGHTING (EXTERIOR)
05/15/18

PART 1. GENERAL

1.0 Summary

A. This section addresses exterior roadway, parking lot and pedestrian light fixtures and poles.

1.1 Quality Assurance

A. Only products and associated components furnished by the specified manufacturers below will be acceptable.

1.2 Lighting System/Supply Voltages

A. The consultant is responsible for thoroughly investigating the existing and proposed electrical supply systems to establish service availability and the proper voltage coordination of the specified fixtures.

1.3 New Conduit

A. All new light standards shall be supplied by PVC conduit of the size appropriate for each installation. Direct buried cable is not acceptable. All new pole bases that are dead end in a group shall have an additional conduit stubbed out and capped for future use.

1.4 Hand Holes for Light Poles

A. All light poles shall have hand holes (inspection holes) and covers with gaskets within four vertical feet of the base. Holes shall be 2” wide by 4” high, minimum.

1.5 Lighting Controls

A. All exterior lighting shall be controlled by either time clock or photocell or a combination of the two controls. Consult Facilities Management to determine the program requirements and desired controls.

B. Photocells are typically mounted at the top of the light standard. Where multiple standards are installed, determine the number of fixtures allowed to be controlled for each photocell.

C. When time clocks are required, consult Facilities Management for locations.

1.6 Fuses

A. Every pole mounted light fixture shall be in - line fused inside of the pole. The fuse shall be accessible through the hand hole specified. Fuses shall be BUSS, HLR type and of the appropriate size for each application.

1.7 Extra Materials

A. Furnish extra materials that match the products installed and are packaged with protective covering for storage.

1. Lamps: 10 for every 100 of each type and rating installed

2. Acrylic Lenses: 2 for every 100 of each type installed

3. Ballasts: 2 for each type installed

PART 2. EXTERIOR LIGHTING DESIGN GUIDELINES

Design guidelines are provided to ensure proposed lighting levels are met for future lighting projects.

a. Design to light levels as specified in the *Illuminating Engineering Society of North America (IESNA) handbook (latest edition)* for space types & comply with ASHRAE/IES standards for lighting power densities.

b. Point by point calculations should be completed by the designer. Each point should be no greater than 10’ on center.

c. A completed table should be included to show the results of the calculation (i.e average footcandles,max/min ratios, etc).

d. Show 10 feet beyond parking lot or walkway to indicate spill light, especially at property lines if project is LEED and attempting points for light trespass.

e. Designer must meet or exceed the requirements for the lighting power density requirements per current IECC or ASHRAE.

f. Designer should include in the contractor’s/installer’s scope of work to measure footcandle levels after installation to ensure that designed light levels have been met as follows:

1) Horizontal readings are taken 6” above pavement at locations 10’ on center squared.

2) Vertical readings are taken 5’ above grade in direction of pedestrian and vehicular traffic.

3) These footcandle standard minimums, etc must be included in the lighting specifications so that a pass/fail review can be made by the lighting designer prior to final acceptance.

END OF SECTION

SUPPLEMENTAL INFORMATION

The following information is provided to supplement the construction standards contained in the previous section. This may include additional graphic information on products listed in the standards, or information on additional products or materials that have been used successfully on other campus projects, but may not be applicable to all projects. Consult with Facilities Management about the applicability of any particular products for specific projects.

Saturn 2 LED

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Project: ______________________

Type: ______________________ **Qty:** __________

SA2L – ____ – ____ – ____ – ____ – ____ – ____ – ____

Series | Optics | Mounting | Light Engine | CCT | Finish | Voltage | Option

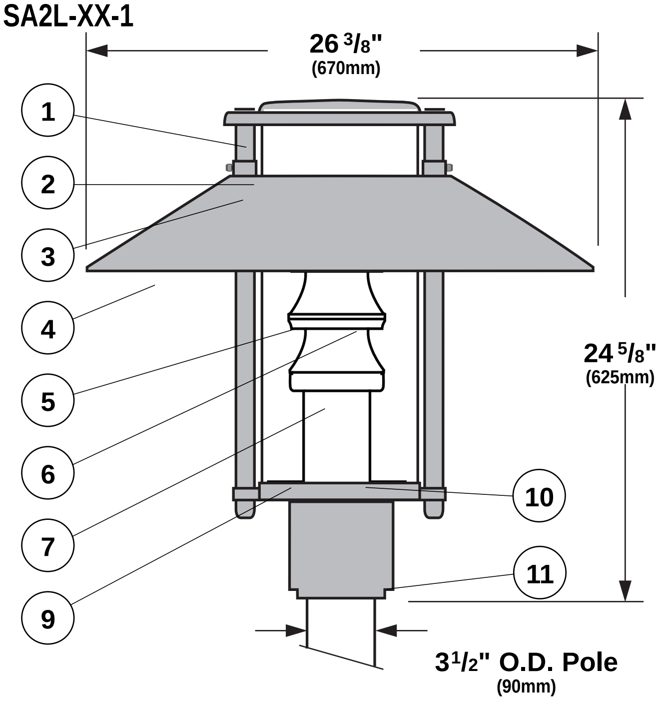
____ – ____ – ____ – ____

Pole Series | Height | Finish | Pole Options

Series	Optics	Mounting	Light Engine	CCT	Finish	Voltage	Options
SA2L Saturn 2 LED	**TS** Tritec Symmetric **TA** Tritec Asymmetric	**1** Single **1A** Single Arm Mount **2** Double **W** Wall Mount	**L26** 26W **L50** 50W	**30** 3000K **40** 4000K	**WH** White **BK** Black **BZ** Bronze **SV** Silver **SP** Specify Premium Color	**UNV**[1] **347** **480**	**HS** House Side Shield (180°) **PCT** Photocell Tenon **NH** No Hoop **MS** Motion Sensor w/optional photocell (meets title 24 requirement. See pole spec sheet)

[1]UNV= 120-277V

SA2L-XX-1



1. Fixture Cover - Aluminum cover with white painted interior for maximum fixture efficiency, has industrial felt gasketing for air circulation. Cover removes for lamp access.

2. Cover Support - Machined support connected to fixture cover with architectural Allen head nut detail.

3. Cover Set Screw - Two stainless steel, socket head cap screws provide attachment of fixture cover and support to 1" (25mm) diameter connection rods. Loosening screws allows fixture cover removal without tools.

4. Fixture Hood - Aluminum shade with white painted interior for maximum reflectivity.

5. LED Array - High Flux LEDs mounted to metal core PCB and attached to external heatsink for maximum thermal performance and life. CCT tolerance within a 3 step bin and provided with a minimum CRI of 80. LED light engine has a reported lumen maintenance of 93% at 50,000 hours. L70 calculated greater than 100,000 hours.

6. LED Optics – Symmetric or Asymmetric distributions created by conical textured reflector and patterned acrylic reveal with alternate LED PCB layouts. Type V and Type IV IES distribution types. An indirect lighting affect spreads brightness and improves visual appearance.

7. LED Driver - LEDs are driven by RoHS compliant constant current programmable LED driver. Driver includes 0-10V dimming to 10% and meets the requirements of IP66. Driver located inside e-block tube within clear outer cylinder.

8. Surge Protector – Independent surge protection device designed to protect luminaire from electrical surge up to 10kA standard. 20kA surge protector optional.

9. Diffuser - Clear, U.V. stabilized, acrylic with minimum wall thickness of 0.125" (3mm).

10. Gasketing - Continuous molded neoprene gasket provides weatherproofing, dust, and insect control at diffuser base.

11. Pole Fitter - Self-leveling, die-cast aluminum, fitter base secured to pole with two, stainless steel, Allen head set screws. For 3 1/2" (90mm) O.D. poles.

Exterior Luminaire Finish -
Selux utilizes a high quality Polyester Powder Coating. All Selux luminaires and poles are finished in our Tiger Drylac certified facility and undergo a five stage intensive pretreatment process where product is thoroughly cleaned, phosphated and sealed. Selux powder coated products provide excellent salt and humidity resistance as well as ultra violet resistance for color retention. All products are tested in accordance with test specifications for coatings from ASTM and PCI.

5 Year Limited LED Luminaire Warranty -
Selux offers a 5 Year Limited Warranty to the original purchaser that the Exelia LED luminaire shall be free from defects in material and workmanship for up to five (5) years from date of shipment. This limited warranty covers the LED driver and LED array when installed and operated according to Selux instructions. For details, see “Selux Terms and Condition of Sale.”

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TEL (845) 834-1400
FAX (845) 834-1401
www.selux.us
SA2L-0517-01 (ss-v1.0)

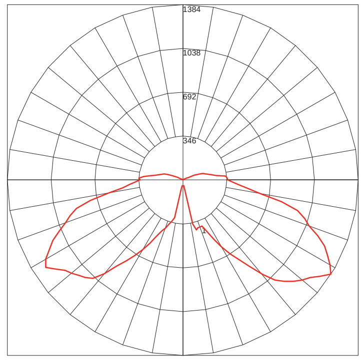
NRTL Listed (i.e. UL, CSA)

Union Made Affiliated with IBEW Local 363

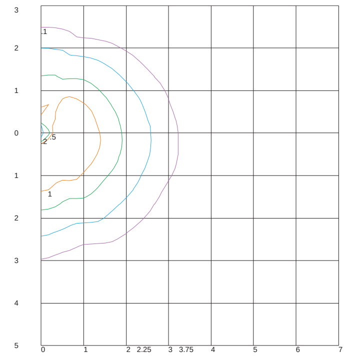
Photometry

TA / 50W LED / 3000K CCT
Catalog #: SA2L-TA-1-L50-30-UNV
Report #: 8684
Delivered Lumens: 4799
Input Watts: 48W
Efficacy: 100 lm/W
Maximum candela of 1384 at 57.5° from vertical.
IES classification: Type IV
Mounting Height: 16' (4.9 m)
Bug Rating: B2-U3-G2

DOWNLOAD IES FILE:
http://www.selux.us/fileadmin/us/exterior/ies_file/SA2L_IES.zip



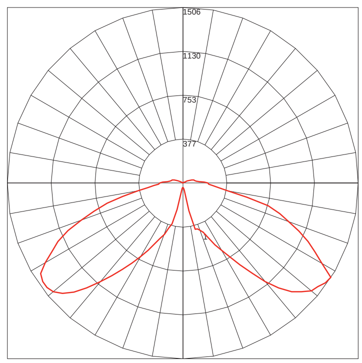
Maximum Candela = 1384.1 Located At Horizontal Angle = 277, Vertical Angle = 57.5
1 - Vertical Plane Through Horizontal Angles (277 - 97) (Through Max. Cd.)



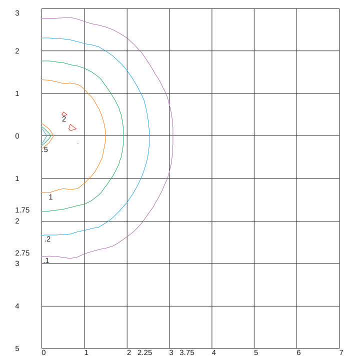
Distance In Units Of Mounting Height
Values Based On 16 Foot Mounting Height

TS / 50W LED / 3000K CCT
Catalog #: SA2L-TS-1-L50-30-UNV
Report #: 8694
Delivered Lumens: 5399
Input Watts: 50W
Efficacy: 108 lm/W
Maximum candela of 1506 at 57.5° from vertical.
IES classification: Type V
Mounting Height: 16' (4.9 m)
Bug Rating: B2-U3-G2

DOWNLOAD IES FILE:
http://www.selux.us/fileadmin/us/exterior/ies_file/SA2L_IES.zip



Maximum Candela = 1506.2 Located At Horizontal Angle = 301, Vertical Angle = 57.5
1 - Vertical Plane Through Horizontal Angles (301 - 121) (Through Max. Cd.)



Distance In Units Of Mounting Height
Values Based On 16 Foot Mounting Height

Saturn LED 3000K & 4000K				
Optics	TS (Tritec Symmetrical)		TA (Tritec Asymmetric)	
Lightengine	L50	L26	L50	L26
Performance				
Delivered Lumens (lm)	5400	2700	4800	2400
Wattage (W)	50	26	48	26
Efficacy (Lm/W)	108.0	103.8	100.0	92.3
Lm Multiplier	1.000	0.500	1.000	0.500

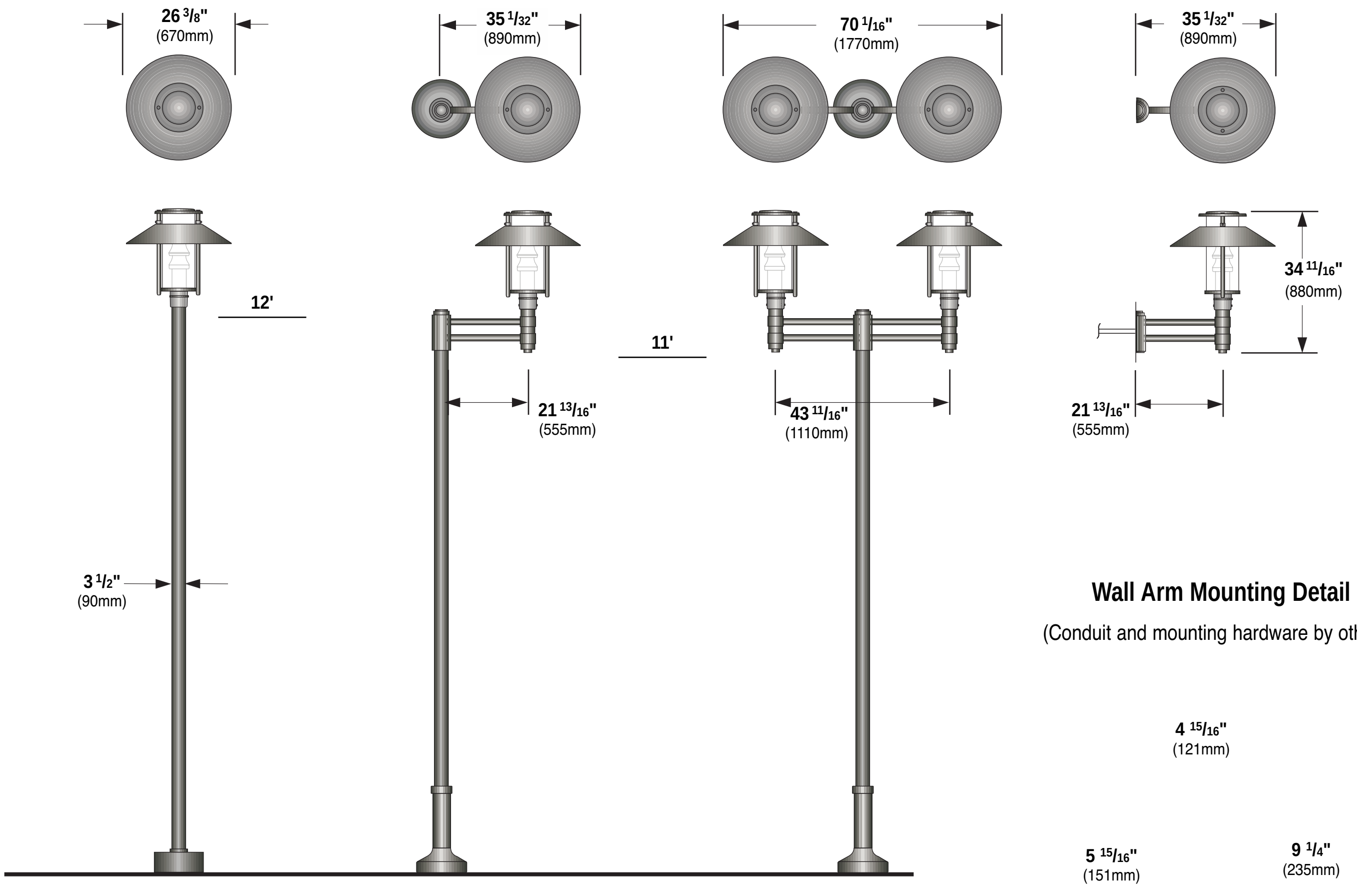
Mounting

Single
Die-cast aluminum fitter base secured to pole with three, stainless steel, Allen head set screws.

Single Arm Mount
Die-cast aluminum single luminaire mounting arm secured to pole with four stainless steel, Allen head set screws. Outer slip fitter for 3 1/2" tenon.

Double
Die-cast aluminum double round luminaire mounting arm secured to pole with four stainless steel, Allen head set screws. Outer slip fitter for 3 1/2" tenon.

Wall
Die-cast aluminum double round wall mount arm. Secured to wall with 1/4" diameter threaded fasteners (by others).



Wall Arm Mounting Detail

(Conduit and mounting hardware by others.)

4 15/16"
(121mm)

5 15/16"
(151mm)

9 1/4"
(235mm)

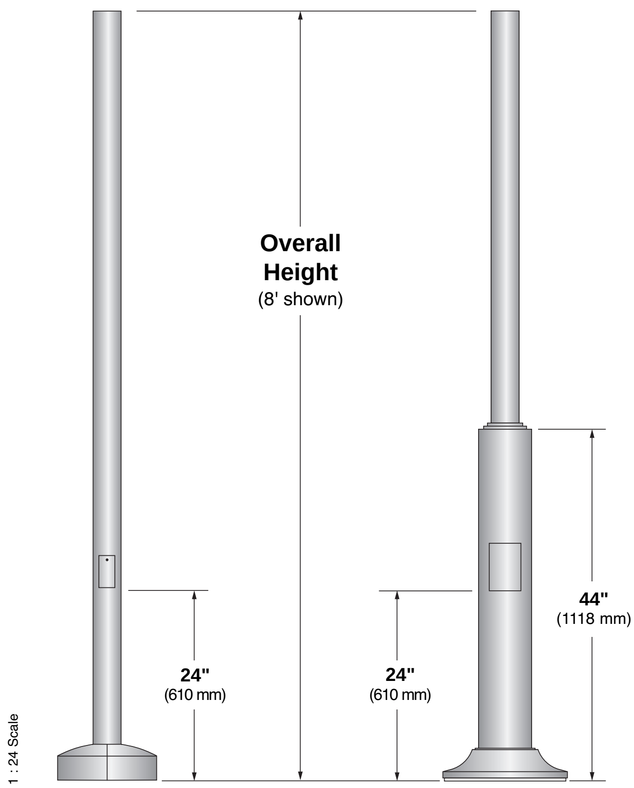
2 9/16"
(65mm)

Pole Information

Refer to pole specification sheets for construction details, anchorage information and additional options.

A35 & S35
Round Straight Aluminum
& Round Straight Steel Poles

S635
Round Stepped
Steel Pole



Shown with standard base covers.

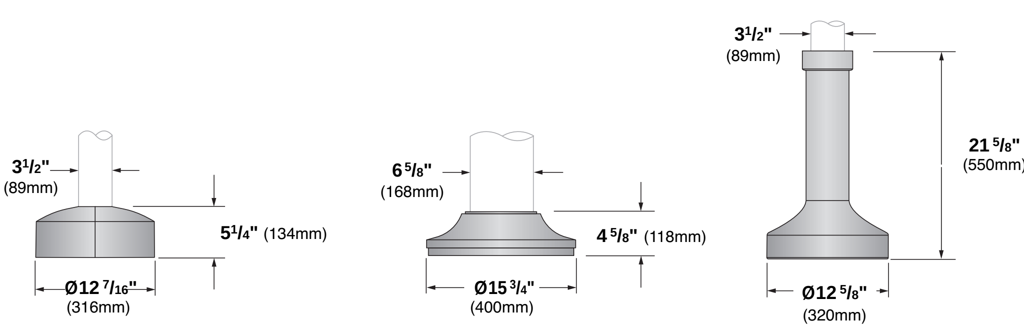
Base Cover Information

Refer to pole specification sheets for construction details, anchorage information and additional options.

Straight Poles (A35 & S35)
BC5 Standard Base Cover
Two-piece cast aluminum

Stepped Steel Pole (S635)
BC6 Standard Base Cover
One-piece cast aluminum

BC1 Optional Base Cover
(A35 & S35) One-piece cast aluminum



Saturn 2 LED

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Pole Data Chart

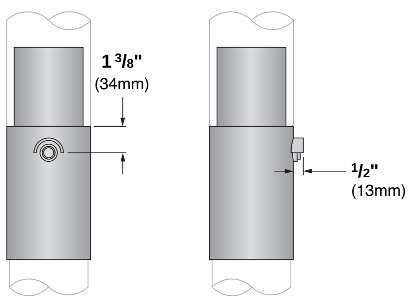
Pole Series		Bolt Circle	EPA Information (ft²)					Height	Finish	Options
			70 mph	80 mph	90 mph	100 mph	110 mph			
S635	3 1/2" Diameter Stepped Steel Pole	Ø9"	57.6	44.3	34.6	27.5	22.8	**8** 8 ft.	**WH** White	**BC1** Decorative Cast Aluminum Base Cover (for A35 & S35 poles only)
A35	3 1/2" Diameter Straight Aluminum Pole	Ø7 3/4"	16.1	12.2	9.4	7.3	5.9		**BK** Black	
S35	3 1/2" Diameter Straight Steel Pole	Ø7 3/4"	14.8	11.3	8.6	6.7	5.4			
S635	3 1/2" Diameter Stepped Steel Pole	Ø9"	45.6	35.0	27.3	21.6	17.8	**10** 10 ft.	**BZ** Bronze	**REC** GFCI Receptacle with weather-proof cover[1]
A35	3 1/2" Diameter Straight Aluminum Pole	Ø7 3/4"	12.4	9.3	7.1	5.4	4.3		**SV** Silver	
S35	3 1/2" Diameter Straight Steel Pole	Ø7 3/4"	11.4	8.6	6.5	4.9	3.9			
S635	3 1/2" Diameter Stepped Steel Pole	Ø9"	37.6	28.7	22.3	17.5	14.4	**12** 12 ft.	**SP** Specify Premium Color	**For PCT option, see p.1**
A35	3 1/2" Diameter Straight Aluminum Pole	Ø7 3/4"	9.9	7.3	5.4	4.0	3.1			**[1] Weatherproof cover intended for portable tools or other portable equipment connected to the outlet only when attended. For other requirements please consult factory.**
S35	3 1/2" Diameter Straight Steel Pole	Ø7 3/4"	9.1	6.7	4.9	3.6	2.8			
S635	3 1/2" Diameter Stepped Steel Pole	Ø9"	31.7	24.2	18.6	14.6	11.9	**14** 14 ft.		
A35	3 1/2" Diameter Straight Aluminum Pole	Ø7 3/4"	8.0	5.8	4.2	3.0	2.2			
S35	3 1/2" Diameter Straight Steel Pole	Ø7 3/4"	7.3	5.3	3.8	2.7	1.9			
S635	3 1/2" Diameter Stepped Steel Pole	Ø9"	21.7	15.8	12.3	9.6	7.6	**16** 16 ft.		
A35	3 1/2" Diameter Straight Aluminum Pole	Ø7 3/4"	4.9	3.2	2.2	1.4	0.8			
S35	3 1/2" Diameter Straight Steel Pole	Ø7 3/4"	4.4	2.8	1.9	1.2	0.6			

[1]Other pole configurations available, consult factory. [2]EPA Calculations allow for 1.3 Gust Factor

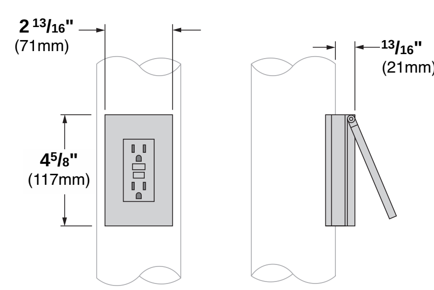
Effective Projected Area of Single Luminaire = 0.92 ft² (0.09m²) / Weight of Luminaire = 35.0 lbs (15.9kg)
Effective Projected Area of Double Luminaire = 2.37 ft² (0.22m²) / Weight of Double Luminaire (includes arms) = 94.0 lbs (42.6kg)

Optional Accessories

Photo Cell Tenon (PCT) - Button type photocell mounted in cast aluminum pole top tenon. Tenon has integral cast visor to prevent false start/stop cycle and can be oriented for optimum performance. Refer to fixture spec sheet to determine if this option is applicable.



GFCI Receptacle (REC) - GFCI duplex receptacle with cast base bolted to pole and gasketed, provided with weather-proof, self-closing cover; located 36" (915mm) from base of pole, inline with hand-hole. Receptacle is intended only for portable tools or other portable equipment to be connected to outlet only when attended by operating personnel.



SECTION 33 30 00
SANITARY SEWER
5/17/18

PART 1. GENERAL

1.0 Summary:

A. Towson University has an extensive underground utilities network, including sanitary sewers. Because the University is continuously expanding, it is imperative that the Consultant give in depth consideration to the existing network when designing new sanitary sewer systems. The A/E should also coordinate with the Owner in regards to planned future buildings adjacent or in proximity to the proposed work.

1.1 Baltimore County Right of Way:

A. Some of the sanitary systems located on the campus of Towson University are held within Baltimore County easements. When applicable, the Consultant shall coordinate with the county to ascertain the availability, costs and other requirements for connections and service.

1.2 References:

A. American Society for Testing and Materials (ASTM):

1. C478: Precast Reinforced Concrete Manhole Sections.

   a. D3034: Type PsM Polyvinyl Chloride (PVC) Sewer Pipe and fittings.

   b. F794: Standard Specification for Poly vinyl chloride (PVC) Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside diameter.

B. Standard specifications and details for construction as distributed by Baltimore County Department of Public Works, latest edition.

1.3 Delivery, Storage, and Handling:

A. Handling: Pipe, fittings, precast concrete manhole sections, and cast iron frames and manhole covers shall be handled carefully at all times. Only suitable equipment and appliances shall be used for the safe loading, hauling, unloading, handling, and placing of materials. Special care shall be exercised so that the preformed resilient joints on pipe and fittings shall not be damaged.

B. Towson University will not provide storage of materials outside of the limit of work.

PART 2. MATERIALS - MINIMUM REQUIREMENTS

2.0 Sanitary Sewer Pipe:

A. All sanitary pipe shall be Polyvinyl Chloride (PVC), Schedule 80 pipe and shall conform to ASTM F679.

B. PVC pipe shall be bell and spigot type. Bells shall be integral with pipe. Spigot end pipe with separate double hub couplings is not acceptable.

2.1 Manholes:

A. Manholes shall be pre-cast concrete of the size and shape required for each application in accordance with ASTM C478.

B. Frames and covers shall be cast iron. Manhole covers shall have the words "SANITARY SEWER" in letters 1.5 (one and a half) inches high cast into the cover.

2.2 Concrete and Mortar for Manholes:

A. Portland Cement Concrete: Portland cement concrete for manhole bases shall conform to Standard Specifications.

1. The concrete shall be Class "A" containing six (6) bags of Portland Cement per cubic yard of concrete.

2. The grading of the combined aggregate shall conform with the requirements of 1-1/2 inches maximum.

3. The consistency of the fresh concrete shall be such that the slump does not exceed four (4) inches.

4. The concrete shall have a minimum compressive strength of 3,000 PSI after twenty-eight (28) days.

PART 3. EXECUTION

3.0 Trenching, Backfilling, and Compacting

A. Refer to Section 02220: Trenching, Backfilling, and Compacting.

B. Over cut trenching to allow for a minimum 6” bed of sand including sidewalls. Where stone larger than 1 ½” is encountered in the excavated materials, remove soil and replace with “select” backfill.

C. Install standard yellow utility tape at 12” below grade.

3.1 Pipe Installation:

A. Pipe Laying:

1. Pipe laying shall proceed upgrade with the spigot ends of bell and spigot pipe pointing in the direction of flow.

2. Each piece shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line.

B. Debris Control: The interior of the sewer pipe shall be kept clean of dirt and debris at all times. When work is not in progress, open ends of pipe and fittings shall be temporarily plugged.

3.2 Field Quality Control:

A. General:

1. The Contractor shall furnish the necessary labor, equipment, and materials necessary to perform air tests of the completed sewerage project before the system is placed in operation or connected to other lines.

2. In no case shall the Contractor place the newly constructed sewer in operation without written approval of the Project Manager, the Engineer.

B. Air Test: All sanitary pipe sewers shall be air tested in accordance with ASTM C 828. All other sanitary sewers shall be air tested using the following procedures:

1. Test shall be conducted between two consecutive manholes, as directed by the Project Manager.

2. The test section of the sewer line shall be plugged at each end. One of the plugs shall be tapped and equipped with an air inlet connection for filling the line from an air compressor.

3. All service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged and carefully braced against the internal pressure to prevent air leakage by slippage and blowouts.

4. An air hose shall be connected to the tapped plug selected for the air inlet; the other end of the air hose shall then be connected to the portable air control equipment, which consists of valves and pressure gauges used to control the air entry rate to the sewer test section, as well as to monitor the air pressure in the pipeline. More specifically, the air control equipment includes a shutoff valve, pressure regulating valve, pressure reduction valve, and a monitoring pressure gauge having a pressure range from 0-5 PSI. The gauge shall have minimum divisions of 0.10 PSI and an accuracy of + 0.04 PSI.

5. Another air hose shall be connected between the air compressor (or other source of compressed air) and the air control equipment. This completes the test equipment setup; test operations may then commence.

6. Air shall be supplied to the test section slowly, filling the pipeline until a constant pressure of 3.5 PSIG is maintained. The air pressure shall be regulated to prevent the pressure inside the pipe from exceeding 5.0 PSIG.

7. When constant pressure of 3.5 PSIG is reached, the air supply shall be throttled to maintain the internal pressure above 3.0 PSIG for at least five (5) minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall. During this stabilization period it is advisable to check all capped and plugged fittings with a soap solution to detect any leakage at these connections. If leakage is detected at any cap or plug, pressure in the line shall be released and all leaky caps and plugs tightened. The test operation may then be started again by supplying air. When it is necessary to bleed off the air to tighten or repair a faulty plug, a new five (5) minute interval shall be allowed after the pipeline has been refilled.

8. After the stabilization period, the air pressure shall be adjusted to 3.5 PSIG and the air supply shut off or disconnected. The gauge shall be observed until the air pressure reaches 3.0 PSIG. At 3.0 PSIG, timing shall commence with a stopwatch that is allowed to run until the line pressure drops to 2.5 PSIG, at which time the stopwatch shall be stopped. The time required, as shown on the stopwatch, for a pressure loss of 0.5 PSIG is used to compute the air loss. Most authorities consider it unnecessary to determine the air temperature inside the pipeline and the barometric pressure at the time of the test.

9. If the time in minutes and seconds for the air pressure to drop from 3.0 to 2.5 PSIG is greater than that shown in the following table for the designated pipe size, the section undergoing the test shall have passed and shall be presumed to be free of defects. The test may be discontinued at that time.

10. If the time in minutes and seconds for the 0.5 PSIG drop is less than that shown in the following table for the designated pipe size, the section of pipe shall not have passed the test; therefore, adequate repairs shall be made and the line retested.

Time Requirements for Air Testing:

PIPE	SIZE	TIME
(inches)	(minutes)	(seconds)
4	2	32
6	3	50
8	5	6
10	6	22
12	7	39
14	8	56

15	9	35
16	10	12
8	11	34
20	12	45
21	13	30

(For larger diameter pipe use the following:
Minimum time in seconds = 462 x pipe diameter in feet)

11. For eight (8) inch and smaller pipe only: If, during the five-minute saturation period, pressure drops less than 0.5 PSIG after the initial pressurization and air is not added, the pipe

12. Multiple pipe sizes: When the sewer line undergoing the test is eight (8) inch or larger diameter pipe and includes four (4) inch or six (6) inch laterals, the figures in the Table for uniform sewer main sizes will not give reliable or accurate criteria for the test. Where multiple pipe sizes are to undergo the air test, the engineer can compute the "average" size in inches, which is then multiplied by 38.2 seconds. The results will give the minimum time in seconds acceptable for a pressure drop of 0.5 PSIG for the "average" diameter pipe.

13. Adjustment required for ground water: An air pressure correction is required when the prevailing ground water is above the sewer line being tested. Under this condition, the air test pressure shall be increased 0.433 PSI for each foot the ground water level is above the invert of the pipe.

3.3 Flushing and Cleaning:

A. General:

1. After all backfilling and pavement restoring operations have been completed, the Contractor shall flush and clean all sanitary sewer lines under the supervision of the Project Manager's representative.

2. During the flushing and cleaning operation, a wire screen with a 1/4 inch mesh or smaller shall be placed over the downstream outlet of the lower manhole to prevent any debris from being washed into the existing sewer system.

3.4 Grade Adjustments to Surface Structures:

A. Frames, Grates, and Covers

1. Frames, grates, and covers of all surface structures (manholes, clean outs, etc.) shall be adjusted to proposed finish grade. Grade rings shall be supplied and installed as required.

2. Frames of new or adjusted surface structures shall be supported by concrete with minimum dimensions as follows: six (6) inches wide by ten (10) inches deep.

B. Structures Within Paved Areas

1. A structure located in an area resurfaced with asphalt concrete shall not be constructed to final grade until the adjacent pavement or surfacing has been compacted.

2. The Contractor shall be responsible for referencing structures prior to paving and locating them after paving operations are complete.

3. After asphalt concrete resurfacing is complete, the asphalt shall be cut out six (6) inches wider than the frames of all surface structures. Each frame shall then be raised to finished grade and supported by concrete as noted above. Lampblack shall be added to the concrete to produce a dark finished surface which matches the surrounding asphalt concrete surface.

END OF SECTION

SECTION 32 14 13
CONCRETE PAVERS
5/17/18

PART 1. GENERAL

1. Summary:

   A. While many of the original pedestrian walkways in the core of campus are traditional brick pavers, newer walkways use concrete pavers. These are generally intended to match the size and color of traditional brick pavers. The types of systems described and depicted in this Section are acceptable for new work. Coordinate the design of new walkways and paver installations with adjacent existing conditions.

   Consultant shall determine specific base and edge restraint requirements for all areas. Consultant should confirm any areas that require access for vehicular traffic.

PART 2. MATERIALS

1. Manufacturer (Basis of Design):

   A. Hanover Architectural Products

   Hanover Prest Brick
   Traditional Style
   Red (R-15)
   Natural Finish
   Gray (accent or border where applicable)

   Use 4” x 8” x 2 3/8” for pedestrian walkways.
   Use 4” x 8” x 3” for areas required to accommodate vehicular traffic.

   B. Techo Bloc - Blu 80MM Collection

   Slate Color - Shale Grey

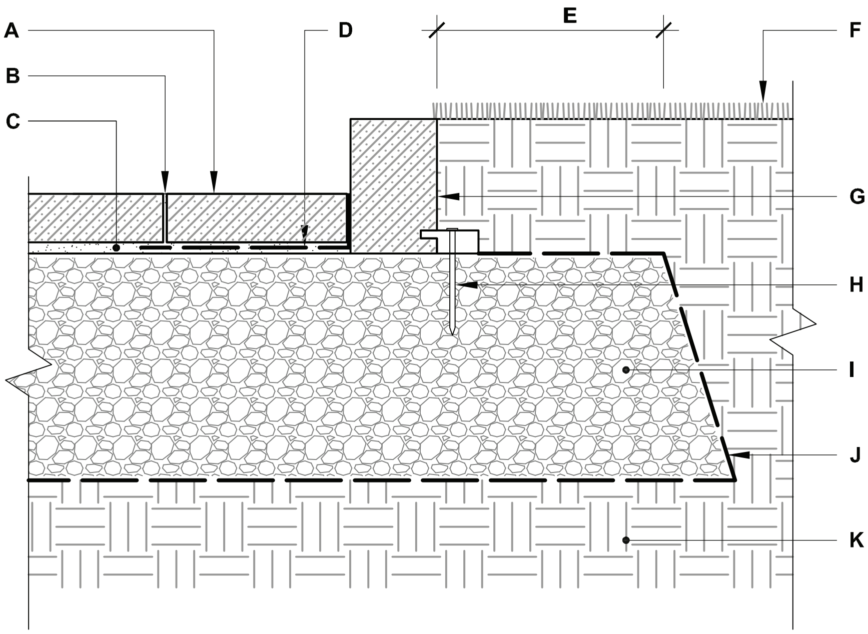
SUPPLEMENTAL INFORMATION

The following information is provided to supplement the construction standards contained in the previous section. This may include additional graphic information on products listed in the standards, or information on additional products or materials that have been used successfully on other campus projects, but may not be applicable to all projects. Consult with Facilities Management about the applicability of any particular products for specific projects.

Interlocking concrete pavers

ON GRANULAR BASE

P
01



A. TECHO-BLOC PRECAST CONCRETE PAVER 2 3/8" (60 mm) THICK MIN. CONFORMING TO ASTM C 936

B. SAND JOINT FILL CONFORMING TO ASTM C 144

C. SETTING BED (CONCRETE SAND) 1" (25 mm) THICK CONFORMING TO ASTM C 33

D. GEOTEXTILE 12" (300 mm) WIDE ENCAPSULATING SETTING BED

E. EXTRA WIDTH EQUAL TO FOUNDATION THICKNESS

F. LAWN

G. TECHO-BLOC EDGE RESTRAINT

H. NAIL

I. COMPACTED GRANULAR BASE CONFORMING TO ASTM D 2940
THICKNESS ACCORDING TO PROJECT SPECIFIC CONDITIONS

J. GEOTEXTILE

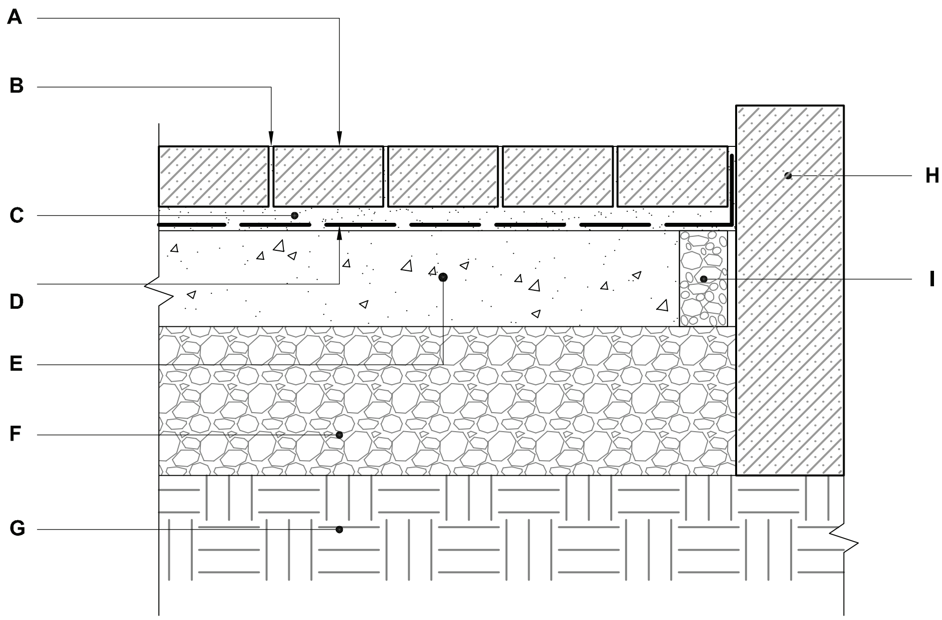
K. SUBGRADE

TYPICAL SECTION - **INTERLOCKING CONCRETE PAVERS** - ON GRANULAR BASE
MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Interlocking concrete pavers On reinforced concrete slab

P 03



A. TECHO-BLOC PRECAST CONCRETE PAVER 3 1⁄8" (80 mm) OR 3 15⁄16" (100 mm) THICK CONFORMING TO ASTM C 936

B. STABILIZED SAND JOINT FILL CONFORMING TO ASTM C 144

C. SETTING BED (CONCRETE SAND) 1" (25 mm) THICK CONFORMING TO ASTM C 33

D. GEOTEXTILE, COVER JOINTS AND TURN UP AGAINST EDGE RESTRAINT

E. REINFORCED CONCRETE SLAB

F. GRANULAR BASE

G. SUBGRADE

H. EDGE RESTRAINT

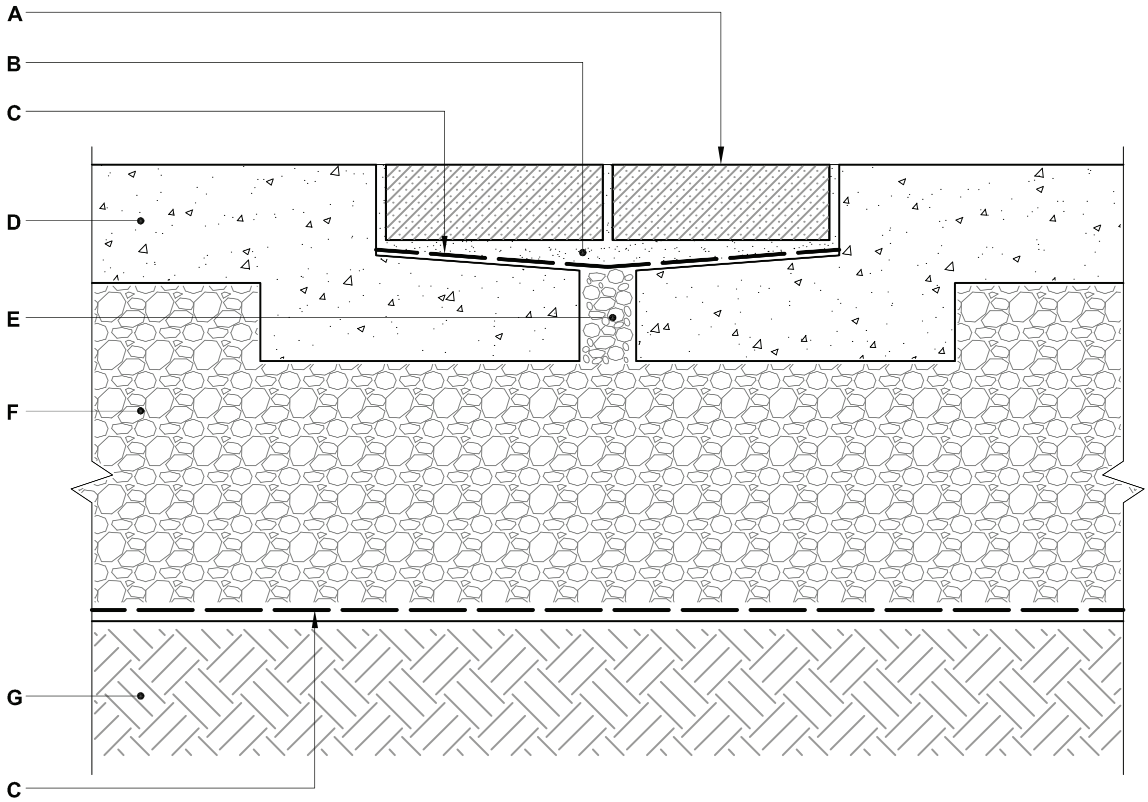
I. DRAINAGE HOLE AT LOWEST ELEVATIONS, 3" (75 mm) DIA.
FILL WITH FREE DRAINING AGGREGATE 1⁄2" (10 mm)

TYPICAL SECTION - **INTERLOCKING CONCRETE PAVERS ON REINFORCED CONCRETE SLAB**
MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Interlocking concrete pavers

INSERTED IN REINFORCED CONCRETE SLAB



A. TECHO-BLOC PRECAST CONCRETE PAVER
3 1/8" (80 mm) OR 3 15/16" (100 mm) THICK
CONFORMING TO ASTM C 936

B. SETTING BED (CONCRETE SAND) 1" (25 mm) THICK
CONFORMING TO ASTM C 33

C. GEOTEXTILE

D. REINFORCED CONCRETE SLAB

E. DRAINAGE HOLE AT LOWEST ELEVATIONS,
3" (75 mm) DIA.
FILL WITH FREE DRAINING AGGREGATE
1/2" (10 mm)

F. GRANULAR BASE

G. SUBGRADE

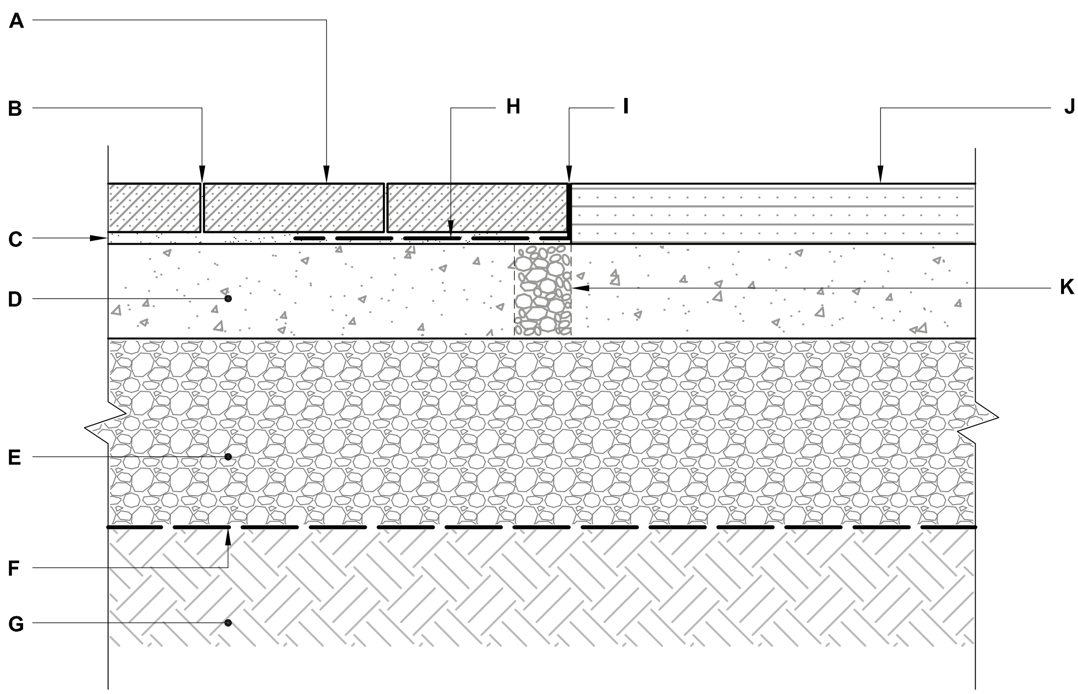
TYPICAL SECTION - **INTERLOCKING CONCRETE PAVERS -** INSERTED IN REINFORCED CONCRETE SLAB
MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Interlocking concrete pavers

WITH ASPHALT TRANSITION – HEAVY TRAFFIC

P 05



A. TECHO-BLOC PRECAST CONCRETE PAVER 3 15⁄16" (100 mm) THICK CONFORMING TO ASTM C 936

B. STABILIZED SAND JOINT FILL CONFORMING TO ASTM C 144

C. SETTING BED (GRANITIC SAND) 1" (25 mm) THICK CONFORMING TO ASTM C 33

D. STABILIZED BASE (ASPHALT TREATED BASE), THICKNESS AS SPECIFIED ON DRAWINGS AND SPECIFICATIONS
12" TO 24" (300 TO 600 mm) UNDER ASPHALT PAVEMENT

E. GRANULAR BASE, THICKNESS AS SPECIFIED ON DRAWINGS AND SPECIFICATIONS

F. GEOTEXTILE

G. NATURAL SOIL OR COMPACTED BACKFILL

H. GEOTEXTILE 12" (300 mm) WIDE ENCAPSULATING SETTING BED

I. SAW-CUT PAVEMENT (STRAIGHT LINEAR JOINT) AND SEAL JOINT

J. ASPHALT PAVEMENT

K. DRAINAGE HOLE AT LOWEST ELEVATION, 3" (75 mm) DIA.
FILL WITH FREE DRAINING AGGREGATE ½" (10 mm) AND COVER WITH GEOTEXTILE

TYPICAL SECTION - **INTERLOCKING CONCRETE PAVERS** - WITH ASPHALT TRANSITION, HEAVY TRAFFIC

MARCH 2013

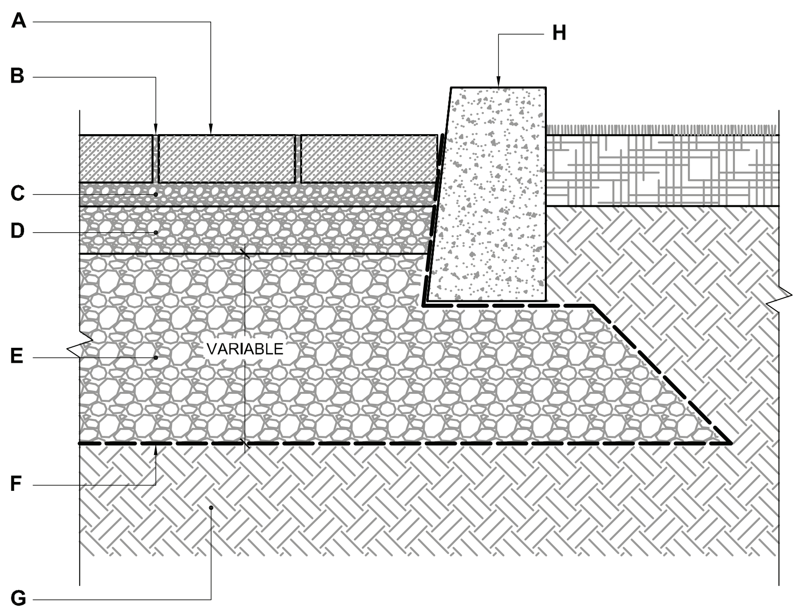
NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Permeable interlocking concrete pavers

INFLO, MISTA random, PERMEA, VICTORIEN PERMEABLE, VILLAGIO & VILLAGIO GRANDE

FULL INFILTRATION

PP 01A



CASE No 1 - FULL INFILTRATION

A. PERMEABLE PAVER FROM TECHO-BLOC, 2 3/8" TO 3 15/16" (60 TO 100 mm) THICK INFLO, MISTA RANDOM, PERMEA, VICTORIEN PERMEABLE, VILLAGIO OR VILLAGIO GRANDE CONFORMING TO ASTM C 936

B. JOINT FILLING MATERIAL, NO. 8 (FOR INFLO, PERMEA AND VILLAGIO) OR NO. 9 STONE (FOR MISTA RANDOM, VICTORIEN PERMEABLE AND VILLAGIO GRANDE) CONFORMING TO ASTM D 448

C. BEDDING COURSE, 2" (50 mm) THICK NO. 8 STONE CONFORMING TO ASTM D 448

D. BASE COURSE, 4" (100 mm) THICK NO. 57 STONE CONFORMING TO ASTM D 448

E. SUBBASE COURSE, THICKNESS AS PER DESIGN NO. 2 STONE CONFORMING TO ASTM D 448

F. GEOTEXTILE

G. SUBGRADE

H. EDGE RESTRAINT

TYPICAL SECTION - **PERMEABLE INTERLOCKING CONCRETE PAVERS** - FULL INFILTRATION

MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

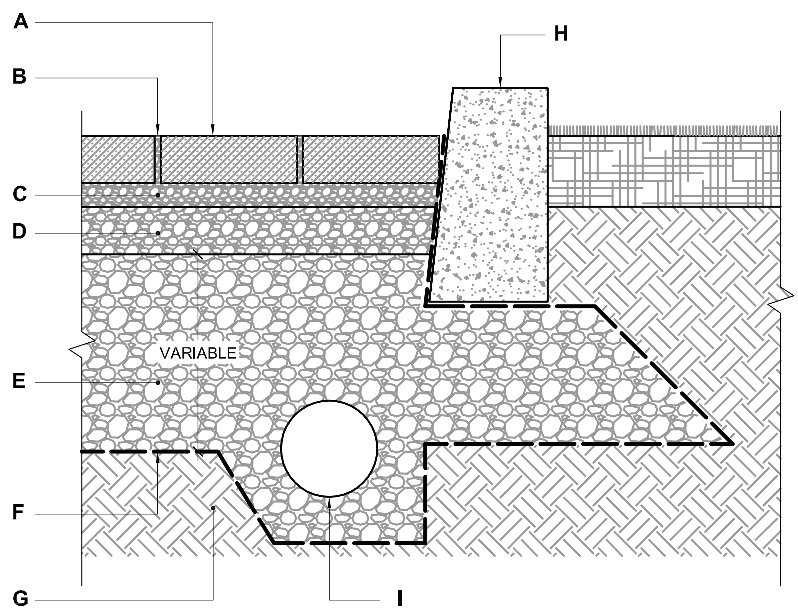
Techo-Bloc
Precious Stones™
www.techo-bloc.com

Permeable interlocking concrete pavers

INFLO, MISTA random, PERMEA, VICTORIEN PERMEABLE, VILLAGIO & VILLAGIO GRANDE

PARTIAL INFILTRATION

PP 01B



CASE No 2 - PARTIAL INFILTRATION

A. PERMEABLE PAVER FROM TECHO-BLOC, 2 3/8" TO 3 15/16" (60 TO 100 mm) THICK INFLO, MISTA RANDOM, PERMEA, VICTORIEN PERMEABLE, VILLAGIO OR VILLAGIO GRANDE CONFORMING TO ASTM C 936

B. JOINT FILLING MATERIAL, NO. 8 (FOR INFLO, PERMEA AND VILLAGIO) OR NO. 9 STONE (FOR MISTA RANDOM, VICTORIEN PERMEABLE AND VILLAGIO GRANDE) CONFORMING TO ASTM D 448

C. BEDDING COURSE, 2" (50 mm) THICK NO. 8 STONE CONFORMING TO ASTM D 448

D. BASE COURSE, 4" (100 mm) THICK NO. 57 STONE CONFORMING TO ASTM D 448

E. SUBBASE COURSE, THICKNESS AS PER DESIGN NO. 2 STONE CONFORMING TO ASTM D 448

F. GEOTEXTILE

G. SUBGRADE

H. EDGE RESTRAINT

I. PERFORATED DRAIN SPACED AND SLOPED TO DRAIN STORED WATER TO STORM SEWER SYSTEM OR RETENTION BASIN

TYPICAL SECTION - **PERMEABLE INTERLOCKING CONCRETE PAVERS** - PARTIAL INFILTRATION

MARCH 2013

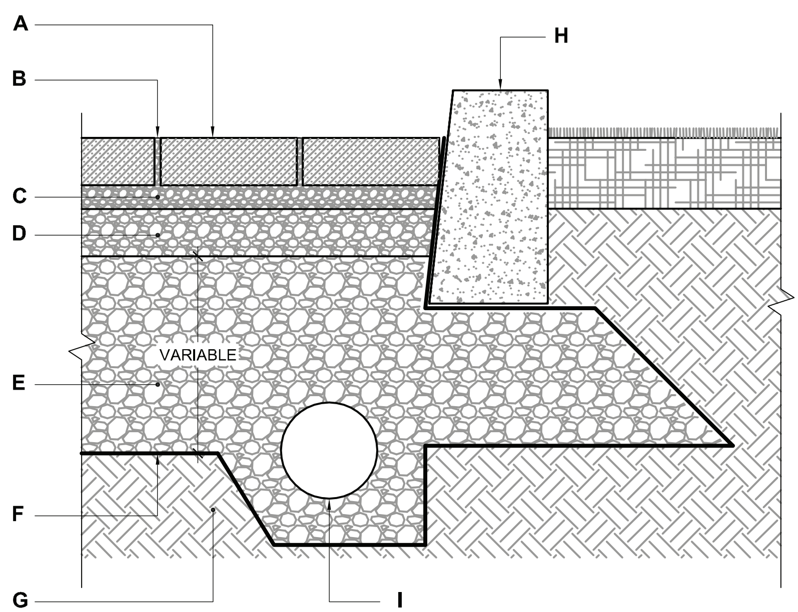
NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Permeable interlocking concrete pavers

INFLO, MISTA random, PERMEA, VICTORIEN PERMEABLE, VILLAGIO & VILLAGIO GRANDE

NO INFILTRATION

PP 01C



CASE No 3 – NO INFILTRATION

A. PERMEABLE PAVER FROM TECHO-BLOC, 2 3⁄8" TO 3 15⁄16" (60 TO 100 mm) THICK INFLO, MISTA RANDOM, PERMEA, VICTORIEN PERMEABLE, VILLAGIO OR VILLAGIO GRANDE CONFORMING TO ASTM C 936

B. JOINT FILLING MATERIAL, NO. 8 (FOR INFLO, PERMEA AND VILLAGIO) OR NO. 9 STONE (FOR MISTA RANDOM, VICTORIEN PERMEABLE AND VILLAGIO GRANDE) CONFORMING TO ASTM D 448

C. BEDDING COURSE, 2" (50 mm) THICK NO. 8 STONE CONFORMING TO ASTM D 448

D. BASE COURSE, 4" (100 mm) THICK NO. 57 STONE CONFORMING TO ASTM D 448

E. SUBBASE COURSE, THICKNESS AS PER DESIGN NO. 2 STONE CONFORMING TO ASTM D 448

F. GEOTEXTILE (OR IMPERMEABLE MEMBRANE)

G. SUBGRADE (IMPERMEABLE)

H. EDGE RESTRAINT

I. PERFORATED DRAIN SPACED AND SLOPED TO DRAIN STORED WATER TO STORM SEWER SYSTEM OR RETENTION BASIN

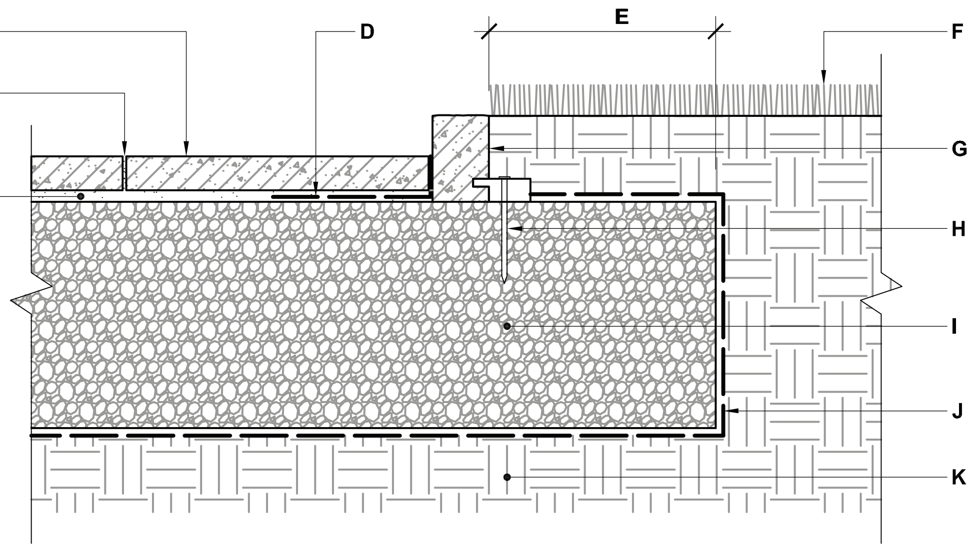
TYPICAL SECTION - **PERMEABLE INTERLOCKING CONCRETE PAVERS** - NO INFILTRATION

MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

SLABS

D
01



A. TECHO-BLOC PRECAST CONCRETE SLAB 1 ¾" (45 mm) THICK MIN. CONFORMING TO CSA A231.1

B. SAND JOINT FILL CONFORMING TO ASTM C 144

C. SETTING BED (CONCRETE SAND) 1" (25 mm) THICK CONFORMING TO ASTM C 33

D. GEOTEXTILE 12" (300 mm) WIDE ENCAPSULATING SETTING BED

E. EXTRA WIDTH EQUAL TO FOUNDATION THICKNESS

F. LAWN

G. TECHO-BLOC EDGE RESTRAINT

H. NAIL

I. COMPACTED GRANULAR BASE CONFORMING TO ASTM D 2940
THICKNESS ACCORDING TO PROJECT SPECIFIC CONDITIONS

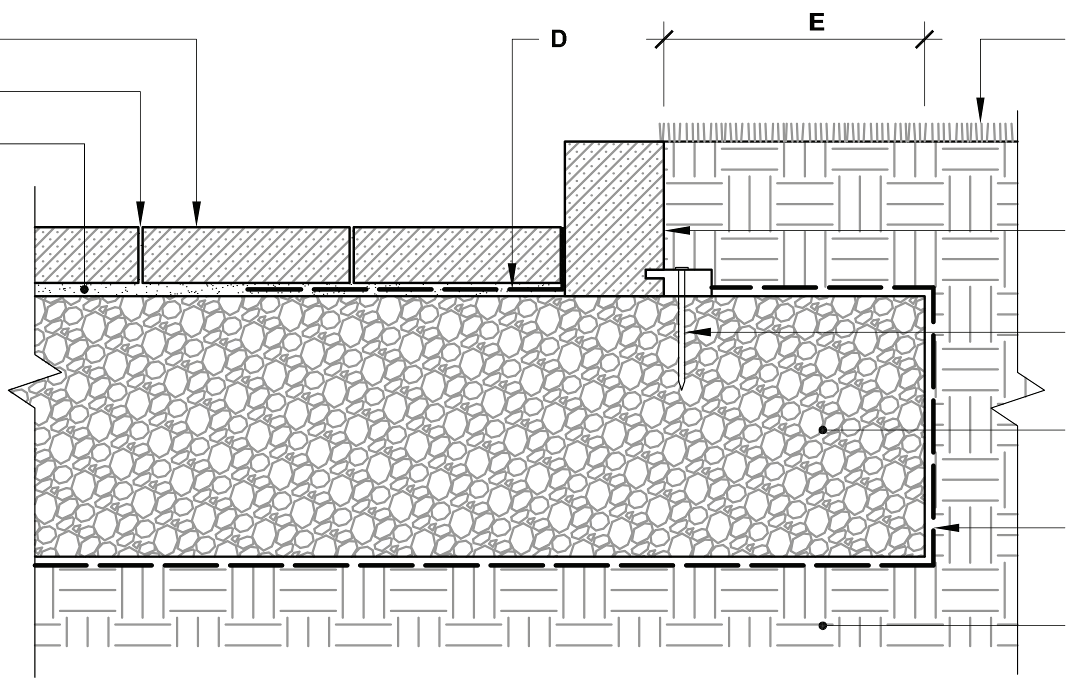
J. GEOTEXTILE

K. SUBGRADE

TYPICAL SECTION - **SLABS**
MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Pavers and edge restraint
AVIGNON



A. TECHO-BLOC PRECAST CONCRETE PAVER 2 3/8" (60 mm) THICK MIN. CONFORMING TO ASTM C 936

B. SAND JOINT FILL CONFORMING TO ASTM C 144

C. SETTING BED (CONCRETE SAND) 1" (25 mm) THICK CONFORMING TO ASTM C 33

D. GEOTEXTILE 12" (300 mm) WIDE ENCAPSULATING SETTING BED

E. EXTRA WIDTH EQUAL TO FOUNDATION THICKNESS

F. LAWN

G. AVIGNON EDGE RESTRAINT

H. NAIL

I. COMPACTED GRANULAR BASE CONFORMING TO ASTM D 2940
THICKNESS ACCORDING TO PROJECT SPECIFIC CONDITIONS

J. GEOTEXTILE

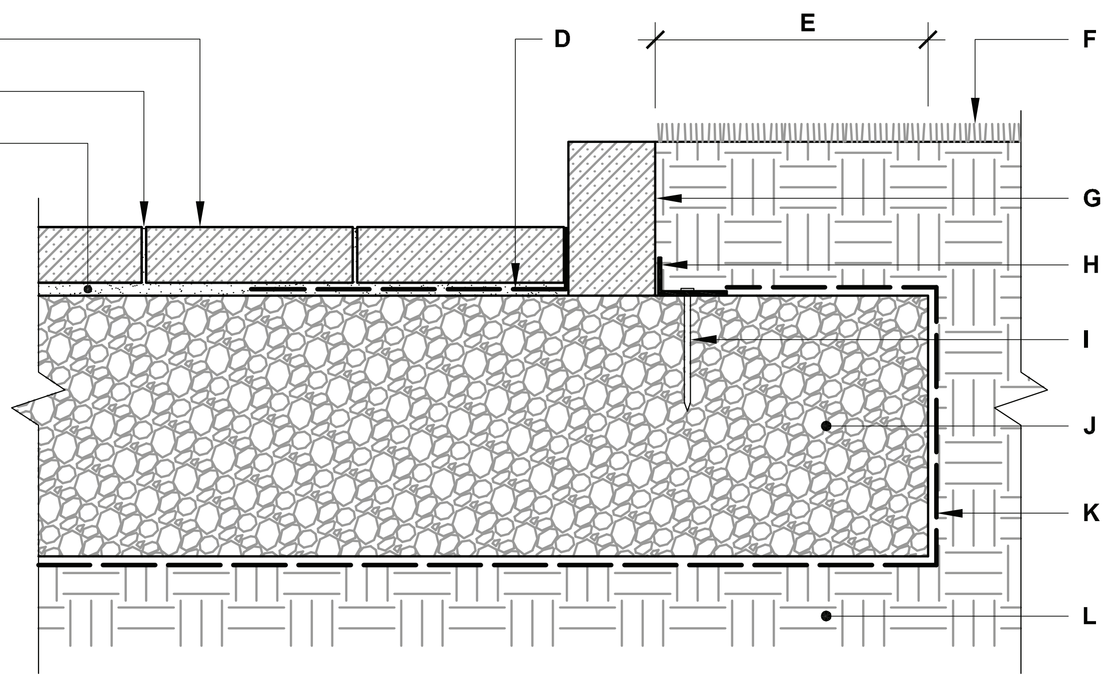
K. SUBGRADE

TYPICAL SECTION - **PAVERS AND EDGE RESTRAINT AVIGNON**
MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Pavers and edge restraint
BELGIK

B
02



A. TECHO-BLOC PRECAST CONCRETE PAVER 2 ³⁄₈" (60 mm) THICK MIN. CONFORMING TO ASTM C 936

B. SAND JOINT FILL CONFORMING TO ASTM C 144

C. SETTING BED (CONCRETE SAND) 1" (25 mm) THICK CONFORMING TO ASTM C 33

D. GEOTEXTILE 12" (300 mm) WIDE ENCAPSULATING SETTING BED

E. EXTRA WIDTH EQUAL TO FOUNDATION THICKNESS

F. LAWN

G. BELGIK EDGE RESTRAINT

H. PLASTIC EDGE

I. NAIL

J. COMPACTED GRANULAR BASE CONFORMING TO ASTM D 2940
THICKNESS ACCORDING TO PROJECT SPECIFIC CONDITIONS

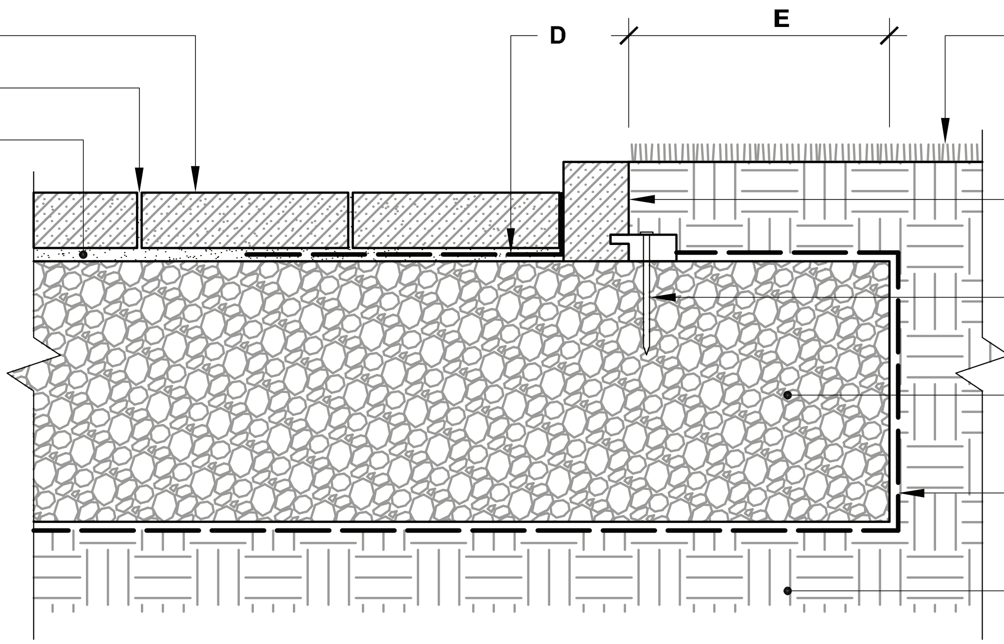
K. GEOTEXTILE

L. SUBGRADE

TYPICAL SECTION - **PAVERS AND EDGE RESTRAINT BELGIK**
MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Pavers and edge restraint PIETRA



A. TECHO-BLOC PRECAST CONCRETE PAVER 2 3⁄8" (60 mm) THICK MIN. CONFORMING TO ASTM C 936

B. SAND JOINT FILL CONFORMING TO ASTM C 144

C. SETTING BED (CONCRETE SAND) 1" (25 mm) THICK CONFORMING TO ASTM C 33

D. GEOTEXTILE 12" (300 mm) WIDE ENCAPSULATING SETTING BED

E. EXTRA WIDTH EQUAL TO FOUNDATION THICKNESS

F. LAWN

G. PIETRA EDGE RESTRAINT

H. NAIL

I. COMPACTED GRANULAR BASE CONFORMING TO ASTM D 2940
THICKNESS ACCORDING TO PROJECT SPECIFIC CONDITIONS

J. GEOTEXTILE

K. SUBGRADE

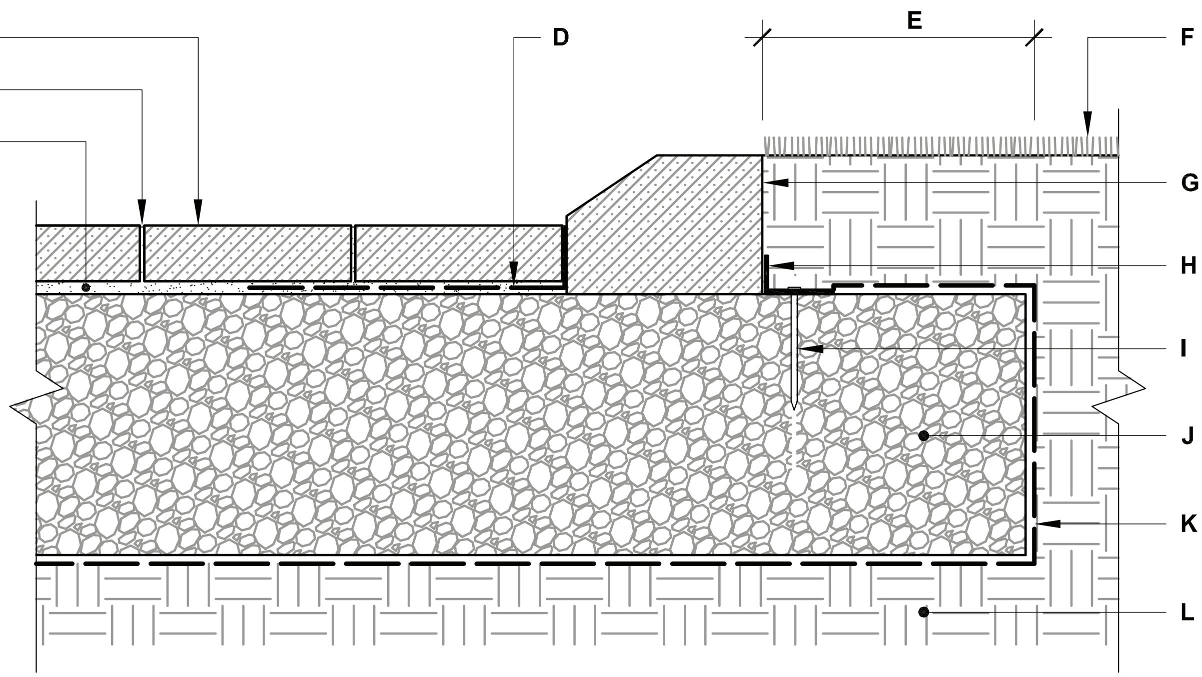
TYPICAL SECTION - **PAVERS AND EDGE RESTRAINT PIETRA**
MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Techo-Bloc
Precious Stones™
www.techo-bloc.com

Pavers and edge restraint TUNDRA

B 04



A. TECHO-BLOC PRECAST CONCRETE PAVER 2 ³⁄₈" (60 mm) THICK MIN. CONFORMING TO ASTM C 936

B. SAND JOINT FILL CONFORMING TO ASTM C 144

C. SETTING BED (CONCRETE SAND) 1" (25 mm) THICK CONFORMING TO ASTM C 33

D. GEOTEXTILE 12" (300 mm) WIDE ENCAPSULATING SETTING BED

E. EXTRA WIDTH EQUAL TO FOUNDATION THICKNESS

F. LAWN

G. TUNDRA EDGE RESTRAINT

H. PLASTIC EDGE

I. NAIL

J. COMPACTED GRANULAR BASE CONFORMING TO ASTM D 2940
THICKNESS ACCORDING TO PROJECT SPECIFIC CONDITIONS

K. GEOTEXTILE

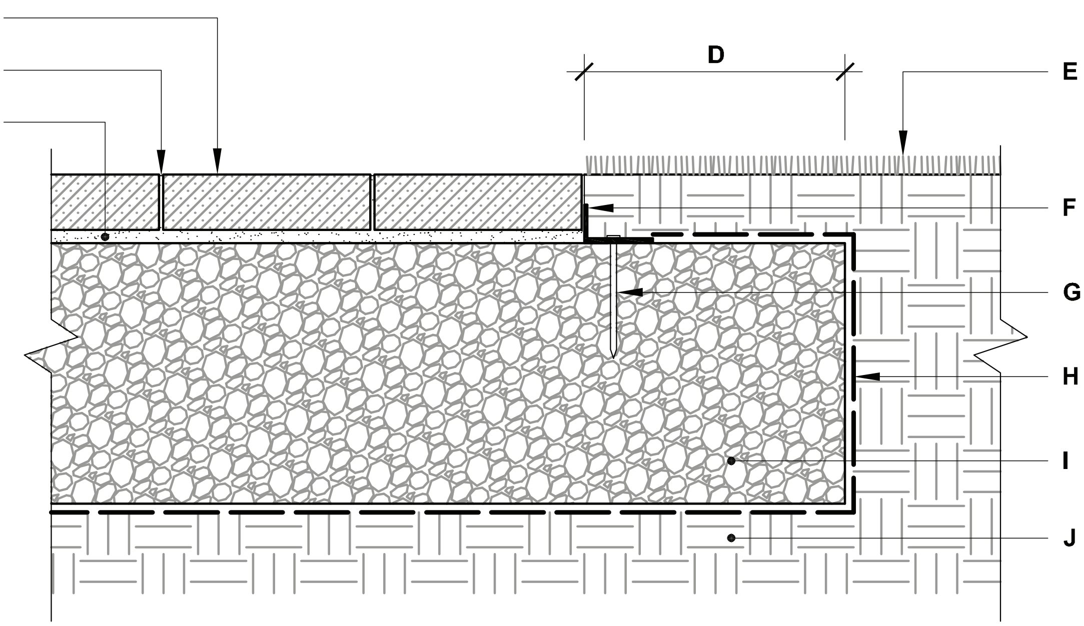
L. SUBGRADE

TYPICAL SECTION - **PAVERS AND EDGE RESTRAINT TUNDRA**
MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

Pavers and plastic edge restraint

B 05



A. TECHO-BLOC PRECAST CONCRETE PAVER 2 3/8" (60 mm) THICK MIN. CONFORMING TO ASTM C 936

B. SAND JOINT FILL CONFORMING TO ASTM C 144

C. SETTING BED (CONCRETE SAND) 1" (25 mm) THICK CONFORMING TO ASTM C 33

D. EXTRA WIDTH EQUAL TO FOUNDATION THICKNESS

E. LAWN

F. PLASTIC EDGE RESTRAINT

G. NAIL

H. GEOTEXTILE

I. COMPACTED GRANULAR BASE CONFORMING TO ASTM D 2940
THICKNESS ACCORDING TO PROJECT SPECIFIC CONDITIONS

J. SUBGRADE

TYPICAL SECTION - **PAVERS AND PLASTIC EDGE RESTRAINT**
MARCH 2013

NOTE: This drawing is issued for information only. Do not use for construction. Do not measure from this drawing.

SECTION 32 33 00
SITE FURNISHINGS
7/06/18

PART 1. GENERAL

1.0 Summary:

A. Through implementation of a campus wide landscape improvements program in 1999, Towson University has established standards for site furnishings including furniture and trash receptacles. While these standards are not intended to be proprietary, only items matching in dimension and appearance will be acceptable.

PART 2. MATERIALS – MINIMUM REQUIREMENTS

2.0 Manufacturer:

A. Listed below are manufacturer contacts for the products identified in this Section.

1. Landscape Forms, Inc.
   431 Lawndale
   Kalamzoo, MI 49001
   Phone: 800-521-2546
   Fax: 616-381-3455

2. Victor Stanley, Inc.
   P.O. Drawer 330
   Dunkirk, MD 20754
   Phone: 301-855-8300
   Fax: 410-257-7579

3. Graber Manufacturing, Inc.
   1080 Uniek Drive
   Waunakee, WI 53597

B. Products: See manufacturers spec data in the appendix following Part III of this Section.

PART 3. EXECUTION

3.0 Site Investigation

A. Thoroughly investigate the surface and substrate of the materials that the furnishings will be attached to. Do not drill into structural concrete without identifying locations of pre stressed and post tension members.

3.1 Installation:

A. All furnishings specified shall be installed by the contractor using approved methods by the manufacturer.

B. All furnishings shall be permanently attached by use of vandal proof fasteners appropriate for the type of surface the item is to be fastened to. All exposed fasteners are to be stainless steel.

SUPPLEMENTAL INFORMATION

The following information is provided to supplement the construction standards contained in the previous section. This may include additional graphic information on products listed in the standards, or information on additional products or materials that have been used successfully on other campus projects, but may not be applicable to all projects. Consult with Facilities Management about the applicability of any particular products for specific projects.

Victor Stanley, Inc.

P.O. DRAWER 330 - DUNKIRK, MD 20754 USA
TEL (301) 855-8300 - FAX (410) 257-7579

PRODUCT SPECIFICATIONS

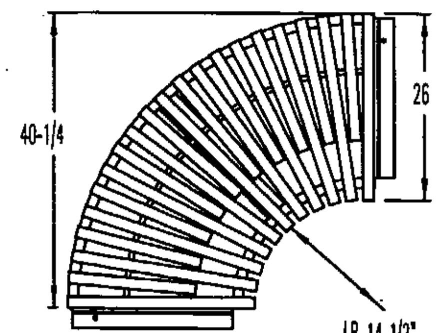
CADD Department	VIEWS 5
DRAWN R.D.N.	REV. 8/19/97

STEELSITES ™
NRBC1-90
Standard Surface Mount

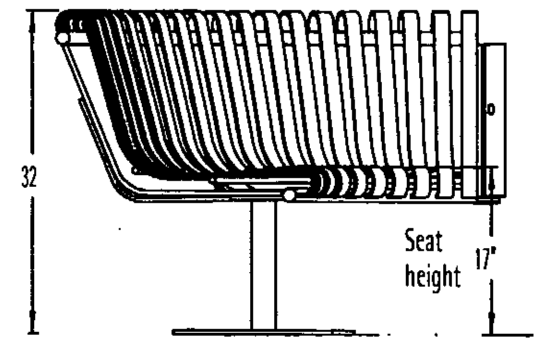
For your convenience and economy, this bench is shipped partially unassembled

All fabricated components are steel shot-blasted, etched, phosphatized and electrostatically powder-coated with TGIC polyester powder coatings.

TOP VIEW

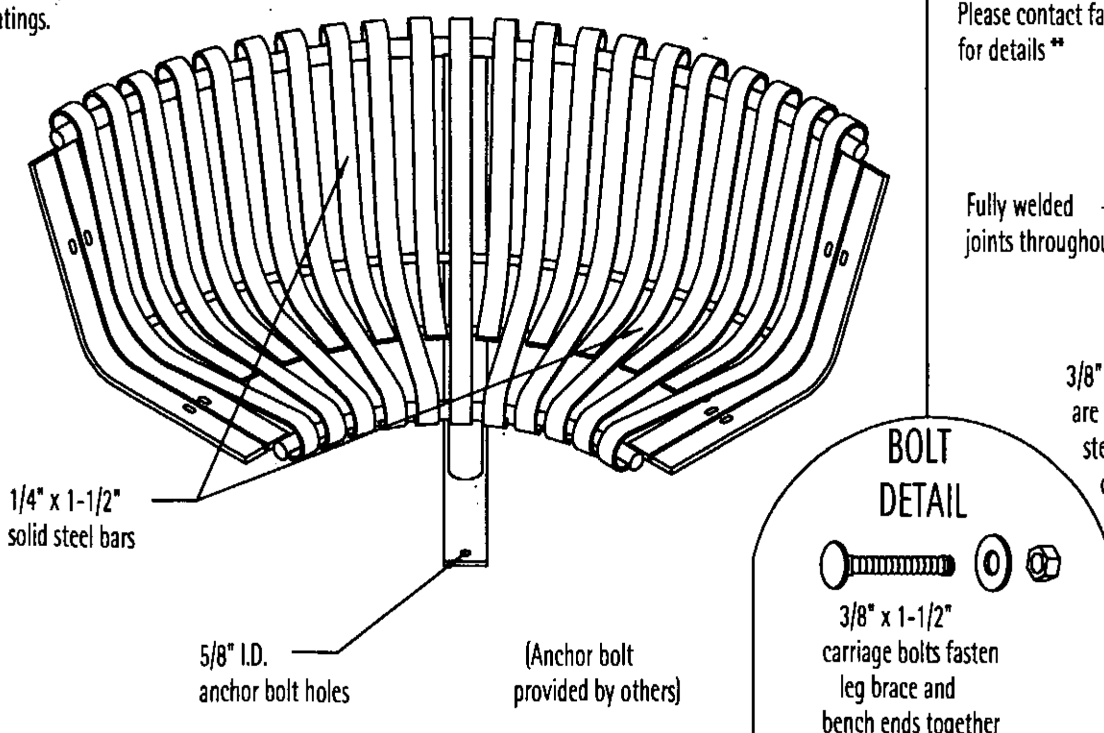


SIDE VIEW

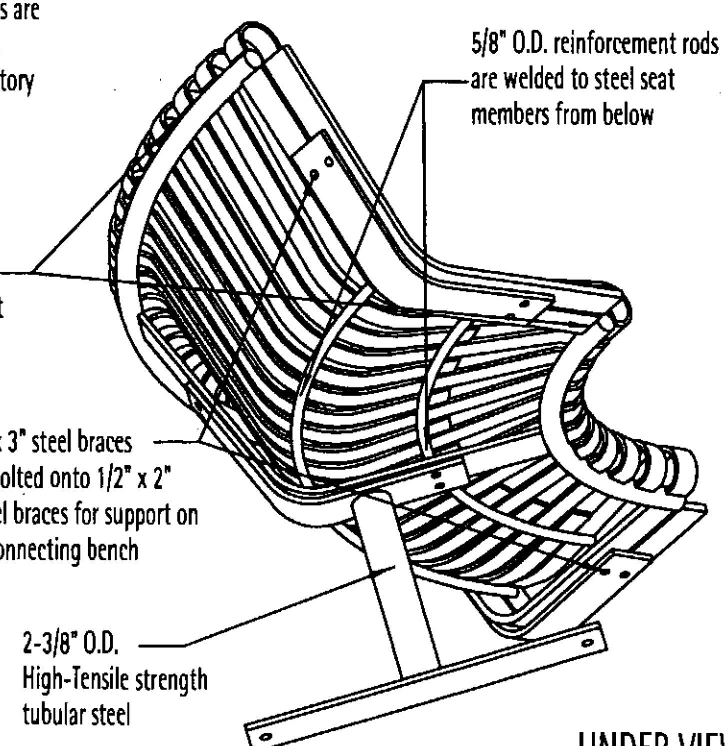


It is not recommended to locate anchor bolts until assembled bench is in place.

PERSPECTIVE



** All specifications are subject to change. Please contact factory for details **



UNDER VIEW

Victor Stanley, Inc.

P.O. DRAWER 330 - DUNKIRK, MD 20754 USA
TEL (301) 855-8300 - FAX (410) 257-7579

PRODUCT SPECIFICATIONS

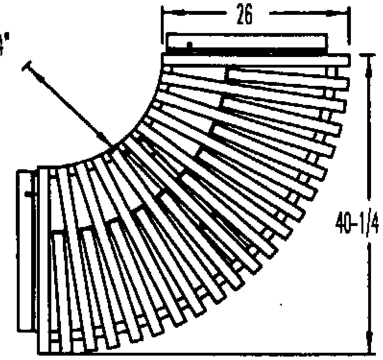
CADD Department	VIEWS 5
DRAWN R.D.N.	REV. 8/20/97

STEELSITES ™
NRB-90
Standard Surface Mount

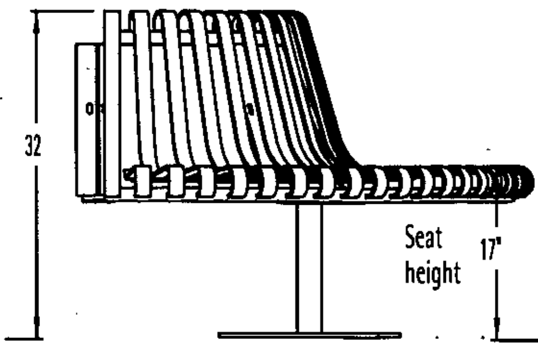
For your convenience and economy, this bench is shipped partially unassembled

All fabricated components are steel shot-blasted, etched, phosphatized and electrostatically powder-coated with TGIC polyester powder coatings.

TOP VIEW

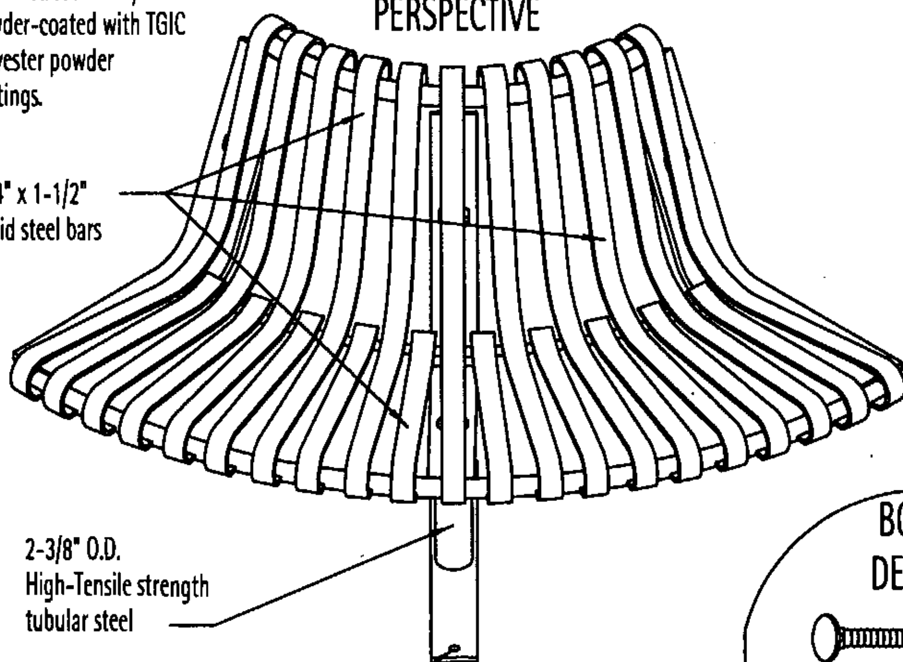


SIDE VIEW



It is not recommended to locate anchor bolts until assembled bench is in place.

PERSPECTIVE

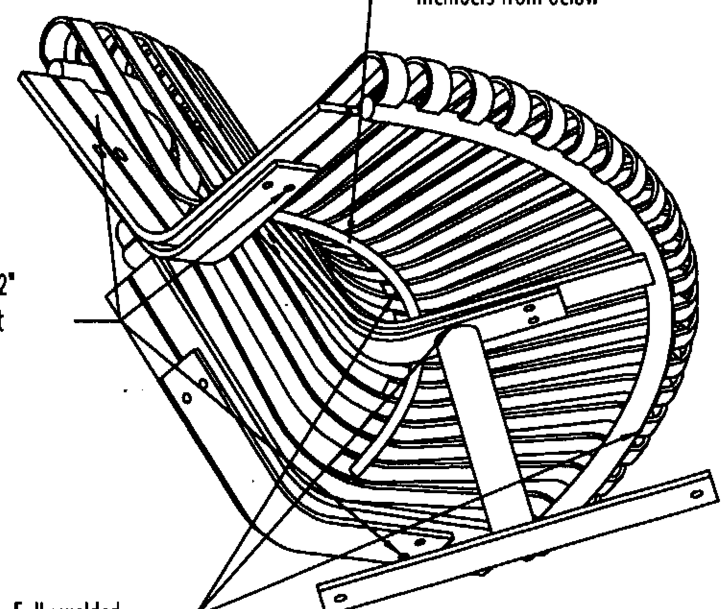


** All specifications are subject to change. Please contact factory for details **

BOLT DETAIL

3/8" x 1-1/2" carriage bolts fasten leg brace and bench ends together

UNDER VIEW



Victor Stanley, Inc.

Web site: www.victorstanley.com

P.O. DRAWER 330 - DUNKIRK, MD 20754 USA
TEL (301) 855-8300 - FAX (410) 257-7579

DR#2000_13	
PG 1	OF 1

PRODUCT SPECIFICATIONS

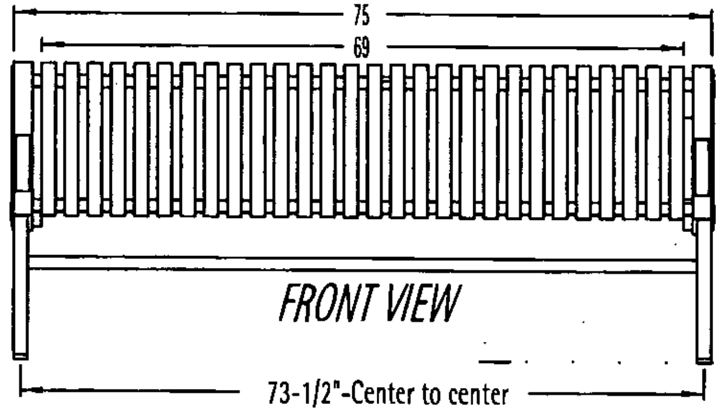
CADD Department	VIEWS 5
DRAWN R.D.N.	REV. 1/24/00

CLASSIC SERIES

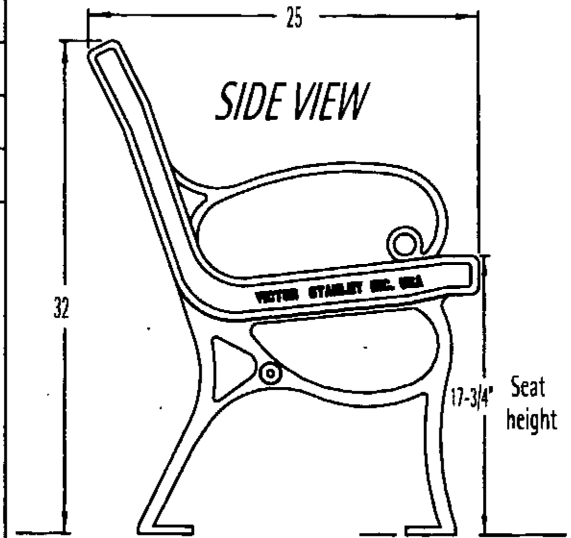
CR-138

Standard 6 Foot Length

For your convenience and economy this bench is shipped partially unassembled



FRONT VIEW



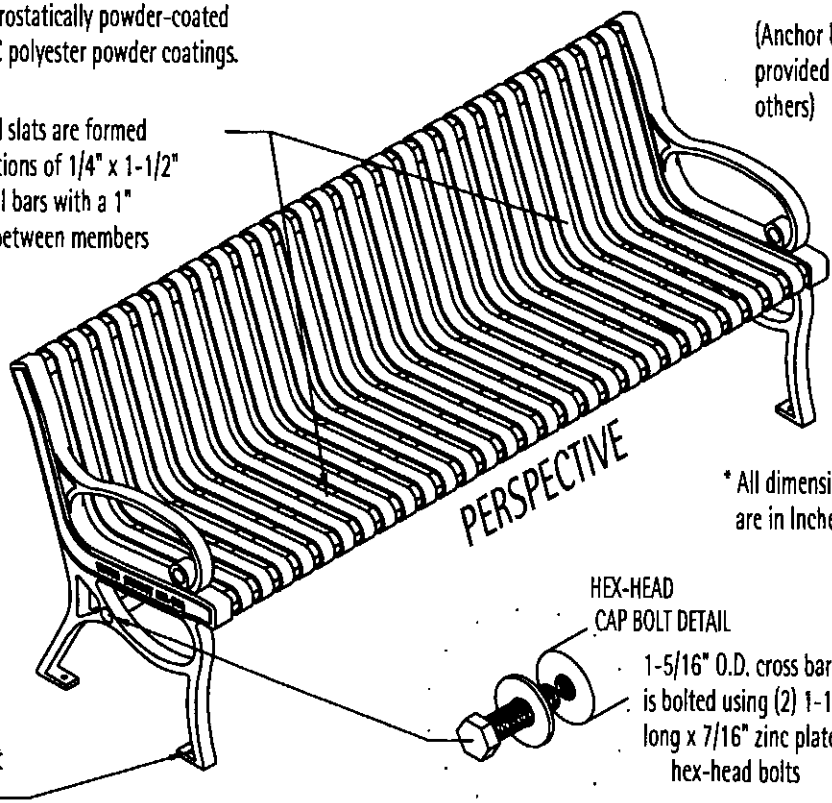
SIDE VIEW

Casting dimensions vary slightly.

All fabricated components are steel shot-blasted, etched, phosphatized, preheated and electrostatically powder-coated with TGIC polyester powder coatings.

(28) Steel slats are formed from sections of 1/4" x 1-1/2" solid steel bars with a 1" spacing between members

(Anchor bolts provided by others)



PERSPECTIVE

* All dimensions are in Inches *

(4) 3/8" I.D. anchor bolt holes

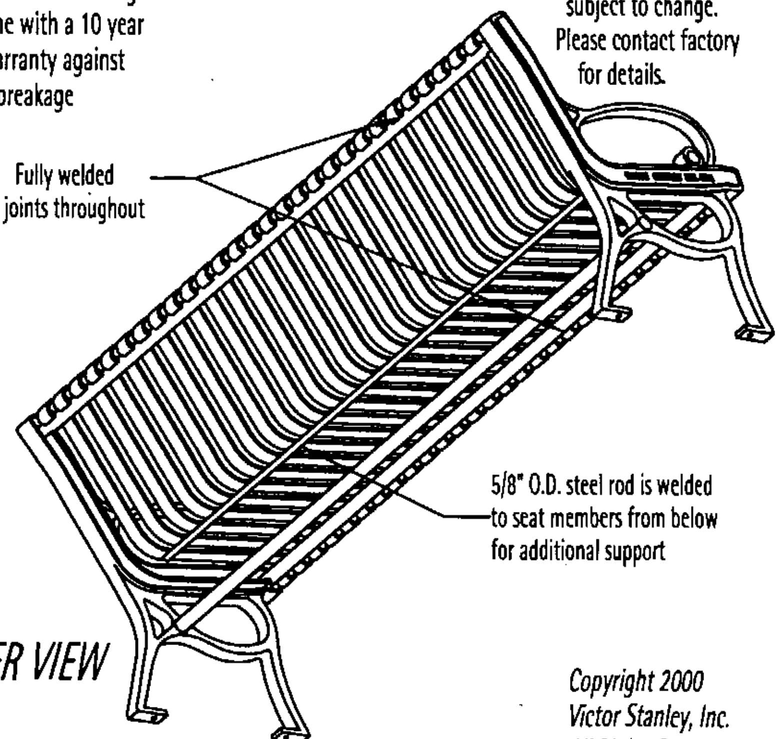
HEX-HEAD CAP BOLT DETAIL

1-5/16" O.D. cross bar is bolted using (2) 1-1/2" long x 7/16" zinc plated hex-head bolts

Ductile Iron castings come with a 10 year warranty against breakage

All specifications are subject to change. Please contact factory for details.

Fully welded joints throughout



5/8" O.D. steel rod is welded to seat members from below for additional support

UNDER VIEW

Victor Stanley, Inc.
P.O. DRAWER 330 - DUNKIRK, MD 20754 USA
TEL (301) 855-8300 - FAX (410) 257-7579

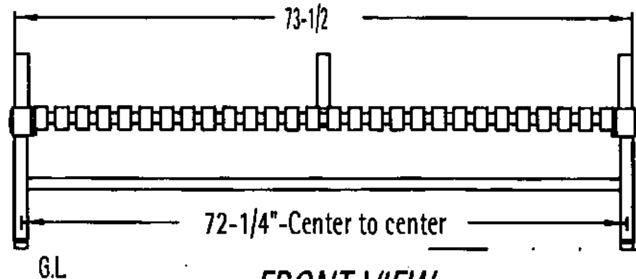
PRODUCT SPECIFICATIONS

CADD Department	VIEWS 5
DRAWN R.D.N.	REV. 10/6/97

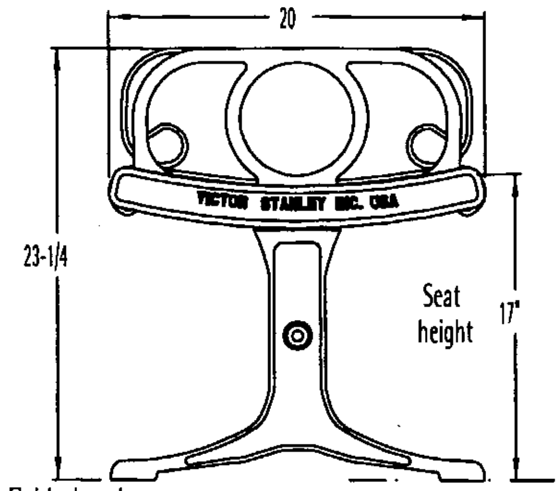
CR-44

CLASSIC SERIES
Standard 6 Foot Length
Shown With Optional Center Armrest

* For your convenience and economy this bench is shipped partially unassembled *



FRONT VIEW



SIDE VIEW

It is not recommended to locate anchor bolts until assembled bench is in place.

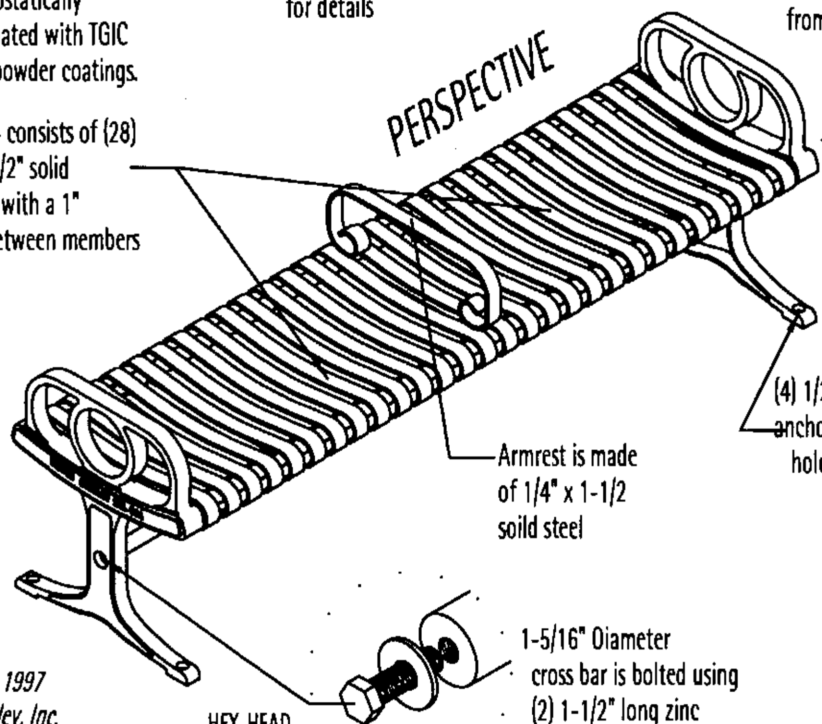
All fabricated components are steel shot-blasted, etched, phosphatized and electrostatically powder-coated with TGIC polyester powder coatings.

All specifications are subject to change. Please contact factory for details

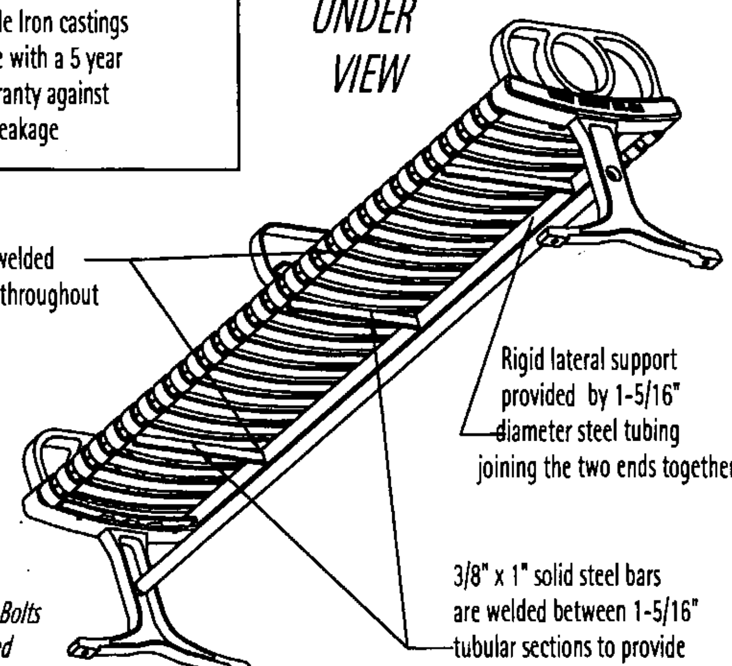
Center to center distance is approximate. (variations in castings arise from different rates of cooling)

Ductile Iron castings come with a 5 year warranty against breakage

PERSPECTIVE



UNDER VIEW



Victor Stanley, Inc.

P.O. DRAWER 330 - DUNKIRK, MD 20754 USA
TEL (301) 855-8300 - FAX (410) 257-7579

PRODUCT SPECIFICATIONS

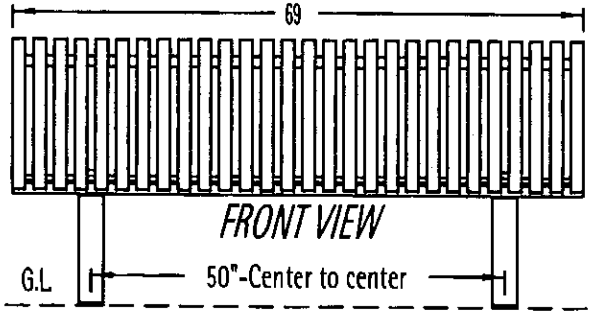
CADD Department	VIEWS 4
DRAWN R.D.N.	REV. 11/3/97

NRB-6 STEELSITES ™

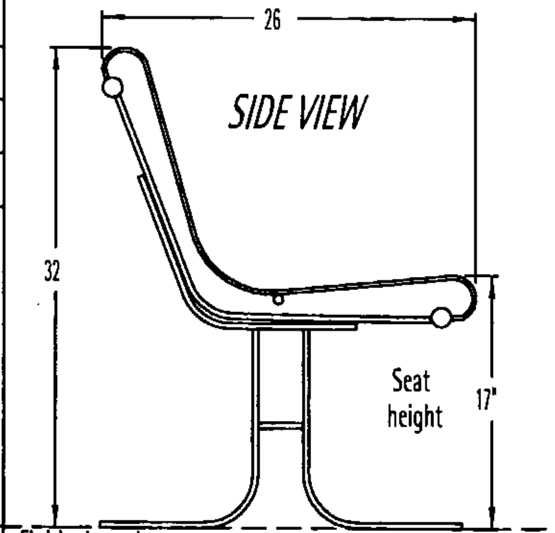
All Steel Contoured Bench
Standard 6 Foot Length
Shown With Optional Gullwing Legs

All fabricated components are steel shot-blasted, etched, phosphatized and electrostatically powder-coated with TGIC polyester powder coatings.

** All specifications are subject to change. Please contact factory for details **

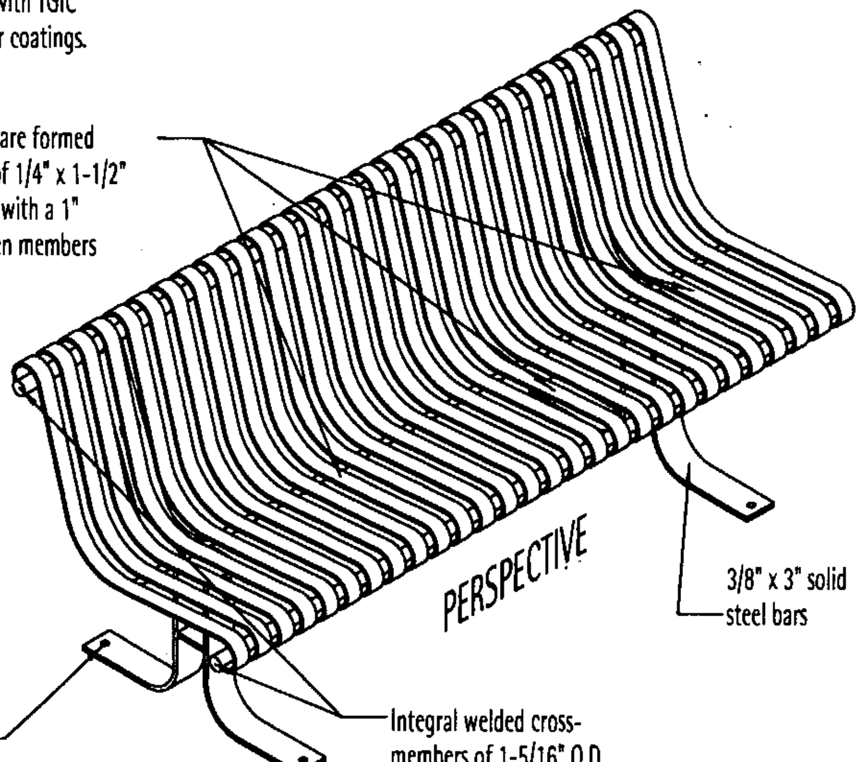


FRONT VIEW

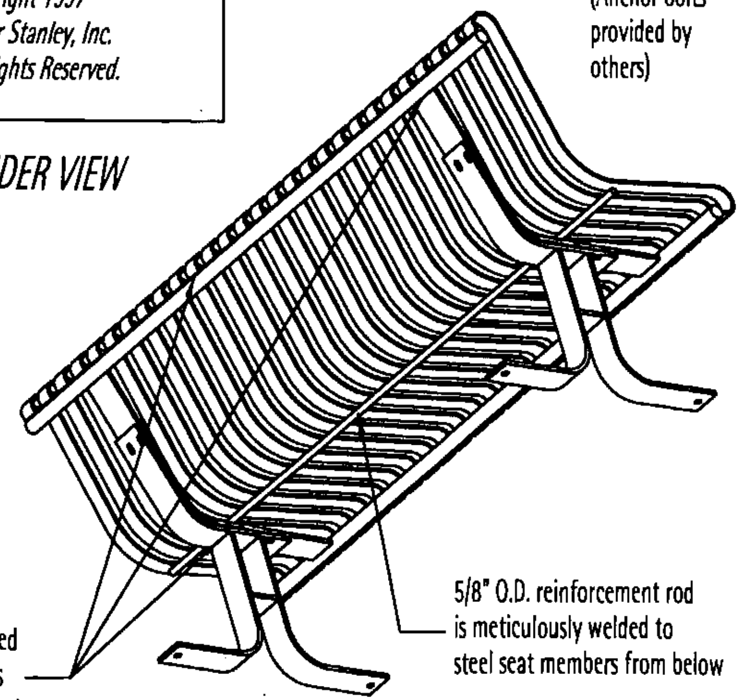


SIDE VIEW

It is not recommended to locate anchor bolts until bench is in place.



PERSPECTIVE



UNDER VIEW

Victor Stanley, Inc.

P.O. DRAWER 330 - DUNKIRK, MD 20754 USA
TEL (301) 855-8300 - FAX (410) 257-7579
WEB SITE: http://www.victorstanley.com

DR#2000_49	
PG 1	OF 1

PRODUCT SPECIFICATIONS

CADD Department	VIEWS 5
DRAWN R.D.N.	REV. 2/16/00

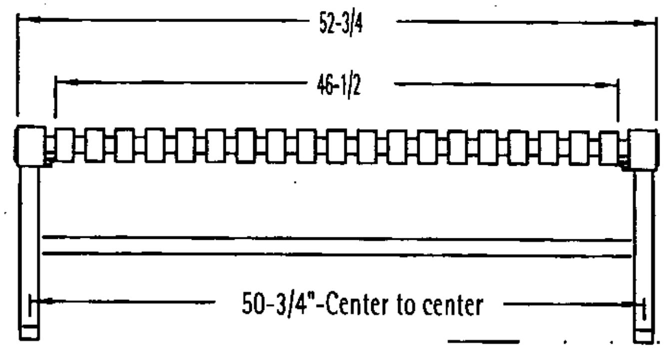
CLASSIC SERIES

CR-24

Standard 4' Length

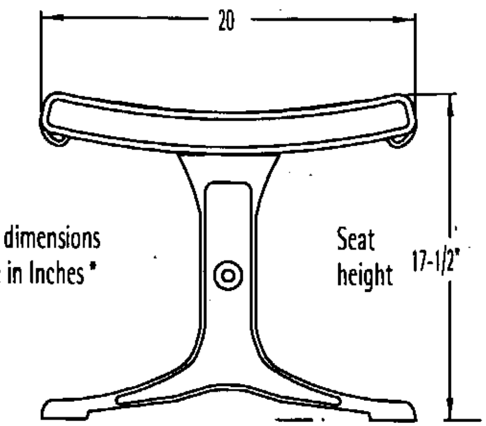
For your convenience and economy this bench is shipped partially unassembled

All fabricated components are steel shot-blasted,etched, phosphatized, preheated and electrostatically powder-coated with TGIC polyester powder coatings.



FRONT VIEW

SIDE VIEW

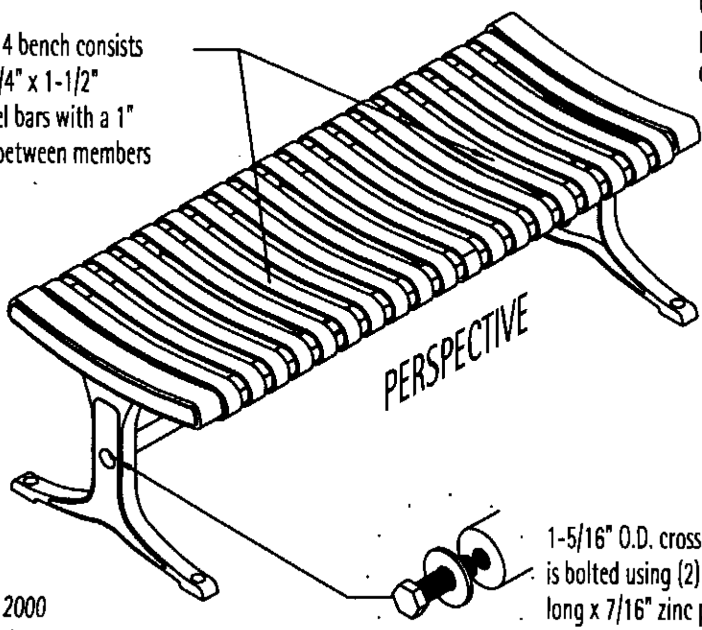


* All dimensions are in Inches *

It is not recommended to locate anchor bolts until bench is in place.

The CR-24 bench consists of (19) 1/4" x 1-1/2" solid steel bars with a 1" spacing between members

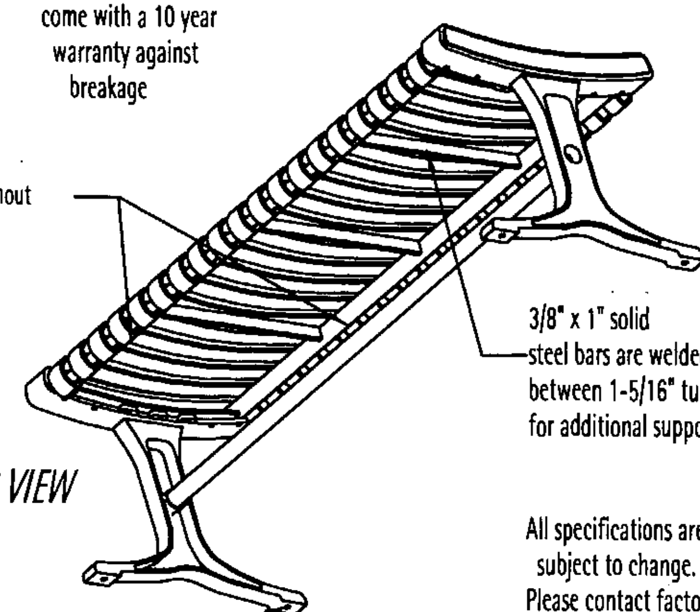
(Anchor bolts provided by others)



1-5/16" O.D. cross bar is bolted using (2) 1-1/2" long x 7/16" zinc plated hex-head bolts

Ductile Iron castings come with a 10 year warranty against breakage

Fully welded joints throughout



UNDER VIEW

3/8" x 1" solid steel bars are welded between 1-5/16" tubing for additional support

1/2" I.D. anchor bolt hole

All specifications are subject to change. Please contact factory for details.

Victor Stanley, Inc.

P.O. DRAWER 330 - DUNKIRK, MD 20754 USA
TEL (301) B55-B300 - FAX (410) 257-7579

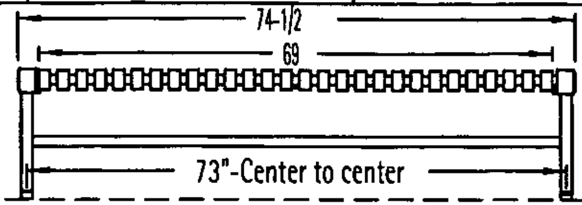
PRODUCT SPECIFICATIONS

CADD Department	VIEWS 6
DRAWN R.D.N.	REV. 4/4/97

CR-24

CLASSIC SERIES
Standard 6 Foot Length

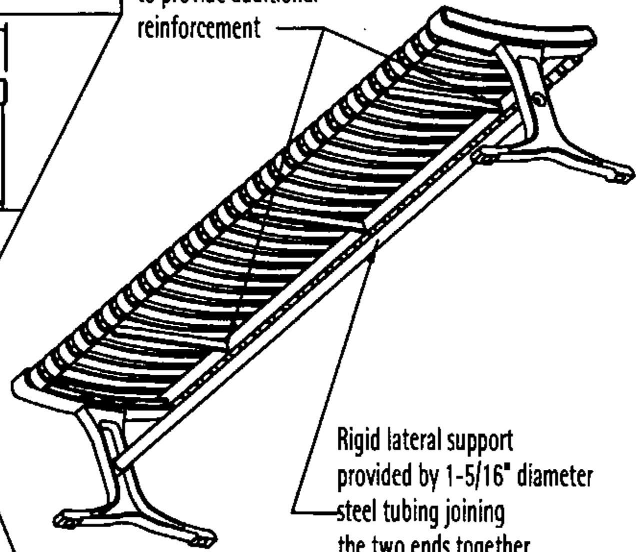
** For your convenience and economy this bench is shipped partially unassembled **



Center to center distance is approximate. (variations in castings arise from different rates of cooling)

FRONT VIEW

UNDER VIEW



3/8" x 1" solid steel bar welded between 1-5/16" tubular sections to provide additional reinforcement

Rigid lateral support provided by 1-5/16" diameter steel tubing joining the two ends together

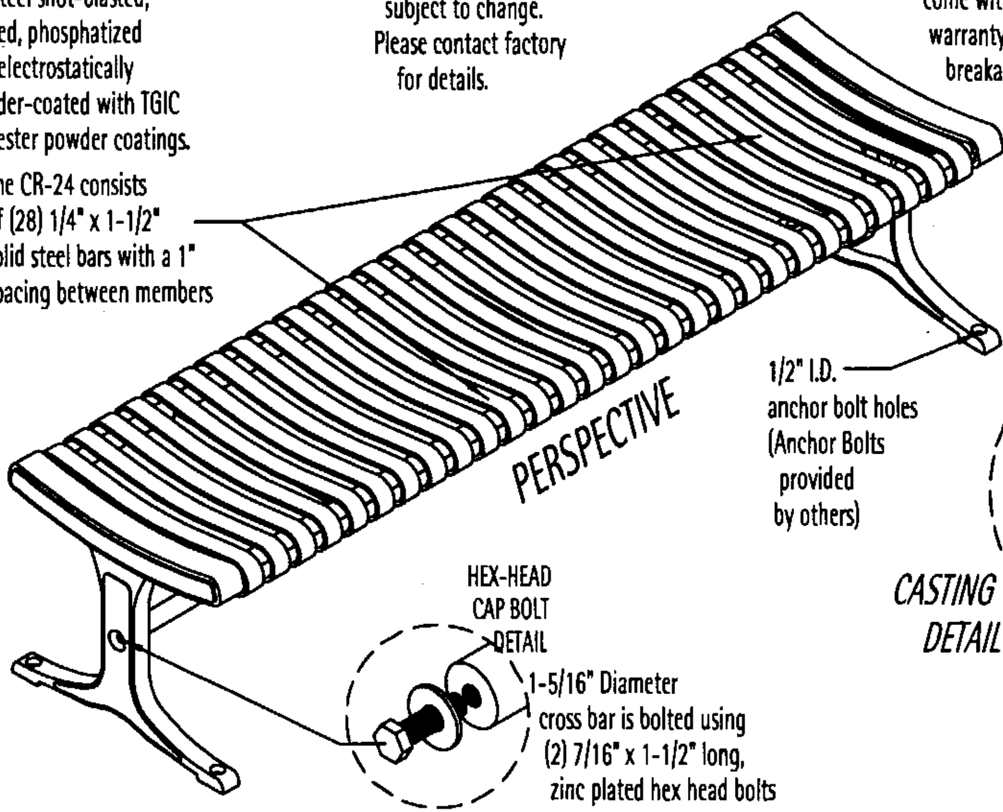
It is not recommended to locate anchor bolts until assembled bench is in place.

All fabricated components are steel shot-blasted, etched, phosphatized and electrostatically powder-coated with TGIC polyester powder coatings.

All specifications are subject to change. Please contact factory for details.

Ductile Iron castings come with a 10 year warranty against breakage

* All dimensions are in Inches *

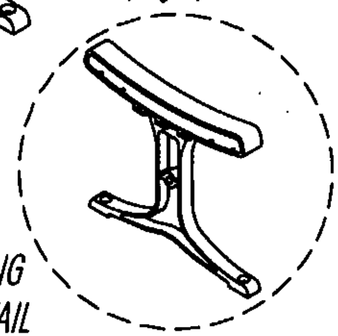


The CR-24 consists of (28) 1/4" x 1-1/2" solid steel bars with a 1" spacing between members

1/2" I.D. anchor bolt holes (Anchor Bolts provided by others)

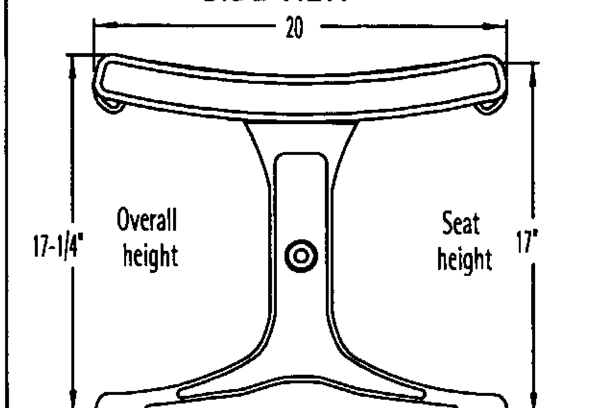
1-5/16" Diameter cross bar is bolted using (2) 7/16" x 1-1/2" long, zinc plated hex head bolts

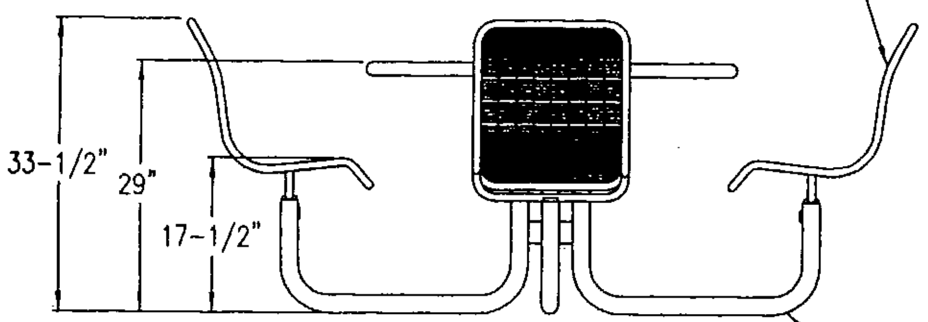
Casting dimensions vary slightly.



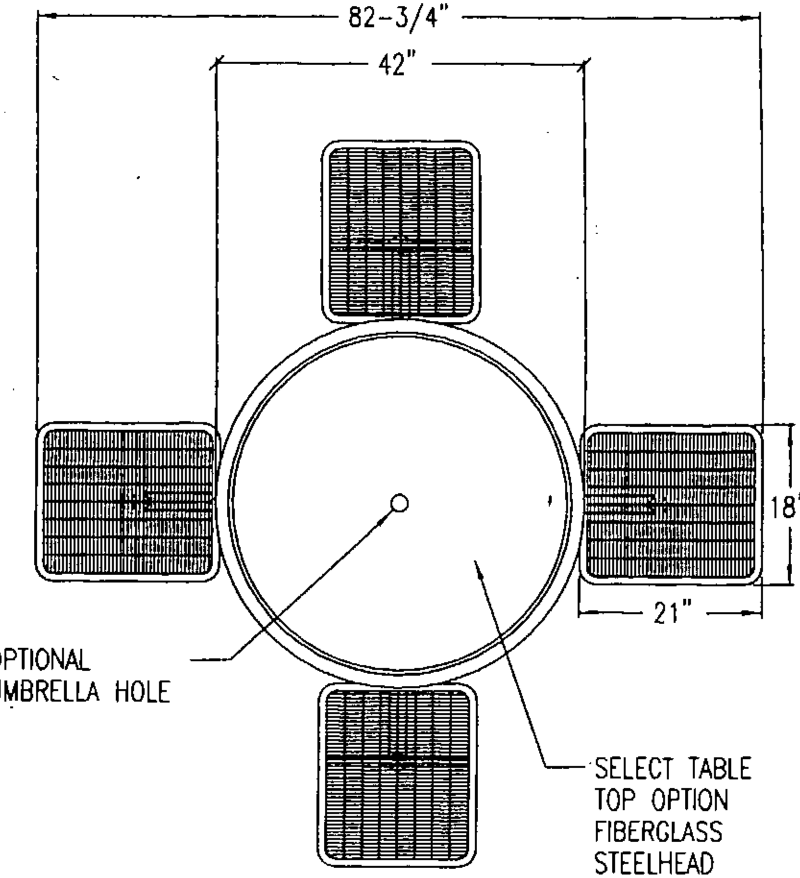
CASTING DETAIL

SIDE VIEW





ELEVATION

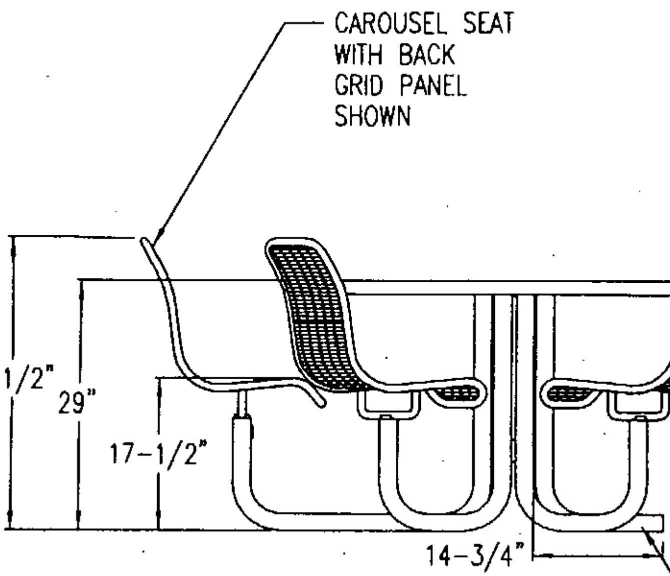


NOTE: STEELHEAD TOP SHOWN

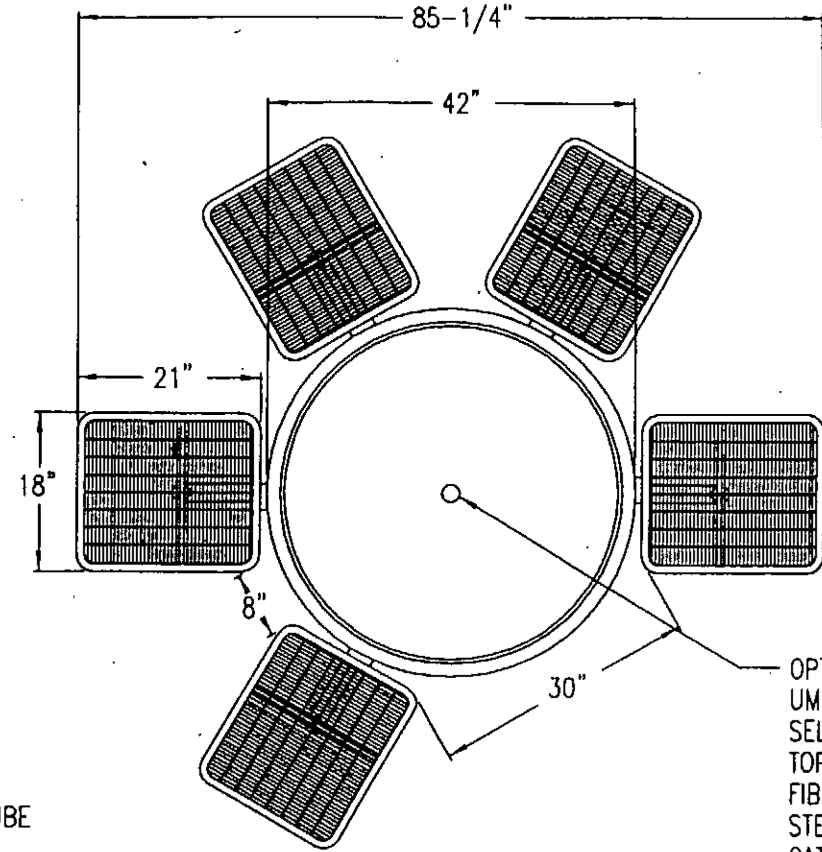
PLAN

l a n d s c a p e f o r m s
431 LAWNDALE AVE.
KALAMAZOO, MI 49001
PHONE: 800-521-2546
FAX: 616-381-3455

TITLE: FOUR SEAT CAROUSEL WITH BACKED SEATS
DESIGN: CAROUSEL
PATENT:
FILE: CR4310
DATE: 12-19-95
AUTHOR: RHB



SIDE VIEW

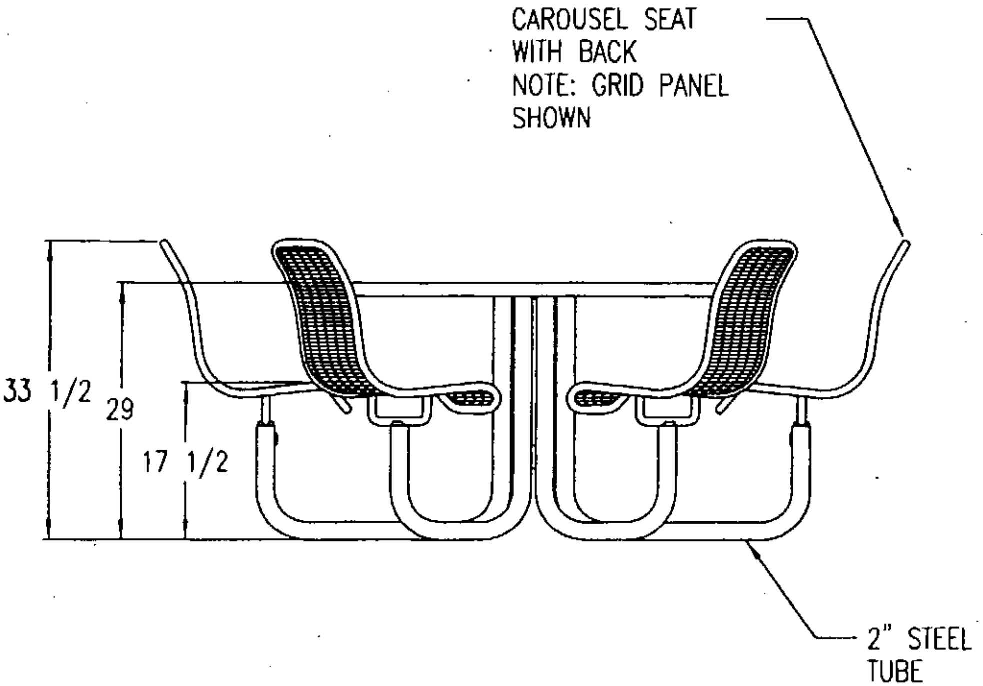


TOP VIEW

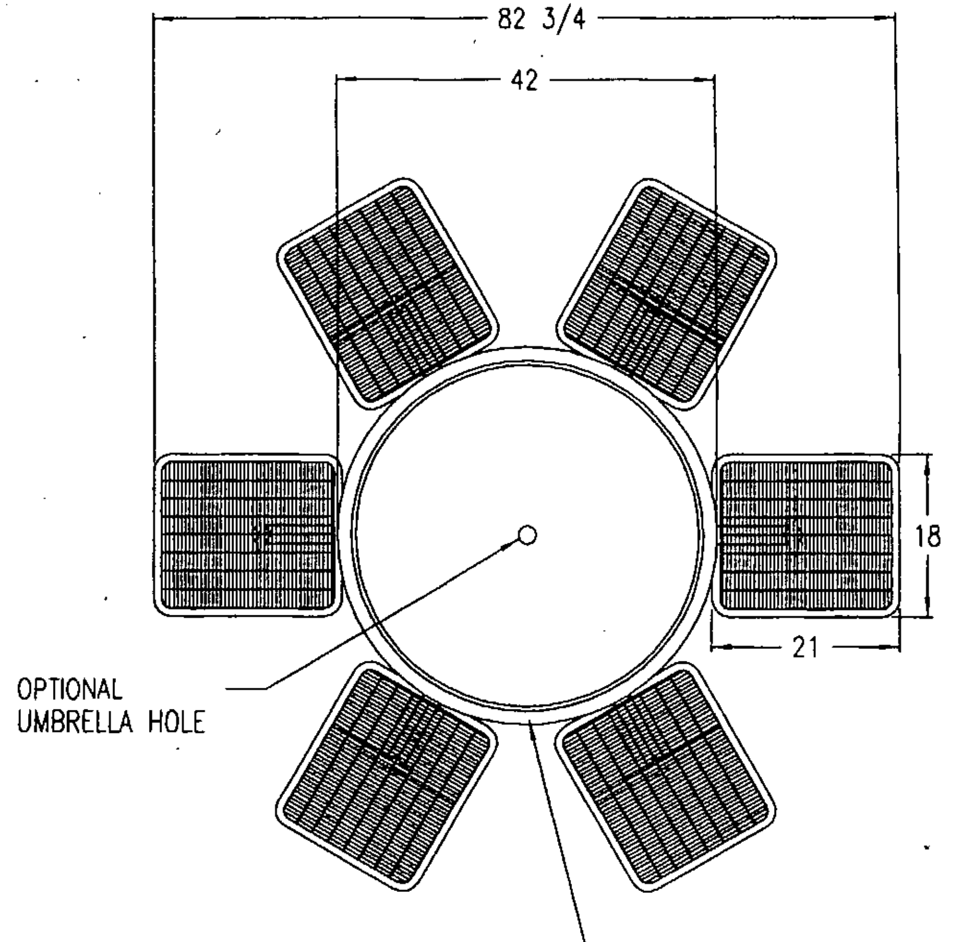
l a n d s c a p e f o r m s •

431 LAWNDALE AVE.
KALAMAZOO, MI 49001
PHONE: 800-521-2546
FAX: 616-381-3455

TITLE: FIVE SEAT CAROUSEL WITH BACKED SEATS
DESIGN: CAROUSEL
PATENT:
FILE: CR4316
DATE: 1-10-97
AUTHOR: RHB



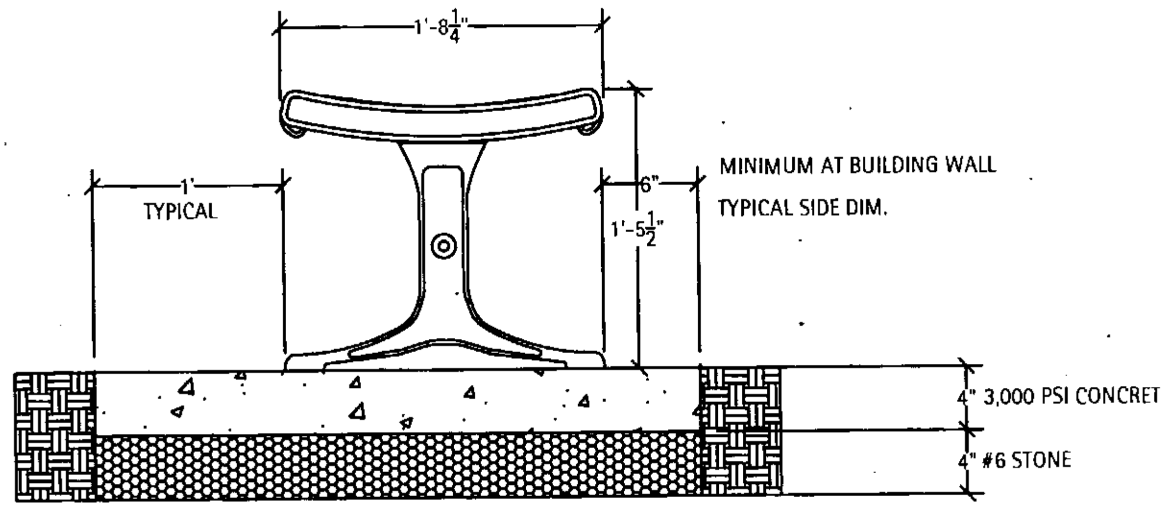
SIDE VIEW



TOP VIEW

l a n d s c a p e f o r m s
431 LAWNDALE AVE. PHONE: 800-521-2546
KALAMAZOO, MI 49001 FAX: 616-381-3455

TITLE: SIX SEAT CAROUSEL WITH BACKED SEAT
DESIGN: CAROUSEL
PATENT:
FILE: CR4312
DATE: 1-13-97
AUTHOR: RHB



TYPICAL PAD AT BENCH

Victor Stanley, Inc.
P.O. DRAWER 330 - DUNKIRK, MD 20754 USA
TEL (301) 855-8300 - FAX (410) 257-7579
WEB SITE: http://www.victorstanley.com

DR#2000_123	
PG 1	OF 1

PRODUCT SPECIFICATIONS

CADD Department	VIEWS 5
DRAWN R.D.N.	REV. 5/22/00

IRONSITES ™ SERIES

S-45

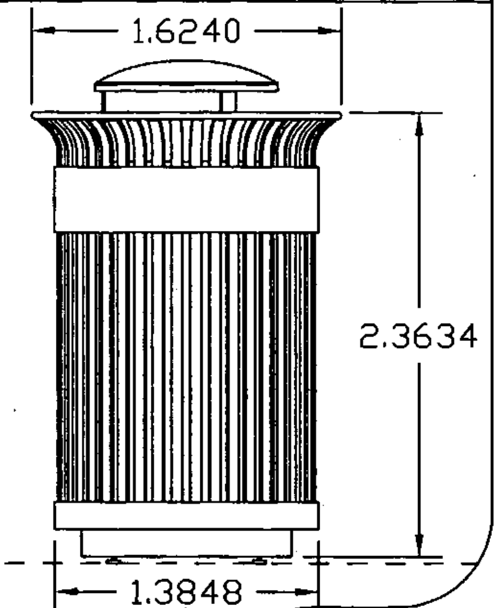
45 Gallon Capacity Litter Receptacle
Shown With A Optional S-2 Steel Dome Lid

All fabricated components are steel shot-blasted, etched, phosphatized, preheated and electrostatically powder-coated with TGIC polyester powder coatings.

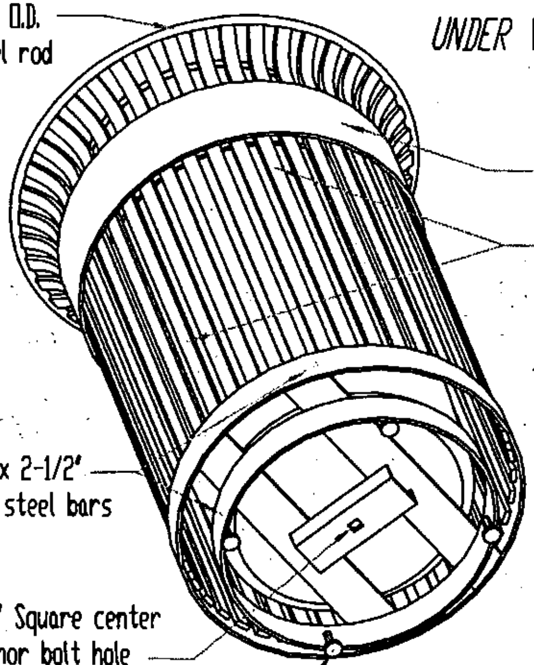
All specifications are subject to change. Please contact factory for details.

SIDE VIEW

* All dimensions are in Inches *

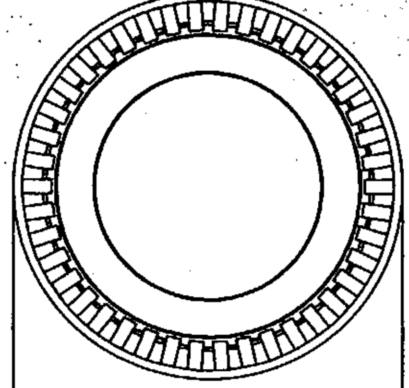


UNDER VIEW

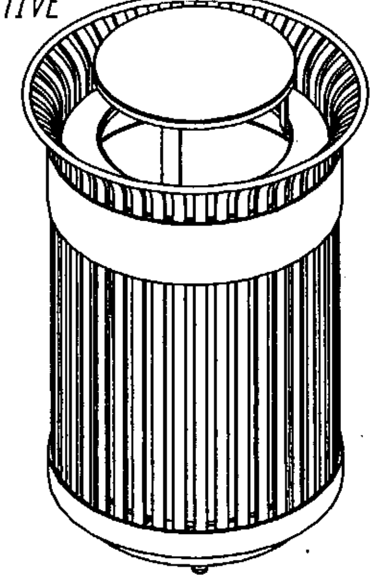


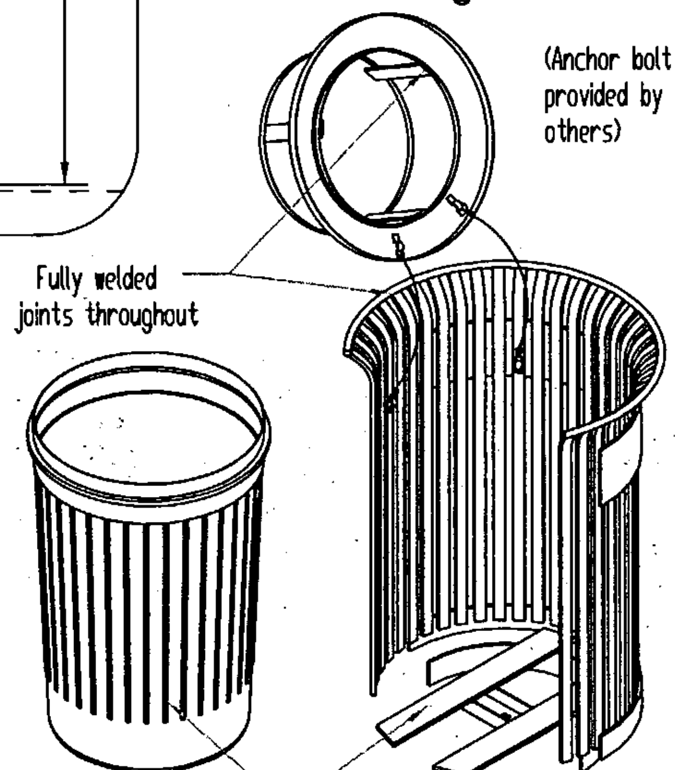
U.S. Patent D# 304,632

TOP VIEW



PERSPECTIVE





CUT SECTION

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P(800) 448-7931, P(608) 849-1080, F(608) 849-1081
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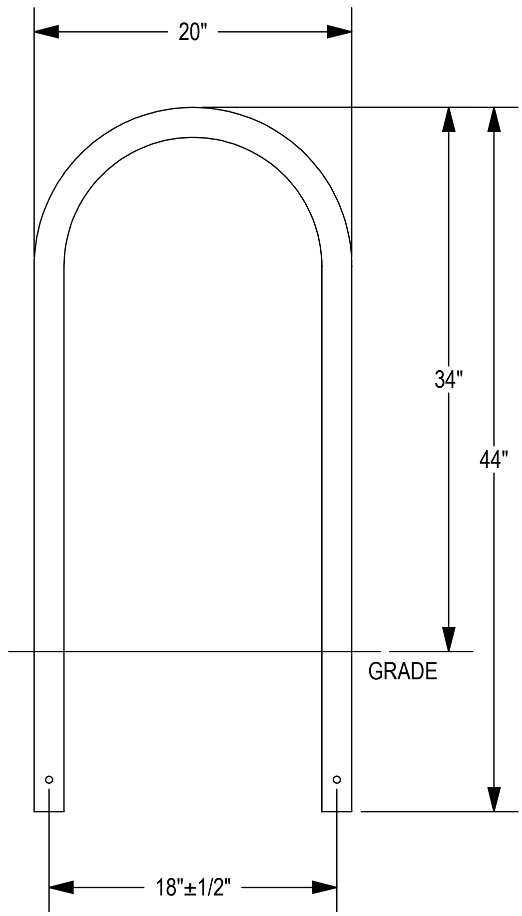

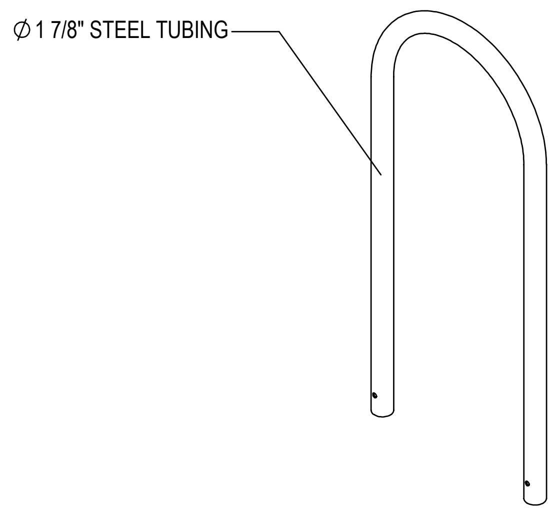

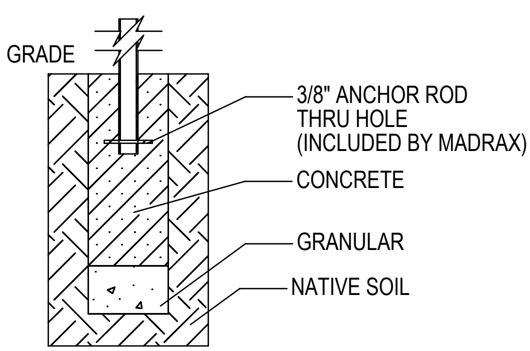

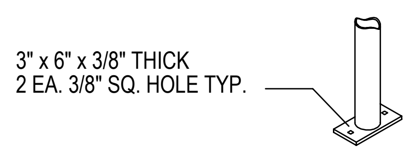

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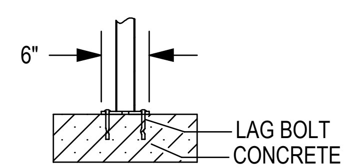

☐ IN GROUND MOUNT (IG)

CHECK DESIRED MOUNT ☐

☐ SURFACE FLANGE MOUNT (SF)

PRODUCT: U190-IG(SF)
DESCRIPTION: 'U' BIKE RACK
2 BIKE, SURFACE OR IN GROUND MOUNT
DATE: 6-2-17
ENG: SMC

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NOTES:
1. INSTALL BIKE RACKS ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
2. CONSULTANT TO SELECT COLOR(FINISH), SEE MANUFACTURER'S SPECIFICATIONS.
3. SEE SITE PLAN FOR LOCATION OR CONSULT OWNER.

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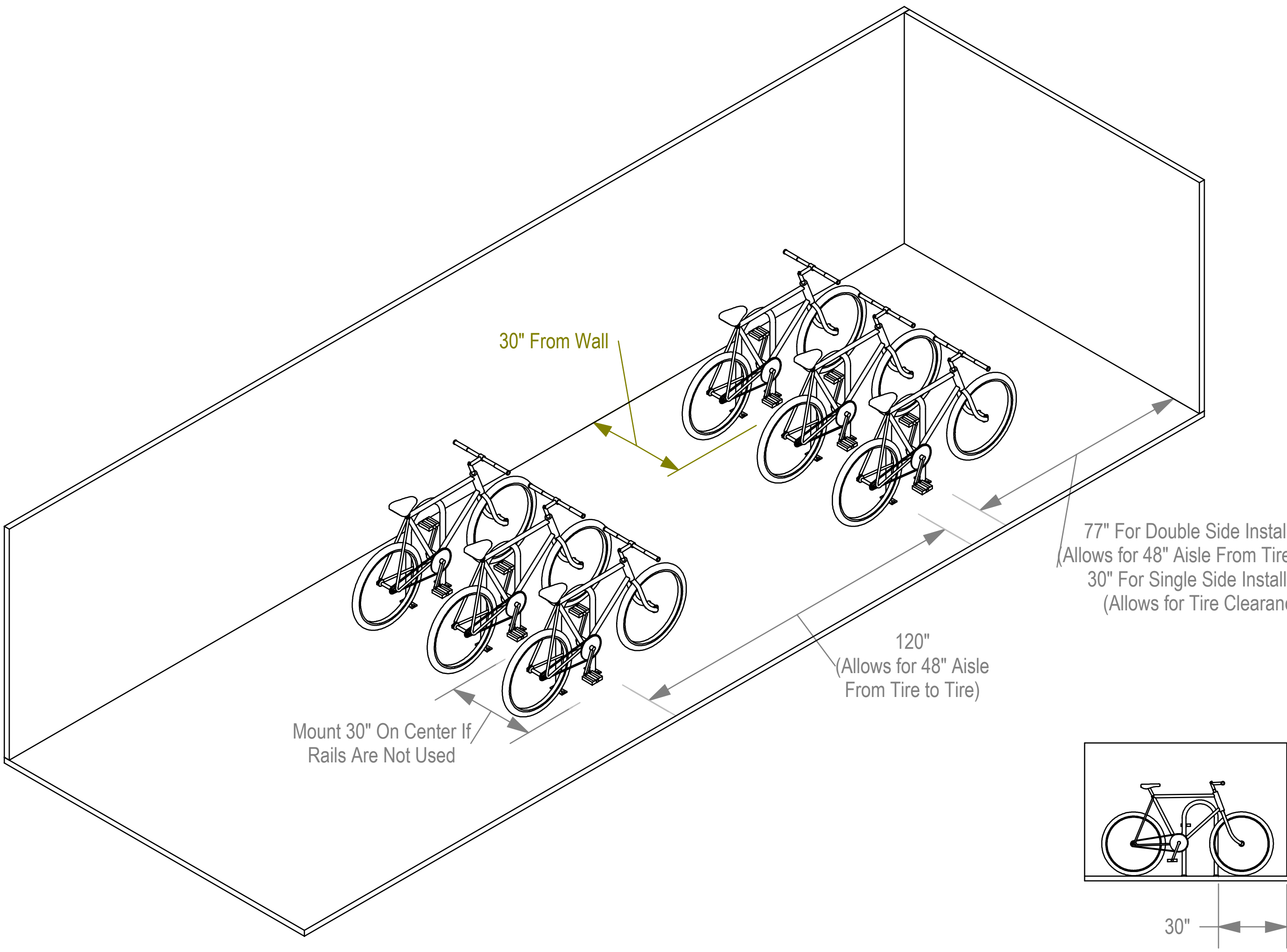


Inverted U Rack Installation Guide
CHECK LOCAL CODES

Installation Guide Applies to The Following Madrax Bike Racks:

- U Rack
- Square U Rack
- U-Two
- U's On Rails

DATE:7-11-12
ENG: SMC

There must be at least a six foot clear walkway from buildings to comply with the American with Disabilities Act. The bicycle rack cannot be located directly in front of a store entrance or exit, nor in a driveway. The bicycle rack cannot be located closer to the curb than two feet. Three feet from curb is ideal, although in certain circumstances, the distance may be greater.

The footprint of a bicycle is approximately 2 feet by 6 feet.
Some handlebars can be as much as 30 inches wide.

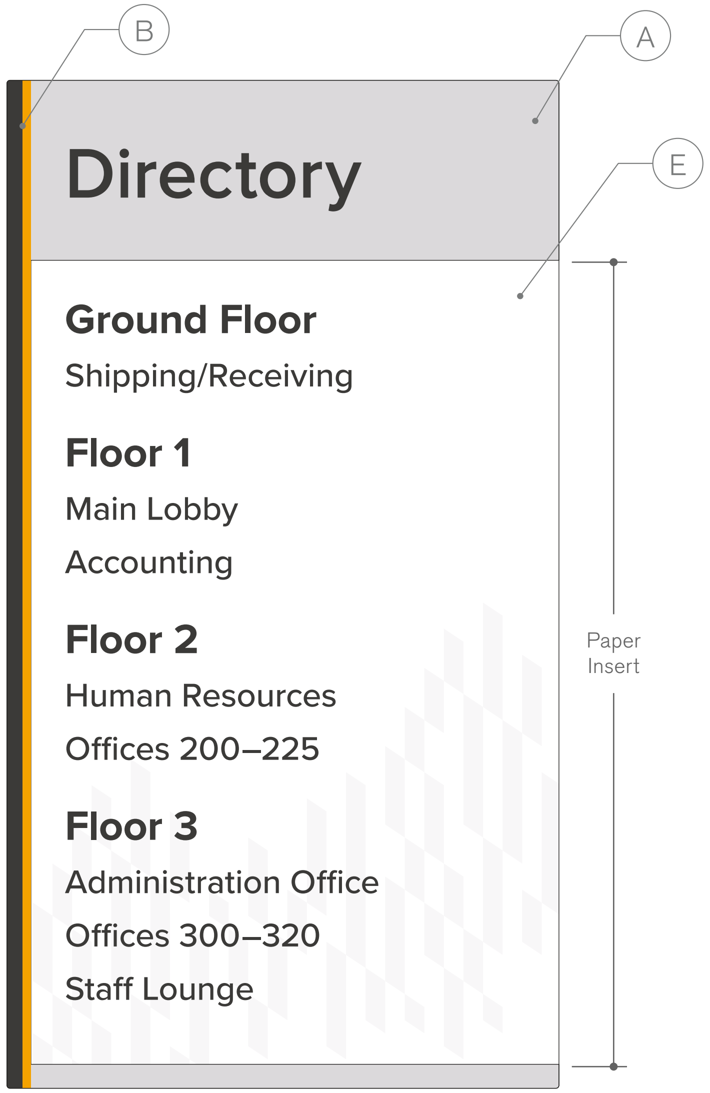
NOTES:
1. INSTALL BIKE RACKS ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
2. CONSULTANT TO SELECT COLOR(FINISH), SEE MANUFACTURER'S SPECIFICATIONS.
3. SEE SITE PLAN FOR LOCATION OR CONSULT OWNER.

Appendix A

TU CAD Standards

Appendix B

Interior Sign Standards



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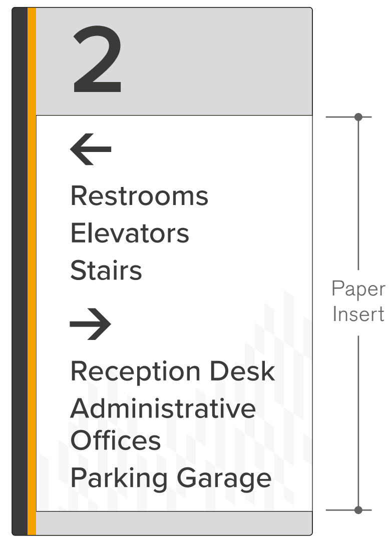

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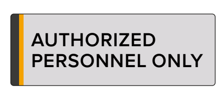

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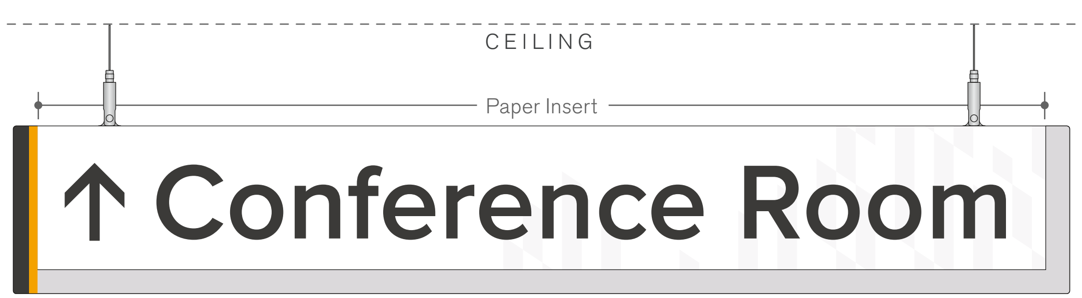

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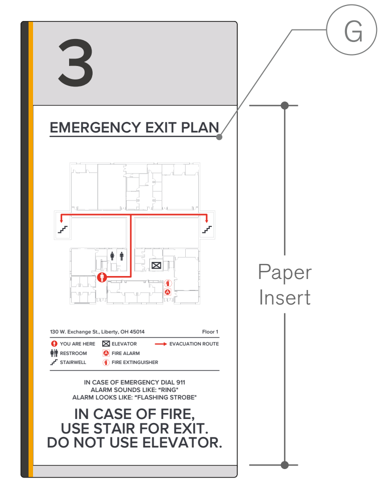

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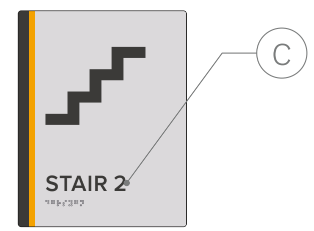

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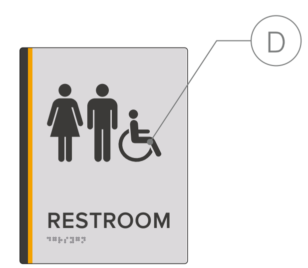

Type E.2 VV1AW-014018
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Type E.2
Alternate Layout

Type E.2
Alternate Layout

Type E.3 VV1AW-014018
7.0"w X 9.0"h

Type F V1AH10
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Type G V1AH13
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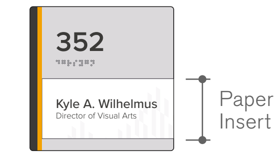

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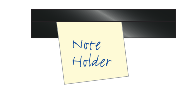

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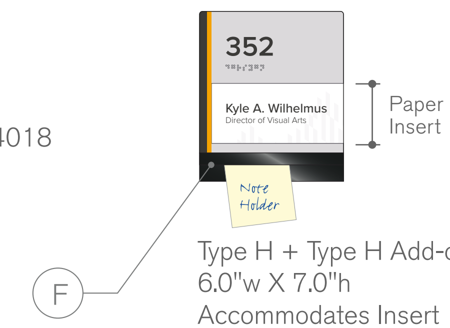

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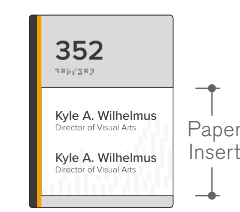

Type I V1AH28
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Accommodates Insert

Type J.2 V1AJ03
6.0"w X 7.0"h

Direct Print Background
(A) To match PMS Cool Gray 1C

Direct Print Graphic
(B) To match PMS 447C, 1235C

Raised Copy
(C) To match PMS 447C;
Font: Proxima Nova (ADA)

Direct Print Copy
(D) To match PMS 447C;
Font: Proxima Nova (ADA)

Insert
(E) Media: White Paper;
Font: Proxima Nova Bold, Medium, Light;
Copy Color: To match PMS 447C;
Graphic: Use art on RND
(To match PMS Cool Gray 1C, 25% Opac.)

Metal Accent
(F) Black

Evac Insert
(G) Media: White Paper;
Font: Proxima Nova (ADA);
Graphics/Copy Color: To match PMS 447C

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www.takeform.net

Rendering

Project:
Towson University

Date: 02.21.19
Drawn By: JM

Filename:
TOW0025_171071_RND_rev3

Design Review By:

Revisions:
03.29.19JM removed options
04.29.19CAO add E.3, O.1-3. L.b, logo
06.10.19JG add APO, L.c, alt layouts

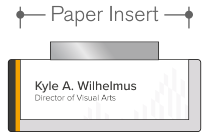
Scale: 1½" = 1'

Vivid
IMAGE INTENSE SIGNAGE

Notes:
- Uppercase, brailled copy to be raised. All other copy, including pictograms, to be printed unless otherwise noted.
- Sign copy shown is for sample purposes only

Window Backer if required:
- Vivid: White Appliqué

Product Approval
☐ As Is ☐ As Noted
Approved By: ________________
Date: ________________



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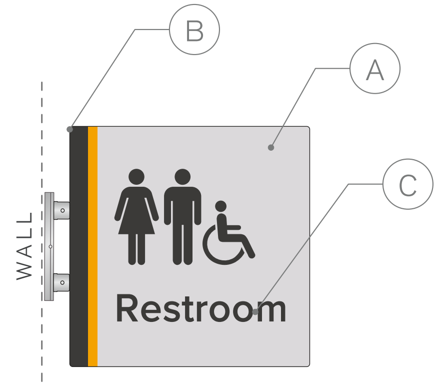
Accommodates Insert
Custom Cubicle Clip Mount



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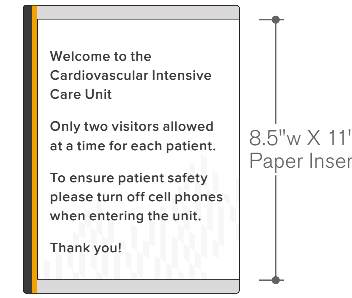

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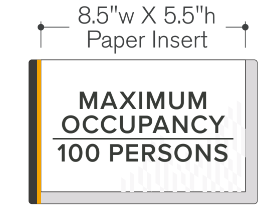

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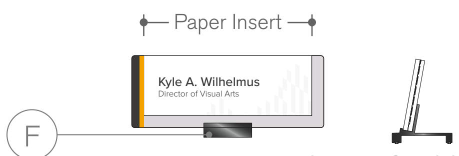

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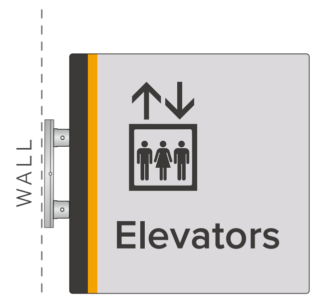

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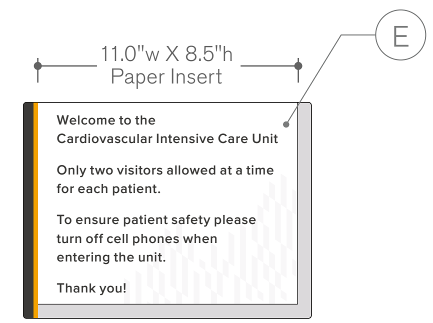
Alternate Layout



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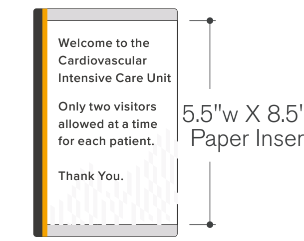

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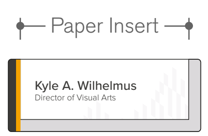

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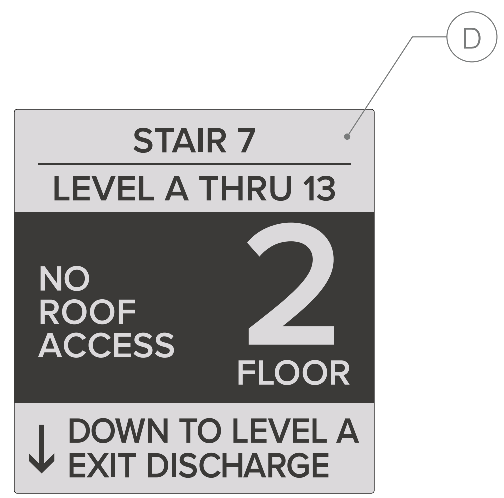
Accommodates Insert
Tape Mount



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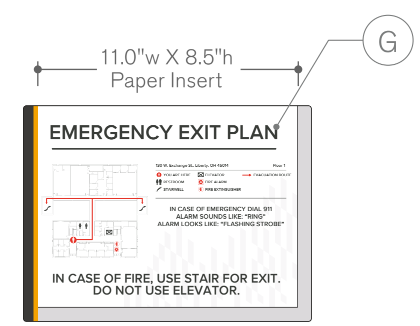

Type O.1
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Direct Print Background
(A) To match PMS Cool Gray 1C

Direct Print Graphic
(B) To match PMS 447C, 1235C

Direct Print Copy
(C) To match PMS 447C;
Font: Proxima Nova (ADA)

ACM
(D) To match PMS Cool Gray 1C, 447C;
Font: Proxima Nova (ADA)

Insert
(E) Media: White Paper;
Font: Proxima Nova Bold, Medium, Light;
Copy Color: To match PMS 447C;
Graphic: Use art on RND
(To match PMS Cool Gray 1C, 25% Opac.)

Metal Accent
(F) Black

Evac Insert
(G) Media: White Paper;
Font: Proxima Nova (ADA);
Graphics/Copy Color: To match PMS 447C

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Notes:
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- Sign copy shown is for sample purposes only

Window Backer if required:
- Vivid: White Appliqué

Product Approval

☐ As Is ☐ As Noted

Approved By: ________________

Date: ________________

Appendix C

Classroom Technology Standards

Classroom Technology Standards

A Guide for Classroom Planning

Produced by the Office of Technology Services

Published: 12/20/2011
Last Updated: 5/12/2021

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Classroom Taxonomy

Overview (CTSG-001)

The Office of Technology Services (OTS) works with stakeholders in the university community, vendors, manufacturers, college/departmental technology staff, and academic leadership including department chairs and deans to develop design standards for the audiovisual technology installed in Towson University's nearly 500 classrooms that best meet the needs of the university. The goals of standardization aim to:

1. Provide a comfortable, modern, flexible, easy-to-use, and reliable teaching-learning environment that accommodates a variety of instructional methods

2. Design an active, engaging environment for today's generation of learners

3. Provide a consistent, intuitive interface for controlling audiovisual equipment throughout the campus for faculty, staff, and students

4. Ensure maximum reliability and up-time based on proven designs, components, and installation methods

5. Ensure ease of support and usage by installing standard computer models and audiovisual components

6. Keep the number of makes and models to a minimum so that an inventory of replacement equipment can be maintained

7. Provide a means for easy, intuitive incorporation of end-user devices such as phones, tablets, and laptops

Article CTSG-001; Version 1; Last Revised 10/16/2019

Classroom Audiovisual Architecture & Accessibility (CTSG-002)

1. Digital Architecture

The audiovisual industry has transitioned from an analog to digital audiovisual architecture and OTS adapted our standards to meet these demands. As part of the transition, known as the "analog sunset" in consumer and professional electronics, new devices are shipping with digital outputs only and older analog outputs are being disabled or severely limited by new content. The changes OTS made allow the University to take advantage of the latest technologies, provide better integration of digital devices brought on campus, streamline classroom design, and meet growing instructional needs.

2. Flat Panels vs. Projection

Some spaces benefit from using flat panels (4k or greater resolution) instead of traditional projectors and projector screens. This is already happening in spaces that don't rely heavily on white boards, such as conference rooms and some classrooms as well. Flat panels offer brighter, sharper images and are not dramatically affected by ambient light.

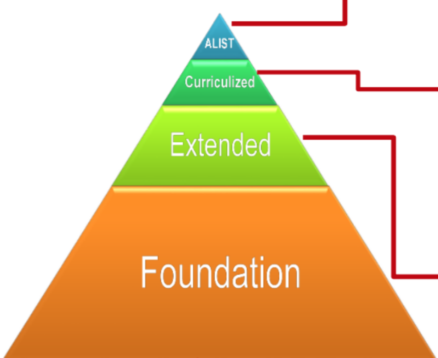
3. Accessibility

All systems must be designed with accessibility in mind and meet all current Americans with Disabilities Act (ADA) requirements. This includes but not limited to:

a. Installation of Assistive Listening Devices in rooms with voice reinforcement or where sound is a key part of instruction.
b. Installation of height adjustable podiums
c. Appropriate placement of podiums to provide required clearance
d. Making Xpanels available for all rooms with control systems, which allows rooms to be controlled remotely through a personal device

Article CTSG-002; Version 1; Last Revised 11/04/2020

Classroom Technology Tiers (CTSG-003)



Tier	Support
ADVANCED LEARNING/INSTRUCTIONAL SPACES AND TECHNOLOGIES: High-end, high-cost, specialty technology and venues. **Examples**: Simulation models, digital microscopes, observation labs and recording devices, specialty control devices; concert or performance venues in which students physically use the equipment; radio and TV production; advanced distance learning suites.	**SUPPORT** Support, training, documentation, and learning resources for faculty provided by college or department technology staff or other resources; OTS role, if applicable, limited to review of design in relation to campus standards, interaction with network and infrastructure, etc. For certain technologies and venues, OTS may play a specific, limited role in support, with roles and responsibilities articulated via memoranda of understanding.
CURRICULIZED: Course-specific technology needed for instruction to support a specific academic class, program, major, etc. Students must physically interact with the technology, which is typically not as general purpose as Extended or Foundation. **Examples**: Specialty monitors with high-precision drawing capability; unique printers, possibly higher-end 3D and subtractive manufacturing devices; specialty peripherals; ceiling mounted document camera, ultra-high resolution display or projection; specialty collaboration workstations; software categories 6, 7, and 8, including discipline specific applications.	
EXTENDED: Proven general-purpose technologies in which deployment is done in a deliberate, phased, or limited manner or is evolving in adoption but not yet considered foundational. **Examples:** Multiple screens or flat-panel displays; interactive solutions (interactive projectors and/or flat panels); fixed wireless projection and collaboration features; software category 5. Students must either directly interact with the technology, or the technology is used by the instructor in a way to engage students or enhance the students' learning experience.	**SUPPORT** Telephone, chat, training, documentation, and secondary in-person support (as workload permits) provided by OTS staff. College or department technology providers typically provide routine in-person or classroom-based incident support, in collaboration with OTS staff. Support roles and responsibilities between OTS and departments/colleges will typically be covered in a common campus-wide delineation of duties.
FOUNDATION: Proven, current-generation general-purpose audiovisual and projection systems and is core for all formal learning spaces. **Standard Equipment Includes:** projector with screen or flat panel; in-ceiling speakers; podium with computer and monitor (touch); document camera; Crestron LCD touch panel and control system; Cable Cubby with HDMI connection for portable devices; distance learning and lecture capture systems; software categories 1-4; instructor and student computers, thin clients, and other devices for student use. Optional add-on: dual-image multi-window processor to show two different audiovisual sources side-by-side on the projector or flat panel.	

See the "STF Project Categories" linked below for information on Foundation, Extended, Curriculized, and ALIST tiers:
https://www.towson.edu/technology/facultystaff/support/instruction/classroom/projects/

Article CTSG-003; Version 1; Last Revised 11/23/2020

Projector Configuration Requirements (CTSG-004)

1. Any setting that shuts down a projector based on the loss of signal must be disabled.

Article CTSG-005; Version 1; Last Revised 2/23/2017

Classroom Computer Configuration Requirements (CTSG-005)

1. Overview

A classroom computer is primarily used to present information to classes by using a display and is shared by multiple faculty. Classroom computers are critical to instruction and are configured with security settings and file management measures to preserve system integrity and assure that the computer runs consistently at an optimum level of performance. Because many people share the computer, it is different than a personal computer in an office or home. Personal files must not be stored on this computer but stored using one of the other options outlined in this chart: https://www.towson.edu/technology/facultystaff/documents/storing-data-risks-vs-benefits.pdf. Installation of special software is managed with several options (listed below) to accommodate faculty needs. Software installed on the computer will be upgraded regularly in a timely manner that does not disrupt instruction.

Windows-based PCs will be the primary solution, with interactive monitors in new venues. If there is a need for both Windows and Mac Operating Systems, a dual-boot Mac will be deployed so the faculty member can choose which OS they wish to use when starting the system.

2. Classroom computer standards

a. A base lab image and imaging process is provided by OTS, see the TU Lab Managers SharePoint site for more information: https://tu.sharepoint.com/sites/ctc/tulabs/default.aspx

b. Computers follow classroom Active Directory guidelines

c. Users logon as Users (not Administrators)

d. Classroom-specific group policy is applied

i. Group Policy is set so shutdown is disabled

ii. Group Policy is set so that the PC never sleeps.

iii. Group Policy is set so the monitor doesn't sleep until after 90 min.

iv. Group Policy is set so screen saver doesn't start until 60 min.

v. Group Policy is set not to show last logged on user:

Computer Configuration\Windows Settings\Security Settings\Local Policies\Security Options

Do not display last user name in logon screen = Enabled

vi. Group Policy is set to delete profiles

vii. Group Policy is set to disable “Welcome Screen”

e. Classroom PCs are part of their own Configuration Manager collection for managing installation packages, etc.

f. Remote Desktop is enabled

g. BIOS is set to have the computer automatically power on overnight

h. The computer is configured with standard university software (below). If special software is needed, several options are available:

i. Install software on an office computer and use Remote Desktop to access the software on that computer (recommended)

ii. Virtual Workspace access

iii. If software is not available in Run Advertised Programs, please discuss software needs with your department head or technology coordinator.

3. Software Included on Standard Configuration

Windows:

a. Microsoft Windows 10 Enterprise and Updates
b. Microsoft Office 365 Enterprise (Includes Word, Excel, Access, & Power Point) and Updates
c. Microsoft Internet Explorer and Updates
d. Mozilla Firefox
e. Google Chrome
f. .Net Framework
g. Microsoft System Center Configuration Manager Client
h. Virtual Workspace Client
i. Adobe Reader
j. Windows Media Player
k. Adobe Shockwave Player
l. VLC
m. Filezilla Client
n. Microsoft Silverlight
o. Java
p. Panopto
q. Cisco WebEx Meetings
r. Zoom

Mac:

a. Micosoft Office 2019 Enterprise (Includes Word, Excel, & Power Point) and Updates
b. Mozilla Firefox
c. Google Chrome
d. Virtual Workspace Client
e. VLC
f. Filezilla Client
g. Java
h. Adobe Air

i. Cisco WebEx Teams
j. Cisco WebEx Meetings
k. Zoom
l. iLife
m. iWork
n. Microsoft Remote Desktop

4. Classroom Organizational Unit (OU)

a. A Classrooms OU exists at: towson.edu/Computer Accounts/Lab and Public/Classrooms and Conference Rooms

b. Under the \Classrooms and Conference Rooms OU, there are separate OUs for each university building; each building OU will contain the classroom computer accounts, groups, group policy, etc.

c. Managers of the Classrooms and Conference Rooms OU that can create computer accounts, etc. are in the Smart Classroom Administrators group.

5. Standard Classroom Computer Naming Convention

a. Classroom Computers

To identify classroom computers, a standard naming convention was established as follows: CLS-BuildingRoomNumber-01, 02, etc.

IMPORTANT: room numbers need to use the 4-digit number, used by Facilities.

Example: two computers installed in the Cook-404A classroom would have the following names:
CLS-CK0404A-01
CLS-CK0404A-02

b. Lab - Classroom Computers

Some classrooms are also computer labs that have their own Lab OU and computer naming convention. In these cases the instructor computer can be located in the lab OU but MUST be named using the standard naming convention outlined above.

An example of a lab –classroom instructor computer account is: CLS-ES0107-01

An example of a lab-classroom student computer account is: ES0107-02, ES0107-03, etc.

6. InFocus MondoPad (Retired)

The PC appliance must be treated as a regular classroom PC. There is currently a standard image available that will configure most settings (other than adding a maildrop). The following items must be done for each:

a. Join to domain
b. Install SCCM
c. Install endpoint protection

d. Name properly (CLS-CollectionCode-MOND)
e. Change Mondopad logo to TU logo
f. Enable minimize button for non-admin accounts under Settings>General
g. Set browser homepage to www.towson.edu
h. Install Microsoft Office
i. Install Microsoft Lync, Skype, Flash, Adobe Reader, Citrix, Shockwave, Java, VLC, Firefox, Chrome (with Remote Desktop plugin), Panopto, and Visio Viewer
j. Set up maildrop (CollectionCode-Mondopad@towson.edu). The password must be set not to expire and stored in KeePass. See Knowledge Center Article: https://www.towson.edu/knowledgecenter/admin/adminarticle.aspx?article=823&searchtype=IT
k. Printers can be added by the department like a regular Windows PC
l. Set passcodes (4-pin Admin)
m. SSID must match computer name
n. Add Athena local admin account with same password as the regular image
o. Add short cuts for Lync, Skype, and Office
p. Follow campus standards for BIOS settings (except for SATA operation): https://www.towson.edu/knowledgecenter/admin/adminarticle.aspx?article=763&searchtype=IT

Article CTSG-006; Version 1; Last Revised 11/04/2020

Classroom Standard Equipment (CTSG-006)

1. Document Cameras

a. ELMO PX-30E

- The ELMO PX-30E is the university's standard document camera, it can show high-quality 4K images and integrate with other ELMO products or a PC. This document camera is the best choice in the majority of classroom installations.

Manufacturers Link: http://www.elmousa.com/

c. WolfVision VZ-8plus4

- The WolfVision VZ-8plus4 provides a slightly warmer color due to the use of a halogen lamp. In a side by side comparison there was minimal differences in image quality when compared to the standard ELMO P30HD, but it is twice the cost. This document camera is only practical for projects with external funding sources or situations where slight differences in color are vital for teaching, such as an art class.

Manufacturers Link: http://www.wolfvision.com/

d. WolfVision VZ-3

- The WolfVision VZ-3 is a competitor to the ELMO document camera mentioned above. It offers a smaller footprint, LED lighting, and easy to use one arm design.

Manufacturers Link: http://www.wolfvision.com/

e. WolfVision EYE-14

- The WolfVision EYE-14 is a Ceiling Visualizer that is mounted above a flat surface and allows everything in it's field of vision to be projected. This is ideal for situations that call for large objects to be demonstrated to a class.

Manufacturers Link: http://www.wolfvision.com/

f. WolfVision vSolution Cam

- The WolfVision vSolution Cam is a smaller compact document camera that does not have a base.

Manufacturers Link: http://www.wolfvision.com/

2. Projectors

a. Panasonic PT-FRZ50WU7 (Standard)

- The Panasonic PT-FRZ50WU7 is a full HD (1920 x 1080) 5,000 lumen projector that uses a laser light source. This design requires no lamp replacement or filter cleaning and has a virtually instant on/off time.

Manufacturers Link: http://panasonic.net/

c. Panasonic PT-RZ770

- The PT-RZ770 is a 7,200 lumen WUXGA resolution (1,920 x 1,200) projector that is perfect for large venues or rooms that require more advanced projection capabilities.

Manufacturers Link: http://panasonic.net

e. Epson BrightLink

- The Epson BrightLink is an "interactive projector" allowing a pen to be used to control motions and annotations on the screen. The projector is mounted directly above the projection surface so it can fit in many different size rooms.

Manufacturers link: www.epson.com/brightlink

f. Epson PowerLite Pro L1300UNLUNL

- The Epson PowerLite Pro L1300UNL features high color output, high lumen output, and WUXGA high definition widescreen resolution. This makes it appropriate for large venues such as large tiered lecture halls, concert halls, theaters, etc. that require 4K emulation.

Manufacturers link: http://www.epson.com/

3. Speakers

Note: Some rooms may require, 2.1, 5.1, or 7.1 sound systems, in those cases equipment choices must be discussed as part of the project planning and based on the best fit for the room.

a. Bose EdgeMax EM90 & EM180

- The Bose Edgemax series of in-ceiling speakers offer capabilities of wall mounted speakers with an aesthetically pleasing design.

Manufacturers link: https://www.bose.com

b. Atlas FAP62T

- The Atlas FAP62 is an in-ceiling loudspeaker with 32-watt 70/100V transformer and ported enclosure

Manufacturers link: https://www.atlasied.com/fap62t

4. Cable Access Enclosure

a. Extron Cable Cubby 500

- The Cable Cubby 500 includes connections for Ethernet, USB, HDMI, 3.5mm audio, and power connections

Manufacturers link: http://www.extron.com/

b. Extron Cable Cubby 202

- The Cable Cubby 202 is available for smaller form factor podiums.

Manufacturers link: http://www.extron.com/

c. Liberty Adapter Ring

- The Liberty Adapter ring attaches to the HDMI cable and features the following connections:
    - Micro HDMI "D" male to HDMI "A" female
    - Full sized DisplayPort male to HDMI female
    - Mini HDMI "C" male to HDMI "A" female
    - Mini-DisplayPort male to HDMI female
    - DVI Digital male to HDMI Female
    - USB-C to HDMI Female
    - VGA to HDMI Female
    - Lightning to HDMI Female

Manufacturers link: https://secure.libertycable.com/

5. Computer Monitors

a. Planar PCT2485

- Standard desktop computer monitor for instructor computers

Manufacturers link: http://www.planar.com/products/desktop-touch-screen-monitors/24-inch/helium/

b. Dell 22" Widescreen Monitor

- Standard desktop computer monitor for lab computers

Manufacturers link: http://www.dell.com/

c. ViewSonic TD2220

- This optical touch monitor (can use stylus or finger tips) allows for instructors to bring interactivity to their lecture material. With a 22" display it provides a large workspace that makes it easier to engage students with content like videos and images.

Manufacturers link: http://www.viewsonic.com/us/td2220.html

6. Audiovisual System + Interface

The university standardized on Crestron as the primary audiovisual control system and is currently moving all classrooms onto the university network to allow remote management using Crestron Fusion RV (formerly known as RoomView).

a. Crestron DMPS3-4K-350-C

- The Crestron DMPS3-4K-350-C is an AV control system, switcher, mic mixer, and amplifier.

Manufacturers link: https://www.crestron.com/products/model/DMPS3-4K-350-C

b. Crestron CP3N (Active Learning)

- The Crestron CP3N is a control processor is used in more complex spaces, such as Active Learning rooms, and in conjunction with Crestron NVX equipment listed below:
  Crestron DM-NVX-D30
  - DM NVX HDR Network AV Decoder.

  Crestron DM-E30C
  - DM NVX HDR Network AV Encoder Card

Manufacturers link: https://www.crestron.com

c. Crestron TS-770-B (Standard)

- The Crestron TS-770 is a 7" touch screen with an edge-to-edge glass screen for higher durability. It is the tabletop model. For wall mounting the TSW-770-B must be used.

Manufacturers link: http://www.crestron.com/

e. Crestron TSW-570P-B-S (Active Learning Standard)

- The Crestron TSW-570P is a 5" touch screen with an edge-to-edge glass screen for higher durability.

Manufacturers link: http://www.crestron.com

7. Wireless Presenter Remotes

Wireless presenter remotes are commonly used in classrooms to advance PowerPoint slides without having to walk back to the computer. These are not covered under STF funds or supported by OTS but we recognize they are important in the overall instructional environment. Policies and funding for wireless presenters vary by college so please check with local IT providers, chairpersons, or other college leadership before purchasing one since they may require drivers to be installed on classroom PCs. Wireless presenters are available online and at consumer electronics stores such as Best Buy, Staples, etc.

8. Assistive Listening Devices

a. Williams Sound FM-457 Pro

- This is an RF assistive listening device used to improve hearing ability in spaces with voice amplification.

Manufacturers link: https://www.williamssound.com/

9. Microphones

a. Vaddio EasyMic Ceiling MicPOD

- This is a ceiling mic that connects to the in-room computer via USB. It is used in smaller spaces such as conference rooms.

Manufacturers link: http://www.vaddio.com/

c. Biamp TCM 1 Beamtracking microphone

- This is a ceiling mic that connects to the in-room computer via USB. It is used in medium to large spaces such as classroom and lecture halls.

Manufacturers link: https://www.biamp.com

10. Cameras

a. Vaddio RoboSHOT 12 QUSB

- This is a pan/tilt/zoom camera that connects to the in-room computer via USB.

Manufacturers link: http://www.vaddio.com/

b. Vaddio ConferenceSHOT FX

- This is a fixed wide-angle camera for meeting rooms and huddle spaces.

Manufacturers link: http://www.vaddio.com/

c. Vaddio HuddleSHOT

- This is an all-in-one speaker bar with built-in camera and microphone.

Manufacturers link: http://www.vaddio.com/

11. Audio Mixers

a. Biamp TesiraForte AVB CI

- This is a microphone mixer that connects to the in-room computer via USB.

Manufacturers link: https://www.biamp.com/

12. Audio Amplifiers

a. Bose Free Space ZA190

- This is an external amplifier that must be used in room with video conferencing in conjunction with the Biamp TesiraForte mixer.

Manufacturers link: https://www.bose.com

13. Projection Screen

a. Da-Lite 21857LSC - White Case 113 D / 60 x 96

- This is an electric tensioned HD screen with 0.9 gain.

Manufacturers link: https://www.legrandav.com/products/da-lite

14. Non-Interactive Display

We do not have a specific standard model large display but all must be commercial grade, 4K, controllable over RS-232, and have a No Show/Display Mute function. The NEC C Series is currently in use on campus.

15. Interactive Display

a. ClearTouch CTI-6065K-UH20

- This is an 86" 4K interactive (touch) display (but a smaller model may be appropriate for some spaces).

Manufacturers link: https://www.getcleartouch.com

16. Scheduling Panel

a. Crestron TSS-770-B-S-LB KIT

- This is a 7" room scheduling touch screen with room availability light bar.

Manufacturers link: https://www.crestron.com

17. Wireless Projection

a. Mersive SolsticePod

- Allows clients to wirelessly project material from Windows and Mac computers as well as iOS and Android mobile devices.

Manufacturers link: https://www.mersive.com

18. Power Conditioners

a. Middle Atlantic RLNK-915R

- This is a networked power conditioner. Components must be connected in this order and labeled within the device:
  1. Control Processor
  2. Network Switch
  3. Computer
  4. Wireless Input
  5. USB Extender
  6. Mic Mixer
  7. Distribution Amplifier

Manufacturers link: https://www.middleatlantic.com

Article CTSG-007; Version 1; Last Revised 11/18/2020

Stickers (CTSG-007)

1. STF Stickers

a. Sticker must be properly aligned.
b. Stickers must not be in the way of any function, but must be conspicuous to the general observer
c. Stickers must be affixed during QA before photos are taken so they show in the Virtual Tour.
d. After a room is tagged it will be marked as such in COLLECTIONS in the Virtual Tour.
e. Items that must be stickered

ii. Projectors

- Will be affixed on side facing down if ceiling mounted, must not cover any other labeling, fans, or buttons
- In future, stickers must be applied prior to mounting for easy access

ii. Document cameras

- Sticker must be affixed on (WV VZ-3 specific)
  i. On the back of the arm
  ii. On the plate that connects the base to the arm.
     1. Stickers must not be placed on the white base

iii. Computer – computers include class and lab computers as well as iPad's purchased with STF

- Stickers must be affixed on
    i. The front of desktop computers
        1. Stickers placed on the front must not cover any buttons or lights
    ii. The top near the TU tag for desktops, the bottom/back for laptops/tablets

iv. Processor in rack

- Sticker must be placed on the front of the DMPS3-4K-350C - this is to identify the entire rack

v. Cameras

2. Interactive Display Stickers

A. Must be placed on the bottom left hand corner of all interactive touch screen displays including computer monitors.

Article CTSG-008; Version 1; Last Revised 11/16/2020

Distance Learning & Lecture Capture

Standard Equipment (CTSG-008)

Towson University utilizes a software based distance learning & lecture capture model. Rooms either include USB cameras/microphones or a bridge to convert standard camera/microphones to a format that can be connected to the computer in the room.

a. Cameras must be mounted 7 feet above finished floor.

b. Flat panel displays must be mounted 6 feet above finished floor to the center of the display.

c. Flat panel displays must be mounted 6 inches away from fire alarms/annunciators.

d. Microphones installed for voice reinforcement must also feed distance learning/lecture capture system. Wireless and podium microphones must always be set up for voice reinforcement and distance learning/lecture capture.

e. Camera names must be entered in the configuration page of each camera device so that they match the name on the Crestron touch panel (i.e. Camera 1) and are recognized by the computer USB as this name.

1. Basic Setup

a. Camera - Basic/portable recording can be accomplished in any room with a webcam plugged into the instructor's PC, TU recommended models can be found here: https://www.towson.edu/technology/facultystaff/hardwaresoftware/hardware.html

b. Wireless Microphone - A wireless USB mic can be added to this setup for more flexible instructor micing. To capture omnidirectional sound, products are available from Blue and Acoustic Magic to capture the entire room audio.

2. Permanent Setup

a. Foundation – This is used to describe the majority of our standard classrooms on campus. These rooms are used for general lectures and would need basic video and mic capabilities to facilitate software-based lecture capture.

Equipment: PTZ USB camera, mic mixer w/USB out, Ceiling microphones, and wireless mic. Two displays are also added on the podium to allow for dual monitor functionality.

b. Curriculized – These are rooms that have needs that go above and beyond what is found in a standard room; this could include the need for more advanced microphones, more camera angles, etc.

Equipment: One or more HD PTZ cameras, mic mixer w/ USB out, ceiling mic arrays, wireless mic(s). Two displays are also added on the podium to allow for dual monitor functionality. Additional equipment to support specific courses or programs of study may be included in Curriculized rooms.

c. ALIST: These are rooms that must contain the highest quality video and audio quality possible with consideration given to room lighting, acoustics, etc. They represent the fewest number of classrooms. Special staffing may be necessary to assist faculty or control equipment in a studio environment. Broadcast or near broadcast quality may be typical, as well as other unique types of technology beyond computers and audiovisual.

Equipment: 2 HD PTZ Cameras, mic mixer w/USB out, individual mics at each seat, podium mic & wireless mic (s).

Article CTSG-009; Version 1; Last Revised 3/17/2021

Distance Learning Equipment in ALIST/Curriculized Spaces (CTSG-009)

1. The minimum set of equipment must be installed as follows:

a. Display 1 in view of instructor

b. Display 2 in view of students

c. Camera facing instructor

d. Camera facing students

2. Each display device must be able to be able to show any source and be controlled independently using the multiple display touch panel layout found in Appendix A.

3. Standard Scenario

a. Projector/Main Display: Local computer content (PowerPoint, etc.) (Must also have the ability to show all media and camera shots)
b. Display 1: Displays remote students (or used as a confidence monitor in lecture capture scenarios)
c. Display 2: Shows remote students or remote instructor (depending on scenario)

Article CTSG-010; Version 1; Last Revised 11/16/2020

Instructor Stations

Requirements (CTSG-010)

Each podium must contain the following:

1. Articulating arms must be used for the monitors (or interactive displays). Model Info: Ergotron 45-241-026
2. Dual Monitors are recommended in any room used for instructional recording.
3. Podium casters must be lockable
4. No doors must be over the keyboard compartment
5. At least one (quiet) fan must be present in the cabinet
6. Grommet positions for whip (if applicable)
7. Core drilling must be used for new buildings, in addition to the conduit for a quad electric outlet and 4 network drops, each floor box must have separate conduit for AV signal and speaker, mic, camera cabling. 3 1" conduits or 2" and a 1" conduit.
8. If no core drilling is present, locking wall plates/receptacles must be used [see Locks (CTSG-016)] and AV cables (whip) must be tightly secured to avoid a tripping hazard. If cables must, as a last resort, be run

across floors the ADA compliant Legrand OFR Series Overfloor Raceway System must be used. Temporarily, yellow tape provided by OTS is acceptable but only if there is a confirmed date when permanent raceway/core drilling will be completed and the use has been approved by OTS.

9. In large venues where high power projectors are used, a dedicated circuit must be provided to prevent the projector from shutting down if too much power is drawn.

10. Six network ports must be run to the instructor stations (1 PC, 1 Laptop, 1 Crestron, 1 Wireless Input, 1 Power Conditioner, 1 Future Expansion).

11. Wire diagram must be provided in digital format

12. All cables must be labeled

13. Document cameras must be connected to the podium computer via USB

14. Equipment mounted behind displays and cameras (i.e. power strips, power supplies, USB extenders, DM receivers, etc.) must not use velcro to secure it in place. Instead we require where possible the use of cable ties, wall mounts, or other methods that do not use an adhesive that easily breaks down.

15. AV, computers, and other technology devices are not put on timed circuits or sensors. Power must be available to them 24/7.

16. Assistive listening devices must be installed in all rooms with voice reinforcement or where sound is a key part of instruction in a quantity that it is in compliance with current ADA requirements.

Article CTSG-011; Version 1; Last Revised 11/16/2020

Cable Cubby (CTSG-011)

The Cable Cubby must include Ethernet, USB, HDMI, 3.5mm audio, USB-A/USB-C power outlets, and two electrical outlets. HDMI, Ethernet, and 3.5mm audio must contain pull-through cables with male connectors. USB must contain pull-through cable with female connector.

Article CTSG-012; Version 1; Last Revised 6/20/2019

Lighting

Overview (CTSG-012)

1. Intuitive wall-mounted light switches must be within easy reach of the instructor workstation. They are very reliable, require no training, and will work regardless of the state of the Crestron system.
2. Lighting controls must also be integrated into the Crestron system where possible. These controls are meant to supplement, not replace, the standard wall switches.
3. Additional factors: switches must be installed at wheelchair-accessible height; for multiple switches (zoned lighting), the switches must either be labeled or a reference placard must be mounted next to the switch bank; redundant switches must be located on the wall as close as possible to each entry door to the room.

Article CTSG-013; Version 1; Last Revised 10/23/2019

Lighting and Switching Specifications (CTSG-013)

1. Soft Lights directly in front of projection screen must be able to be turned off (including turning off any motion sensor so they do not come back on inadvertently).

2. Lights in the student seating area of the room must be dimmable to allow for low-level illumination (for note-taking) or completely off (for watching videos, etc., where no note-taking is needed).
3. The "master" bank of light switches that control the entire room must be installed on the wall behind or next to the podium for easy access (unobstructed) when lecturing; the instructor must not have to walk more than two steps to manage the lights during the class.
4. At least one light switch must be placed near the entrance of the room. This will let room users turn on at least a portion of the room lights so you can safely enter the room (and turn off the light when leaving).
5. Any occupancy sensors must have the ability to be overridden using the light switches at the instructor podium so the entire room can be darkened or illuminated during a class, under control of the instructor.
6. Light switches must be labeled, ideally with pocket inserts, so the instructor knows what the switch turns on/off. You mustn't have to use trial and error.
7. A motorized screen switch must also be placed near the podium and labeled. The switch must have up/down/stop (three buttons). Primary control of the screen will be under Crestron touch-panel control, but the manual wall switch must be able to override the Crestron system to allow for manual control.
8. Sight lines – lighting should be flush to the ceiling – or dropped in a way as to not obstruct projector throw to screen.

Touch Panel

Overview (CTSG-014)

Our standards require that a touch panel be installed in most rooms that control the AV functions of the room. Our standard touch panels have a similar look and functionality, with standard "hard" buttons with main controls and variations of "soft" menus that can be customized depending on the equipment in each room. Screen shots must be submitted to Towson University for review prior to project competition

Article CTSG-015; Version 1; Last Revised 11/16/2020

Natural Flow Patterns When Moving Between Controls (CTSG-015)

1. The user begins the experience with the Start button and works their way through the left column of “hard” buttons. The Start button tells the user what to do next: step through the other buttons on the left-hand column and turn on the projector, select their audiovisual source, and lower the screen. When class is done, they'd press the Finish to shutdown the system. This kind of natural flow pattern helps guide the movement of a user through a class session.

2. When deciding on what goes on the left-hand panel of hard buttons vs. the right, we followed people's natural reading style for a two-column presentation: you start at the left-most column, read your way from top to bottom, then move on to the next column, doing the same: top to bottom.

3. Secondary controls, menus, and submenus then appear "on demand" as “soft” buttons in the touch panel based on choices made by pressing a hard button. This follows people's natural skimming style: periphery first (the left and right hard-button panels), followed by the content in the central field (the touch panel).

Article CTSG-016; Version 1; Last Revised 10/22/2019

Status Bar (CTSG-016)

The status bar will be always visible at the bottom of the touch panel. It will include the current time of day (12 hour time); and annunciators to show whether No Show or No Sound is selected.

Article CTSG-017; Version 1; Last Revised 11/16/2020

Nesting Menus in Layers (Drilldown) (CTSG-017)

A philosophy in User Experience best practices is to keep structures as flat as reasonably possible, without being excessively flat. In most cases we try to keep our control panels structure only a couple layers deep.

If used, there must be a clearly labeled "Previous Page" button, and other things would need to be locked out while the submenu is active.

Fonts and Colors (CTSG-018)

1. In order to uphold User Experience best practices on color and fonts, colors used should be intuitive in the context, color impairments should be considered, and fonts should be limited to 1 or 2 styles that are easy to read. Examples: red generally indications stop, off. or extreme; green can mean go, on, or within a set limit; yellow is generally used to indicate caution, or near a set limit." Avixa provides additional guidance on color usage. It is not absolute, but it is a valuable guide.

2. For multiple button selections with only one permissible choice (e.g., selecting the primary audiovisual source), the button the user selects must appear depressed to be very clear the choice has been made. When one is selected, the non-selected buttons must in a raised state. Any buttons that are not appropriate for the context or not an allowable option must be grayed out.

3. Flashing text must be used sparingly for imperatives, emphasis, in-transit states, or vital messages.

4. When raising the volume the color must go from green to yellow to red to indicate the volume is reaching the upper limit.

5. TU Standard Settings:

    a. Font – Arial

    b. Main Titles – 14 Bold

    c. Button Column Titles – 14

    d. Button Text – 11

    e. Other Text – 11

    f. Alias setting: Anti-Aliased

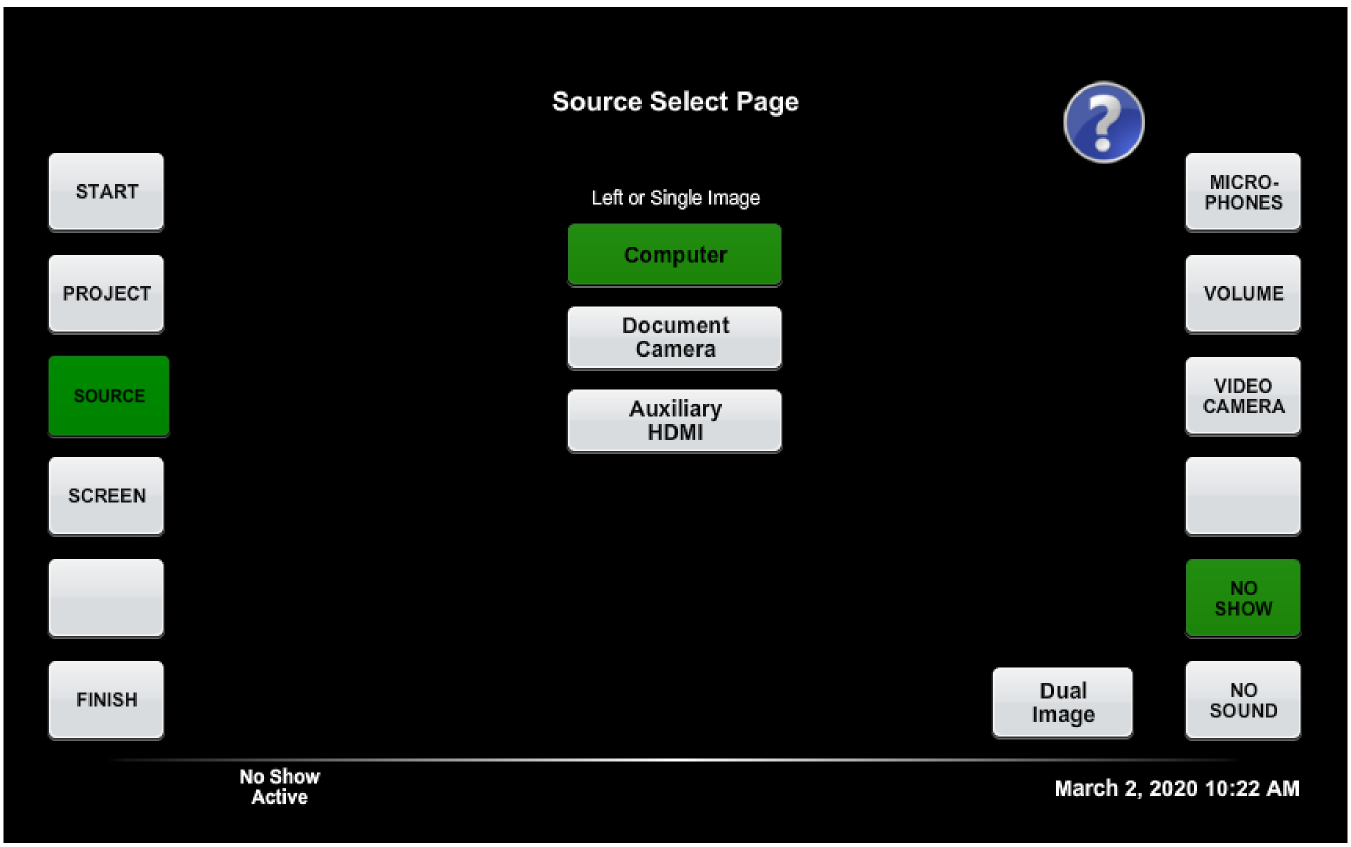
Article CTSG-019; Version 1; Last Revised 11/16/2020

Hard Buttons (CTSG-019)

1. The following “hard” buttons must be present:
    a. Start – Press to begin using the system, wakes up screen. Must be the only button that can be pressed when at the splash screen.
    b. Project – Press to lower screen and turn on the projector or display
    c. Source – Displays the list of sources available in the room
    d. Screen – Displays manual screen controls
    e. Finish – Press to turn system off
    f. Microphones – Press to select whether to use microphones if room is equipped

g. Volume – Press to change the volume of the system
h. Video Camera (formerly Record) – Press to access the Camera Control Page if room has PC-connected camera.
i. No Show – Press to temporary stop sending image to projector or display
j. No Sound – Press to temporarily mute the system. If the system is muted, press to unmute the system. Pressing the volume up or down buttons must also unmute the system.
    i. "No Sound" function must mute all audio coming from the system including any microphone currently set to "Use." All current "Use" or "Don't Use" states must be cached at this point.
    ii. When "No Sound" is turned off, all microphones should be restored to the cached "Use" or "Don't Use" state they were in prior to "No Sound" being activated.
    iii. Un-muting any source by pressing the "mute" button or changing the volume must explicitly place "No Sound" to the "not on" state. Cached states are to be overwritten the next time "No Sound" is set to "on".

2. Hard buttons must display a "feature not available" message if not applicable to the room. See "Camera Control Page" for rooms without cameras in Appendix A.
3. "Hard" buttons must show green feedback when selected. Buttons must stay green as long as panel is on that page (i.e. Volume button remains green while on Volume Control Page). No Show & No Sound must stay green while enabled as shown in the example below:



4. Pressing any hard button (or the screen itself) must wake the screen if the touch panel is in sleep mode

5. For the TSW-770/760/752/750 Touch Panel, the hard buttons must control the following functions:
   a. Power Button = Emulate the START/FINISH buttons
   b. Home Button = Emulate the SOURCE button
   c. Light Button = Title: “Lighting Control Page” Text: “Lighting control is not available in this room”
   d. Arrow Up = Main volume up. Pressing the volume up or down buttons must also unmute the system.
   e. Arrow Down = Main volume down. Pressing the volume up or down buttons must also unmute the system.

Article CTSG-020; Version 1; Last Revised 11/16/2020

Soft Buttons (CTSG-020)

Please see Appendix A

Article CTSG-021; Version 1; Last Revised 5/18/2012

Defaults on System Start (CTSG-021)

1. No Sound active during system start-up and shut down

2. Mute microphone (“Don’t Use” position), mic stays in “Don’t Use” position until toggled to “use” by client
3. MP3 muted during start up then unmutes like rest of system
4. Volume at default level (60-65 decibels when measured from the center of the room). Use the following white noise generator to test this: http://onlinetonegenerator.com/noise.html. Computer/individual device volume must be at 100% during this test if applicable. All auxiliary connections must be tested with an iPhone.
5. Podium computer must be selected as the source (or laptop if no podium computer)
6. TV must be tuned to CNN unless stated otherwise
7. All buttons (Hard and soft) must be locked out during the startup and shut down of the system.
8. Date and time in lower right hand corner must be in the following format on all pages: July 18, 2012 12:00 (make sure text box is large enough to accommodate September). Time must be synced with the network.
9. Crestron Touch Panel screen must not go to sleep or automatically adjust brightness while system is on
10. On system start-up, all flat panel displays must default to the appropriate input setting in order to display the default source (Computer) even if someone manually changes the input on the display
11. Volume knobs on the front of Crestron equipment must be disabled.
12. The Document Camera must be off when the system starts. The Document Camera and lamp must come on when the “Document Camera” source is selected.

Article CTSG-022; Version 1; Last Revised 3/17/2021

Source Page (CTSG-022)

The Source Page must be laid out in the same order as the example below (exclude any source that is not available in that room):

1. Computer
2. Laptop (VGA)
3. Document Camera
4. DVD
5. Auxiliary
6. TV
7. Auxiliary HDMI
8. Wireless Input’
9. ClearTouch (Access built-in Android OS)

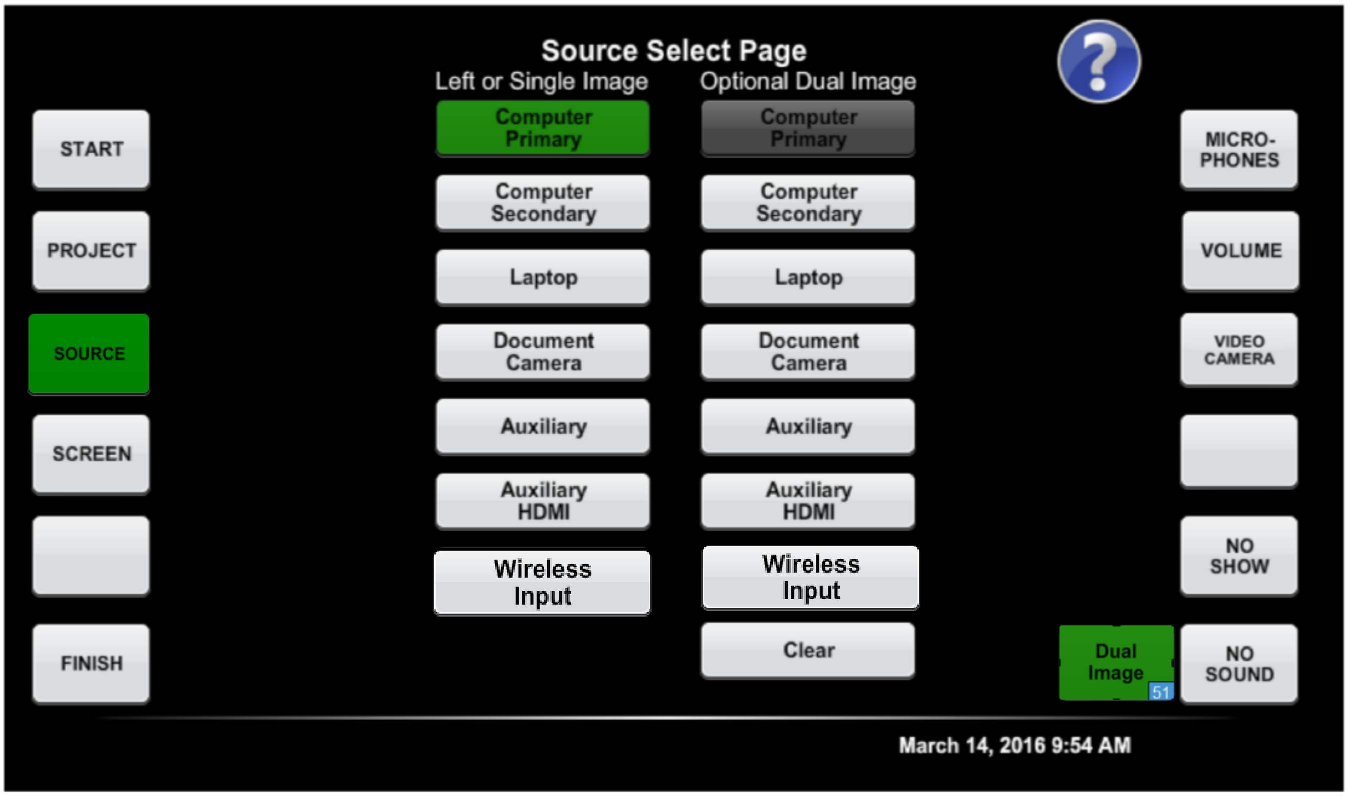
Source column headings must be as follows:

Dual Image rooms: “Left or Single Image” and “Optional Dual Image”
Rooms with two physical displays: “Display 1” and “Display 2”
Rooms with two physical projectors: “Projector 1” and “Projector 2”

If the podium computer had dual monitors, a “Secondary Monitor” Button must be placed directly below the “Computer” button to allow either image to be shown to any display in the room. There must always be an

“Auxiliary HDMI” Button separate from the “Laptop” (VGA) button. All other sources must be hidden unless present in the system including dual display options if dual image is not available. Image Adjust side button must be hidden on digital sources where no adjustments are possible (i.e. HDMI, DVI, other fully digital sources). Fully digital systems (i.e. Crestron DMPS3-4K-350-C) will not have VGA or composite video inputs and no image adjust options available on any source. Left and right image source list must mirror each other (button must be blacked out on opposite source list when selected). On rooms with single source display, “Clear” button must be removed. In rooms with ClearTouch displays, a source button must be added to access the Android OS, this must also be counted as part of the device usage report.

Left and right image must be stage left and stage right, meaning the instructor’s left and right while facing the students. (http://plays.about.com/od/basics/ss/stageright.htm)



Article CTSG-023; Version 1; Last Revised 1/06/2021

Security

Locks (CTSG-023)

1. Compartment with AV rack must lock separately from computer compartment
2. Computer compartment must not be lockable (unless absolutely needed to be secured)
3. AV rack lock must be a non-electronic combo lock (no-batteries)
4. Core drilling must be used for new buildings, otherwise locking wall plates/receptacles must be used

a. OTS has identified the following model to use with AV wall plates that contain DM, Control, and Speaker cable connections:

b. The wall box must be labeled “Specialty Ports Do Not Disconnect”

SKU	DESCRIPTION
AI-DBP2	Arlington Industries Medium-Sized, Vertical Mount Dri-Box Adapter w/ Non-Metallic Dual Gang Base- White

c. Red Crestron network cables must be secured to the networking wall ports using this model of lock:

SKU	DESCRIPTION
PAN-PSL-DCPL-RD	Panduit-"Package of 10" Flush Mount RJ45 Plug Lock-in Devices and One Installation/Removal Tool

Article CTSG-024; Version 1; Last Revised 10/22/2019

Sonic Shock (CTSG-024)

1. Sonic Shock alarms must be attached to the following equipment items, unless otherwise specified in a statement of work: projectors, large screen displays, and all podium equipment (document cameras, media players, Crestron processors). For equipment located on or inside a podium a single Sonic Shock alarm must be used and the cable looped through the applicable items.
2. The Sonic Shock must be mounted in document camera drawer (if equipped).
3. DVD/Blu-ray need not be alarmed IF it is rack mounted with security screws.
4. Sonic Shocks must be attached to SMART podiums and all-in-one PCs/Macs.
5. If there is a reason to locate the Sonic Shock elsewhere (e.g. not in the drawer), an exception must be requested through TU.
6. Sonic Shock Stickers must be affixed to projector.
7. Sonic Shock keys must all be keyed to the TU master.

Article CTSG-025; Version 1; Last Revised 11/16/2020

Classroom (CTSG-025)

1. It is recommended that swipe Locks must be installed on main classroom entrance
2. All keys (i.e. podium) must be turned over to Manager of Classroom Technology.
3. It is recommended that classrooms that feature computer labs or other expensive equipment have an alarm that requires a code for access.

Article CTSG-026; Version 1; Last Revised 10/16/2019

AV Rack (CTSG-026)

1. Use security screws to rack-mount equipment
2. Racks that are outside of podiums must have their own keyed locks
3. All rack equipment that is capable of having a password must have one (Crestron controllers, routers, etc.)

Article CTSG-027; Version 1; Last Revised 10/22/2019

Networking

Crestron Network Cables (CTSG-027)

All Crestron processors must be connected to network ports using RED network cables. This will help quickly identify which cable runs to the Crestron for installation and troubleshooting purposes.

Article CTSG-028; Version 1; Last Revised 6/1/2012

Information Needed (CTSG-028)

1. Please see Crestron Worksheet for information needed to add Crestron equipment on the TU Network: [Crestron Worksheet]

2. Once a port is configured the red Crestron network cable must remain plugged into the same port and port must be labeled with a "C".

3. All Crestron processors must have the following DNS servers entered in settings: 10.20.1.5 and 10.20.1.6

Article CTSG-029; Version 1; Last Revised 10/22/2019

Routers/Switches (CTSG-029)

1. Any switches being used in the podium must first be approved by Towson University's network group.

2. Items such as computers and Crestron equipment cannot be plugged into the same switch since they use different VLANs. Only one VLAN can be assigned to a switch/router so all devices must match this VLAN.

3. Red network cables must be used to connect the router/switch to the wall port if a Crestron device is connected to the router/switch.

4. Routers/Switches must not be plugged into any other port besides the one that was specifically configured for it or it could pose a security threat to the TU network.

Article CTSG-030; Version 1; Last Revised 10/22/2019

VLAN (CTSG-030)

1. All Crestron processors must be on VLAN 541
2. All video conference equipment (i.e. Cisco C40) and Digital Signage must be on VLAN 540
3. All Wireless Input devices must be on VLAN 539
4. All scheduling panels must be on VLAN 542
5. All Computers and Cable Cubby network ports must be on the Learning Spaces VLAN.
6. All devices must follow standard host name scheme.

Article CTSG-031; Version 1; Last Revised 3/13/2020

Wall Ports (CTSG-031)

1. All Network ports must be installed with locking wall plates so that cables cannot be unplugged

2. All DM cables that have RJ-45 style connectors must also have locking wall plates so that cables cannot be unplugged

Article CTSG-032; Version 1; Last Revised 11/16/2020

Crestron Fusion RV (CTSG-032)

1. All Crestron systems must be connected to Crestron Fusion RV

2. All Crestron systems must have an Xpanel loaded on the Crestron Fusion RV server

3. All Crestron systems must have the "device usage" module loaded to report on all sources listed in the source column on the Crestron touch panel and "dual image" functionality.

Article CTSG-033; Version 1; Last Revised 12/10/2020

Crestron Code (CTSG-033)

1. The latest version of the un-compiled Crestron processor and touch panel code must be uploaded to the Crestron code share (\\customshare\cclt$) every time a change to the system is made following the guidelines outlined in the instruction document located on the share.

2. A wiring diagram must be uploaded to the Crestron code share (\\customshare\cclt$) every time a change to the system is made.

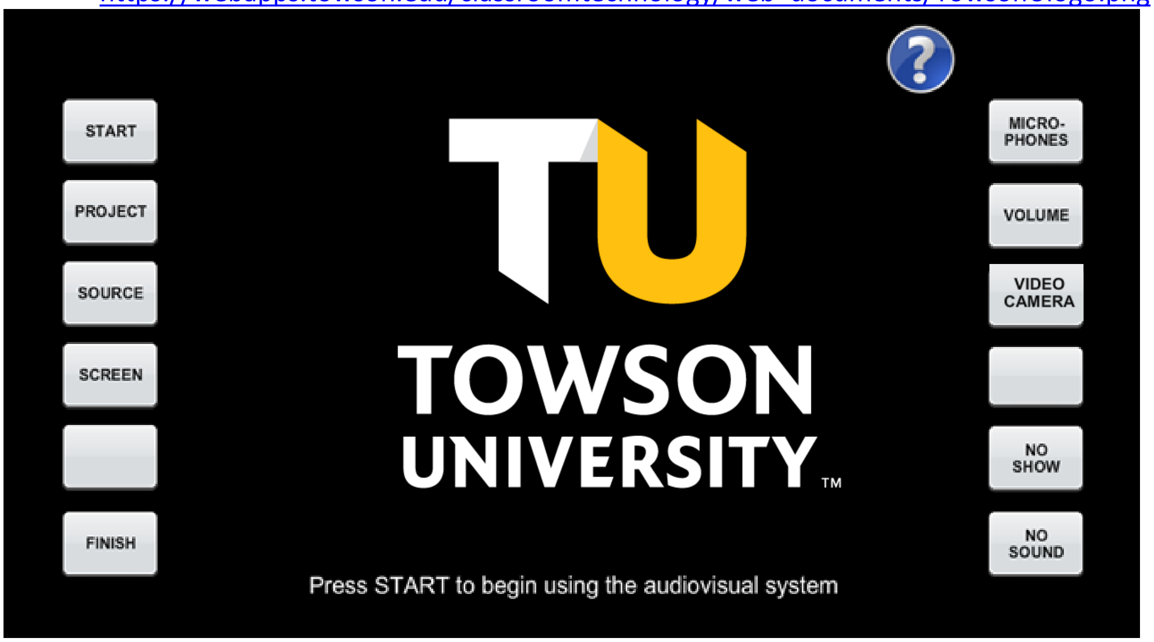
3. All serial numbers must be uploaded to the Serial Number SharePoint site: https://tu.sharepoint.com/sites/cclt/Lists/Towson%20University%20Serial%20Number%20Spreadsheet/AllItems.aspx

Appendix A

Crestron Touch Panel: Soft Buttons TSW-770/760/750/752 (CTSG-034)

1. Splash Screen

   Logo must point to live web graphic located here, logo must be immediately visible and be set to refresh at least once a day in the event of a logo change:
   https://webapps.towson.edu/classroomtechnology/web_documents/TowsonUlogo.png

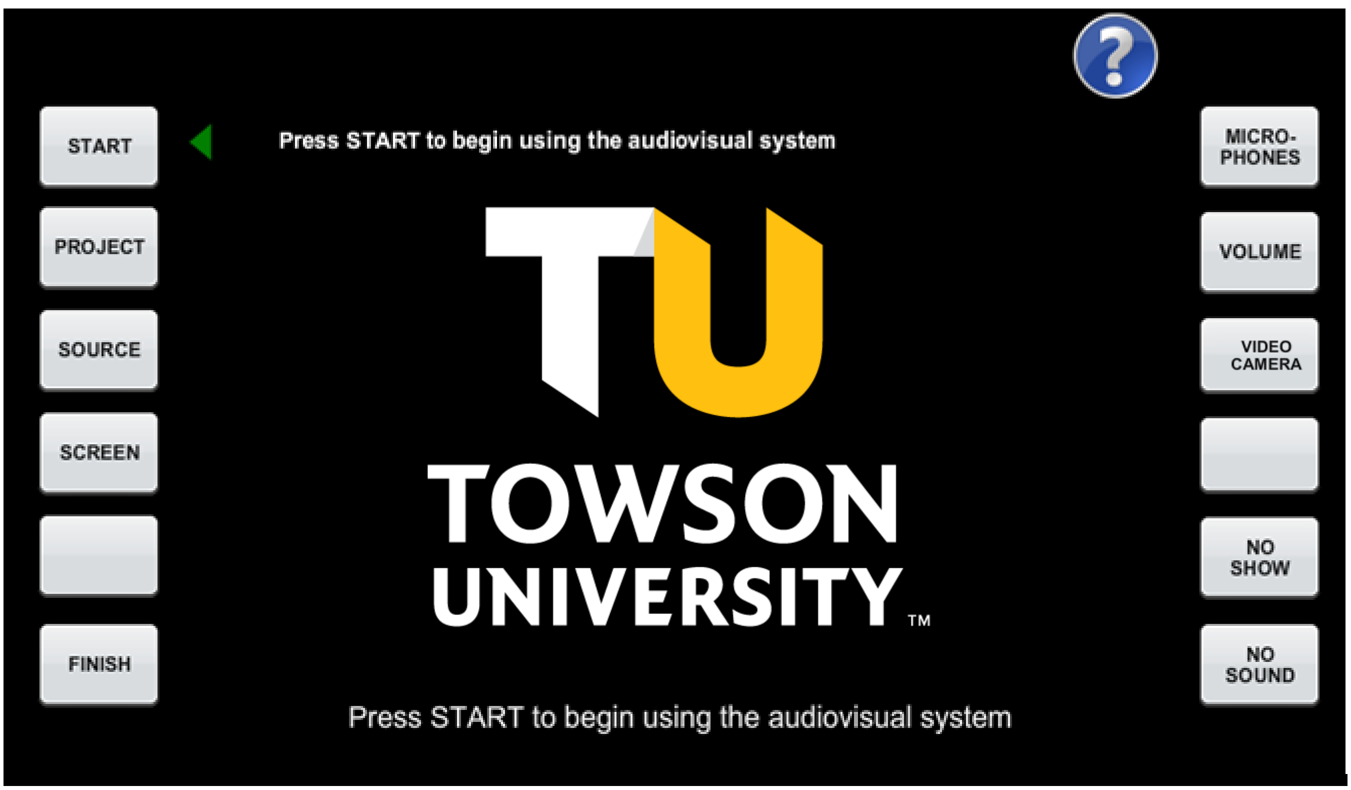


2. Help Screen

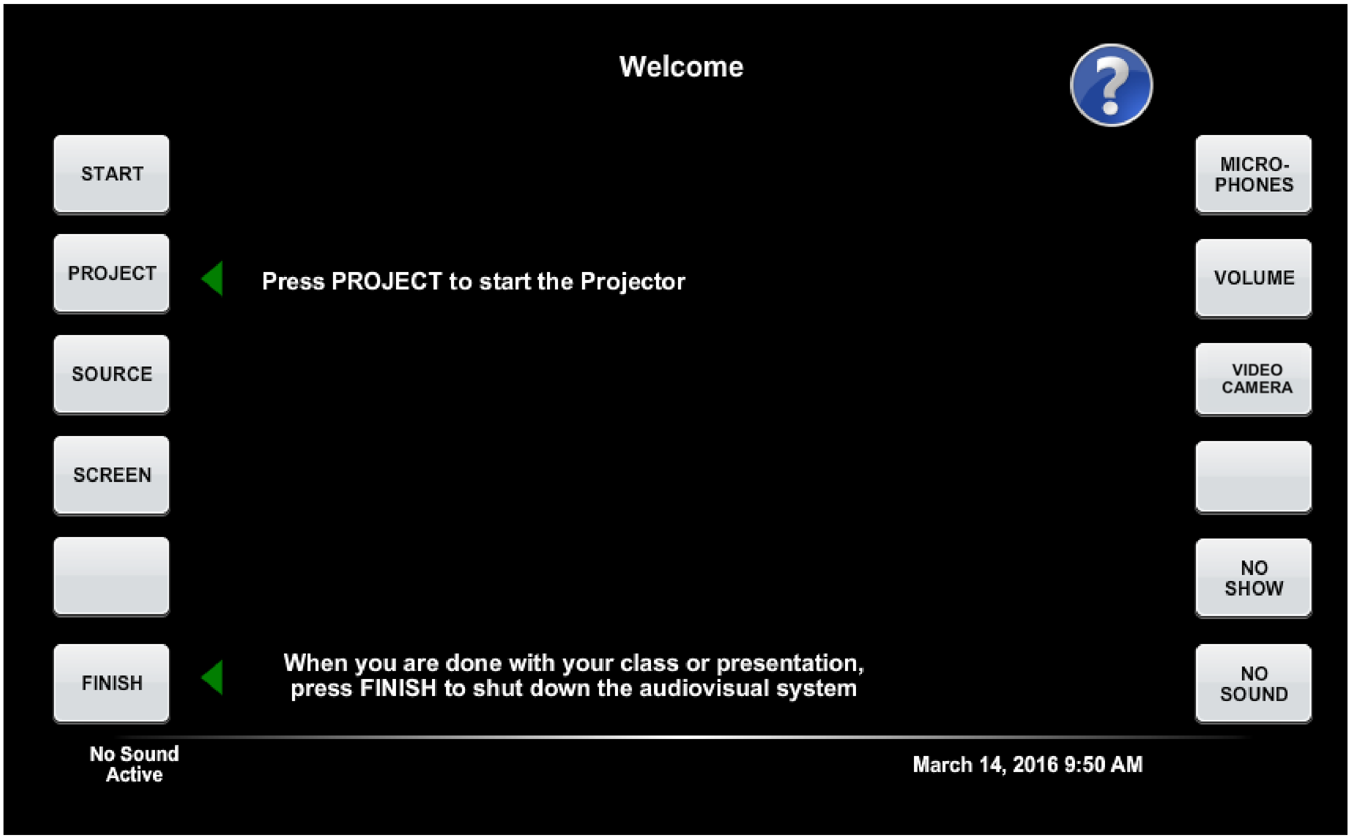
   This page is displayed when the Help (?) button is pressed.

3. Wrong Button Screen

   If button other than "START" is pressed this screen must appear. The arrow/message must disappear 10 seconds later if no further action is taken.

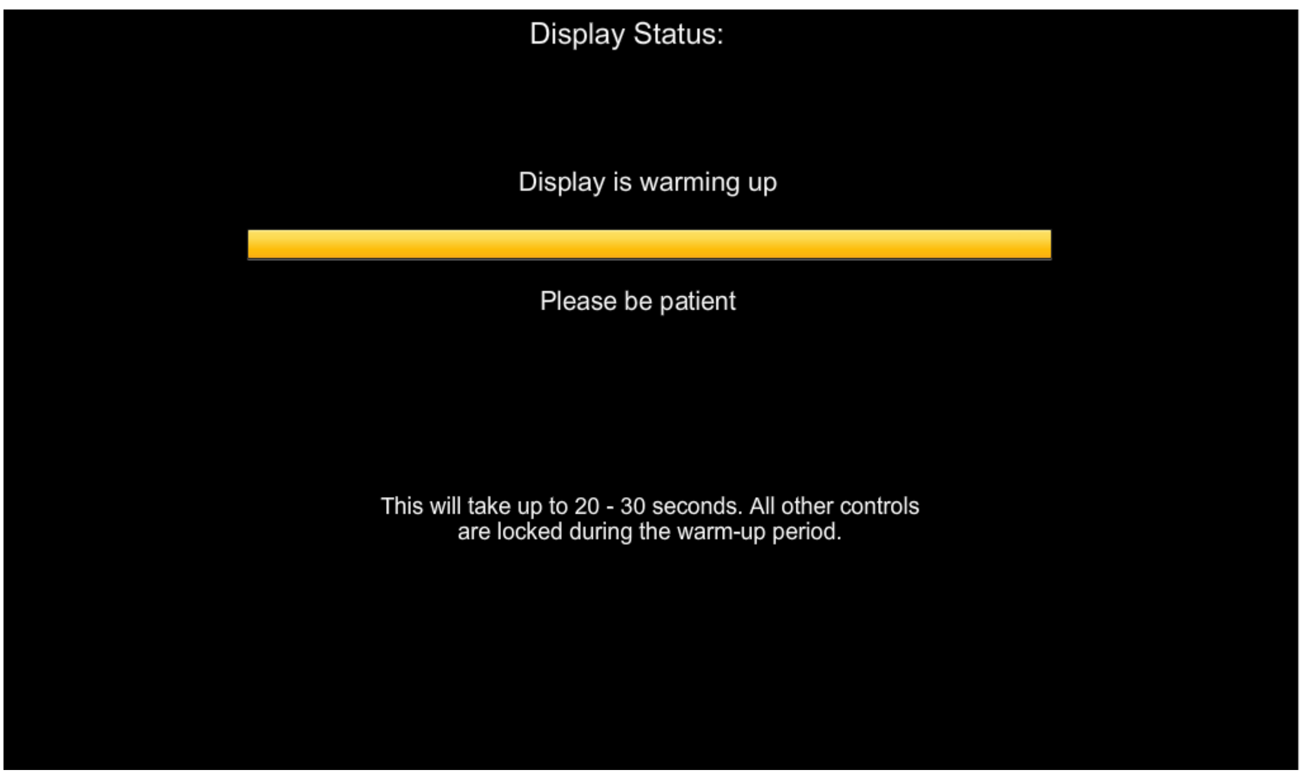


4. Welcome screen
   If the START button is pressed and the user does not press PROJECT to continue with startup it must return to the splash screen in 30 seconds.



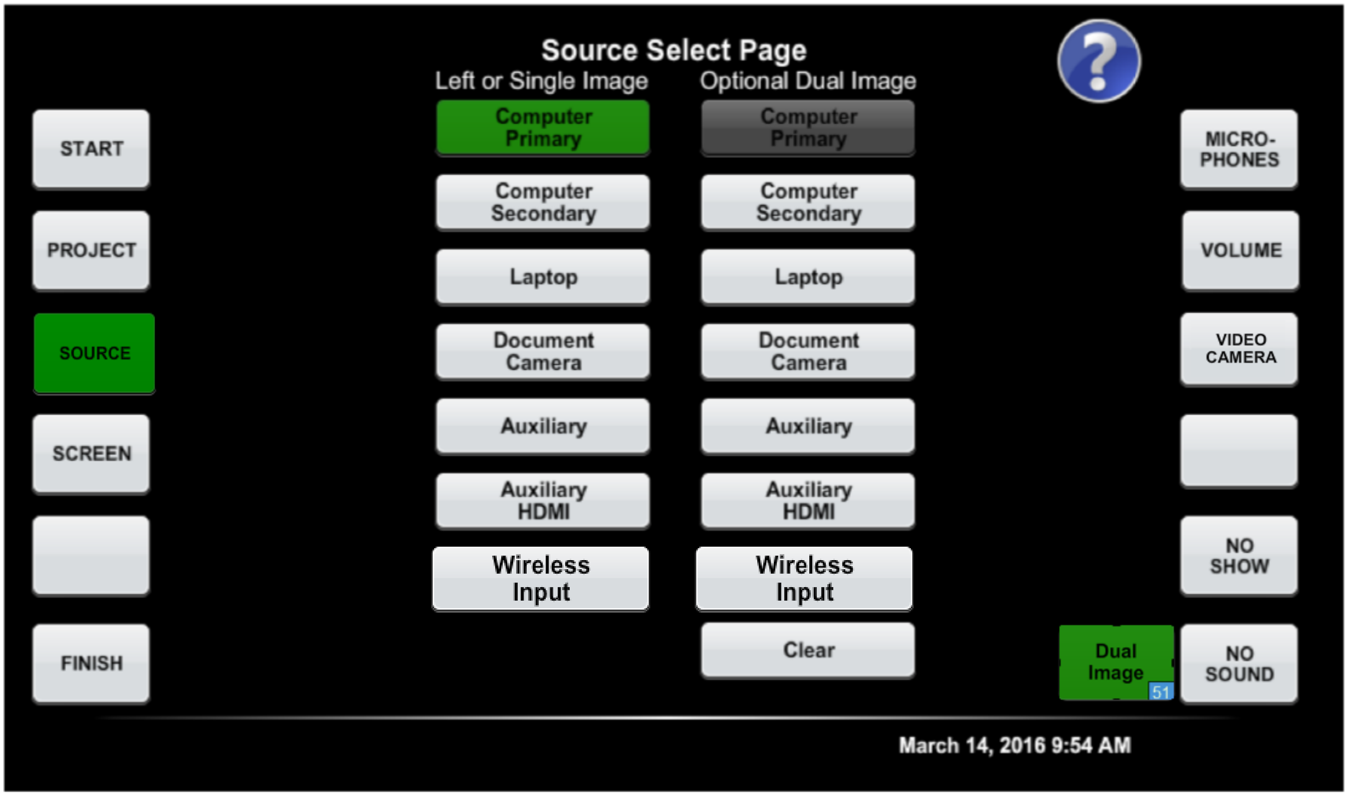
5. Display Status

Status bar must be adjusted to go as quickly as possible on a projector by projector basis depending on startup time

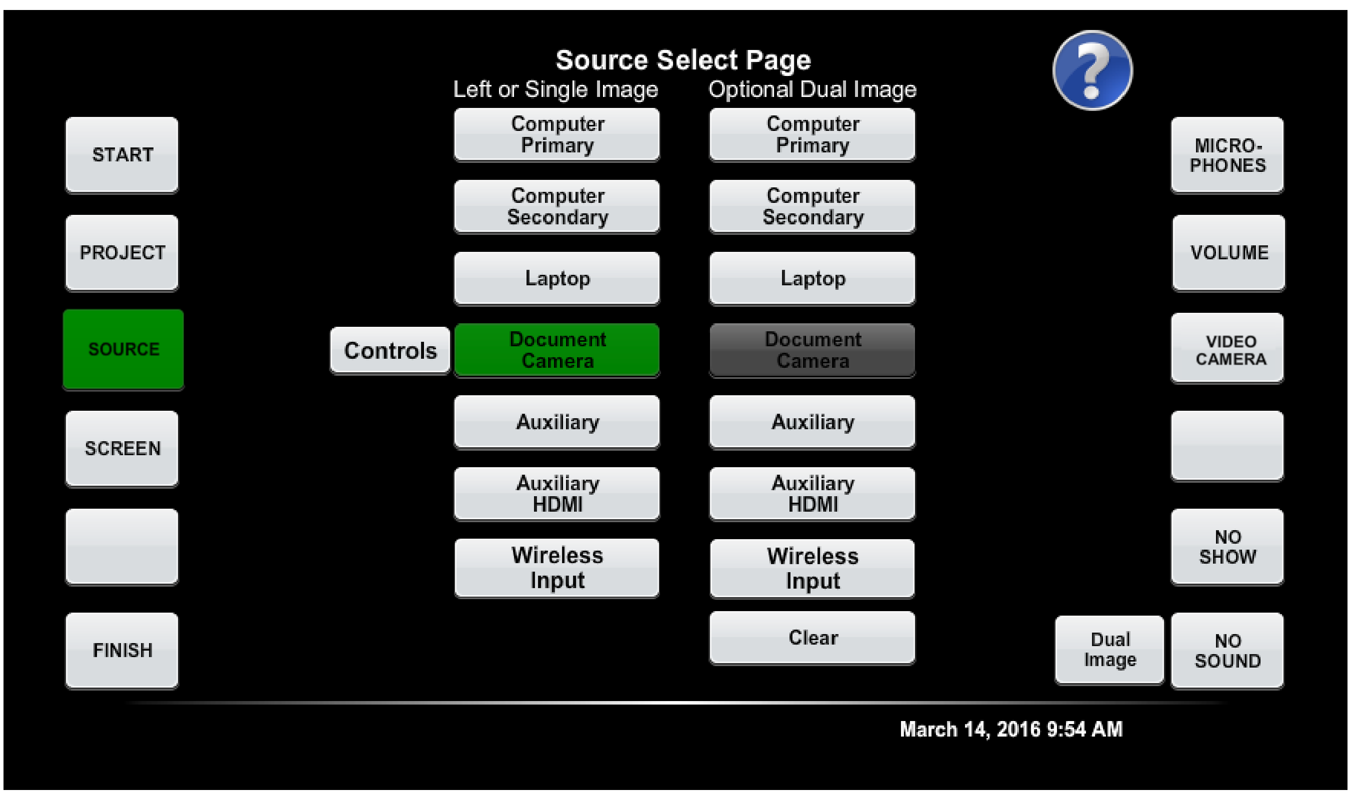


6. Source Select Page

Source Select Page w/ Dual Image Enabled

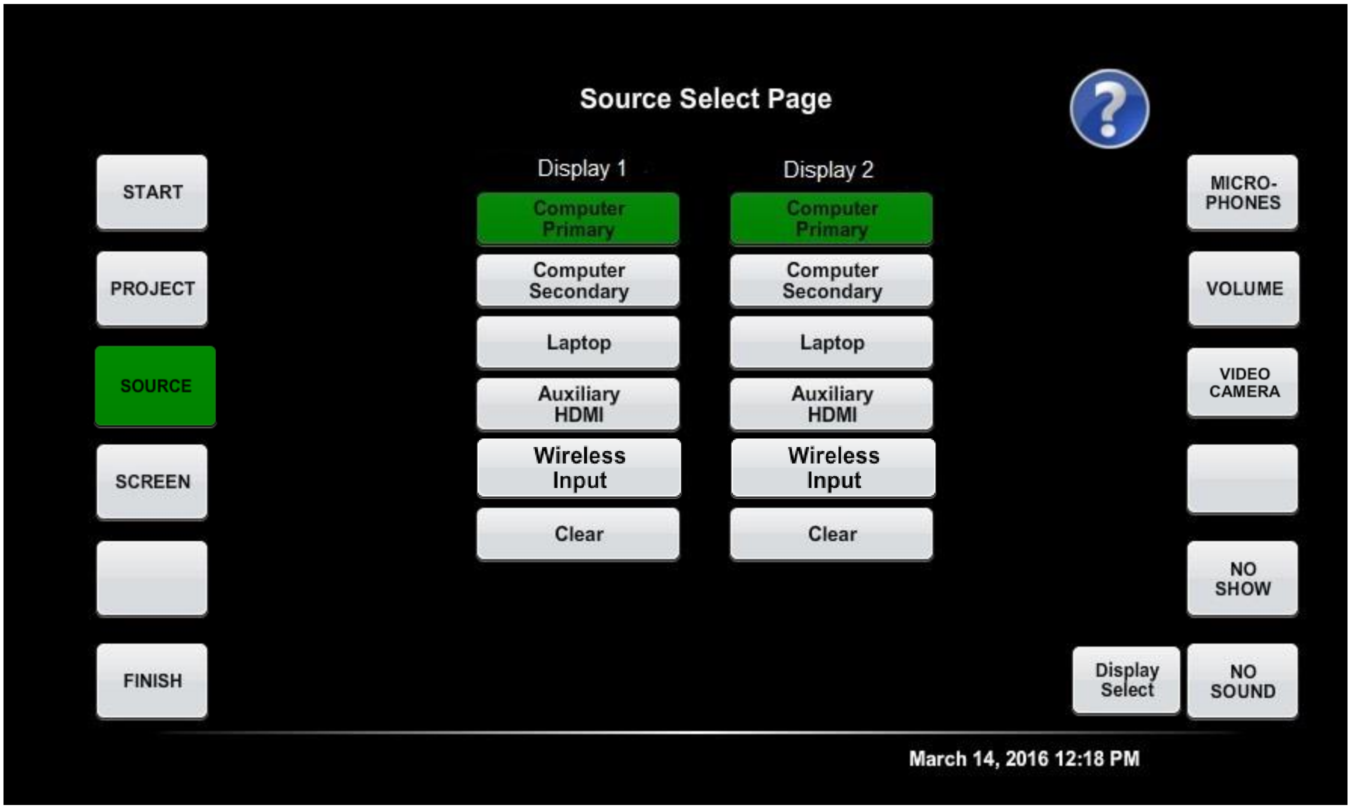


7. Control fly out



8. Source Select page for rooms with two displays. If a room has two “main” displays, the display to the audience’s left (stage right) is “Display 1” and the display to the audience’s right (stage left) is “Display 2”

“Computer Secondary” displays the second monitor of an instructor computer that has a dual monitor setup

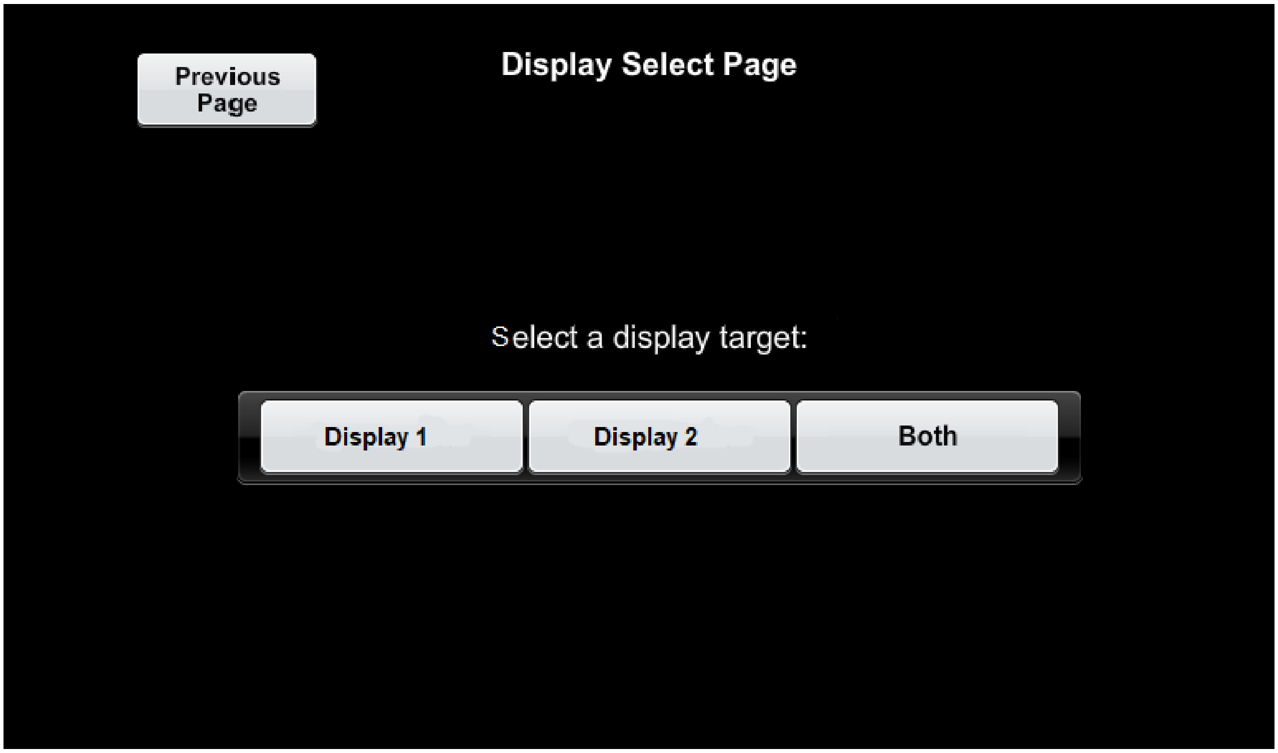


9. Display Select Page

   Appears when pressing START>PROJECT or “Display Select” on the source page

   Buttons should be labeled as follows

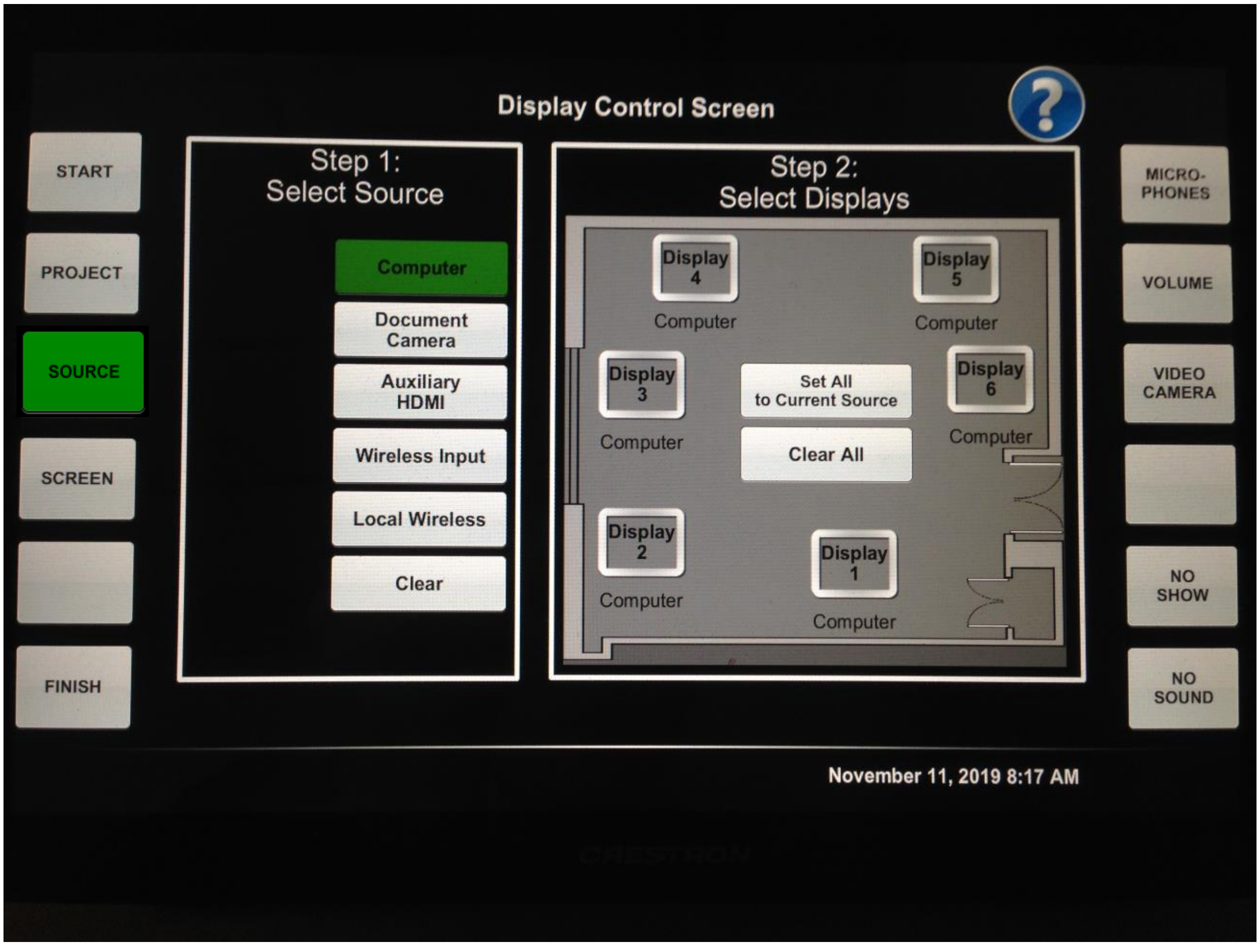
   a. Flat Panel - "Display"
   b. Projector - "Projector"
   c. ClearTouch or other interactive panel = "Interactive Display"
   d. If there is more than one of the same kind they should be labeled "1" and "2"



10. Display Control Screen

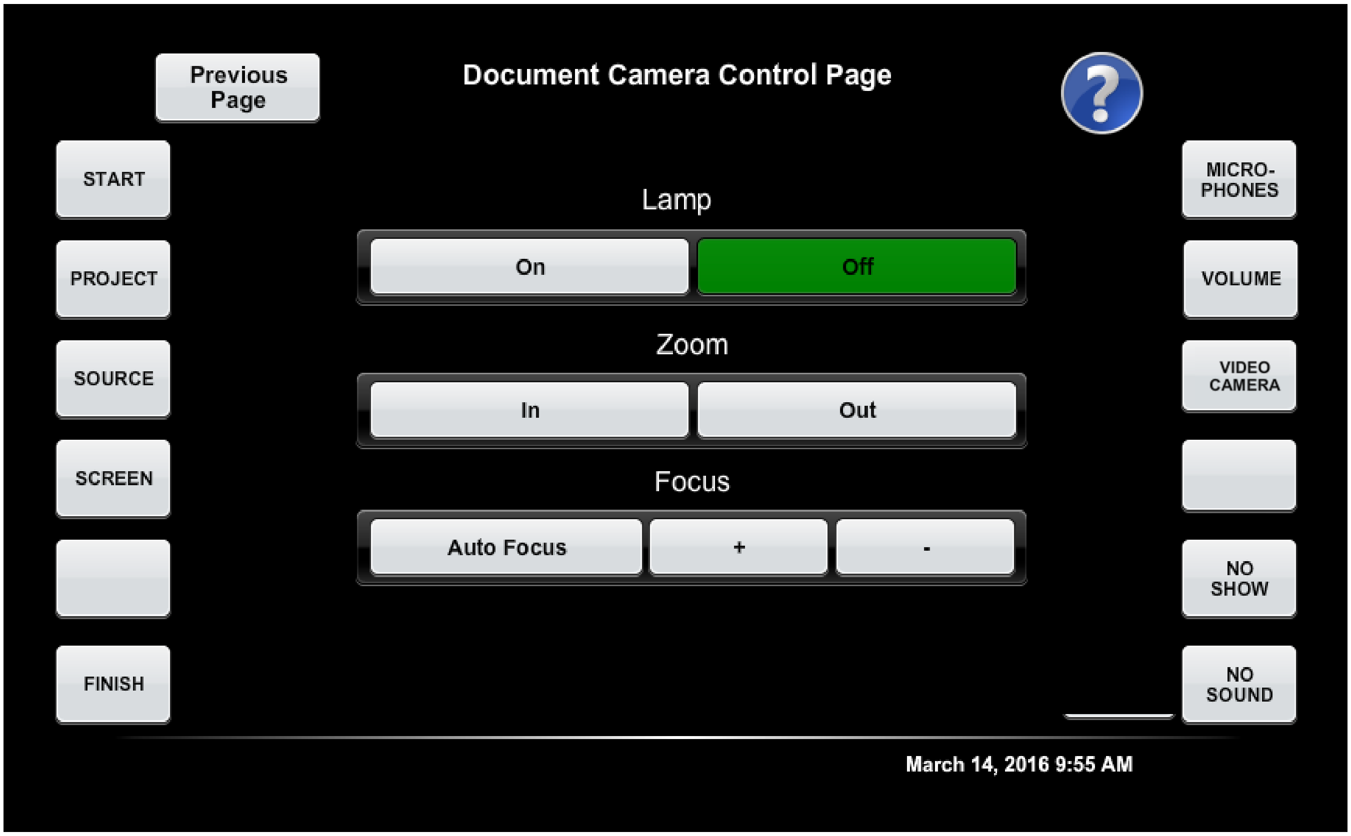
    (This replaces the normal source select page for rooms with three or more displays)

    a. Background graphic must be customized to match the layout of the room
    b. Display icons must be located on the layout to match their actual location in the room
    c. Displays must be labeled by number in a clockwise pattern starting with the "main" Display 1
    d. Display 1 must be the default display on system start up (Display 1 must be on and display "Computer")
    e. The current source must be displayed below the display icon (The text "Off" must be displayed if no source is routed)
    f. Any sources must be routable to any display
    g. Source must not change until a display icon or "Set All" button is pressed
    h. The "No Show" button must put all displays into "No Show" (sometimes called AV Mute or "Eco") mode (black screen) and return them to the last active source when pressed again. It must not turn them off.
    i. When a display is cleared through the "Clear" button, the display must switch to AV Mute mode so it has a black screen and displays the "Off" text below the display icon since no source is routed. If display is not capable of this, it must turn off.

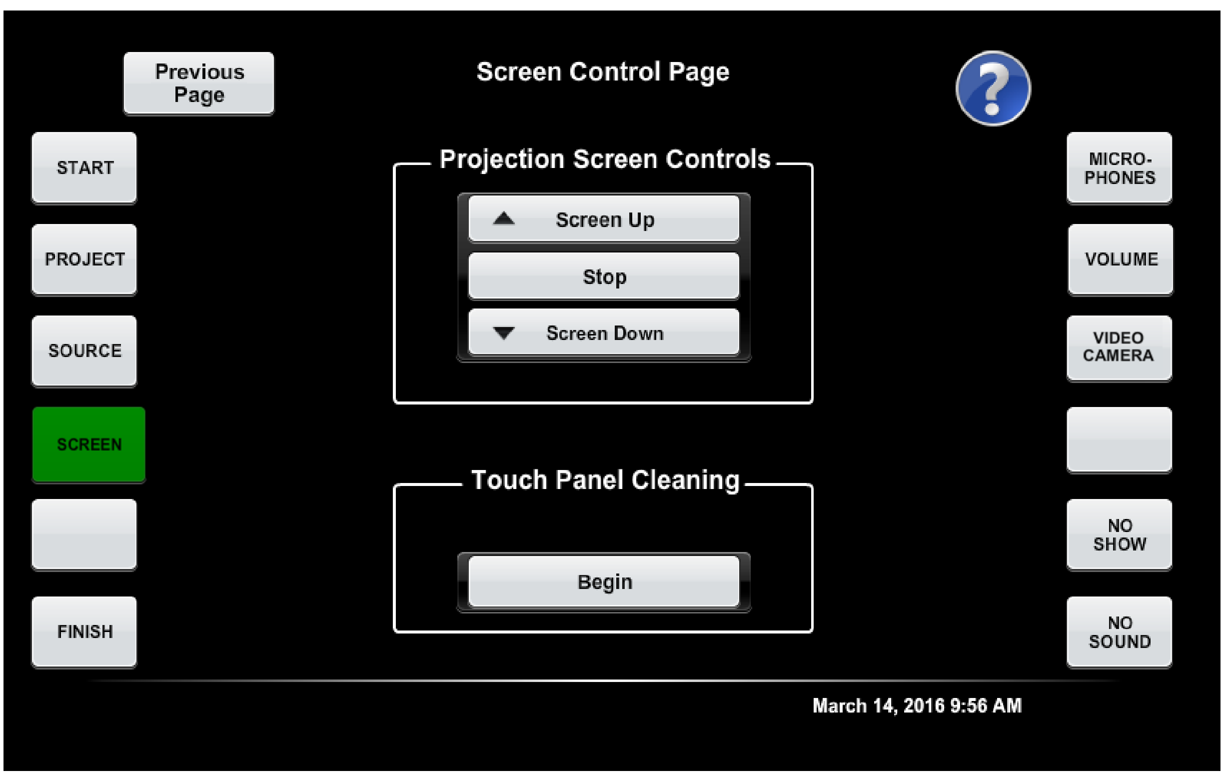


11. Document Camera controls

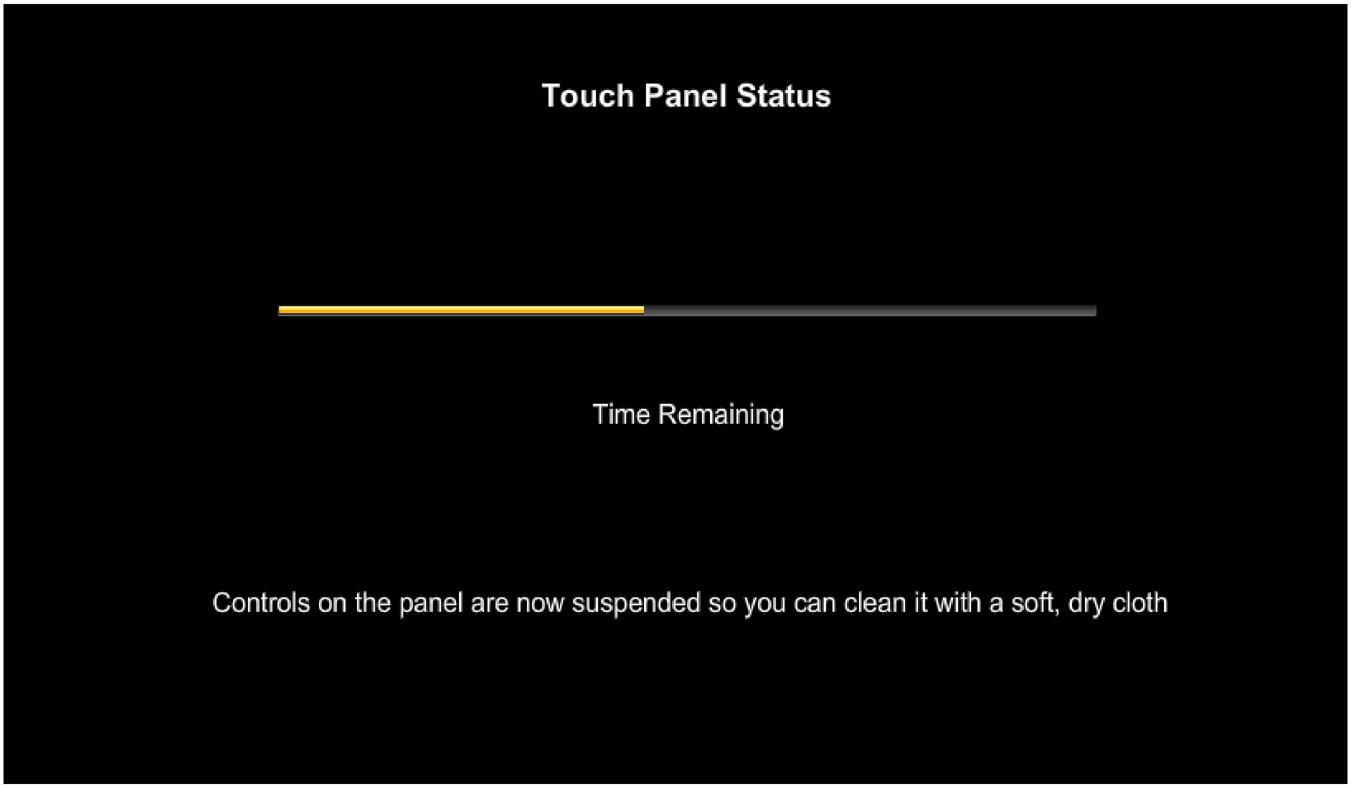
    Where focus is not manually adjustable, the +/- buttons should be left out and the "auto focus' button centered



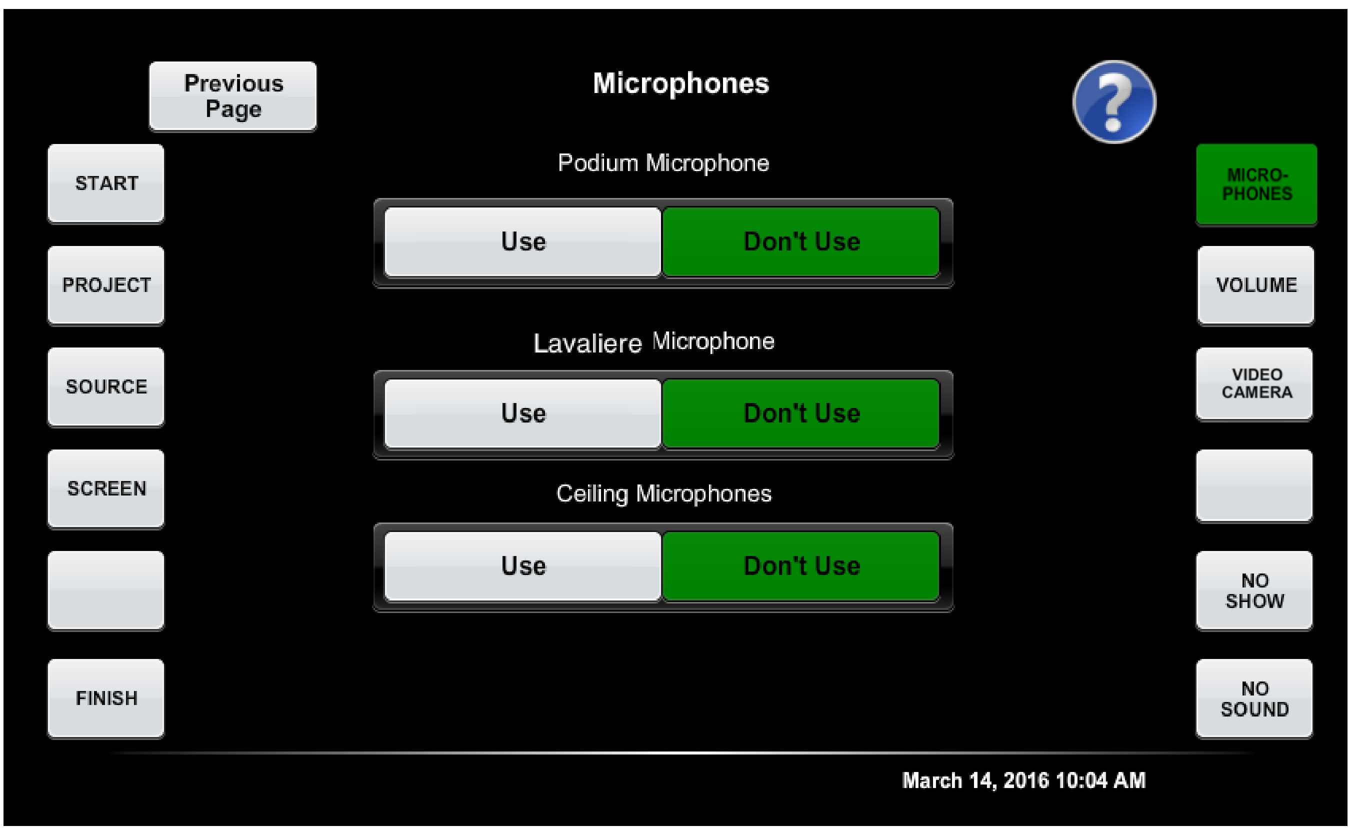
12. Screen Control page
    a. Buttons must turn green when depressed for feedback. All must return to their normal white color when not being pressed.
    b. In rooms without electric screens, only the "Touch Panel Cleaning" section is available.
    c. Begin Button must be press and held for 3 second before initiating



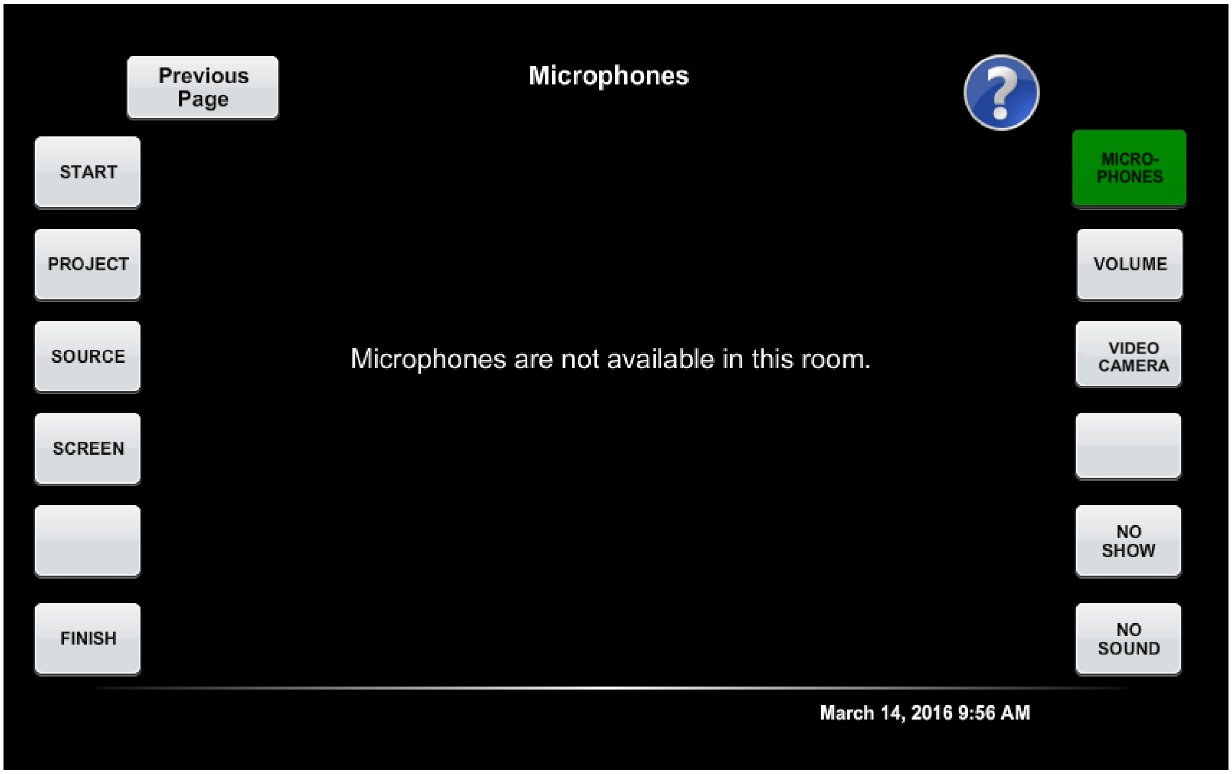
13. Touch Panel Cleaning page
    Starts status bar and locks out all buttons



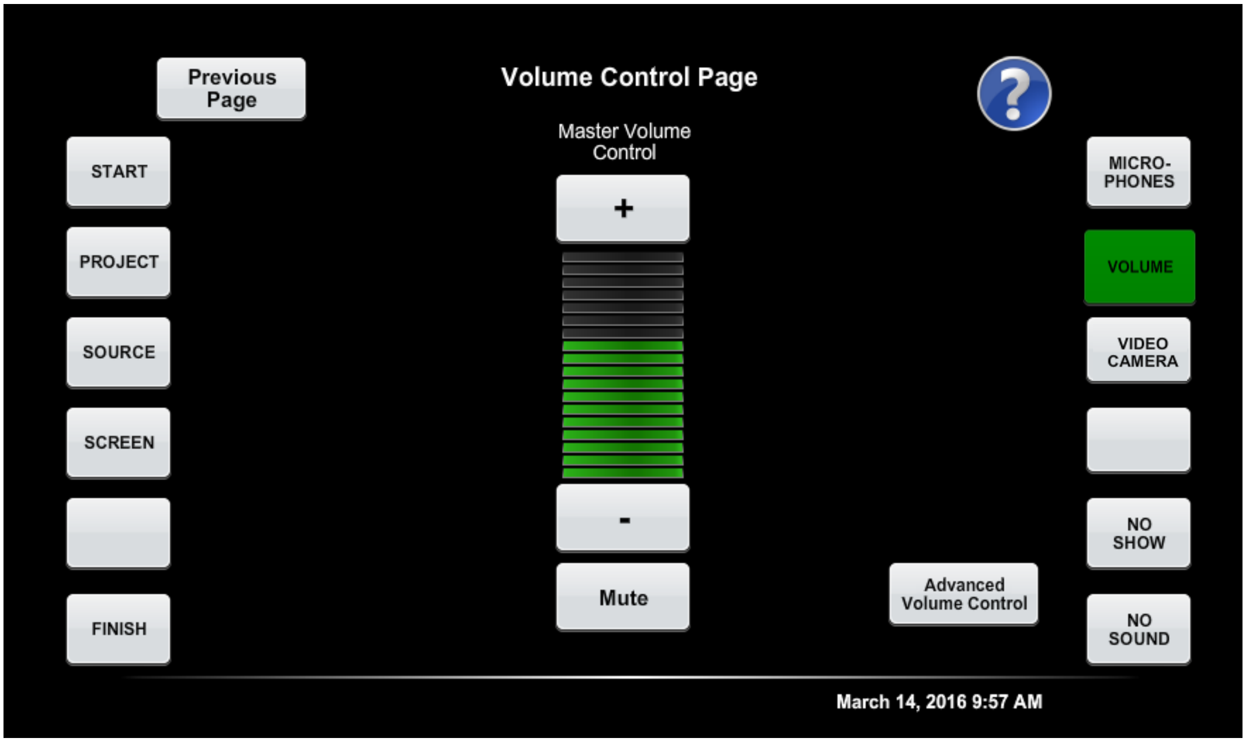
14. Microphones page
    (must add set of identical buttons titled “Handheld Microphone” if one is present in the room)



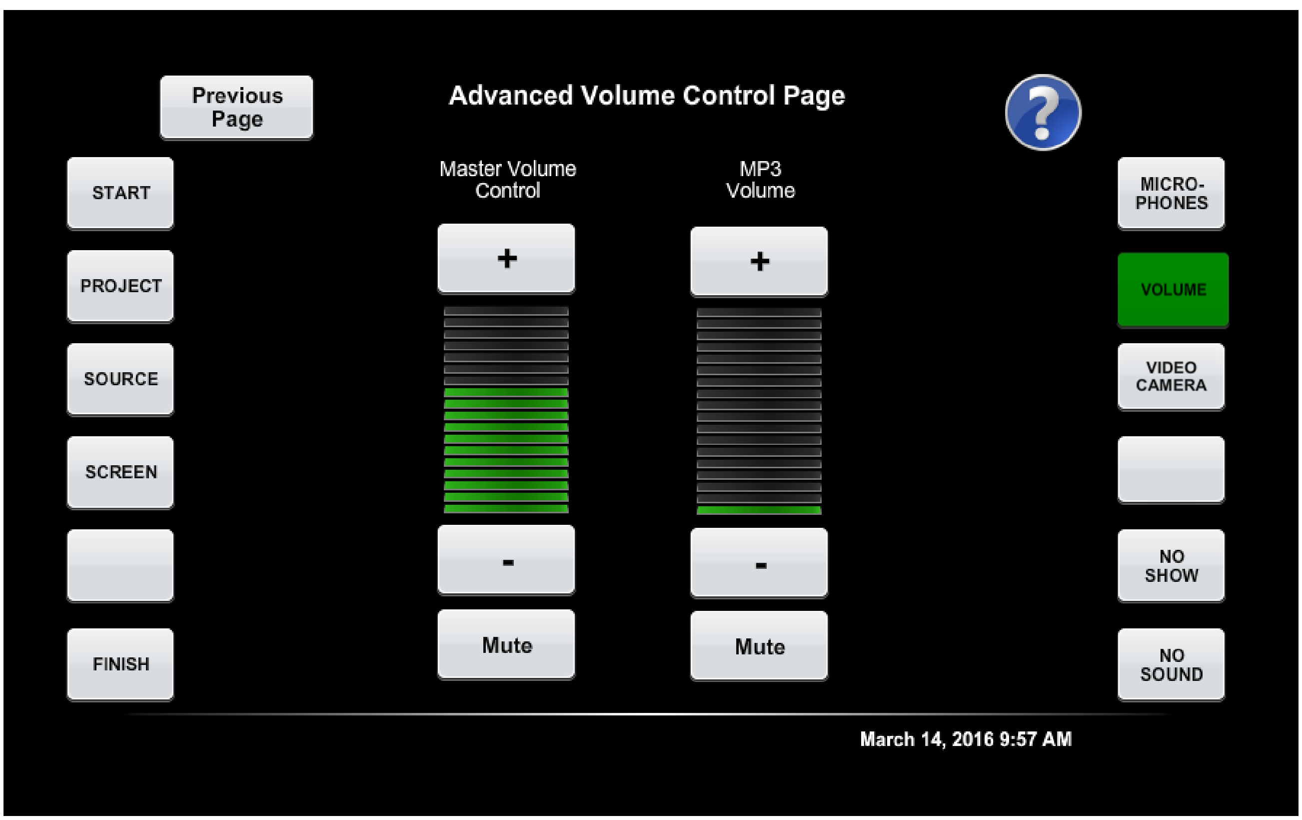
15. Microphones page in room without mics
    (If no Microphones are installed, page must read: "Microphones are not available in this room". If non-controllable microphones are installed, page must read “Microphone control is not available in this room")



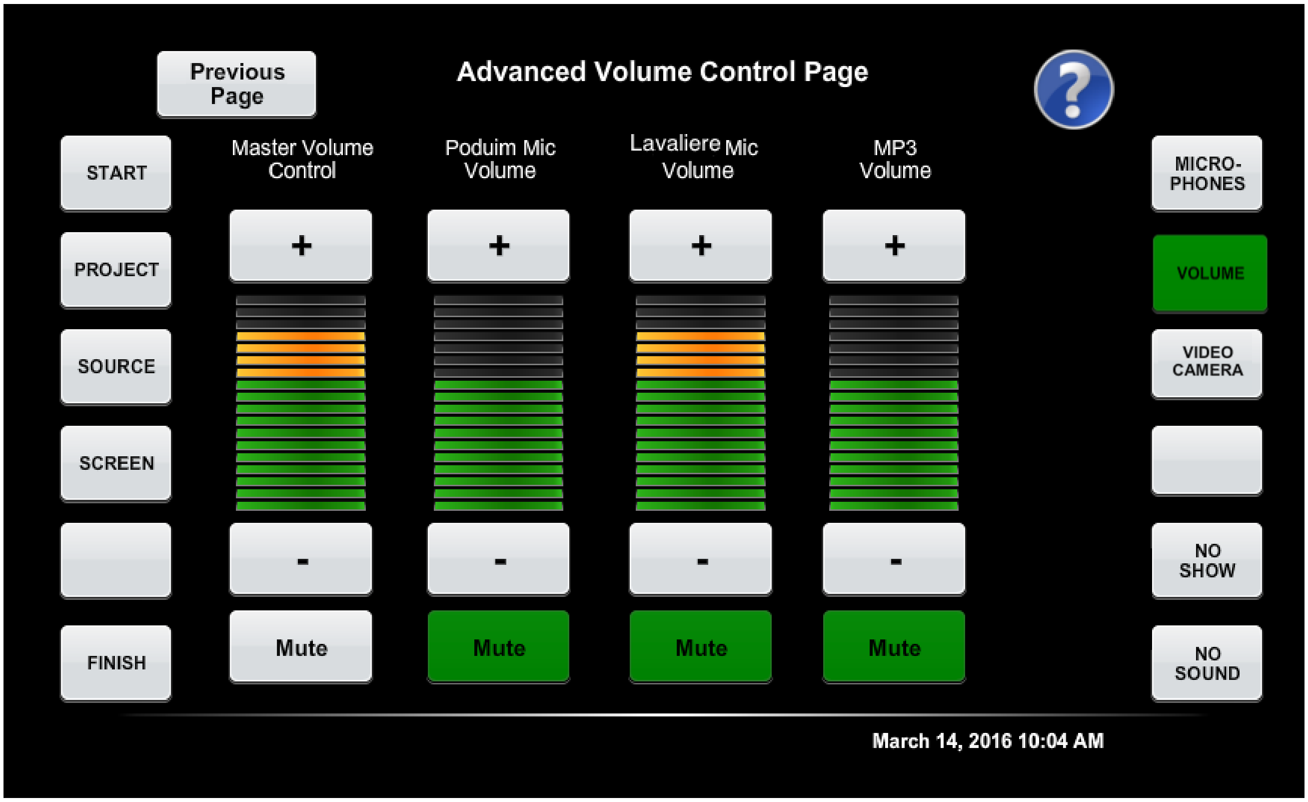
16. Volume page
    (when raising the volume the color must go from green to yellow to red). Pressing the volume up or down buttons must also unmute the system. Master Volume must audibly raise and lower the volume level of all sources including MP3 but it will not affect the fader. The Master mute button must mute all sound including MP3.



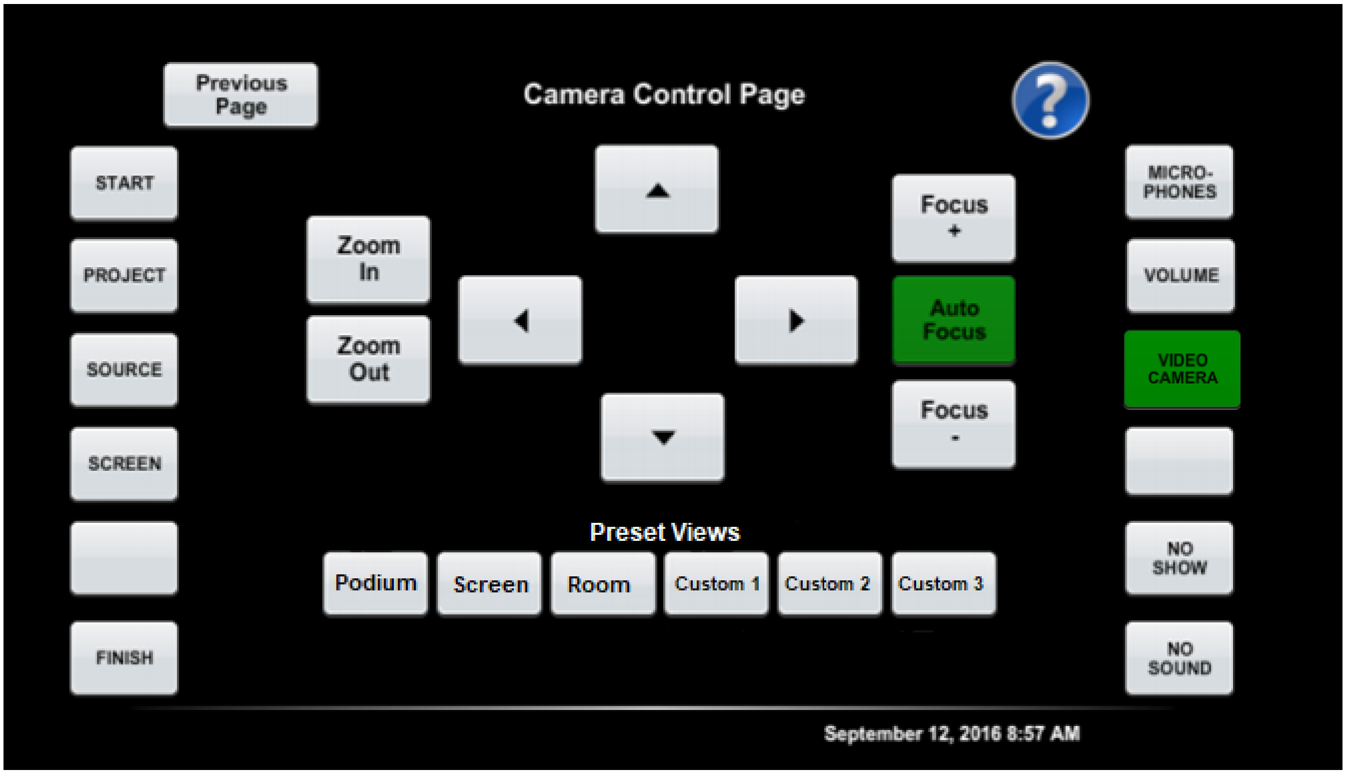
17. Advanced Volume Control page
    (when raising the volume the color must go from green to yellow to red). Pressing the volume up or down buttons must also unmute the system. Master Volume must audibly raise and lower the volume level of all sources including MP3 but it will not affect the fader. Master mute button must mute all sources including MP3.



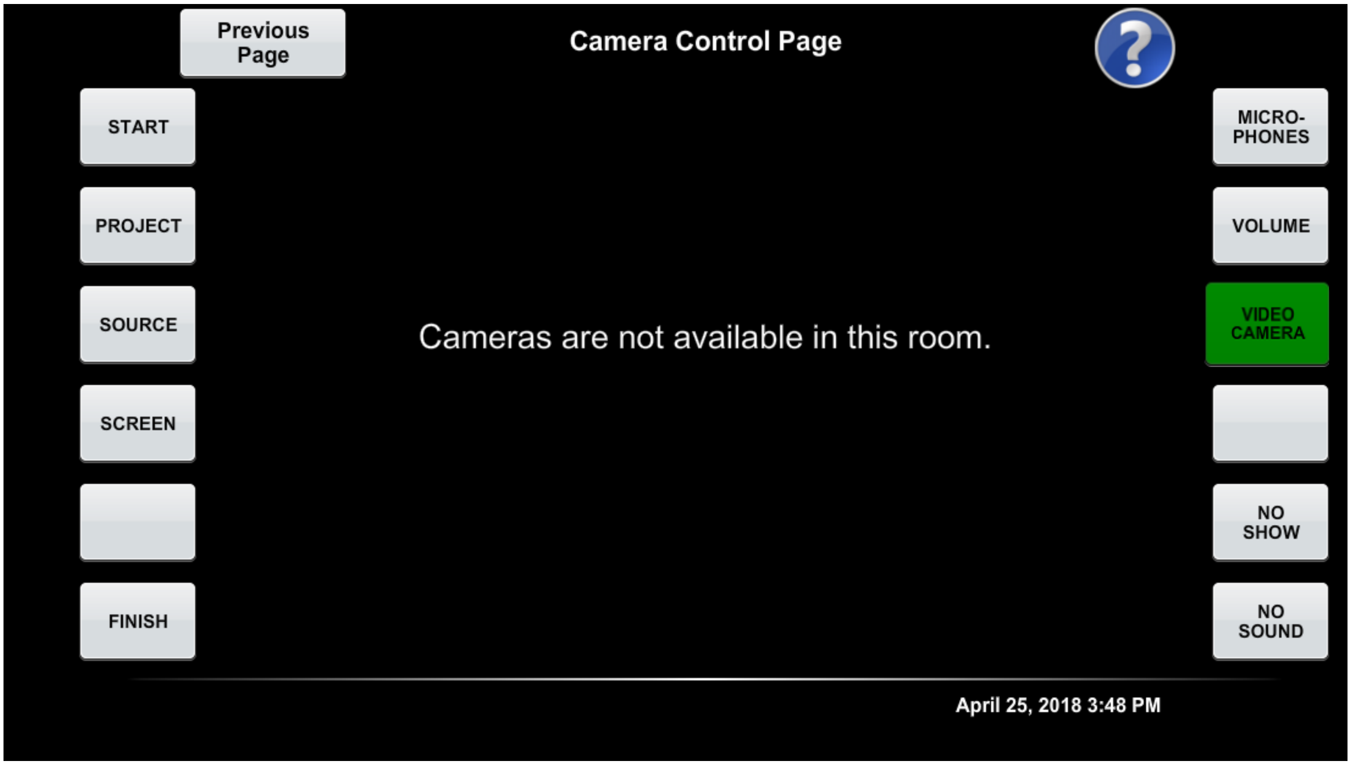
18. Advanced Volume Control page in room with microphones



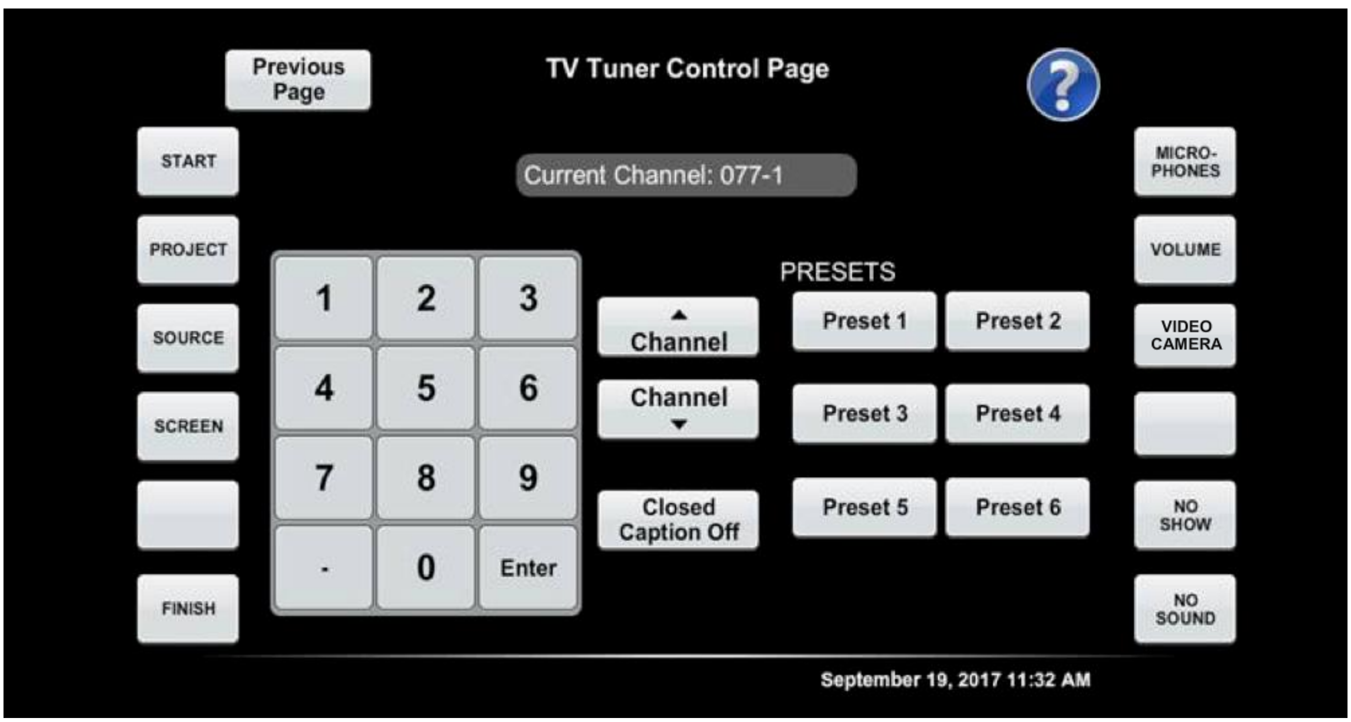
19. Video Camera (formerly Record) Page
    a. Presets 1-3 must be set to the following positions and must remain static even if the system is restarted, these are programmed by holding down the button for 15 seconds to save the current camera position.
        i. Preset 1 (Podium): Zoomed in view of instructor at podium
        ii. Preset 2 (Screen): Zoomed in view of projection screen/whiteboard/main display area
        iii. Preset 3 (Room): Zoomed out view of entire room
    b. Presets 4-6 (Custom 1-3) must remain static even if the system is restarted, these are programmed by holding down the button for 15 seconds to save the current camera position.
    c. Rooms with multiple cameras must be labeled by number in a clockwise pattern starting with the camera at the front of the room mounted closest to the instructor podium (Camera 1). This naming scheme must also be used on the configuration page of each camera so the computer USB will recognize it under the same name.



20. Video Camera (formerly Record) page in room without camera

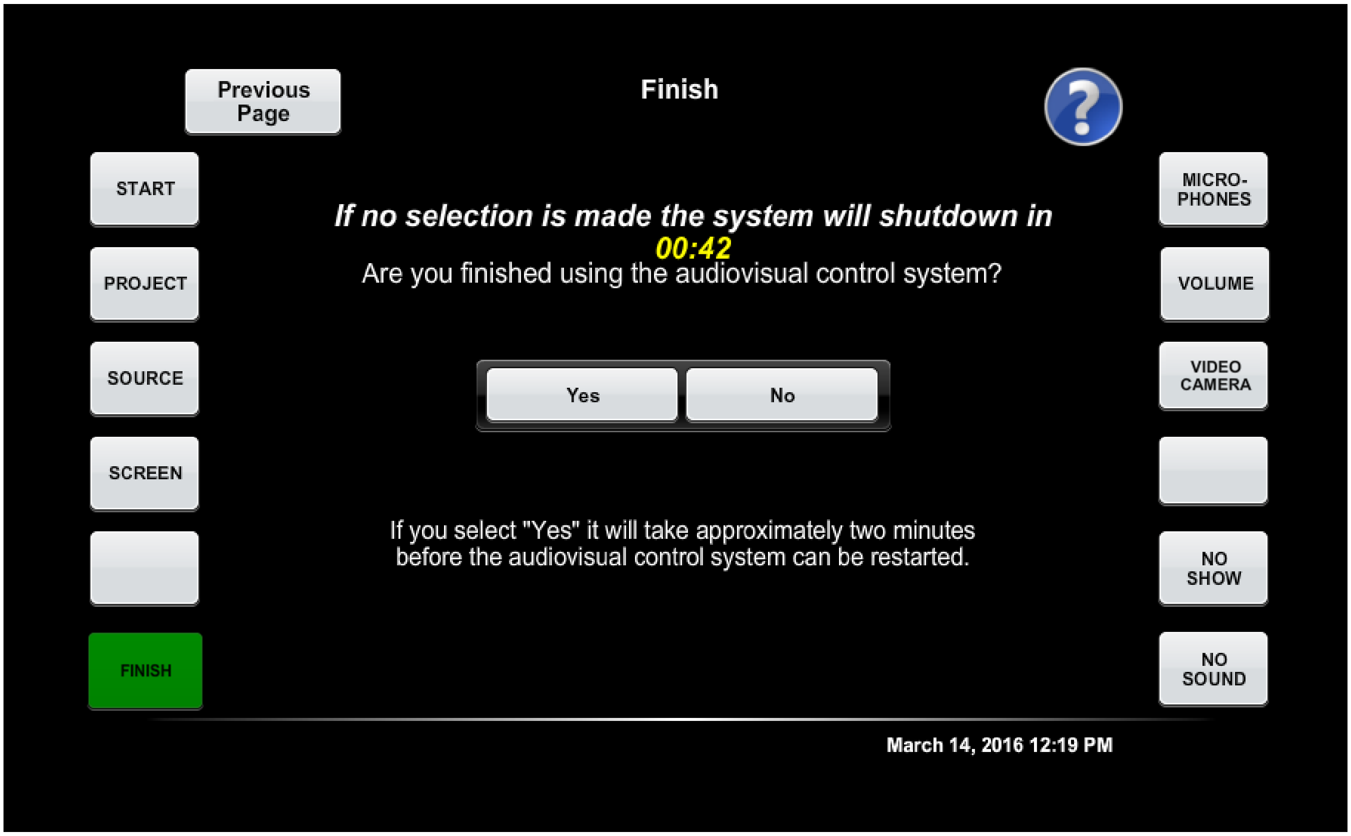


21. TV Control Page

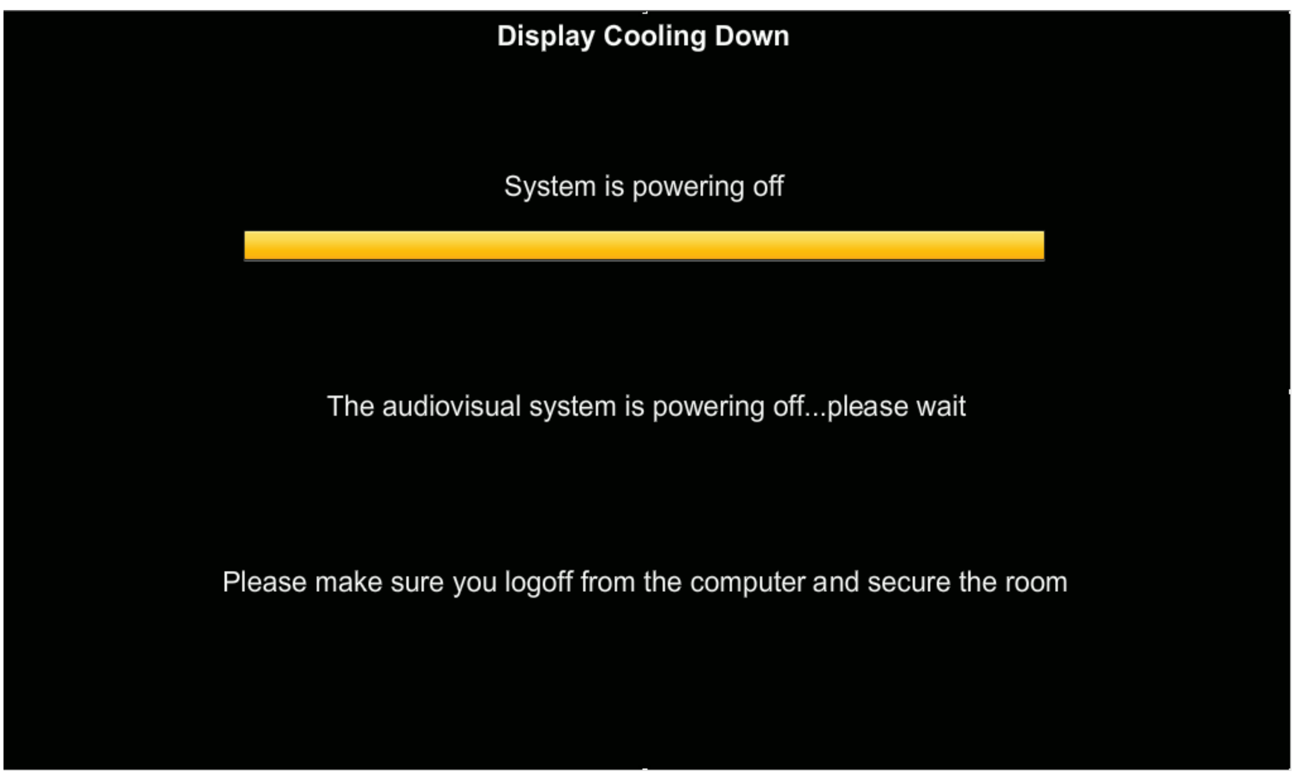


22. Finish Page

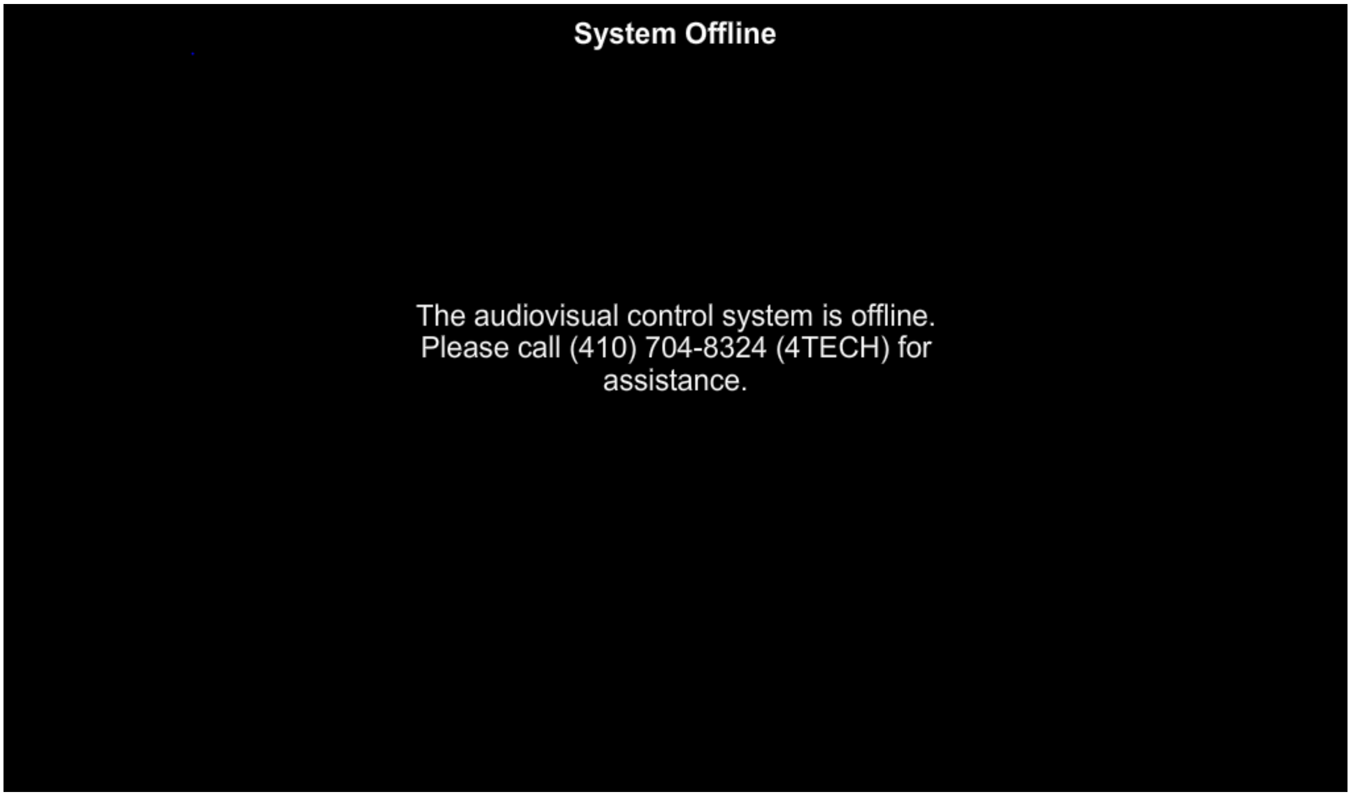
A 60 countdown begins and the system automatically shuts down if nothing is pressed.



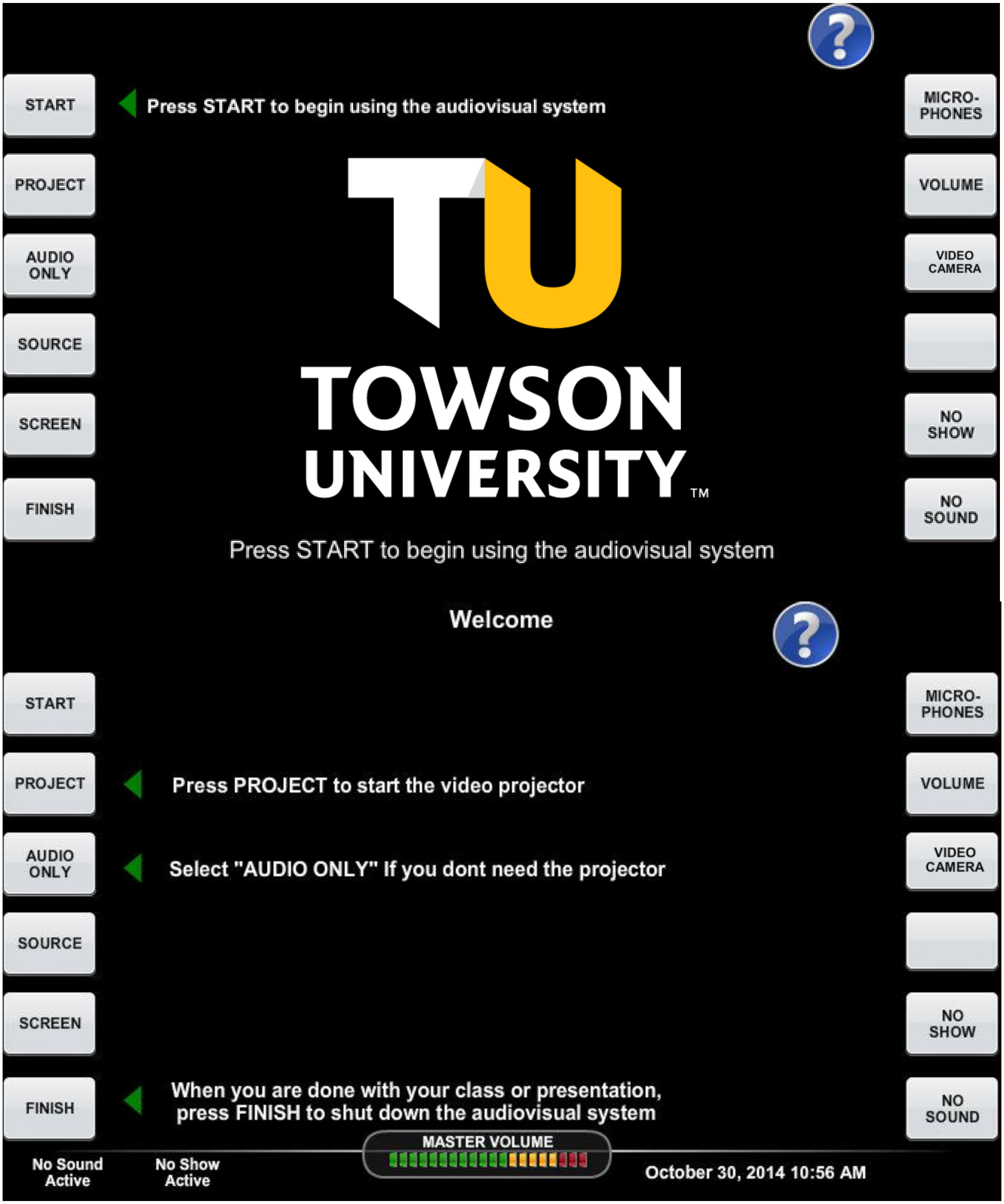
23. Power off page
    Status bar must be adjusted on a room by room basis and take about the same amount of time as it takes for the longest projector or display in the room to safely shut down

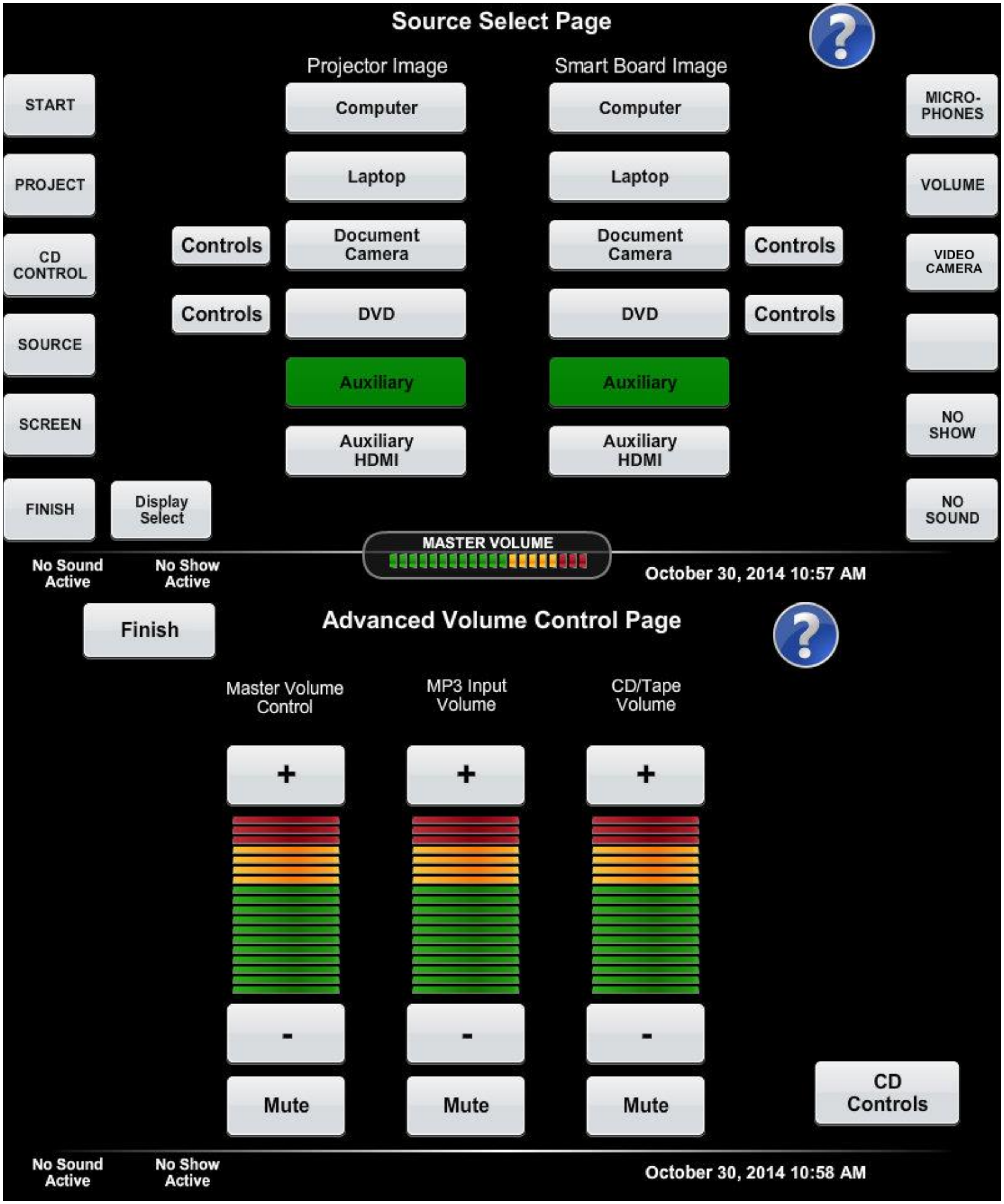


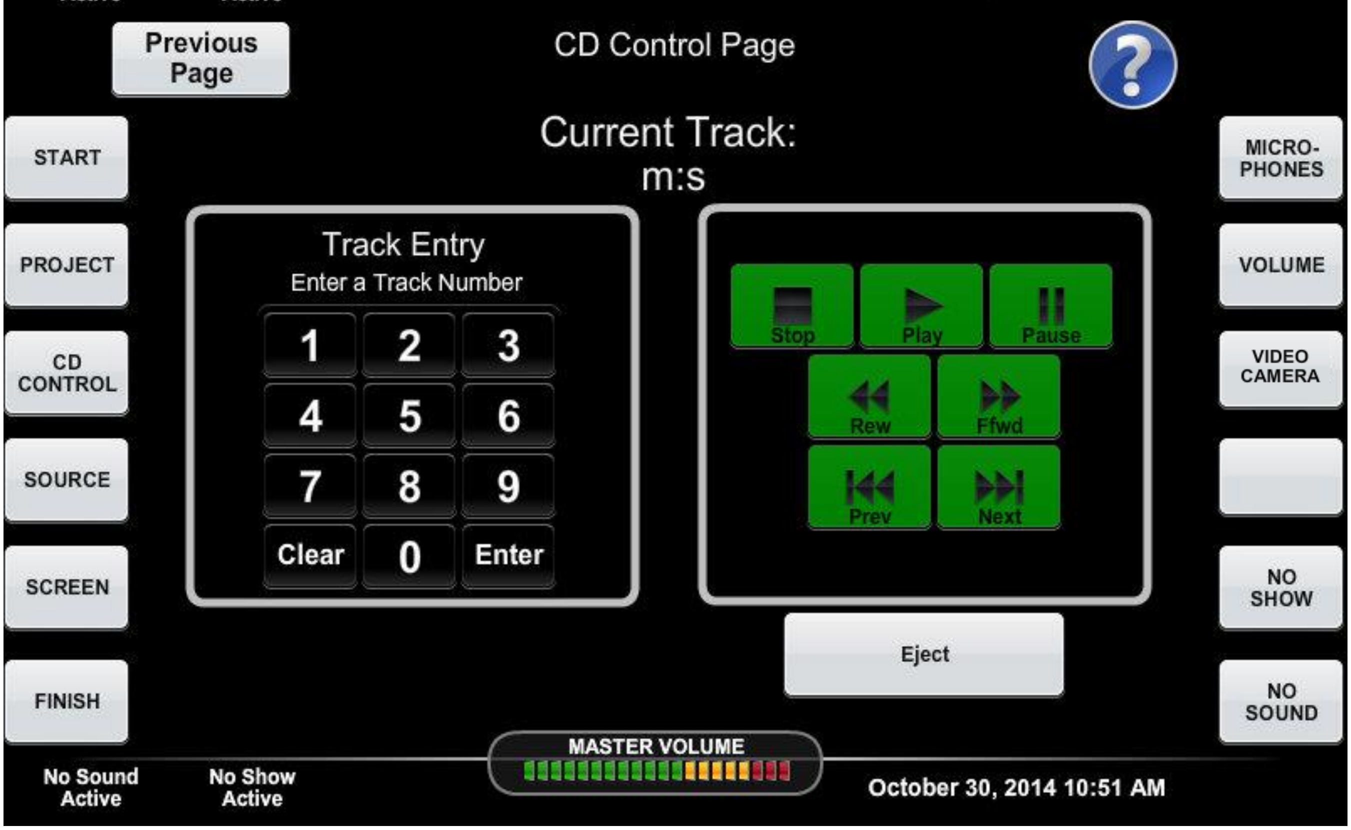
24. System Offline Page
(Appears if touch panel loses its network connection)



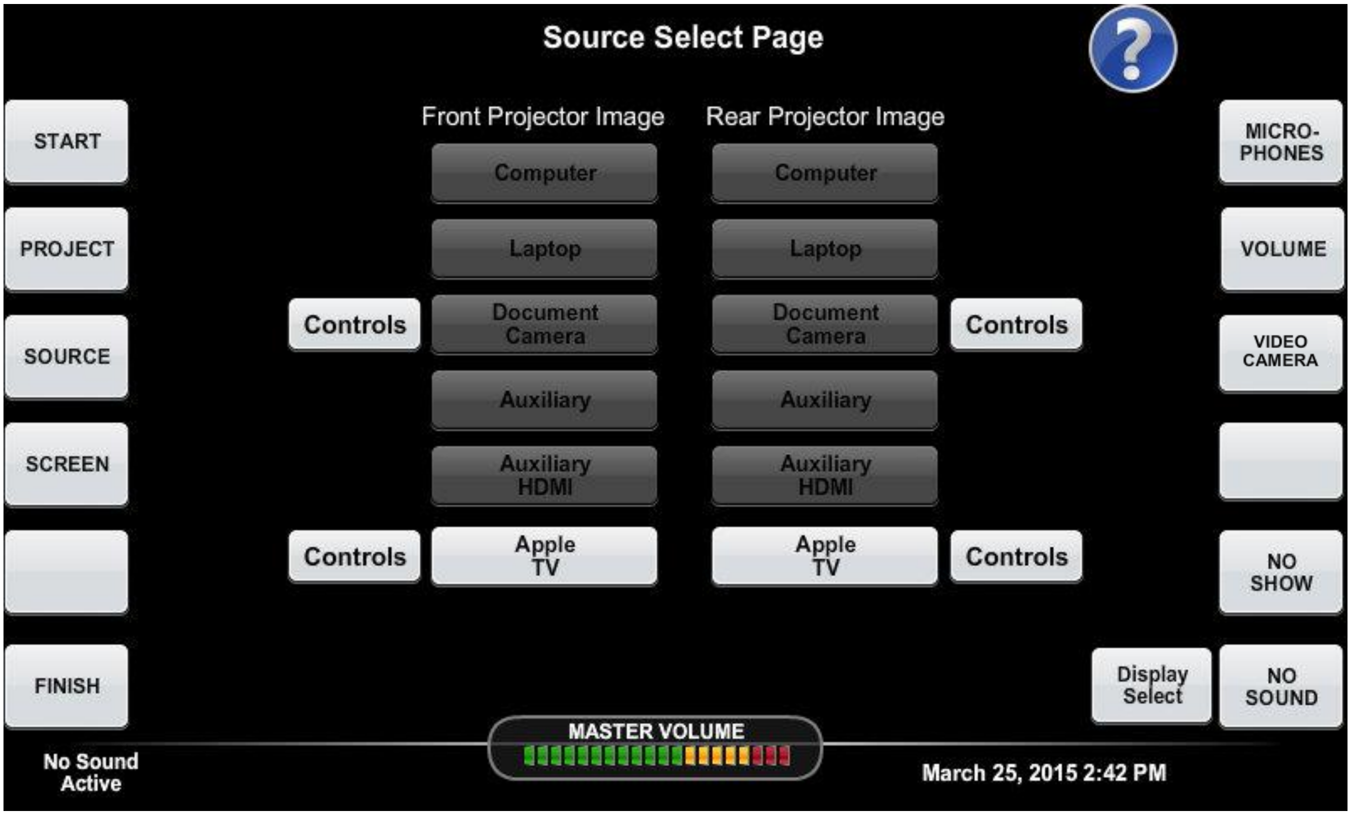
25. For rooms that require an “Audio Only” Option
“Audio Only” button is added between the “Project” and “Source” buttons


START
Press START to begin using the audiovisual system
MICRO-PHONES
PROJECT
VOLUME
AUDIO ONLY
VIDEO CAMERA
SOURCE
SCREEN
NO SHOW
FINISH
NO SOUND
TOWSON UNIVERSITY™
Press START to begin using the audiovisual system
Welcome
START
MICRO-PHONES
PROJECT
Press PROJECT to start the video projector
VOLUME
AUDIO ONLY
Select "AUDIO ONLY" If you dont need the projector
VIDEO CAMERA
SOURCE
SCREEN
NO SHOW
FINISH
When you are done with your class or presentation, press FINISH to shut down the audiovisual system
NO SOUND
MASTER VOLUME
No Sound Active
No Show Active
October 30, 2014 10:56 AM


Source Select Page
Projector Image
Smart Board Image
START
PROJECT
CD CONTROL
SOURCE
SCREEN
FINISH
Display Select
Computer
Laptop
Document Camera
DVD
Auxiliary
Auxiliary HDMI
Controls
Controls
MICRO-PHONES
VOLUME
VIDEO CAMERA
NO SHOW
NO SOUND
MASTER VOLUME
No Sound Active
No Show Active
October 30, 2014 10:57 AM
Finish
Advanced Volume Control Page
Master Volume Control
MP3 Input Volume
CD/Tape Volume
+
-
Mute
CD Controls
No Sound Active
No Show Active
October 30, 2014 10:58 AM

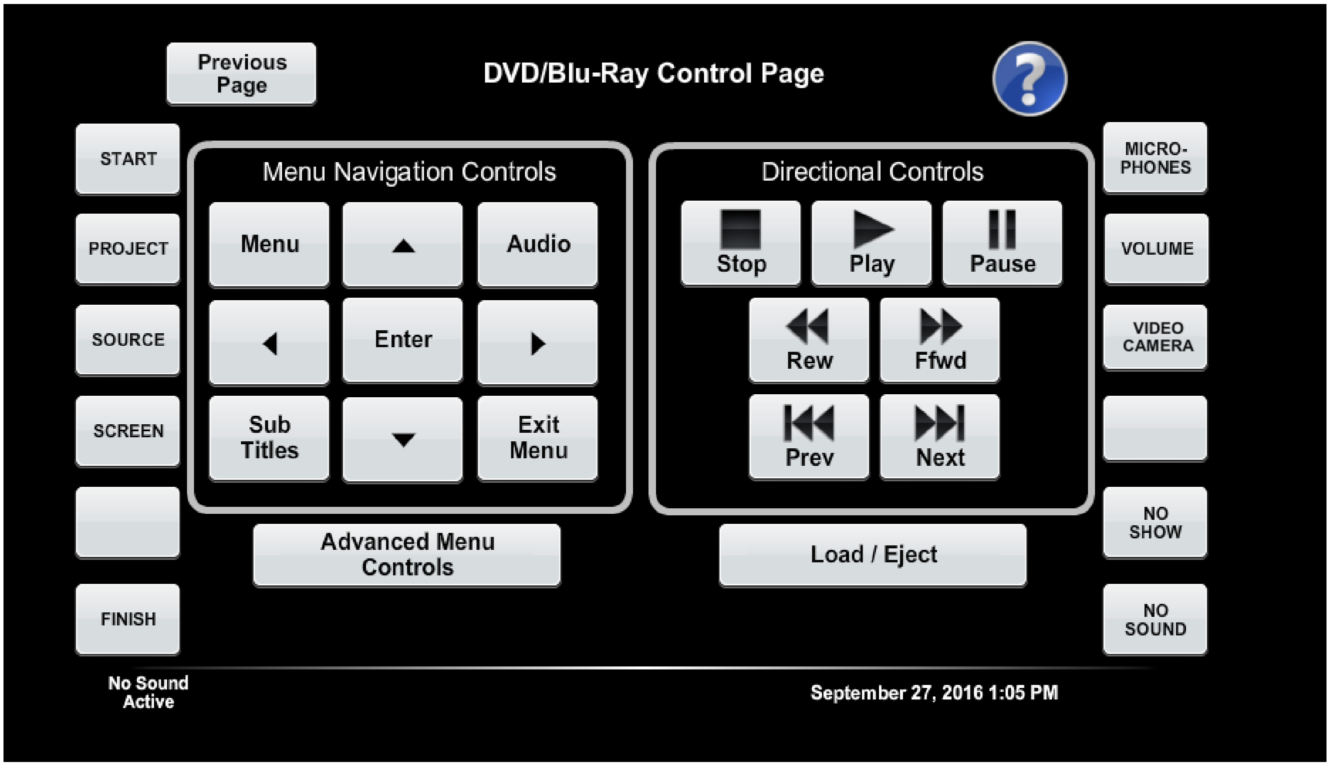


26. Apple TV Source button

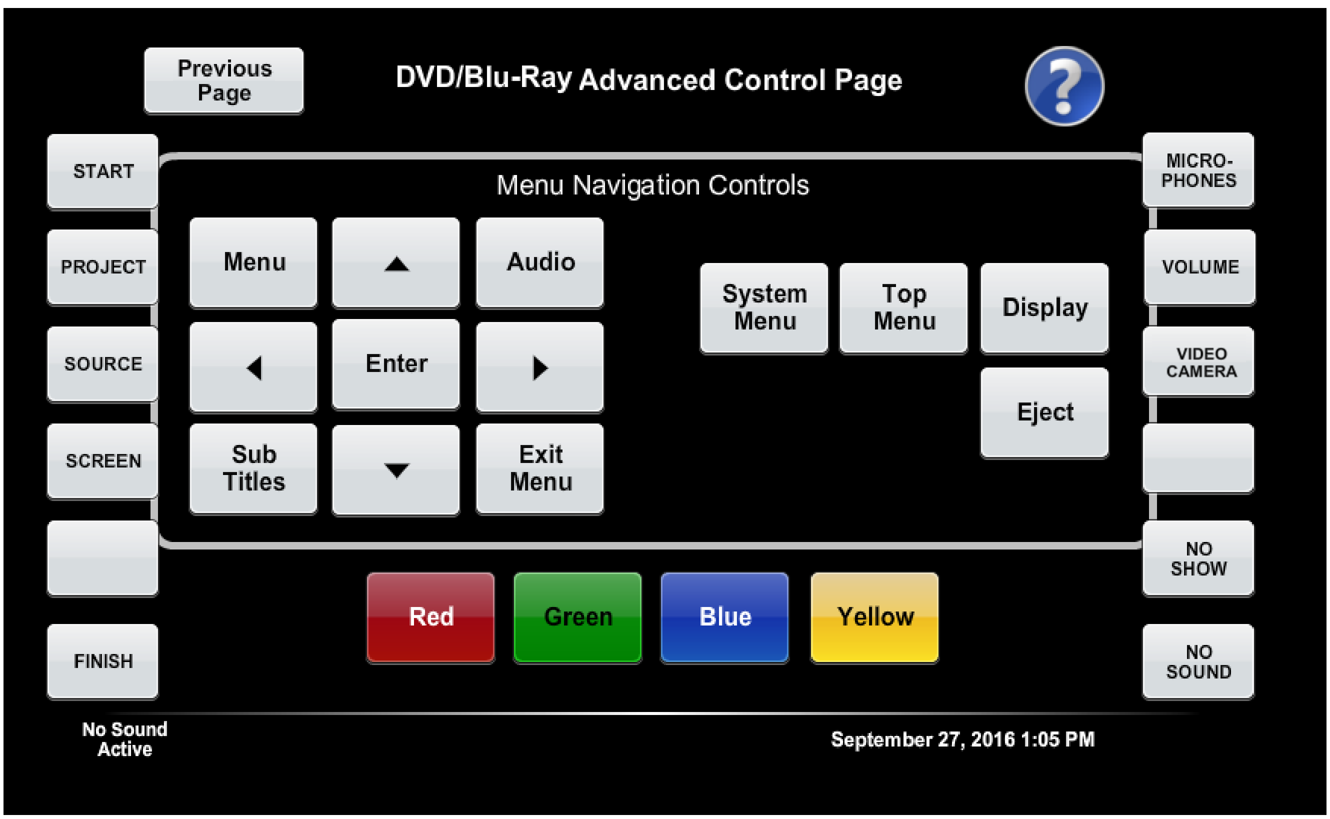


27. Apple TV Controls

28. DVD Control Page



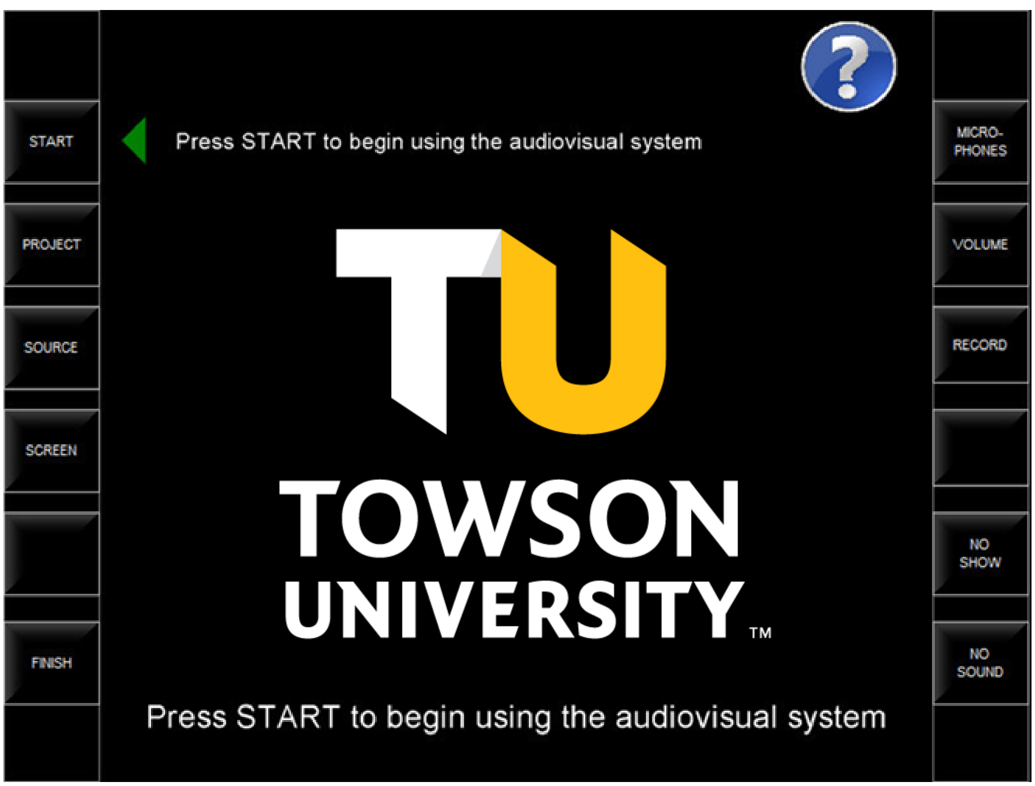
29. DVD Advanced Control Page



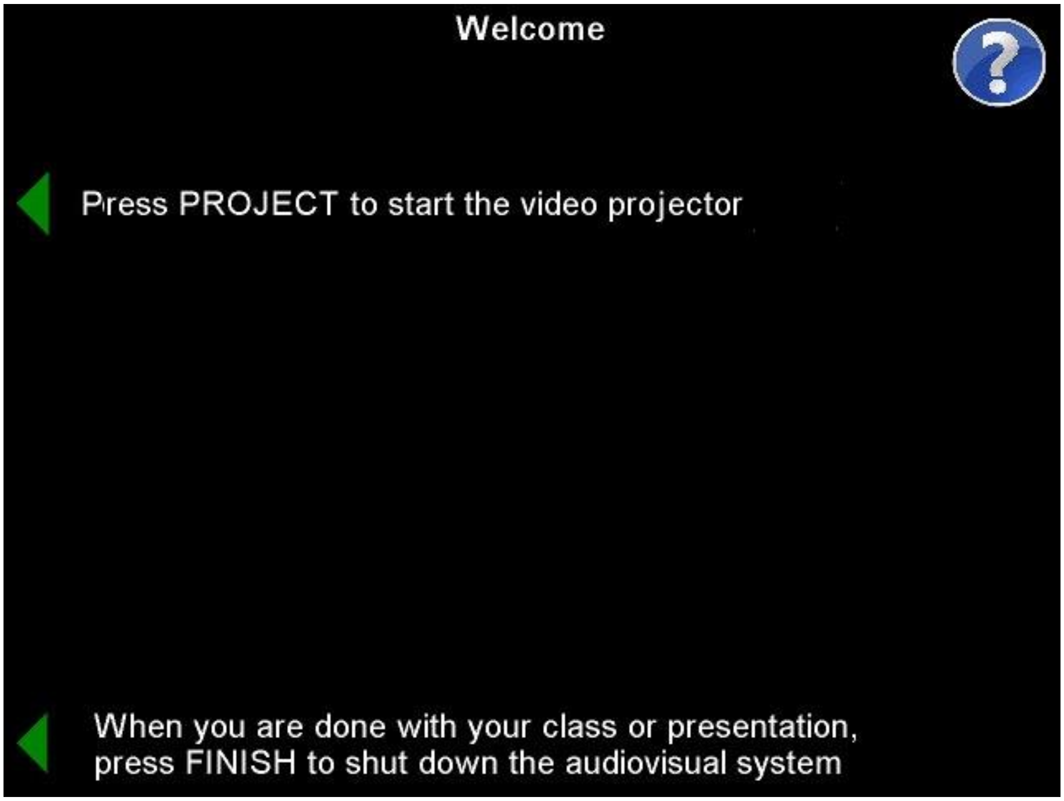
Crestron Touch Panel: Soft Buttons TPS-6L (CTSG-035)

1. Splash Screen

2. This screen must appear if a hard button other than START is pressed. The extra arrow must disappear 10 seconds later if no further action is taken.

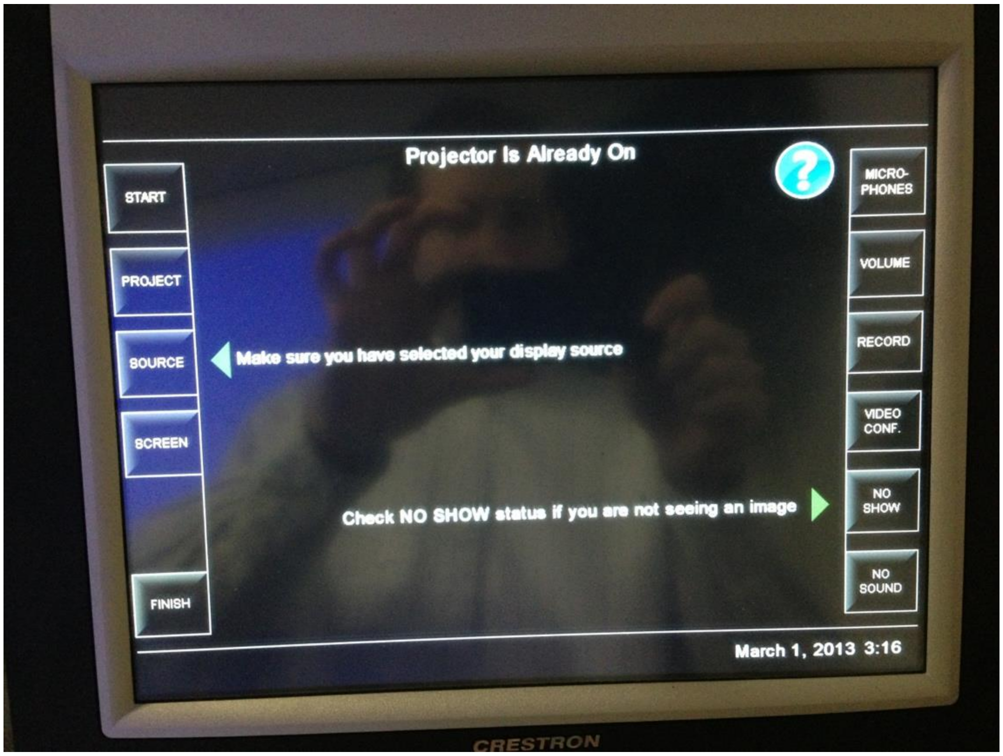


3. Start (If the START button is pressed and the user does not press PROJECT to continue with startup it must return to the splash screen in 30 seconds.)

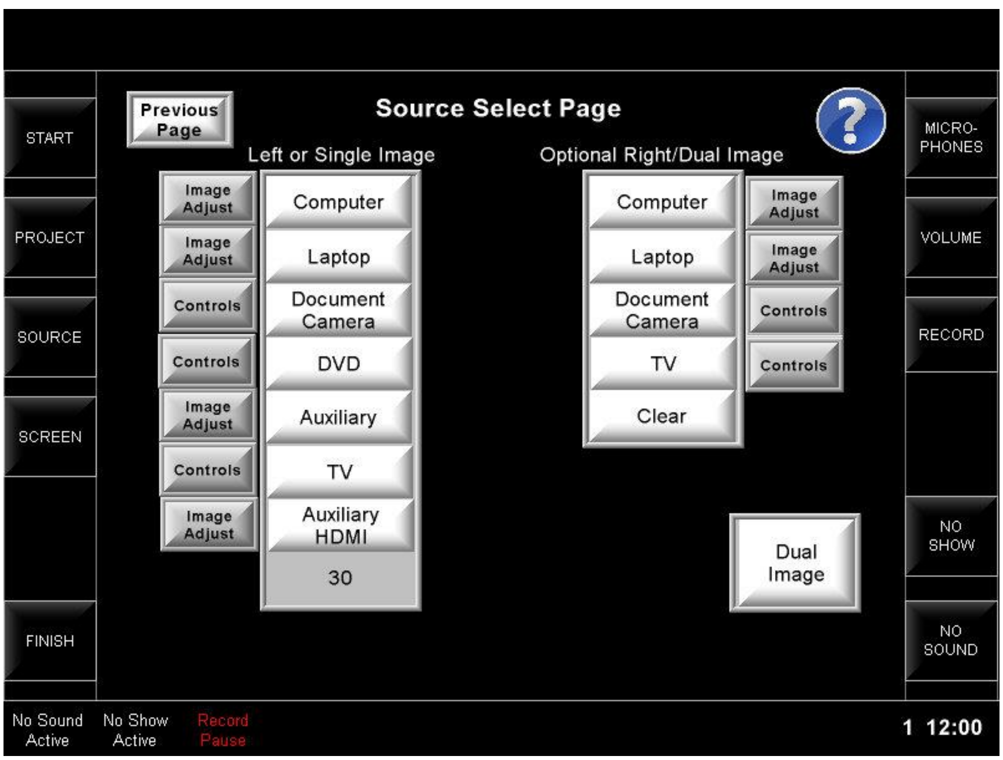


4. Projector Power on
   Status bar must be adjusted on a room by room basis and take about the same amount of time as it takes for the longest projector or display in the room to safely shut down

5. Projector already on page

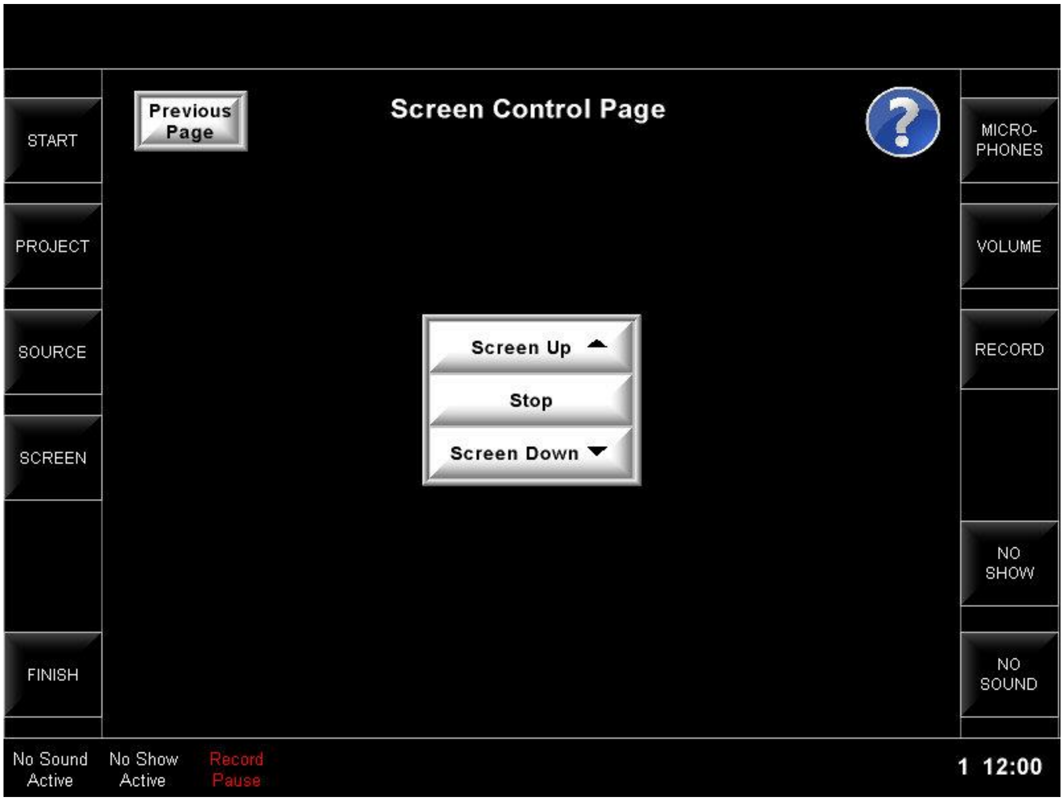


6. Source Select Page (Digital sources will not have "image adjust" sub-pages). Note: The "Optional/Dual Image" column must list all sources on systems that use a TV One dual image processor. The screen shot below was taken from a system using the dual image function built into the projector.

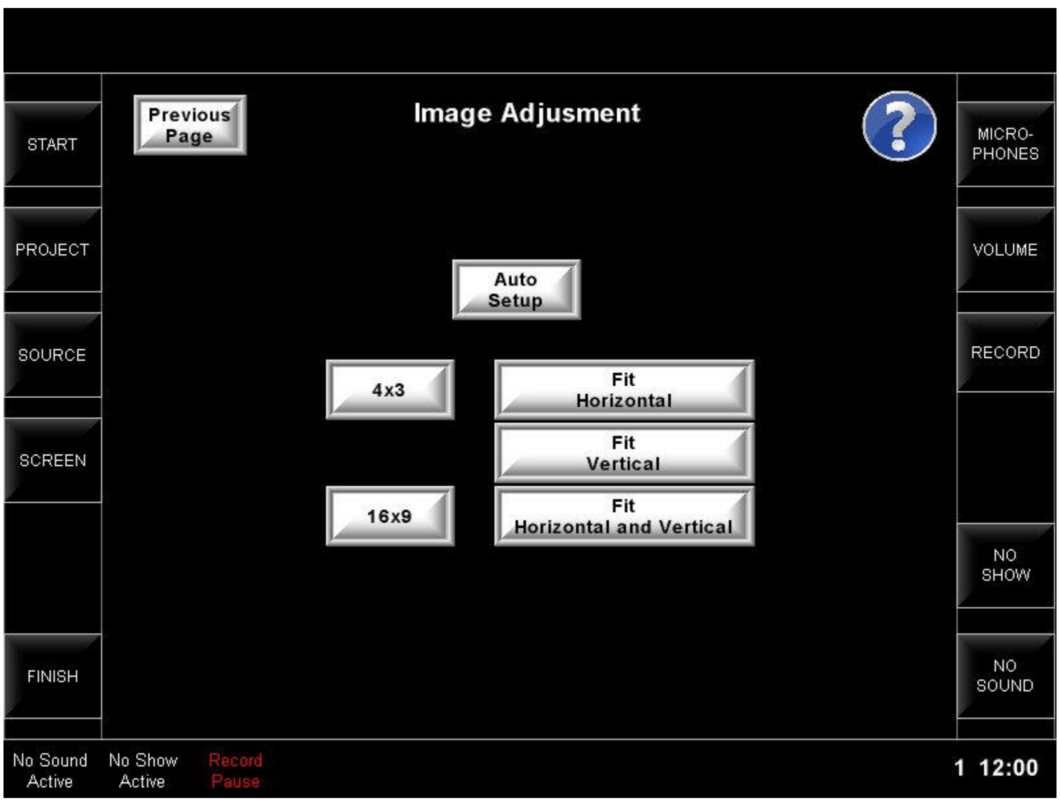


7. Screen Control Page (Must not be available if no electric screen)

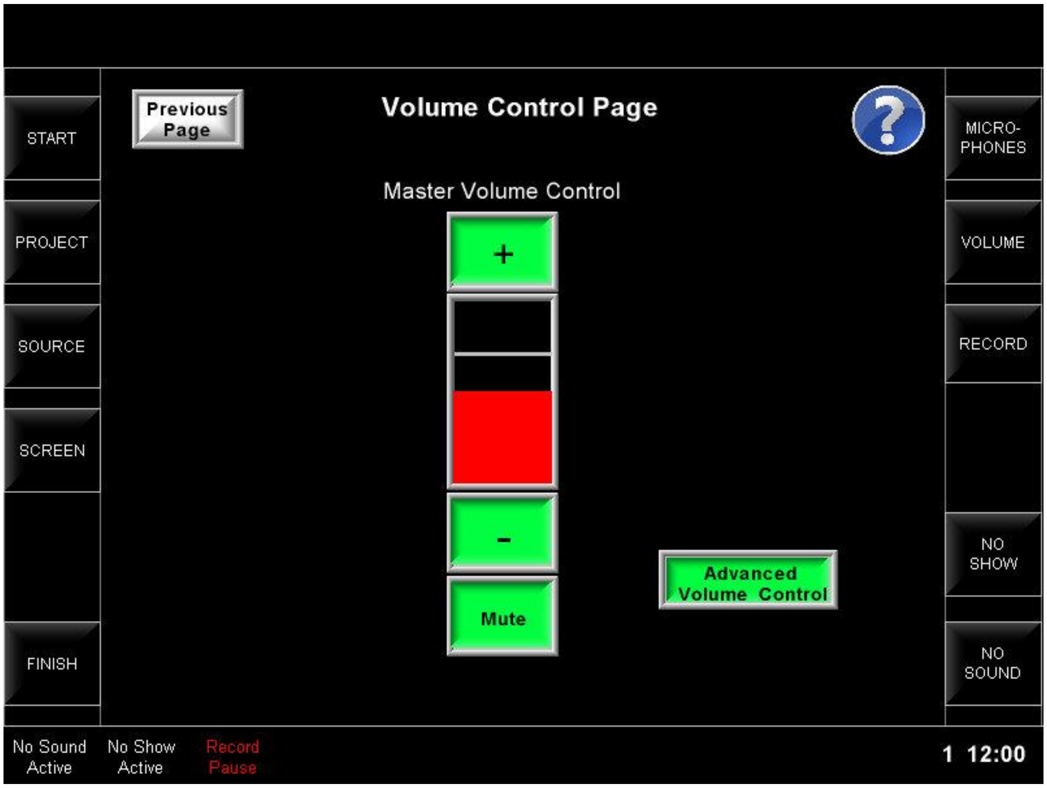
   a. Buttons must turn green when depressed for feedback. All must return to their normal white color when not being pressed.



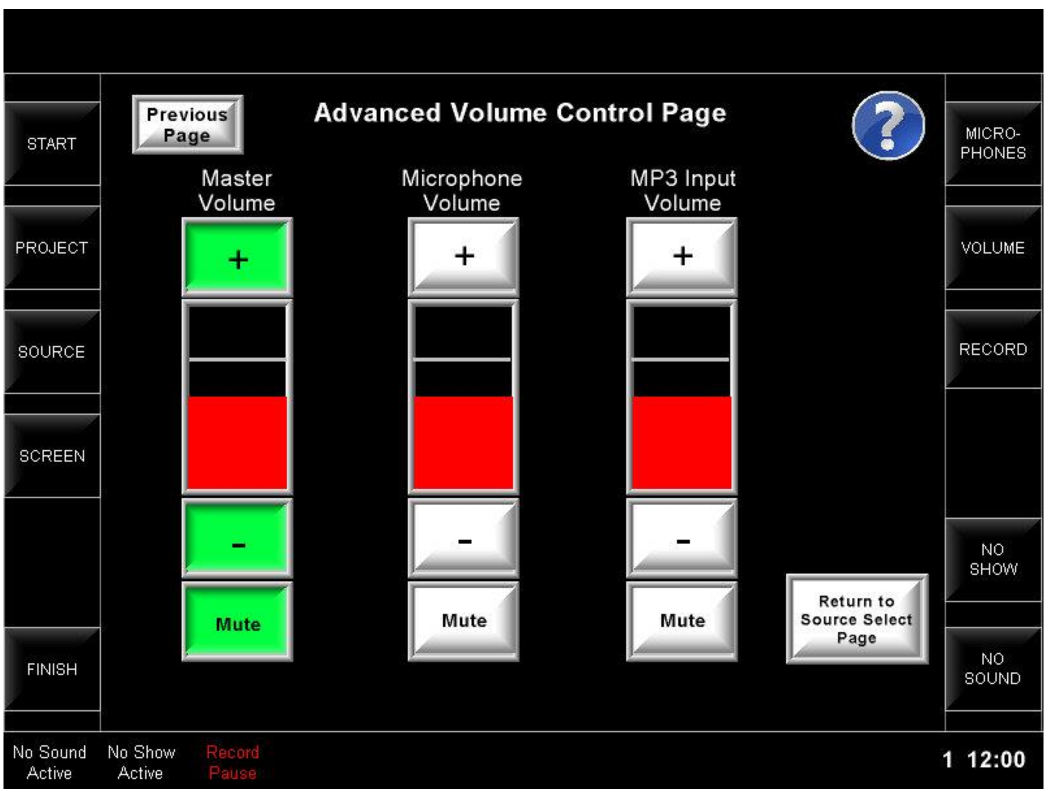
8. Image Adjust (Analog systems only)



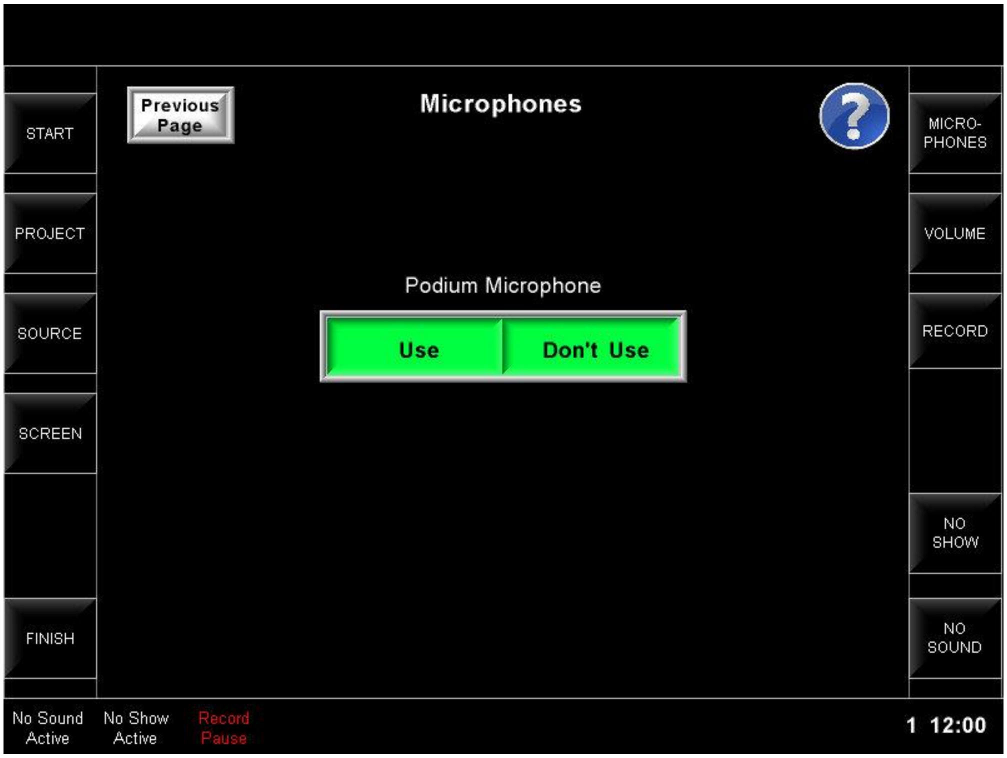
9. Volume (when raising the volume the color must go from green to yellow to red). Pressing the volume up or down buttons must also unmute the system.



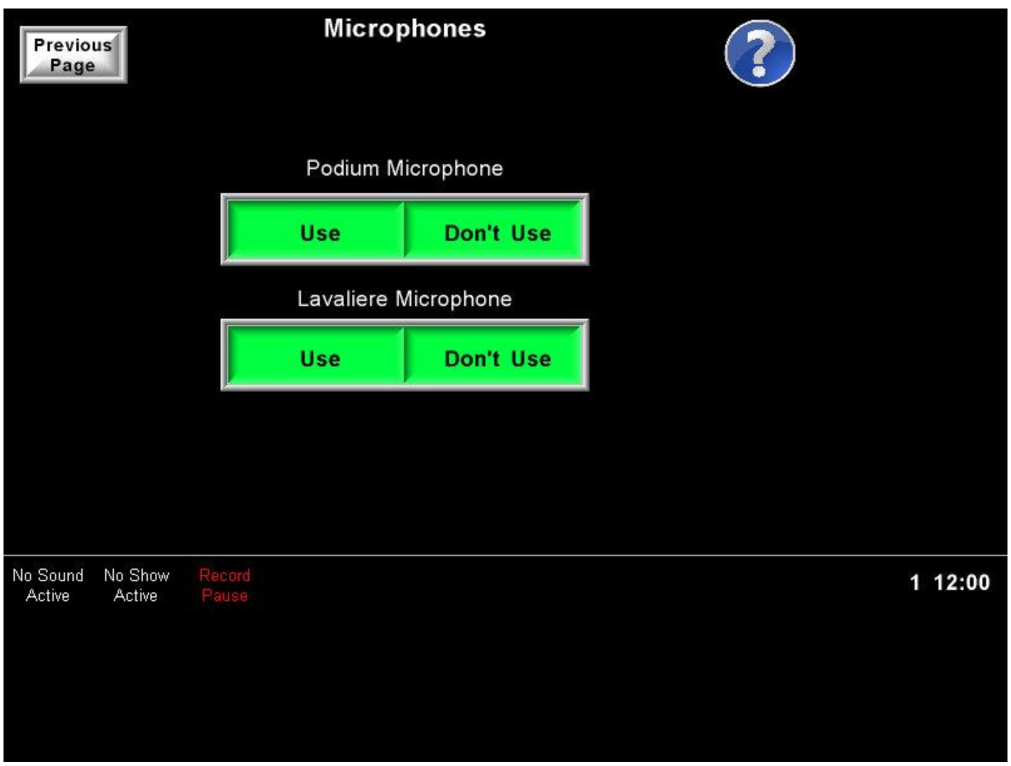
10. Advanced Volume (when raising the volume the color must go from green to yellow to red). Pressing the volume up or down buttons must also unmute the system.



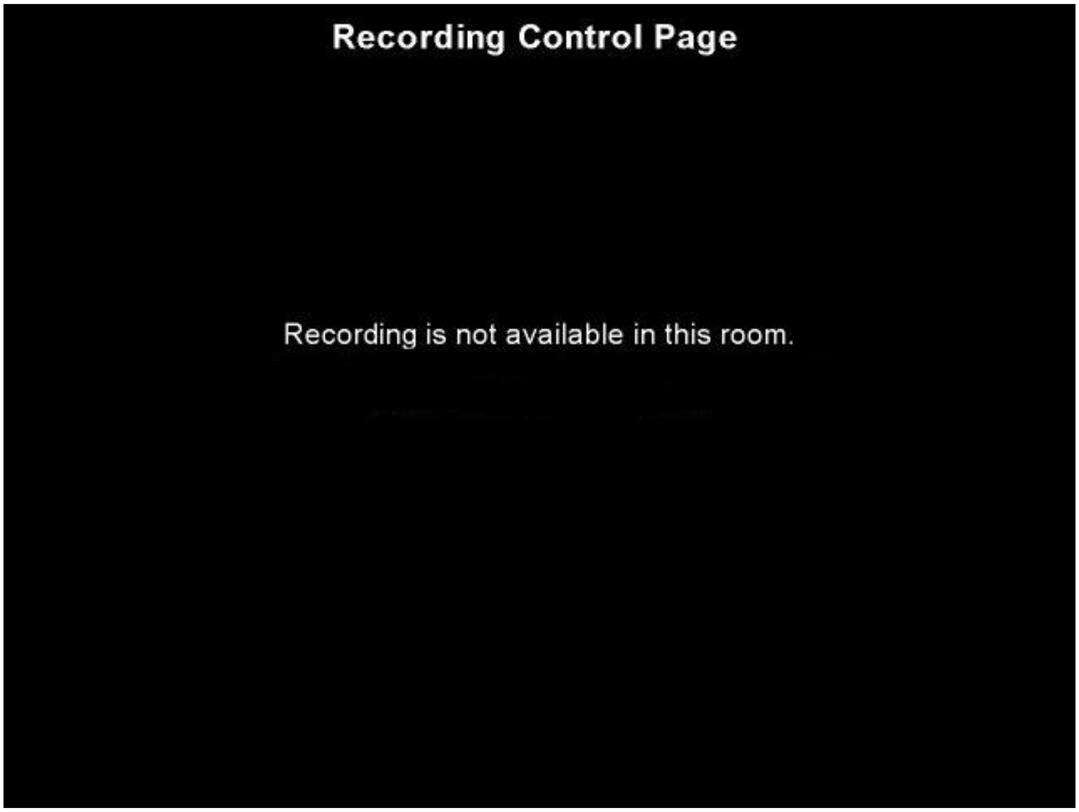
11. Podium Microphone (If no Microphones are installed, page must read: "Microphones are not available in this room". If non-controllable microphones are installed, page must read “Microphone control is not available in this room")



12. Wireless Microphone (must add third set of identical buttons titled “Handheld Microphone” if one is present in the room)



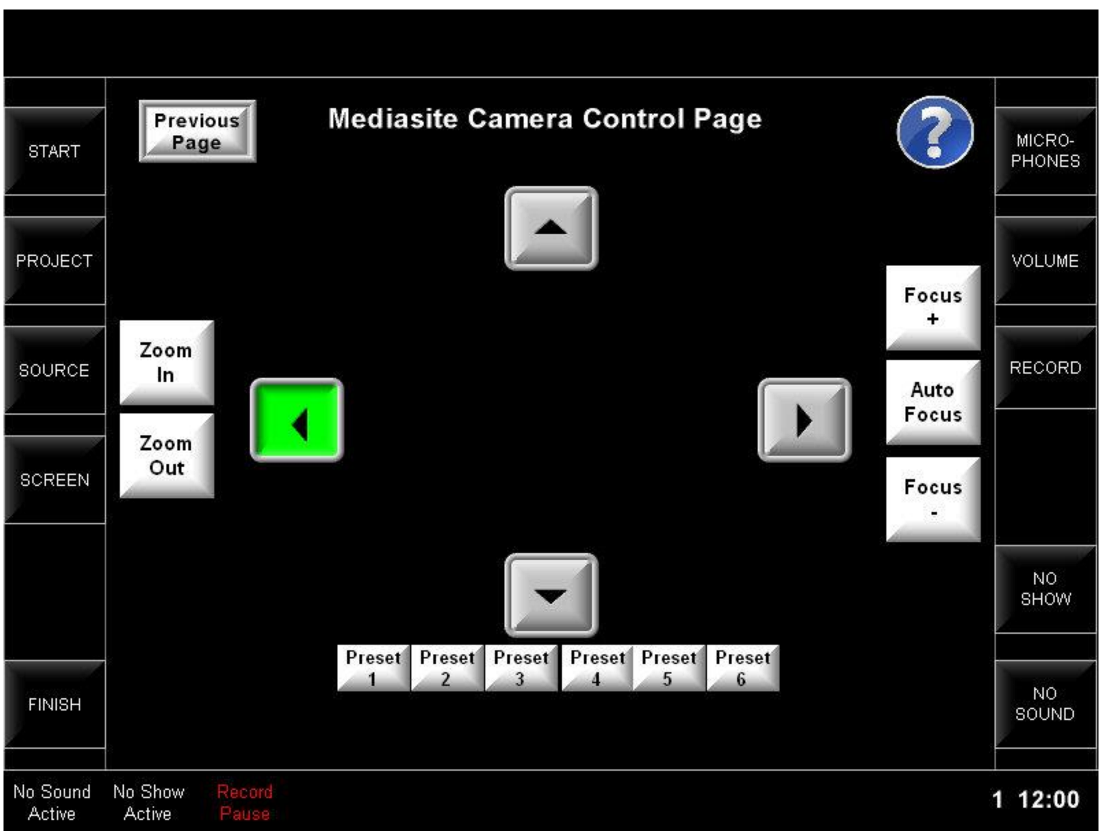
13. Video Camera (formerly Record) (if no camera present)



14. Record Password (see manager for code)

15. Record (For Cisco Only)

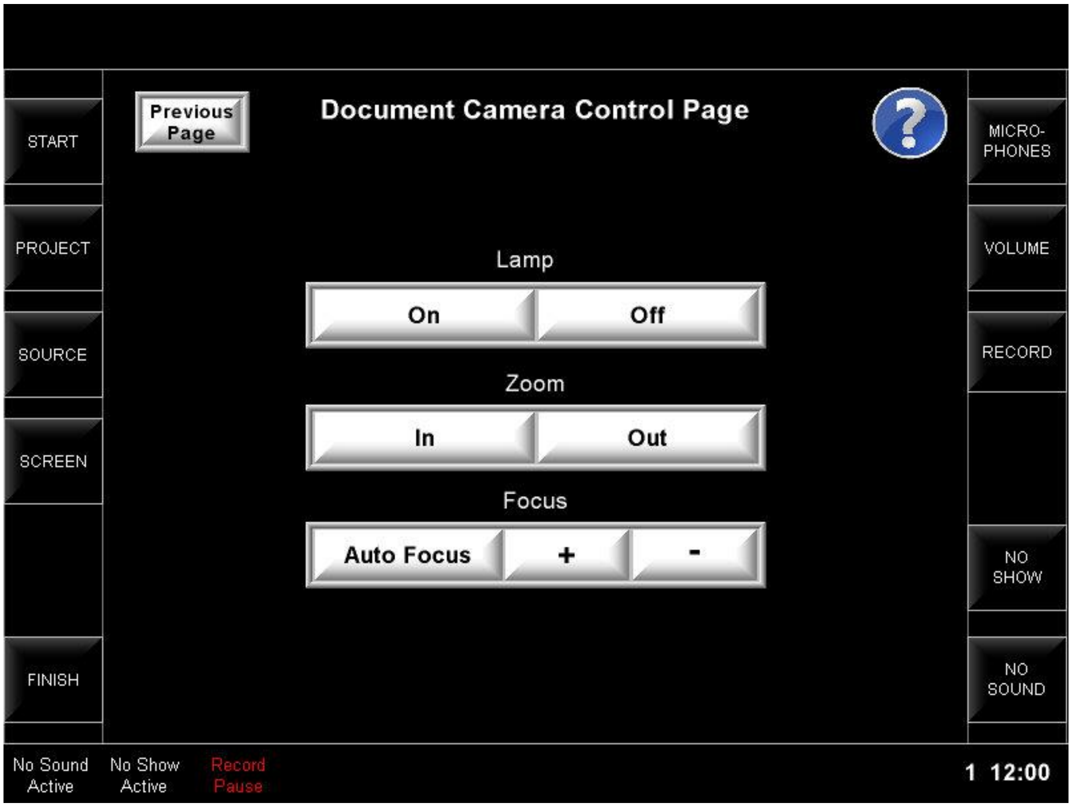
16. Camera Control Page (preview of video must appear behind camera controls)



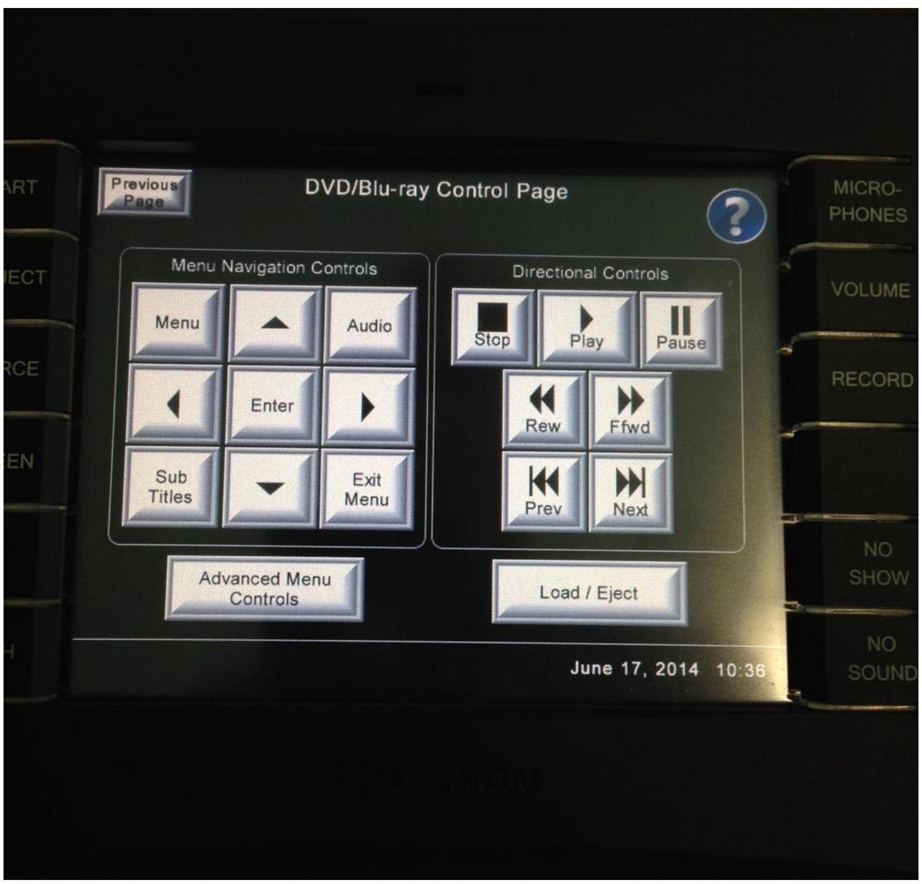
17. Stop Recording (For Mediasite Only)

18. Stop Recording (For other solutions)

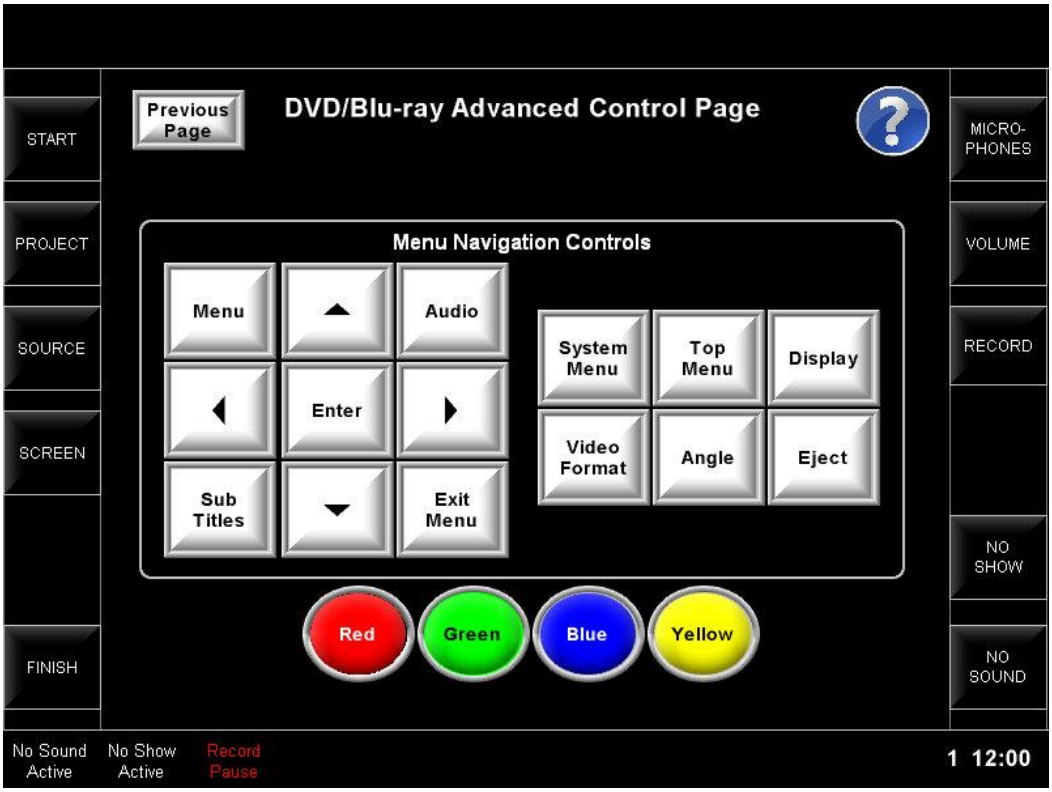
19. Document Camera Control Page (Only include if doc camera can be controlled by the Crestron)



20. DVD/Blu-ray Control Page



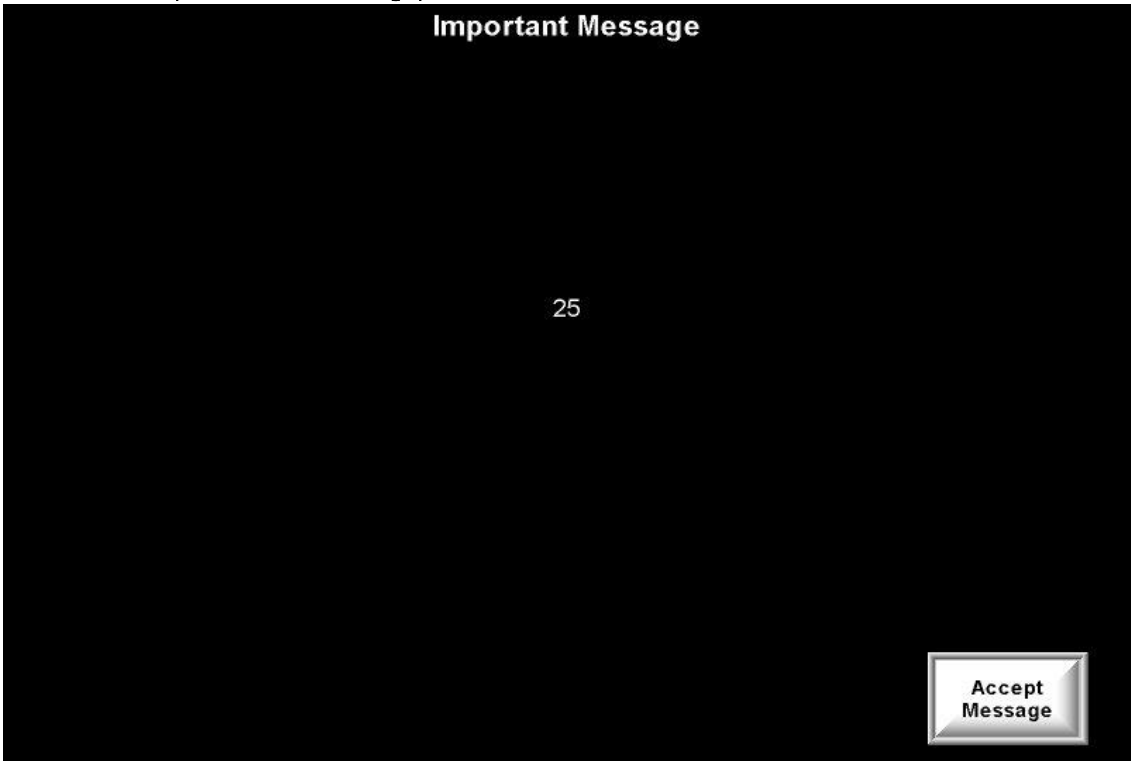
21. DVD/Blu-ray Advanced Control Page



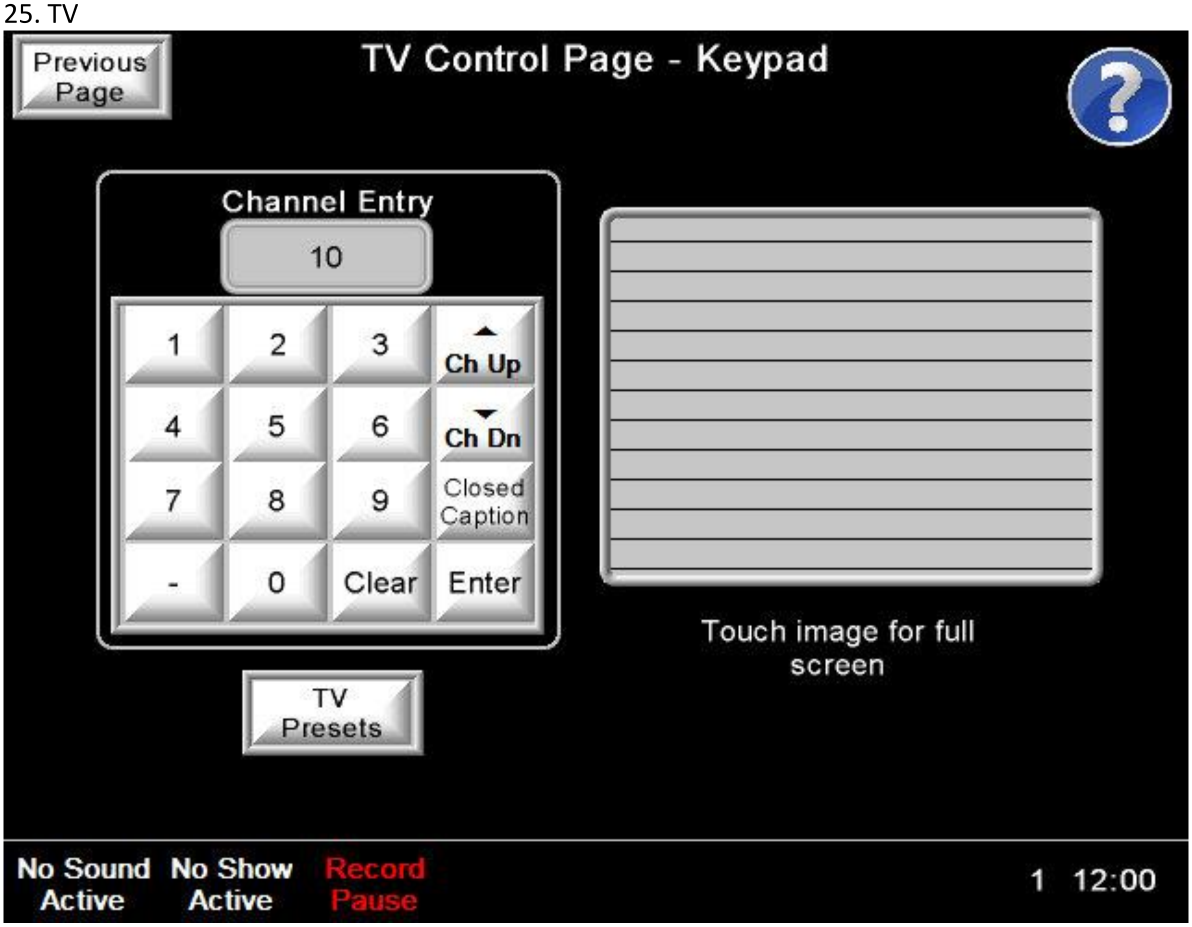
22. Help
    a. The Help button must display the following text:

Please call (410) 704-8324 (4TECH) for
assistance with the audiovisual system.

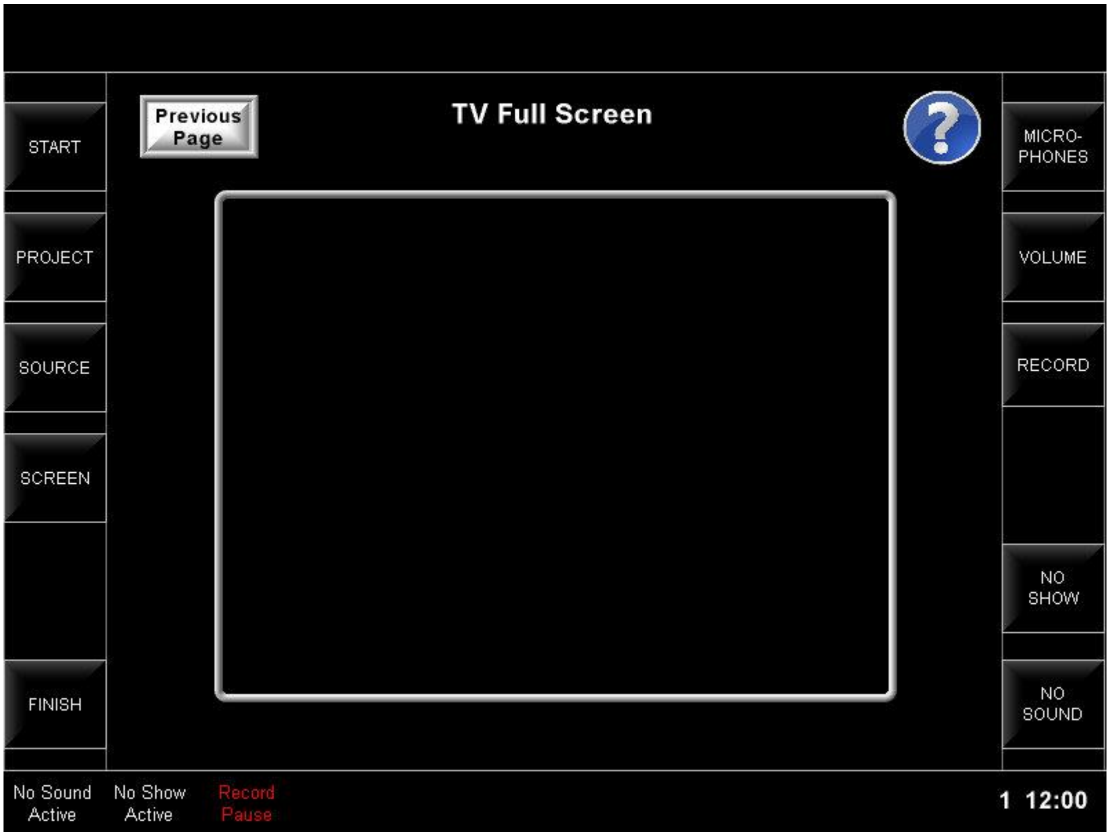
24. Fusion RV (Roomview Message)



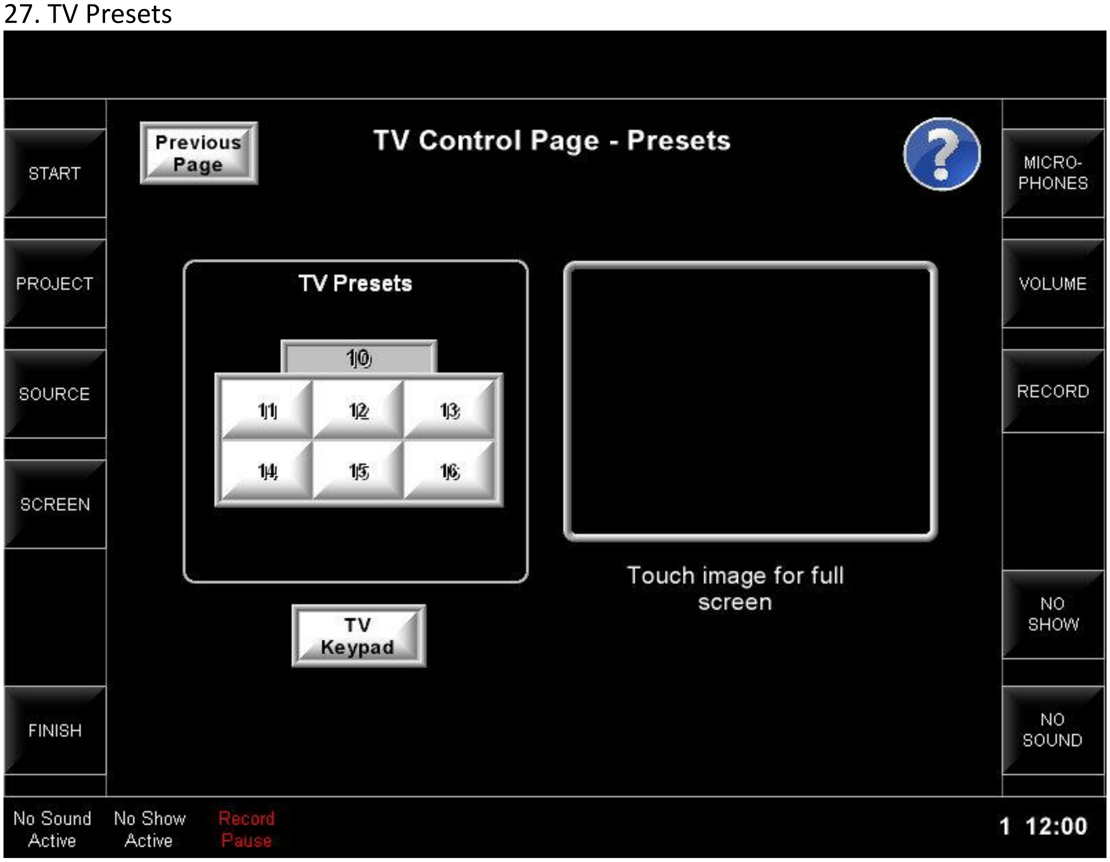
25. TV



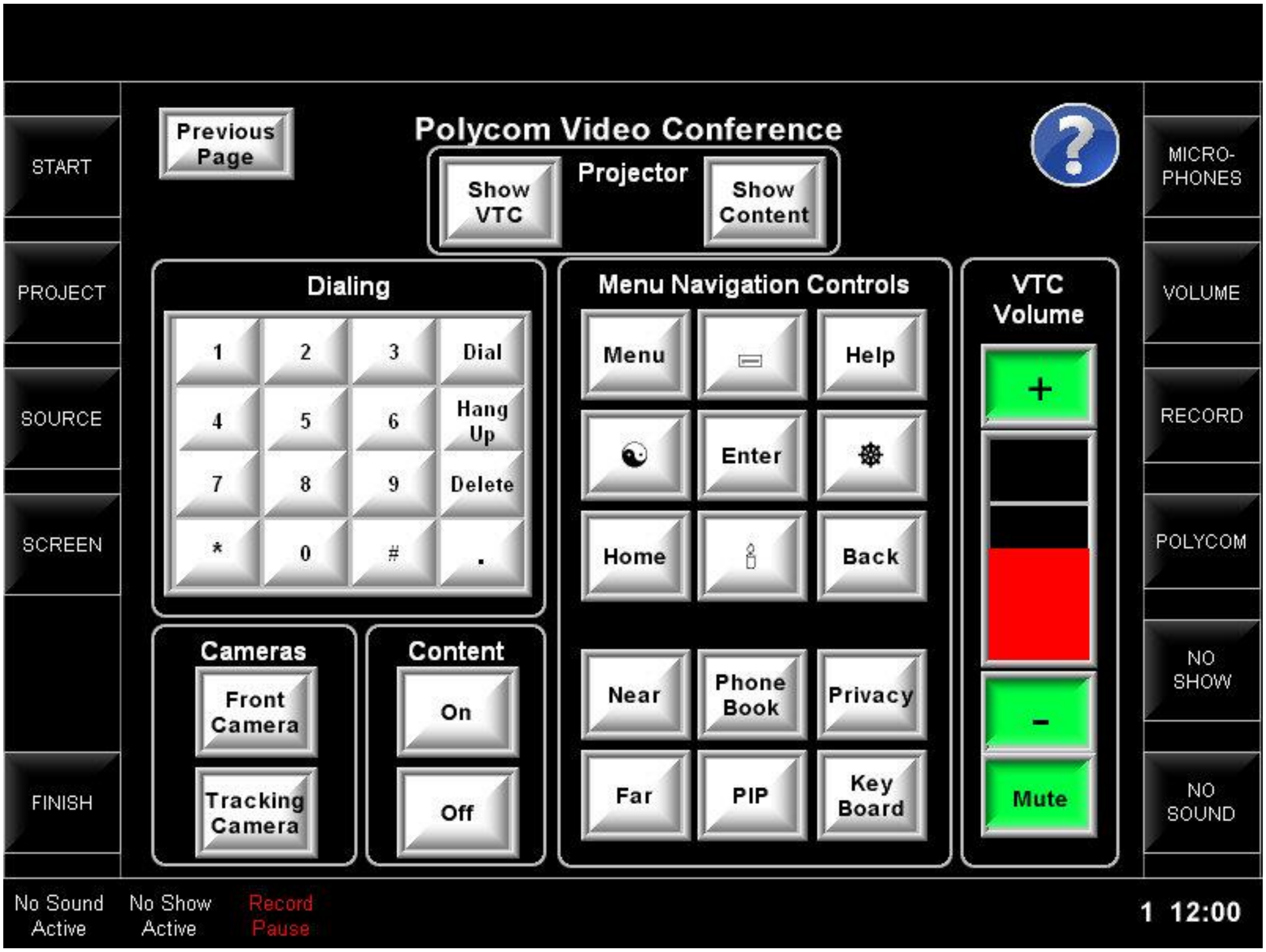
26. TV Full Screen



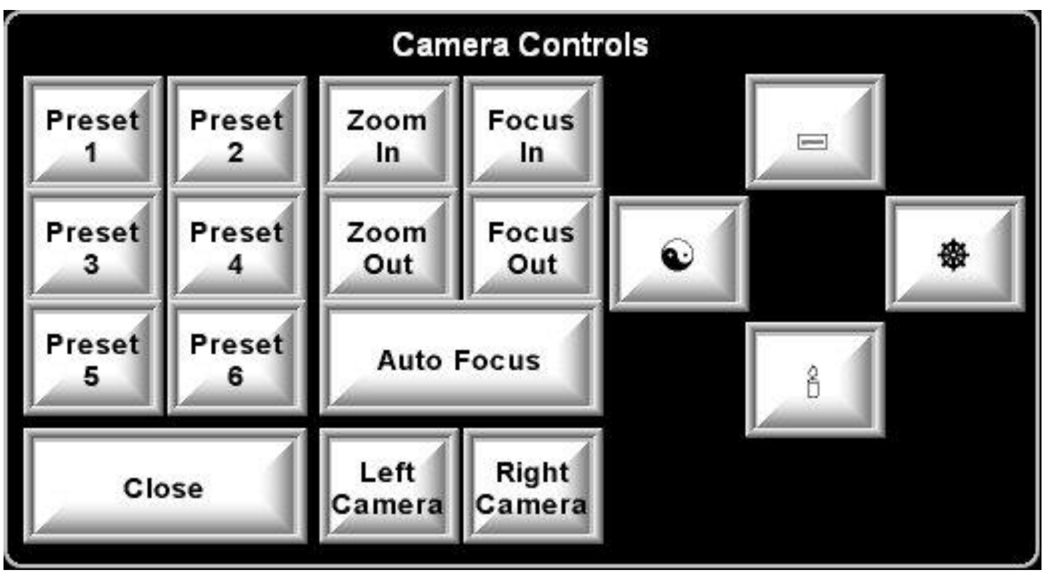
27. TV Presets



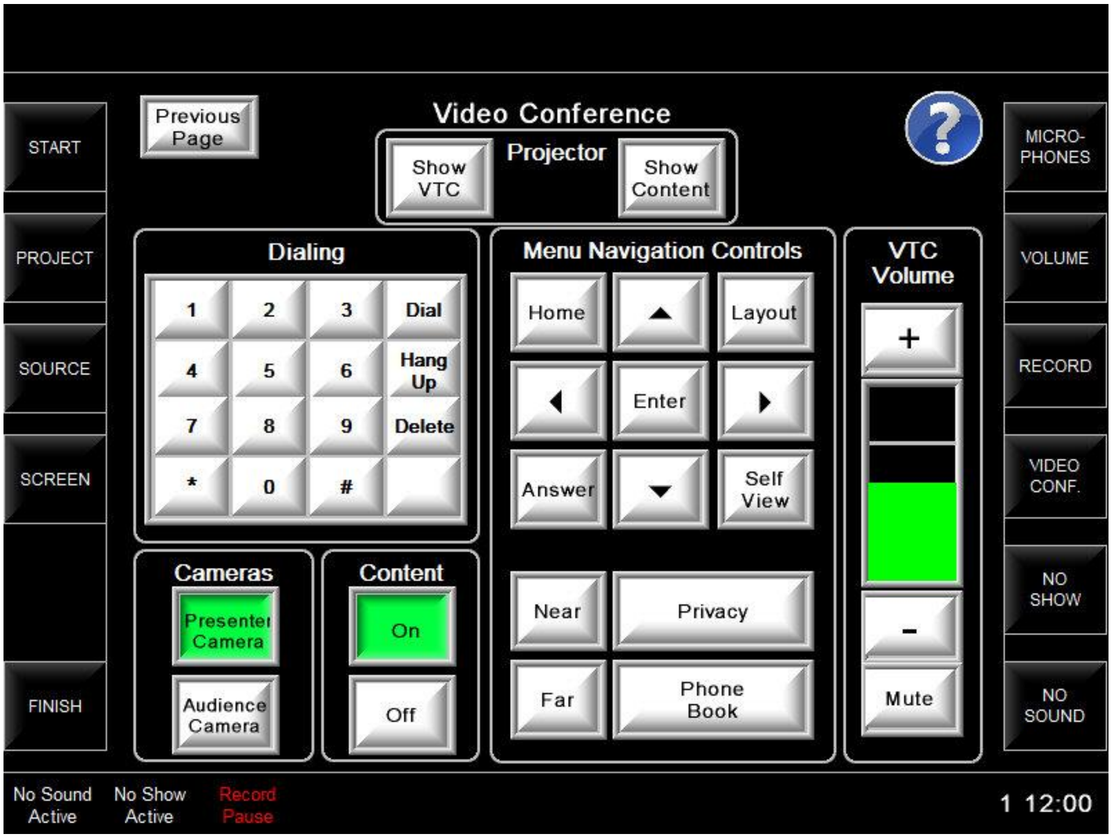
28. Video Conference (For Polycom Only)



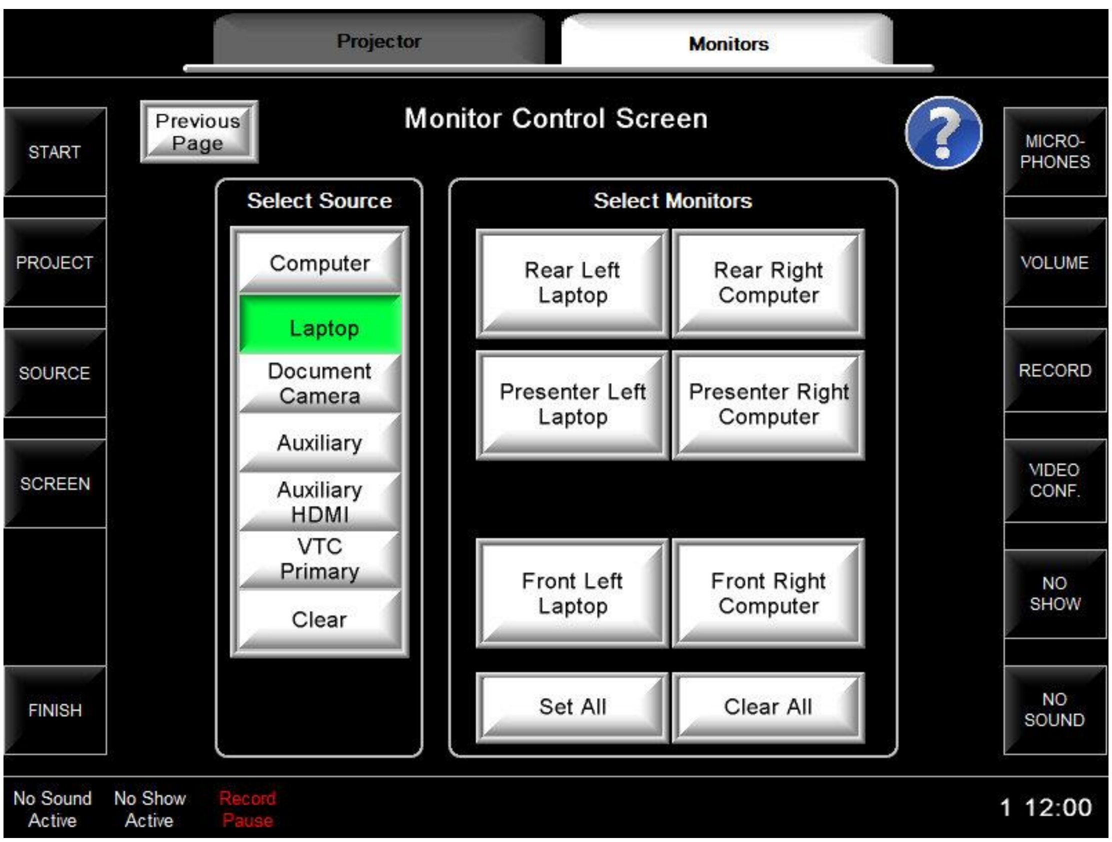
30. VTC Camera Controls



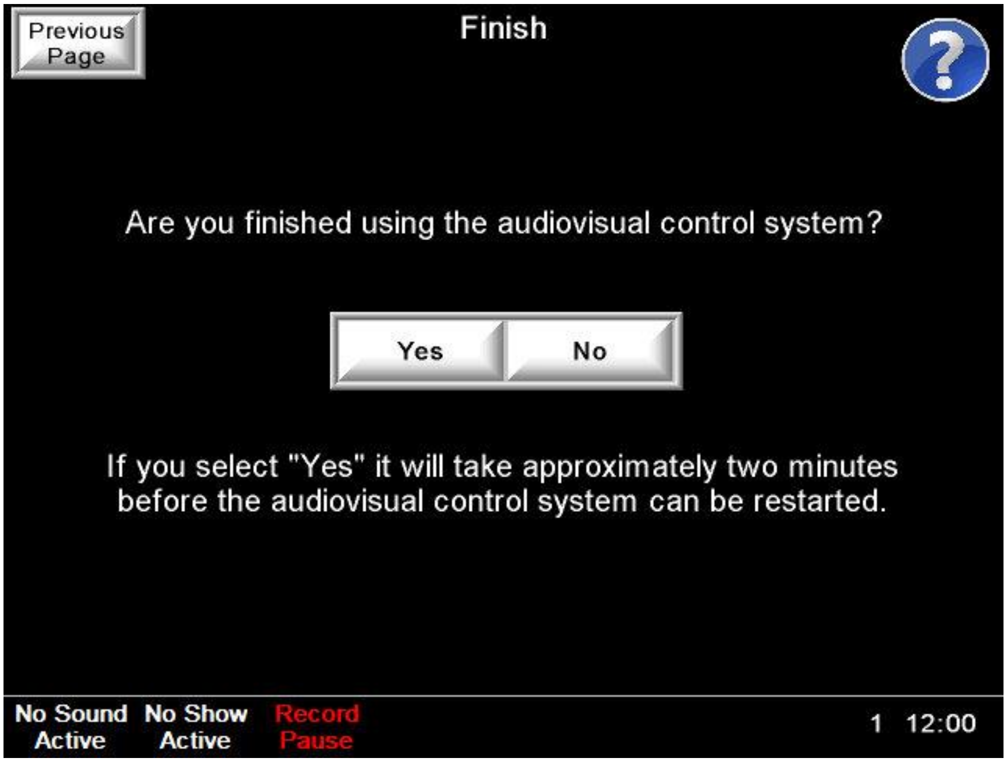
31. Video Conference (For Cisco Only)



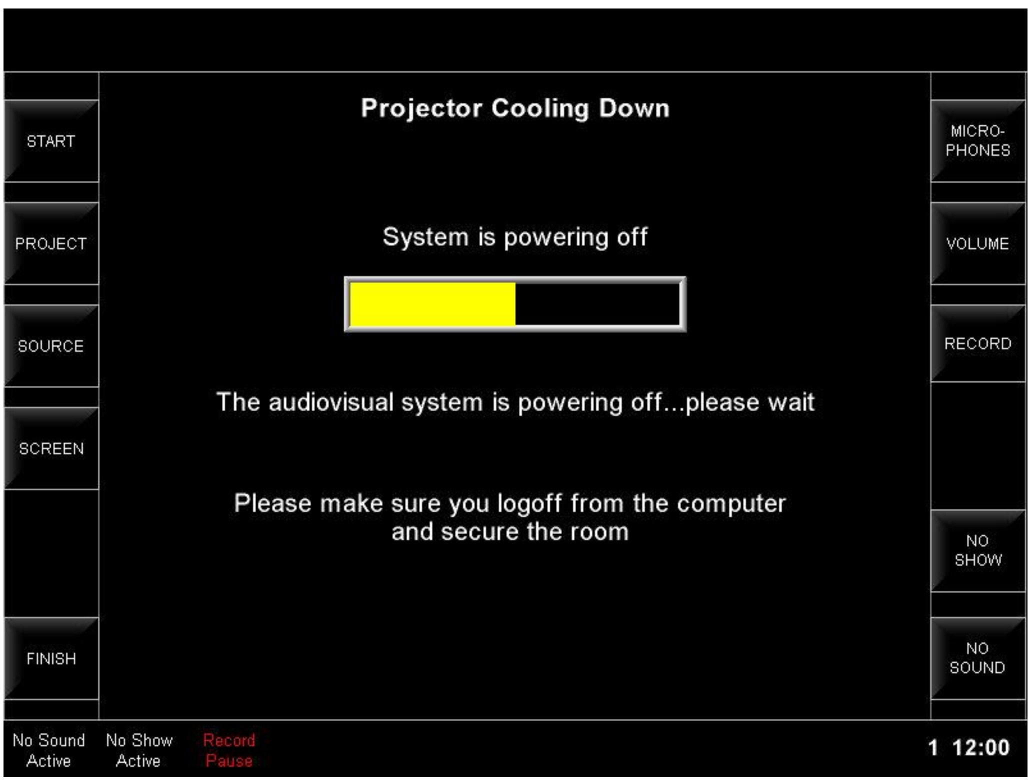
32. Monitor Control Tab



33. Finish (Note: “Yes” must automatically be selected after 1 minute of inactivity)



34. Goodbye (Status bar must be adjusted on a projector by projector basis and go as quickly as safely possible)

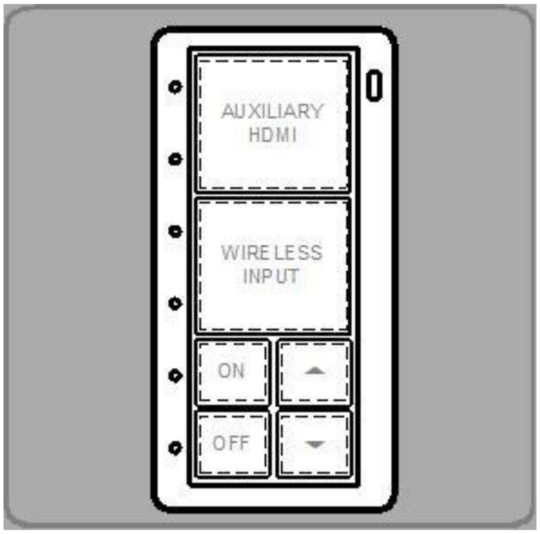


Appendix B

Crestron Push-Button Systems: Hard Buttons (CTSG-036)

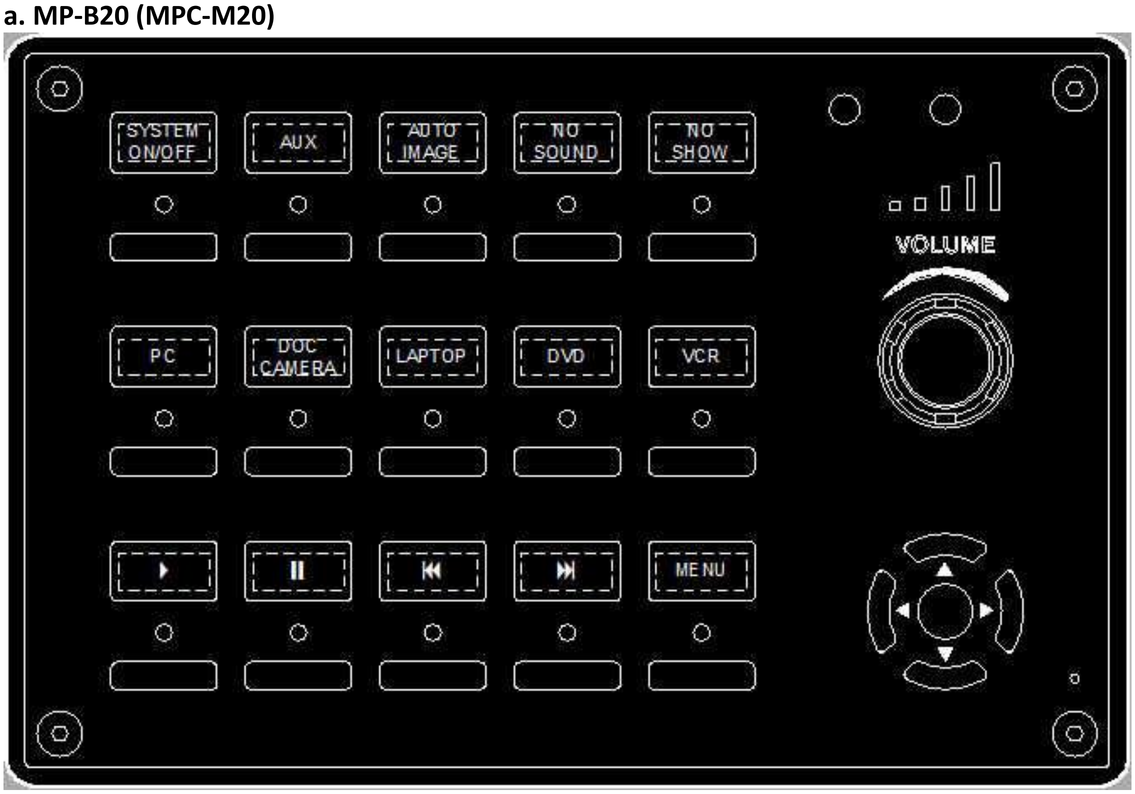
1. Current Standard:

a. Cameo C2N-CBD-P-W-T



2. Previous Standard:

a. MP-B20 (MPC-M20)



A. Types of Crestron push-button systems
   a. MP-M series require a separate MPS system:
      MP-B10

MP-B20

b. MPC-M series do not require a separate MPS system:
   MPC-M10
   MPC-M20
c. The 10 series has 10 select buttons, two rows
d. The 20 series has 15 select buttons on three rows and 5 navigational buttons

B. Color of panel
   a. The Crestron push-button systems are available in black or white.
   b. The black system must be used in all cases unless otherwise specified by TU
   c. The body, faceplate and mount must all be of the same color

C. Color of inserts
   a. On black push-buttons the printed inserts must be black with white lettering
   b. On white push-buttons the printed inserts must be white with black lettering
   c. On any buttons not used the insert must be filled with a blank that matches the color of the faceplate

D. Style of inserts
   a. The lettering on the inserts must be in all caps and be centered on space
   b. Two lines are used but only if required by the length of text

E. Screws on faceplate
   a. The screws on the push-button faceplate must be the screws designed for the system and must match in color

F. Which panel to use
   a. The Crestron MP-B20 is the standard that must be used for most installations
   b. The MPC-M20 must only be used when it is not feasible to also install a MPS
   c. MPC-M10, or MP-B10 must only be used in Tier 1 installations where there is only a wall port and no DVD/VCR to be controlled

G. Standard buttons
   First Row
   a. SYSTEM ON/OFF – Turns the system and projector on and defaults to PC as the main source, press again to turn system and projector off. If system is equipped with an electric screen this button must also raise and lower it.
   b. AUX – Switches to the analog composite video source
   c. AUTO IMAGE – Automatically adjusts image on analog sources must be turned into an HDMI source button on digital systems
   d. No Sound – Press to temporarily mute the system.
      a. Pressing the volume up or down buttons must also unmute the system.
      b. “No Sound" function must mute all audio coming from the system including any microphone currently set to "Use." All current “Use” or “Don’t Use” states must be cached at this point.
      c. When "No Sound" is turned off, all microphones should be restored to the cached "Use" or "Don’t Use" state they were in prior to "No Sound" being activated.
      d. Un-muting any source by pressing the “mute” button or changing the volume must explicitly place “No Sound” to the “not on” state. Cached states are to be overwritten the next time “No Sound” is set to “on”.
   e. No Show – Press to temporary stop sending image to projector

Second Row

f. PC – Switches to the computer source
g. DOC CAMERA – Switches to the document camera
h. LAPTOP – Switches to the laptop connection
i. DVD – Switches to the DVD player
j. VCR – Switches to the VCR

Third Row

k. Play symbol – Press to start playing a DVD or VHS tape, press again to stop
l. Pause symbol – Press to pause a DVD or VHS tape
m. Rewind symbol – Press to skip rewind VHS tape or skip backwards on a DVD
n. Fast Forward symbol – Press to skip forward on a VHS tape or DVD
o. MENU – Brings up the DVD menu
p. Directional buttons control DVD navigation functions

Article CTSG-037; Version 1; Last Revised 7/24/2019

Appendix C

Podium Drawings (CTSG-037)

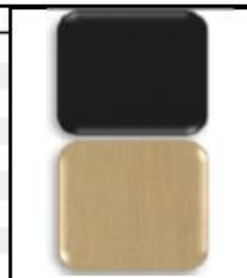
1. Adjustable Height – Left Shelf

CUSTOMER APPROVAL SHEET (NSDS) Please Email/Fax Approval back to Sales Rep

Product Type: Custom		Quote#:	197366/Dale
Item #: 55178-20112	Phantom Product	Ref Item #:	55178-20103

Description: Honors Lectern, Surround, CC700, 1.75"Dia. Hole, FMFMB

Variable	Outcomes
Laminate	Fusion Maple 7909-60 T1
Edgeband	Fusion Maple 3MM
Metal Finish	Black
Lectern Style/OB Cutouts:	Surround
Shelf	Flip Up Shelf Left
Rack Options	Slide-In Rack Cube
Logo Panel Option	NONE
Installed Cove Pwr Module:	None
Cove Color	No Cove/Color was Selected
Custom/Additonal Cutouts:	Worksurface Cutout CUSTOM CC700 & 1.75" Dia. Hole



Conceptual Drawing

Cut Out Details(1): CC700

Cut Out Details(2): 1.75" Dia. Hole

Shock Mount for Shure Mic

Logo: n/a

Original Artwork n/a

Other Notes:

1) Location of CC700 to fit into cutout in secondardary worksurface (2018 Lookbacks)

2)

3)

** Internal Use Only**

Spectrum Industries | Office and Educational Furniture

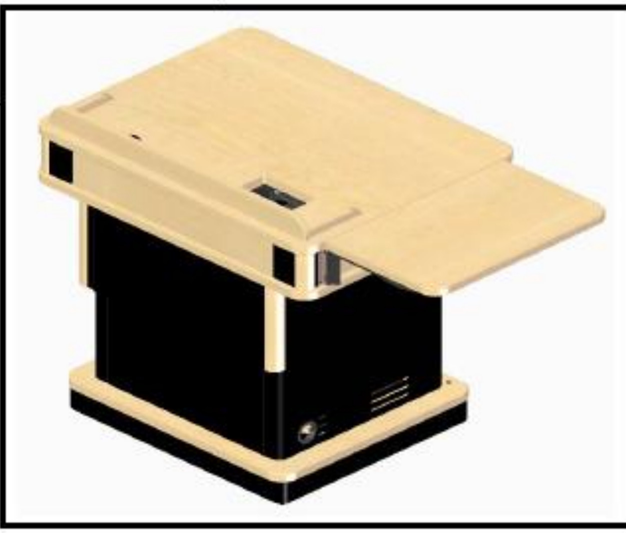
0143609 [0119309 CUSTOM]

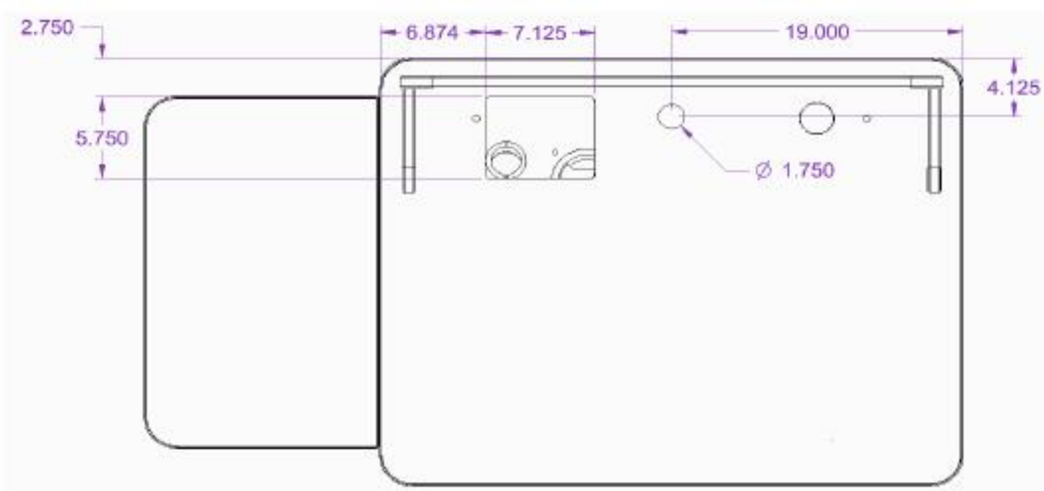
SPECTRUM INDUSTRIES INC. 925 First Ave P.O. Box 400 Chippewa Falls, WI 54729 Ph. 1-800-235-1262 Fax 1-800-335-0473
E-mail: spectrum@spectrumfurniture.com Web site: www.spectrumfurniture.com

Fax approval back to: 1-800-335-0473 **IMAGE DETAIL PAGE** Quote#: 197366/Dale

Item# 55178-20112

Description Honors Lectern, Surround, CC700, 1.75"Dia. Hole, FMFMB





By signing the Customer Approval Sheet the customer agrees that all changes listed above are correct.
No orders for non-standard products will be accepted without a signed Customer Approval Sheet.
Please submit both pages of this approval sheet when returning to Spectrum.

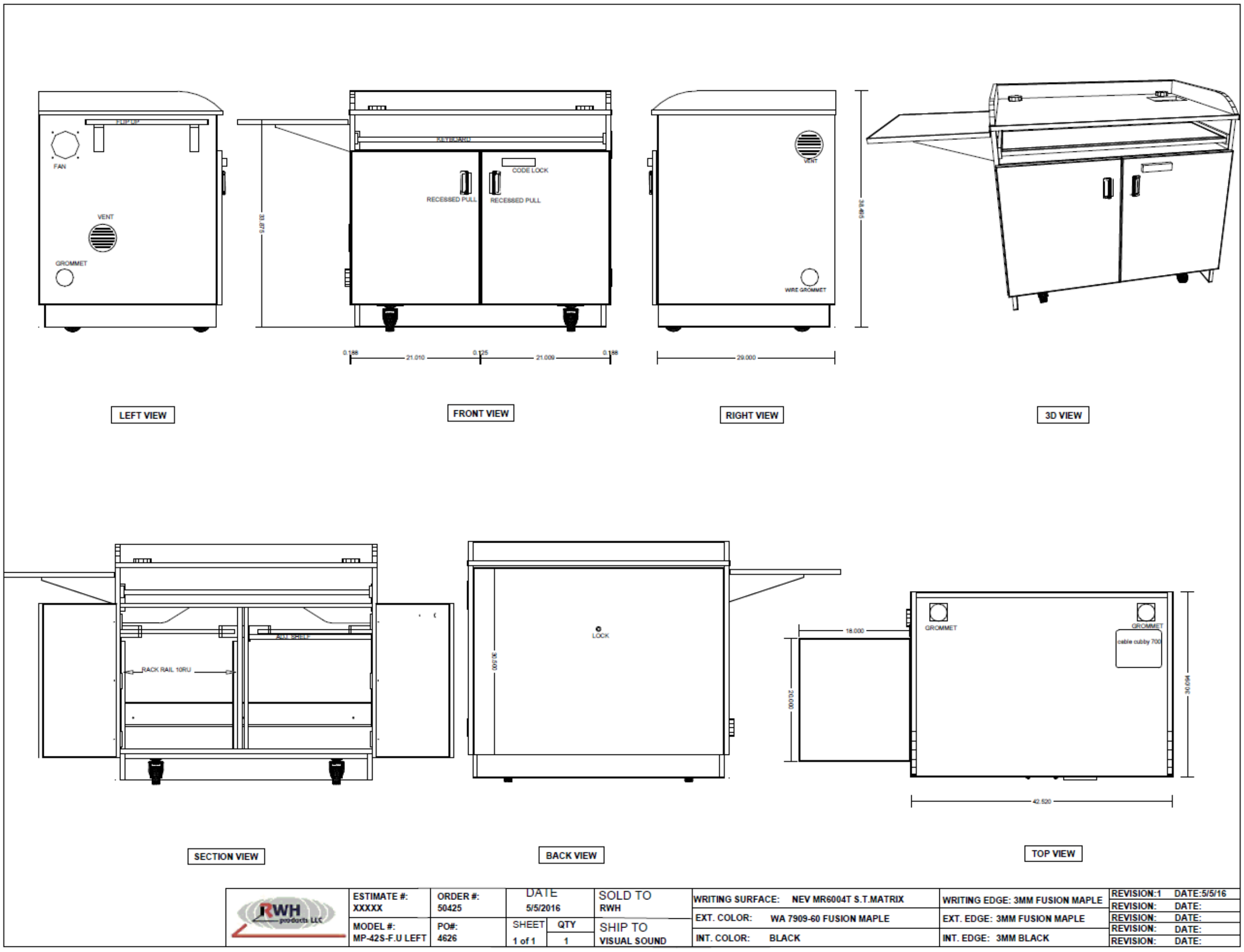
*****Non-standard products are non-returnable, non-refundable and can require a lead time of up to 6-12 weeks depending on the complexity of the changes and the time of year.*****

Approved By: ______________________ Date: ____________
(signature)

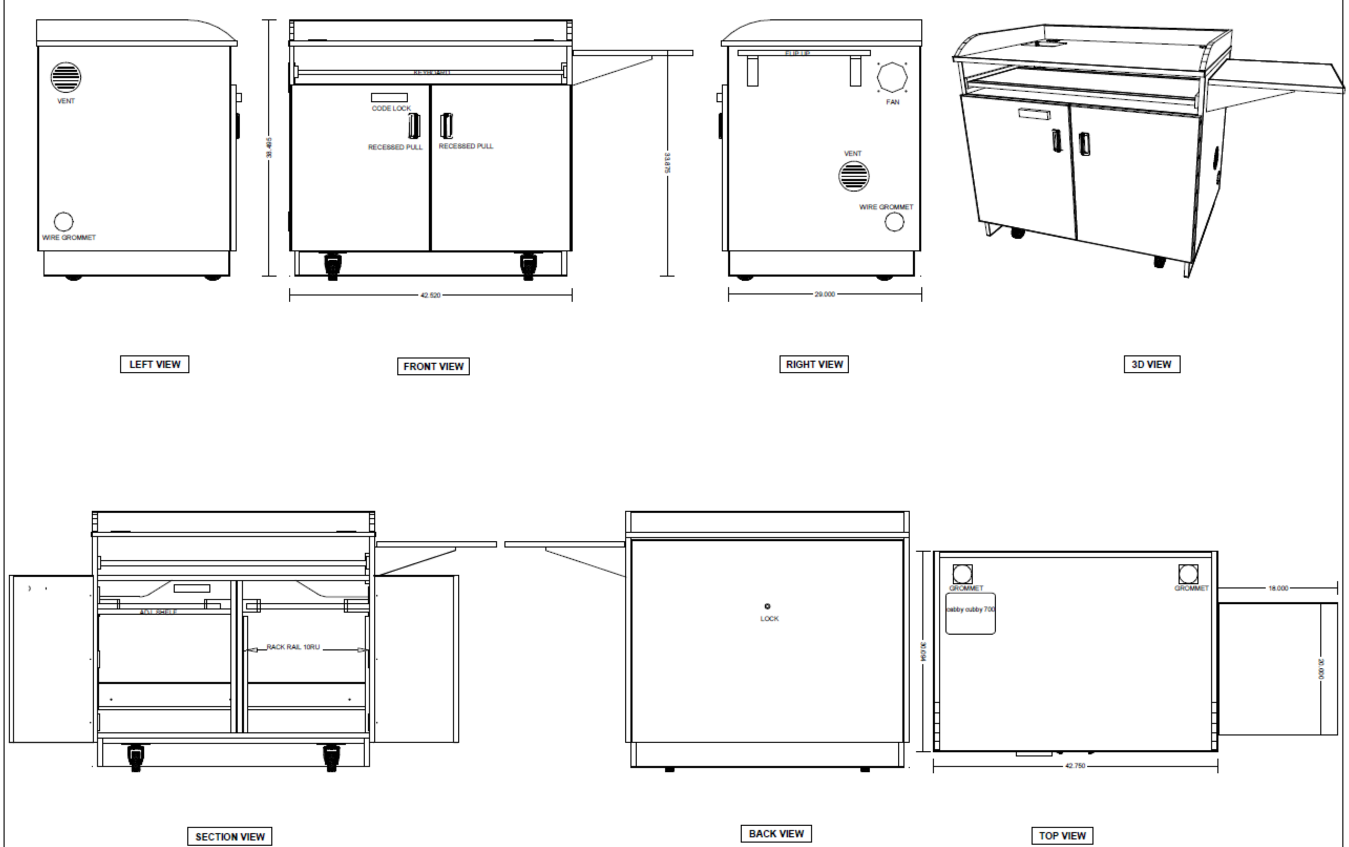
____
(print name)

SPECTRUM INDUSTRIES INC. 925 First Ave P.O. Box 400 Chippewa Falls, WI 54729 Ph. 1-800-235-1262 Fax 1-800-335-0473
E-mail: spectrum@spectrumfurniture.com Web site: www.spectrumfurniture.com

2. Left Shelf

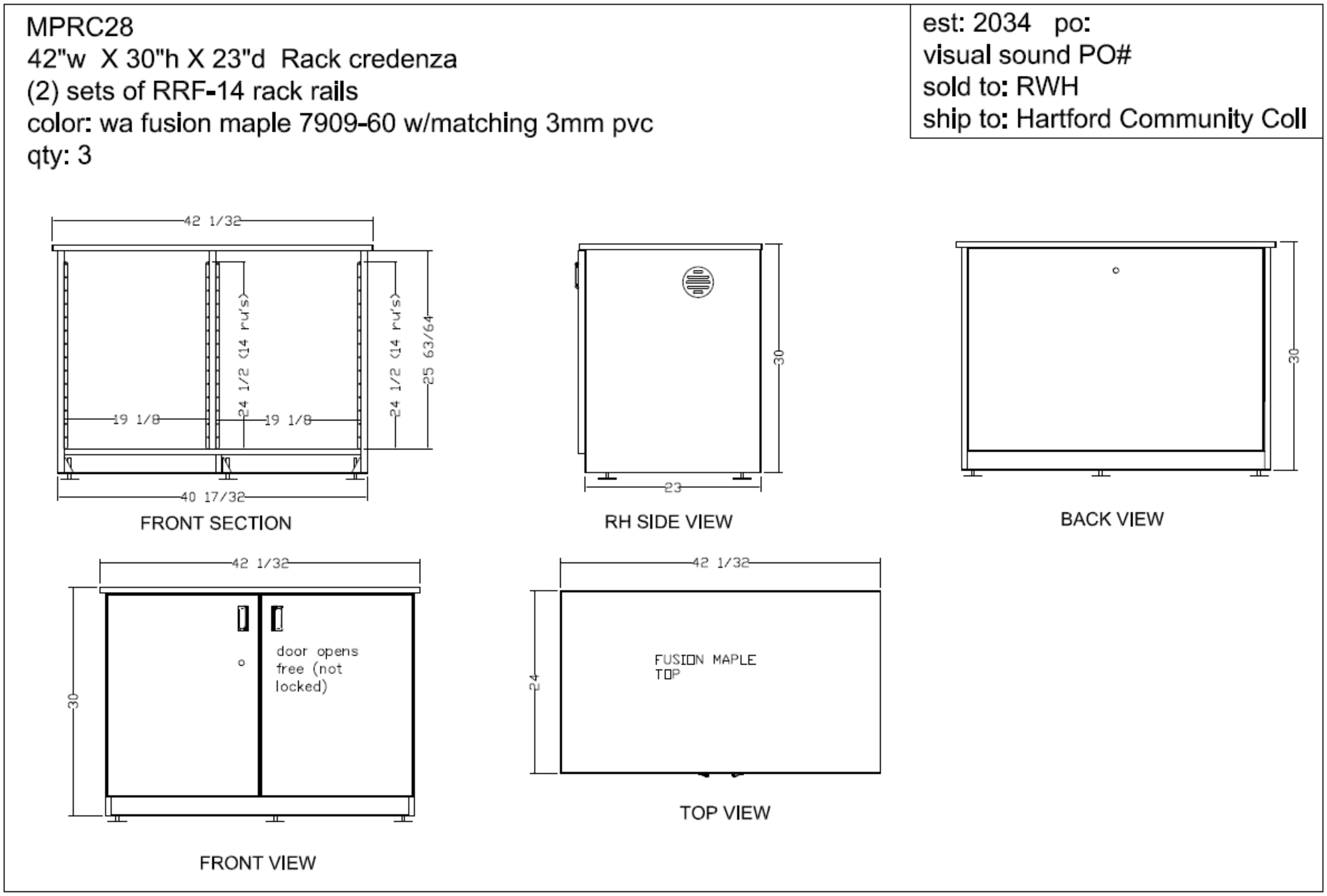


3. Right Shelf



RWH products LLC	ESTIMATE #: XXXXX	ORDER #: tbd	DATE: 5/5/16		SOLD TO: RWH	WRITING SURFACE: NEV MR6004T S.T.MATRIX	WRITING EDGE: 3MM FUSION MAPLE	REVISION:1 DATE:5/25/16
	MODEL #: MP-42S-F.U. RIGHT	PO#: 4626	SHEET 1 of 1	QTY 2	SHIP TO: VISUAL SOUND	EXT. COLOR: WA 7909-60 FUSION MAPLE	EXT. EDGE: 3MM FUSION MAPLE	REVISION: DATE:
						INT. COLOR: BLACK	INT. EDGE: 3MM BLACK	REVISION: DATE:
								REVISION: DATE:
								REVISION: DATE:

Credenza Drawings (CTSG-038)



Article CTSG-039; Version 1; Last Revised 5/21/2012

*Any changes from this design or questions must be directed to Brian Raley at braley@towson.edu.

Appendix D

Non-Standard Rooms (CTSG-039)

1. Towson City Center 209:

a. Primary image duplicated on 2nd projector.
b. Dual image button will project secondary image on other projection screen
c. Small display on monitor on podium shows instructor camera
d. Rear display mirrors primary source
e. Rear display shows distance learning location during video conference.

Article CTSG-040; Version 1; Last Revised 10/22/2019

Lecture Capture Scenario for Cisco Codecs (CTSG-040) (Retired)

1. The "Record" hard button will be pressed on the touch panel

2. Client will be prompted for a pass code

3. A screen with a Qwerty keyboad will come up asking the client to "Enter your NetID to start recording:" (the crestron will need to be programmed to add "@video.towson.edu" to the end of whatever is typed). Paul will follow up with exact command. The command for number 3 will be "xCommand Dial Number:netid@video.towson.edu Protocol:Sip CallRate:4000<LF>" where netid will replace by keyboard entry.

4. A back button must be present to go back to keyboard screen if something is miss typed.

5. A stop recording button must be available to hang up the call. There must be a confirm dialog box before actually stopping the recording. The confirmation must use the general design of the message presented to the user when they press Finish to shut down the system. Use "Are you sure you want to stop recording?" for the verbiage and include Yes/No buttons, as with the Finish confirmation.

Article CTSG-041; Version 1; Last Revised 10/22/2019

Appendix E

Device Configuration Information (CTSG-041)

Mersive SolsticePod

1. Display Tab
   a. Under "Naming and Discover"
      i. Display Name: Room collection code-SolsticePod (i.e. CK0008-SolsticePod)
   b. Under "Access Control"
      i. Access Control: Check Screen Key (unless moderated mode is desired by the client)
   c. Under "Resource Restriction"
      i. Check everything including "Enable AirPlay Discovery Proxy"
   d. Under "System":
      i. Set Admin password to standard
      ii. Update host name to match display name
2. Network tab
   a. Under "Wireless Settings"
      i. Uncheck "enable"
3. A "Wireless Input" button must be added to the Crestron touch panel if applicable.

In rooms with Crestron control systems, the programming must be updated to add a button to the source list on the Crestron touch panel labeled “Wireless Input”. The button must have the same size, color, and font size as all other sources.

The network port must be on the 539 VLAN.

On the management interface of the AirMedia device the following settings must be made:

i. Set Admin Password (See manager for password)

ii. Code must be set to Random (Device Setup>Code>Random)

iii. Host names must consist of the Collection Code with “-AirMedia” added to the end (i.e. CK0006-AirMedia) (Network Setup> Host Name> Collection Code-AirMedia)

iv. The display of the IP address must be turned off (Network Setup>Display of IP address> Off)

Disable the built-in DHCP server

• Right click and save the configuration file to your desktop: am-100_dhcp_server_off.conf (55 bytes)
• Load the downloaded configuration file to the AirMedia via the 'System Configuration' section of the AM-100 web interface.
• Once completed, the DHCP server will no longer be running on the AM-100.

c. Apple TV allows clients to wirelessly project from Apple devices such as MacBooks, iPhones, and iPads. In rooms with Creston control systems, the programming must be updated to add a button to the source list on the Crestron touch panel labeled “Wireless Input”. The button must have the same size, color, and font size as all other sources. Controls must also be added (see image in Appendix A).

The Apple TV must be plugged into a network port on the 539 VLAN

On the menu interface (accessed by pressing the menu button on the remote) the following settings must be made:

i. The device name must be changed to follow the standard naming convention: Collection Code-AppleTV (i.e. HH0313-AppleTV) (Settings>General>Name>Custom)

ii. The time zone must be set correctly (Settings>General>Time Zone)

iii. The serial number must be collected and entered into the TechInfo database (Settings>General>About)

iv. Set Sleep time to “Never” (Settings>General>Sleep)

v. Set Screen Saver to “Never” (Settings>Screen Saver>Start After)

vi. Set AirPlay security to “Onscreen Code” (Settings>AirPlay>Security)

vii. Turn on Conference room Display (Settings>AirPlay>Conference Room Display)

viii. Turn on Restrictions (Settings>General>Restrictions)

ix. Passcode (set to standard)

x. AirPlay Settings (set to “Ask”)

xi. Turn on Automatic Updates (Settings>System>Software Updates)

Tracking Log
11/09/2018 – Updated all instances of DMPS3-4K-300-C to DMPS3-4K-350-C
1/11/2019 – Updated fire alarm/annunciator restrictions
1/24/2019 – Updated logos
2/07/2019 – Updated Adjustable Height Podium documentation
4/08/2019 – More clearly defined “No Sound” functionality
5/15/2019 – New dual image standard
6/20/2019 – New Cable Cubby standard
7/24/2019 – Added Cameo C2N-CBD-P-W-T
8/26/2019 – Updated Display Select Page
11/11/2019 – Added Updated Display Control Page
11/26/2019 – Added camera presets, Interactive Display heading, default source switching, and Cleartouch Source button.
2/14/2020 – Tweaked Camera Control Page Preset Buttons (CTSG-34)
3/10/2020 – Added “hard” button feedback when selected update (CTSG-020)
7/1/2020 – Added clarification to master volume, volume level testing, and document camera power on standards.
10/1/2020 - Moved dual image to optional add on
10/6/2020 – Added networked power conditioner
10/28/2020 – Added Crestron 770 touch panel
3/10/2021 – Removed “Return to Source Select Page” button from “Advanced Volume Control Page” to allow for additional volume bar
3/17/2021 – Added information about touch panel auto brightness settings and camera labels

Appendix D

Safety and Security Technology Standards

2019

Towson University

SAFETY & SECURITY TECHNOLOGY STANDARDS

Document Intent

This document is not intended to replace any input from the Office of Public Safety in all future projects on campus at the program or design phase of all upcoming, future projects. It is the intention of this document to house in one central location a repository of contained information as it pertains to the Office of Public Safety's minimum standards of access control to include video surveillance.

The Access Control Standards Guidelines is a living document that will be modified and updated as needed. A revision date is provided so that appropriate reference can be made.

TU has an enterprise access control infrastructure, software, and processes to manage electronic security access on campus.

The Access Control Standard Guidelines provide guidelines and system intent that might not be covered in a project specification. These guidelines are meant to assist project managers, consultants, contractors and other interested TU parties with the installation, management and of access controls systems to include video surveillance.

Safety & Security Technology Standards

Reasonable Safety & Security technology standards are hereby established for all buildings on campus. These standards include but are not limited to closed circuit television camera systems, card swipe access & electronic door locking systems, public address systems, alarms (burglar, robbery, or panic), and door locking hardware.

New Construction

All new construction projects will include the necessary safety & security technology to meet the campus standards.

New construction projects will be designed taking into account the latest principles of Crime Prevention through Environmental Design (C.P.T.E.D.).

The University Police, Environmental Health & Safety, Access Control, and Architecture, Engineering, & Construction, will work in unison to ensure that all new construction projects incorporate safety & security technology that meets established standards.

Safety & security technology should be given the same deference and importance as other mandatory standards such as fire code, electrical code, environmental regulations, etc.

Major Renovations

Keeping in line with other building code practices, it is expected that any time a university building undergoes major renovation work, that building will be brought up to and in line with safety & security standards as they exist at the time of the project's planning.

Proposed Minimum Standards for all new construction and major renovations:

Surveillance Cameras

Each building will be equipped with sufficient numbers of surveillance cameras so as to allow facial recognition of all persons entering or leaving the building. In addition, all corridors, hallways, and stairwells will be equipped to capture all activity occurring within. In addition, all elevators shall be equipped with interior cameras.

Individual rooms, labs, storage spaces, etc., housing extremely valuable equipment, sensitive research, or processes requiring high levels of security will be evaluated on a case by case basis with surveillance cameras placed in those areas that warrant this level of security.

Surveillance camera system will allow for remote digital storage and retrieval of images.

Electronic Access Systems

A member of the security design team will work with the Office of Public Safety and University Police Department, to develop a building specific plan designating those doors which will be equipped with electronic access card swipe hardware and remote locking/unlocking capability. The locking/unlocking requirements for each interior door may be identified and specified on a case by case basis, based on the review by the Access Control Team in the Office of Public Safety.

The standard should be to control all exterior doors with the same application. Where electronic locking is used on one exterior door it should be applied on all exterior doors for consistency.

Those exterior doors that have been designated as entry points will be equipped with electronic card swipe and/or proximity card readers to eliminate the need to assign traditional keys to building occupants. The designated ADA door will be equipped with a combination card swipe/proximity card reader. The second door will be equipped with a card swipe reader. All exterior doors will be electrified to allow for automatic locking and unlocking on a preset schedule without human intervention. Remote access will be provided for override of the schedule for emergencies, weather related closings, delayed openings etc.

Interior doors leading to areas that are particularly sensitive either by the contents or the nature of business that is conducted within will be equipped with electronic swipe card and/or proximity card readers. Access to residential spaces where students live will be considered as a highly restrictive area. Controls should be in place to restrict any unauthorized access to those areas at entry points, elevators and stairways.

Door locking hardware – Except where prohibited by Fire Code, all interior classroom and office doors will be equipped with a thumb latch locking device that will enable the occupants to lock the room from inside. The interior door handle/knob must simultaneously release the latch and deadbolt with a single action for egress, and allow police, fire, or other emergency response personnel to unlock the door from outside with a pass key.

Mass Communication System – All campus buildings will be equipped with an interior public address system capable of sounding an alarm/siren signal along with voice capability in sufficient decibel levels so that all occupants whether they are in hallways or interior offices, classrooms, lecture halls, etc., will be able to hear the siren/alarm and clearly discern the accompanying voice message(s). This capability is currently provided through the fire alarm/annunciator system.(Must meet NFPA 72)

This document contains guidelines for video surveillance and electronic access control systems to be deployed on the Towson University Campus. Both of these systems are campus wide and centrally monitored in the Police Communications Center. These two sets of guidelines are provided under a single cover because the same organization is responsible for both. Here are some notes regarding the attached information:

1. Where information is included in these guidelines, the University expects the language to be included verbatim.

2. References to specific equipment must be verified at the time a new specification is developed to ensure that equipment is still available. Equipment items listed in this set of guidelines may be manufacture discontinued.

3. Where the documents are related to other sections of a specification, the language in this document needs to reflect that. For example, when access control is related to Finish Hardware.

4. The Office of Public Safety, Access Control unit has final review and approval on specifications related to these systems.

Any questions or comments regarding these guidelines are to be communicated through the University's project manager assigned to the project. This will ensure clear recordkeeping. Staff form the University's OPS Access Control unit are available to meet with those involved in the project to clarify these guidelines and assist the project manager, design and construction groups in completing the work under these sections..

Towson University

Guidelines for CCTV systems

Scope

General

Towson University, the owner, currently uses FLIR Latitude Network Video Management System, version ~~7.00~~8.03 with HF3. This version is current as of ~~January 20, 2018~~ September 10, 2020. Any project that will expand the current system to add video surveillance capabilities to [*This Project Name*]. Cameras will be as indicated and connected to the University's data network. Archiving will be located in the University's core data center as determined by the Office of Technology Services.

1. A contractor who is being sought to complete the expansion of the system as it pertains to this Scope of Work. The successful contractor shall:

    a. Be a recognized dealer of FLIR products.
    b. Have in house design and engineering services.
    c. Have the ability to develop AutoCAD drawings.
    d. Have sufficient installation and service forces to complete the project in the schedule specified. This staff shall have received FLIR technical training from the manufacturer prior to working on this project.
    e. Have demonstrated experience in projects of a similar nature.
    f. Provide 3 references for projects completed within the last 3 years of similar nature.

2. Responsibility for the components of the final installation shall be shared between the contractor and the University as follows:

    a. Server computers and storage required for archiving the video shall be provided by the University.
    b. Network switches and infrastructure from the switches to the University's network core shall be provided by the University.
    c. Network switches shall provide Power Over Ethernet.
    d. Static IP addresses in the correct quantity and subnets for the various locations shall be provided by the University.
    e. The placing of all category 6 cables or class 2 cabling (where required) shall be the responsibility of ~~the contractor~~ the Towson Telecom Group. Cabling shall be placed from the camera location to the indicated network switch location.

f. Installation of the cameras and all necessary mounting hardware, housings and supporting means shall be the responsibility of the contractor.
g. The contractor shall bear responsibility for other items required to meet this Scope of Work that are not specifically indicated as University responsibilities. Additional materials required to make the installation a complete and functioning system are part of this requirement.

3. Based on this Scope of Work and the supplied drawings, the contractor shall develop shop drawings detailing their approach to installing this project. For the purposes of this design, the contractor shall use the maximum camera resolution for each camera type indicated. The University requires thirty (30) days of video storage for post event investigation. The contractor shall work with Mike Roddy or another member of the Office of Public safety and OTS to get to the 30 day retention:

   a. Calculate bandwidth and storage requirements for cameras grouped by building.
   b. Develop the spread of cameras across archivers and the total storage required per archiver.
   c. Indicate general cable pathways through the buildings.
   d. Review indicated camera selections and advises if upgraded cameras are more appropriate for the application.

4. The contractor shall submit shop drawings detailing the design phase of the project. These drawings shall include:

   ~~a. A cabling plan indicating the cable requirements for each camera and device location. This plan shall include both low-voltage and 120 volt cabling and circuits.~~
   ~~b. Specification of the archivers required based on the calculations in General 4a and b~~
   ~~c.~~a. Floor plans with camera identification legend and proposed direction of view.
   ~~d.~~b. A schedule of cameras detailing the proposed name, model and IP address. ~~This schedule shall be keyed to the legend detailed in b., above.~~ Where fixed box cameras are used the lens selection shall also be indicated on this schedule.
   ~~e.~~c. If other than Power over Ethernet cameras are used a design, plan and schedule for the required power distribution for the selected cameras. This shall indicate the design load per power supply and the power supply's published capacity. Design load shall not exceed eighty-five (85%) percent of power supply capacity.

5. The contractor shall provide three (3) copies of the submittal drawings to the owner for review and approval. The approved drawings shall be used for construction. After approval the contractor shall provide to the owner an electronic copy of the submittal in AutoCAD LT 2010 format.

Materials

1. Cameras

   a. Cameras selected for any project shall be as manufactured by DVTel Inc. The following FLIR cameras are listed as acceptable for use on this project:

      i. ~~HD Elite series CM 4221-11~~Flir CM-3308 Ariel HD camera~~.~~ or newer version

      ~~ii.~~ ~~Pro Elite series CP 4221-301~~ Flir Quasar CP-6302-31-P PTZ camera or newer version.

   b. The FLIR economy Line cameras are not acceptable.

   ~~b.~~c. Each camera installed will require a license provided by Flir and will be the responsibility of the contractor to install them on the Towson owned Video Management software (Flir Latitude)

2. Power Supplies

   a. Power Supplies are not required by this project as the cameras are capable of Power Over Ethernet. In the event power supplies are needed, the supplies used shall be listed for the application.
   b. The university prefers to use products manufactured by Altronix Inc.

3. Cable

   a. All cable used for this project shall be plenum rated.
   b. Cable used for Ethernet data shall be category 6.
   c. Category 6 data cabling shall have a green jacket.
   d. Class 2 wiring used for the project shall be rated and listed for the purpose.

4. Patch Panels

a. Cables in equipment rooms shall be terminated on category 6 patch panels.
b. The University uses Tyco (Amp) Category 6 modular patch panels. These patch panels shall be used on this project for future compatibility.
~~c. The contractor shall populate the patch panels as necessary to complete this project. An additional three (3) modules shall be installed in each patch panel.~~

Execution

1. Design

a) Based on the requirements detailed in General 3, 4 and 5 the contractor shall complete the design phase of the project and provide to the University required information and documentation as detailed in the aforementioned sections of this scope.

~~i. This design shall include the pathways to be established for cabling throughout the buildings.~~
~~ii. Indication of where cable will be supported on j-hook pathways, electrical metal tubing or surface metallic raceway.~~
~~iii. Indicate the location of riser points from floor to floor.~~

b) Review in-person with the University's Office of ~~Technology Services~~Public Safety contact the proposed ~~equipment to supply the archiving and networking portions of the system~~camera and other types of hard ware needed to complete the installation of the cameras.. This review is to ensure that the University understands the requirements of the equipment being installed by the contractor.

2. Installation

a) Coordinate the placement of 120 volt electrical service with the University's Electric Shop if needed. The purpose of this coordination is to show to the University's electricians the location where additional service is needed and the total current required.

b) Furnish and install data cabling per the design as submitted and approved by the University.

i. Cabling shall be supported in accessible ceilings by J-Hooks pathways. Attaching cables to other systems (Fire, Sprinkler, Electrical or the like) shall not be acceptable.
ii. J-Hooks shall be placed no greater than 4 feet apart.
iii. Where cable is exposed it shall be run in either thin wall electrical metal conduit or metallic surface metal raceway.

c) Furnish and install cameras per the design as submitted and approved by the University.

i. Furnish and install the low voltage cabling, data and other class 2, required to support the camera locations as indicated on the approved shop drawings. Cable shall be installed within EIA/TIA, BICSI guidelines. The National Electrical Code (NFPA-70) shall also apply.
ii. Provide all necessary hardware to install the cameras in the locations indicated on the approved shop drawings. This shall include, but is not limited to, any special brackets, housings or additional supporting means required to complete a complete and safe installation.
iii. Provide all necessary connectors, lugs and wiring devices to properly interface the cameras to the cabling infrastructure.

d) Furnish and install all necessary software components and licensing to support the system as indicated on the approved drawings. Contractor to supply:

i. Necessary Camera Connection Licenses
ii. 2 Additional Client Licenses.

3. Contractor Testing

a) Rough focus cameras to determine basic angles of view and coverage.

i. Configure camera settings to provide required resolution and storage.
ii. Verify that all camera images are in proper horizontal and vertical perspective.
iii. Label cameras per the approved shop drawings.

b) Verify recording quality and storage requirements for at least one (1) week with all cameras recording. Verify recall of archived video.

c) Verify correct control of all PTZ cameras.

d) Verify viewing of live video at proper resolution and quality.

e) Develop a statement of the items tested and results of the work completed. This document shall be in narrative form providing a description of the work and results of the evaluation. Each item under Contractor Testing shall have its own section in the narrative and the individual components, such as cameras, shall be listed.

f) The purpose of this section is to ensure that all appropriate work is complete before the owner is asked to review the work. The intention is to minimize punch list items and complete the close out as efficiently as possible.

4. Owner Testing

   a) Upon completion of Contractor Testing the contractor shall meet with the owner to review the testing process and narrative document.
   b) The contractor and owner shall work together to fine focus the cameras to determine final coverage.
   c) The contractor shall demonstrate all the facets of the Contractor Testing to the owner's satisfaction.

5. Upon completion and acceptance by the owner, the contractor shall update the design drawings to reflect as-built conditions of the project. The contractor shall supply three (3) hard copies and three (3) soft copies of the as-built documents to the owner.

6. The contractor shall deliver to the owner three (3) hard copies of original Operation and Maintenance manuals for all devices supplied and installed under this section.

Towson University

Guidelines for Electronic Access Control systems

Scope

General

1. Towson University, the owner, currently uses a Lenel OnGuard Version 7.2.269 Access Control System. This version is current as of January 20, 2018. .

2. Any contractor being sought to design and build the access control system for the [*Project Name*]. The successful contractor shall:

    a) Be a Lenel Value Added Reseller
    b) Have in house design and engineering services.
    c) Have the ability to develop AutoCAD drawings
    d) Have sufficient installation and service forces to complete the project
    e) Provide 3 references for projects of similar size and scope completed within the last 3 years.

f) The design shall coordinate items in other sections of this project. For example, Finish Hardware shall include electric strikes, electric latch retraction exit devices, delayed egress exit devices and integrated reader locksets. The access control vendor shall include the interfacing, powering and configuration of these devices in the design of the access control system.

g) The contractor shall submit shop drawings detailing the design phase of the project to the owner for review and approval. At a minimum the shop drawings shall include:

a. A riser diagram detailing the locations of the sub-panels within the facility and the connection of the system data ports and addressing scheme to those locations.
b. Cabinet layouts depicting the interiors of cabinets with proposed port, address and device information.
c. Wall layouts for cabinet and power supply installations in the IT closets. Drawing shall indicate locations of required power outlets.
d. Schedule of Room, Cabinet, ISC Data Port, Address and Device identifier detailing the proposed assignment of devices and naming scheme for the installation.
e. Low voltage power distribution schematic and schedule detailing the proposed power design. Schedule shall indicate the Power Supply Identifier, Output Number, Device Identifier and Designed Current Drain. Include designed load per power supply.

h) The contractor shall provide three (3) copies of the submittal drawings to the owner for review and approval. The approved drawings will be used for construction. After approval the contractor shall provide to the owner an electronic copy of the submittal in AutoCAD LT 2006 format.

Materials

1. Access Control Electronics

   a. All access control electronics used in any project shall be as manufactured by Lenel Systems International to be compatible with the University's currently installed, campus-wide access control system. The following devices are selected by the owner for use on this project.

      i. Intelligent System Controller LNL-3300 or 4300
      ii. Dual Reader Interface LNL-1320
      iii. Alarm Input Board LNL-1100
      iv. Alarm Output Board LNL-1200
      v. Star Multiplexer LNL-8000
      vi. Magnetic Stripe Card Reader LNL-2005

   b. The single reader interface, LNL-1300 (is specifically excluded by the owner from use on this project.

2. Power Supplies

   a. Power supplies used for access control electronics and electric strikes on any project shall be selected as required while meeting the following general provisions.

      i. 12 vdc/24 vdc selectable output.

ii. Filtered and electronically regulated output.
iii. Shot circuit and thermal overload protection.
iv. Built in charger for sealed lead acid or gel type battery backup.
v. AC input and DC output LED indicators.
vi. Power distribution integral to the power supply shall:
    1. Provide overcurrent protection by fuse or PTC circuitry.
    2. Separate the power for electronics boards and locking devices.
    3. Provide logic control for locking devices.
    4. Provide connection points for fire alarm interfaces where required.

b. As a performance standard products manufactured by Altronix are acceptable. Contractor shall supply manufacturer cut sheets as part of the submittal process for selected power supplies and distribution modules.

c. The access control contractor shall provide power supplies for the control electronics and locking devices as indicated in the specification. Where power supplies for specific locking devices are supplied by others, the access control contractor shall be responsible for interfacing the locking device, power supply and control electronics. The access contractor shall supply the required cabling to meet this requirement.

3. Cable

a. All cable used for this project shall be plenum rated

b. Composite cables shall be used for card reader installations where standalone readers, door contacts, request to exit and locking devices are installed. The composite cable shall be a manufactured assembly of individual cables each having a separate purpose to the installation. Each individual cable within the assembly shall have an overall shield, and be color coded and labeled for its purpose. As a performance standard the composite cable shall be Belden Cable #658AFJ. Alternate items must be submitted to owner for approval.

c. Integrated Reader Locksets shall be served by shielded cable having four (4) 18 awg conductors. Individual conductor colors shall be Red, Black, Green and White. As a performance standard the cable shall be Belden Cable # 6302FE. Alternate items must be submitted to owner for approval.

Execution

1. Design

a) Contractor shall coordinate the parts of this system supplied under other sections of this project. Electric strikes, electrified exit devices with request to exit switches and integrated reader locksets are supplied under the 087100 Finish Hardware section. Locations of conduit sleeves, junction boxes and power drops are shown on the electrical drawings.

b) Develop the architecture for the building's access control beginning at the Intelligent System Controller(s) and accounting for the devices required and specified in this document

c) Develop the data distribution and addressing scheme for the access control system. Design the backbone cable distribution necessary to distribute the data between the main panel and sub-panel locations.

    i. Design shall minimize the use of ISC data ports to allow for future expansion.
    ii. Cabling for integrated reader locksets and the interface between such locksets and the access control system.
    iii. Schematic diagram for each special circuit required.
    iv. Connection of specialized power supplies for exit devices and delayed egress exit devices.

d) Determine the requirements for power supplies to support the access control electronics, electric strikes and integrated reader locksets. Design the distribution of power.

    i. The power for electronic boards shall be separated from the power for electric strikes and other locking devices.
    ii. While the power supplies for specific types of locking hardware may be supplied by others, the design must consider the cable necessary to meet the manufacturer's recommendations.
    iii. Power for each device shall be home run to the power distribution point and connected to individually fused or PTC protected terminals at the power supply. Power distribution for locking hardware shall have integral control logic to simplify the interface with the access control electronics.
    iv. At each sub-panel location, an additional 30% capacity shall be designed for electronics boards and locksets to allow for future expansion.

e) In coordination with the owner, develop the naming and labeling scheme for the access control system. Labeling depicted on the drawings shall be used throughout the installation.

f) Develop the submittal documents as prescribed previously in this document. Provide the noted quantities.

2. Contractor shall be responsible for the interface between card readers and door operators where operators are employed. This responsibility includes the necessary cabling, materials and coordination with other trades in the completion of this requirement. The interface between the card reader and the operator shall be as follows:

   a) When the card reader is in unlocked mode, the operator shall function normally.

   b) When the card reader is in card only mode, a valid credential is required to allow the operator to be used for ingress.

   c) In either mode, egress via the operator shall be unimpeded.
   d) Request to exit motion detectors shall be used where the access control system is interfaced with automatic door operators.

3. At multi-leaf exterior or vestibule doors the access control shall be configured as follows:

   a) One leaf shall be designated the operating leaf and will be controlled by a card reader. The designated door can be found in the Finish Hardware section of the construction manual. Door position and request to exit for the opening shall be associated with this door.

   b) The additional leaves shall be equipped to provide electronic locking and unlocking with electric latch retraction exit devices with integral request to exit switches.

   c) All leaves shall have door position switches supplied and installed by the access control contractor.

   d) The request to exit switches in each leaf of a multi-leaf opening shall be parallel connected so that they all satisfy the card readers request to exit state.

e) The door position switches in each leaf of a multi-leaf opening shall be series connected so that each door can break the circuit while all doors must be closed to make the circuit.

4. At locations with delayed egress exit devices, the interface with the card reader shall be as follows:

   a) A card reader shall be placed on the interior side of the door to allow authorized personnel to override the delay function or reset the device.
   b) If the door is identified as in ingress point, a card reader shall be placed on the exterior side of the door. This card reader shall deactivate the delay function and activate the electrified trim to allow ingress to authorized personnel.

   c) The interface between the delayed egress device and the access control system shall utilize the logic of the delayed egress device. The door position switch shall provide door status to the delayed egress device to allow it to function properly. The alarm output form the delayed egress device shall provide the door position to the access control system.

5. The access control contractor shall coordinate required network data drops with the general contractor.

6. Furnish and Install the access control electronics as determined by the design.

7. Furnish and install the required power supplies as determined by the design.

8. Furnish and install the required cabling to connect the individual access control locations to the electronics as determined by the design

9. Furnish to owner One (1) 64 Reader License Upgrade

10. Test the installation prior to connection to the existing system. Testing requires that the contractor configure a database for the installation. This test database shall remain in place until the system is ready to be turned over to the University. The contractor shall demonstrate the function of each device in the system. Test devices as appropriate for the following.

    a) Access Granted/Denied
    b) Change Reader Mode
    c) Door Force Open
    d) Door Held Open
    e) Door Forced Open Restored

f) Door Held Open Restored
g) Alarm Active
h) Alarm Cancelled
i) Mask/Unmask Alarm Inputs
j) Activate/Deactivate Alarm Outputs

11. Upon completion of the project and final acceptance by the owner, the contractor shall supply, to the owner, three (3) complete sets of all drawings and documentation updated and corrected to reflect as-built conditions of the project. These sets of as-built documents shall be both hard and soft copies.

12. Contractor shall supply, to owner, three (3) hard copies of Operation and Maintenance Manuals for all devices supplied and installed under this section.

External Perimeter Access Control

1. The external perimeter system is to be installed per university standards by a university approved Security Contractor as outlined in these guidelines.

2. Programming of the system is performed by the Access Control Team in the Office of Public Safety.

3. Credentialing of the system and the assignment of access levels for card holders is performed by the Access Control Team or a designated building occupant using Lenel's Area Access Manager.

4. Maintenance of the system is the responsibility of Access Control team within the Office of Public Safety at Towson University.

Internal Access Control

1. Internal access control can be achieved in several ways and is driven by the needs of the occupants balanced with safety measures and standards developed by the Office of Public Safety. The Access Control team will review all construction and or renovation projects and make recommendations to the VP of Public Safety for review. Recommendations will then be submitted to the Construction Design team for final approval and inclusion in to the project.
2. Wherever possible the interior doors should be controlled to allow the room occupants the ability to lock the door from inside the room. Thumb latches or similar locking capabilities to provide a "Shelter in Place" capability are required.

Integrated reader Locksets

Where appropriate, the University chooses to use integrated reader locksets. It is the intention of the University to sue devices that integrate most seamlessly with the Lenel OnGuard access control platform. The following devices are acceptable as integrated reader locksets.

1. Allegion AD300 Hardwire Networked Lock

2. Allegion AD400 Wireless Networked Lock

3. Best Access Systems IDH-MAX lock with integrated LNL-1300 reader interface.

Commissioning of an Access Control System post installation

1. All access control systems must be commissioned. Commissioning of the access control system includes the testing of a complete system from the card reader device to the database. The commissioning process is included within the scope of work for both the security contractor as well as the Security Consultant. A system is accepted as complete only after this process has been completed.

Towson University

Guidelines for Locking Hardware systems

Scope

Locking Hardware

General

Towson University, through its in-house lock shop, is required to maintain, repair and interchange many locks, cylinders, exit devices and assorted other finish hardware on an ongoing basis. For this reason, it is imperative to maximize the value and economics of a standardized hardware system. As described in the attached "Spec Section", all materials specified are proprietary with no consideration for substitutions.

Attached Specification Section:

Attached is a Specification Section 08710 available for the A/E to use directly in the proposed documents.

Related Documents:

All drawings and general provisions of the contract including General and Supplementary General Conditions, Division I and other documents Sections required for interface with this Section.

Quality Assurance:

Work specified under this Section shall be accomplished by qualified, skilled tradesmen who have continuously and successfully performed the required tasks for a minimum of five (5) years.

Experience for tradesmen stated above must include the types, models and functions of the specified products.

Finish Hardware:

This Section specifies those items collectively referred to as "Finish Hardware" or "Architectural Finish Hardware". Section encompasses those items of hardware essential to operation, control, and weather-stripping of swinging and sliding doors as normally used throughout a building, namely wood and hollow metal doors. At present, this portion of these Standards will focus on hardware for swinging doors, interior and exterior, including storefront.

Finish Hardware Schedule:

Provide a "Finish Hardware Schedule" listing each of the proposed contents of each Hardware Group.

Aluminum Entrance AND Store Fronts

General

This section provides minimum construction standards for all aluminum/storefront entrances. These entrances must be specified as "best quality" and "heavy duty" for all components and construction.

Quality Assurance

Work specified under this section shall be accomplished by a qualified vendor, whose skilled tradesmen who have continuously and successfully performed projects of equal size and complexity for a minimum of five (5) years.

Storefront Configuration

Coordinate with the owner for storefront door configuration. The preferred configuration provides all doors hinged from the same direction. However, the purpose for this is to accommodate the specified hardware. The consultant still has the flexibility of utilizing other configurations if the specified hardware can be accommodated.

Materials – Minimum Requirements

System Requirements

Doors

1. Manufacturers standard 1-¾" thick glazed door with minimum 0.125 inch thick extruded tubular rail and stile members.

2. **Stiles**: Typically, doors are designed as Wide stile. Wide stile doors are acceptable where existing, adjacent wide stile doors exist. This selection is due to high volume of

student traffic and abuse. Narrow stile doors are not acceptable except where approved by FM.

3. **Finish**: The trend at Towson University is to use bronze duronodic door finishes. This does not prevent the consultant from specifying a clear anodized door, especially in renovation or addition work where existing door finishes are established. Verify the desired finish with AEC.

4. **Weather Stripping**: Manufacturer's standard replaceable weather-stripping as follows:

a) Compression weather stripping: Molded neoprene complying with ASTMD 2000 requirements
b) Sliding weather stripping: wool, polypropylene, or nylon woven pile with nylon fabric or aluminum strip backing with AAMA 701 requirements.
c) Weather sweeps: manufactures standard weather sweep for application to exterior door bottoms with concealed fasteners on mounting strips.

5. **Fasteners and accessories**: manufacturer's standard corrosion resistant, non-bleeding fasteners and accessories compatible with adjacent materials.

6. **Finishes**: Class I, anodic finish: AA-M12C22A42/A44 (mechanical finish: non specular as fabricated; chemical finish: etched, medium matte; anodic coating: Architectural Class I, integrally colored or electrolytic ally deposited color coating 0.018mm or thicker complying with AAMA 606.1 or AAMA 608.1.

7. **Construction**

a) Mechanically fastened, SIGMA deep penetration welded corners.
b). Integral weather-strips system as supplied by the manufacturer, including integral sweeps as required.

8. **Hardware**

a). Door Closers - should be the LCN-4040XP RWPA.

a) Hinges: (Butt Hinges) should be used as primary and continuous (Roton or Select) should be secondary hinges used only when manufactured specific field conditions are in play. Type and offset of hinges must be adapted to the opening and approved by AEC prior to submission.
b) Exit Devices: Von Duprin 99 Series Rm
c) Pulls: (reserved)
d) Push Plates: (reserved)

Manufacturer: Following are acceptable manufacturers of aluminum storefront:

A. Special – Lite SL15 W/SL 484 mid panel /W SL84 Flush Pull or owner approved Equal with comprehensive 10 yr. parts and labor warranty.

Appendix E
Towson University IT Standards

IT INFRASTRUCTURE STANDARDS

Volume I

1/8/2019

TOWSON UNIVERSITY
8000 York Road, Towson, MD 21252

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1 OVERVIEW

1.1 Purpose

1.1.1 This document describes Towson University's IT infrastructure standards for its cable plant and its data, telephone, and television network.

1.1.2 This standard references a set of industry standards to which the University's IT infrastructure must conform and supplements them with University-specific requirements.

1.1.3 The University provides this document to consultants developing construction documents, bidders bidding on cabling projects, and contractors performing cabling work.

1.1.4 For a **consultant** developing construction documents, it provides the information required to design an IT infrastructure that is consistent with Towson University's IT infrastructure standards and to integrate that design into construction documents.

1.1.5 For a **bidder** bidding on a University cabling project that contains or references this document, it defines acceptable materials, execution requirements, and other information required to develop a bid.

1.1.6 For a **contractor** executing cabling work, it provides instructions and requirements for performing the work.

1.2 Organization

1.2.1 This document is divided into four parts:

a) Overview

b) Design standards

c) Parts & Materials

d) Execution

1.2.2 Each parts is organized into sections and subsections.

1.2.3 Each provision of the standard has a unique identifier to make them easy to reference.

1.3 Guidance for Consultants

1.3.1 This section contains guidance for consultants developing construction documents.

1.3.2 A consultant must understand this document thoroughly.

1.3.3 The design specifications section provides the high-level information a consultant needs to design the IT infrastructure.

1.3.4 Parts & Materials

1.3.4.1 This document specifies parts and materials by:

a) Performance characteristics.

b) Specific manufacturer and part number.

1.3.4.2 Parts and materials specified by performance characteristics can be any part by any manufacturer that meets or exceeds the specified performance characteristics except for manufacturers or part numbers expressly prohibited by this document.

1.3.4.3 Parts and materials specified by manufacturer and part number are specific parts that must be used.

1.3.5 Telecommunication Rooms

1.3.5.1 This document goes to great length to specify the bare minimum requirements for Telecommunication rooms. Therefore, they must meet the requirements in this document must be met. There is no room for flexibility.

1.3.5.2 The most common problem and source of frustration for all parties during the development of construction documents is improperly located and sized telecommunications rooms.

1.3.5.3 To ensure telecommunication rooms are properly located and sized, the consultant must:

a) Ensure telecommunication room requirements are included in the conceptual design document along with programming for all other parts of the building, with worst-case square footage and specific requirements for their location.

b) Ensure that telecommunication room requirements are included in all submissions of the design development documents, that the telecommunication rooms are clearly shown on drawings, and that their size and location meets requirements.

c) Ensure that telecommunication room requirements are met in all submissions during the construction document development.

1.3.6 Frequently Missed Items

1.3.6.1 Equipment racks, wire management, patch panels, faceplates, and jacks are all specified by manufacturer and part number are frequently missed.

1.3.6.2 The requirement for penetrations through fire rated structures, particularly the cable count threshold for the use of conduit with fire stopping vs EZ-Path fire barriers, is frequently missed.

1.3.6.3 The color-coding for category 6 and 6A UTP is frequently missed.

1.3.6.4 The color-coding and specific part numbers for category 6 and 6A jacks is frequently missed.

1.4 Scope Conflicts

1.4.1 This section pertains to projects where the University provides this document to a bidder as part of a bid package, or references it in a bid package.

1.4.2 Bidders must bring conflicts between the scope of work and this document to the University's attention for clarification.

1.4.3 If a bidder fails to bring such conflicts to the University for clarification, this document takes precedence unless the scope of work explicitly states it overrides this document.

1.5 Construction Document Conflicts

1.5.1 This section pertains to projects where a design consultant integrates these standards into construction documents used for bid.

1.5.2 The design consultant is solely responsible for integrating these requirements into the construction documents.

1.5.3 The University's review of construction document submissions in no way relieves the design consultant of his responsibility to integrate these requirements into the construction document.

1.5.4 The design consultant must bring conflicts between this document and the construction documents to the University's attention for clarification.

1.5.5 If the design consultant fails to bring such conflicts to the University's attention, this document takes precedence.

1.6 Quality Assurance

1.6.1 The contractor must perform work in accordance with the BISCI Methods Manual.

1.6.2 The contractor must perform work in accordance with the EIA/TIA Building Telecommunications Wiring Standards.

1.6.3 The bidder is responsible for bringing conflicts between this document and the BICSI or EIA/TIA standards to the University for clarification.

1.6.4 If the bidder fails to bring such conflicts to the University for clarification, the more stringent standard applies.

1.7 Submittals

1.7.1 If site conditions prohibit installation as shown on the drawings, the installer must submit the required changes to Towson University for approval prior to installation.

1.7.2 The contractor must submit cut sheets for each part or material required for the project that this document specifies by performance characteristics for the University's review and approval prior to ordering.

1.7.3 The contractor must submit all installation procedures that deviate from the manufacturer's installation procedures to the University for review and approval prior to ordering.

1.8 Documents

1.8.1 The contractor must accurately record the location of service entrance conduit, termination backboards, outlet boxes, port locations and labeling, cable raceways and basket trays, pull boxes, and equipment boxes on detailed floor plans.

1.8.2 The contractor must document the cable plant and associated equipment in accordance with the specifications detailed below.

1.8.3 The contractor must provide test results in Microsoft Excel format for all cables installed.

1.9 Applicable Standards

1.9.1 The University has adopted the standards included in this section and has referenced them rather than repeat them in this document.

1.9.2 In the event of a conflict between these standards, or between these standards and this document, the more stringent standard applies.

1.9.3 TIA/EIA Standard 569 – Commercial Building Standard for Telecommunications Pathways and Spaces

1.9.4 TIA/EIA Standard 568B – Commercial Building Telecommunications Wiring Standard

1.9.5 TIA/EIA Standard 606A – Administration Standard for Telecommunications Infrastructure of Commercial Buildings

1.9.6 TIA/EIA Standard 607 – Commercial Building Grounding and Bonding Requirements for Telecommunications

1.9.7 National Electric Code

2 DESIGN STANDARDS

This section describes the standards a design consultant needs to develop an IT infrastructure that is consistent with the University's IT infrastructure standards and incorporate that design into construction documents suitable for bid.

2.1 Conventions

2.1.1 Throughout this section, the following phrases have the meanings defined here.

2.1.2 The phrase "the consultant must specify" indicates that the consultant must include the information that follows in the construction documents.

2.1.3 The phrase "point of penetration" indicates the point where the outside plant cable emerges into the building, through either an exterior wall or the basement slab, as defined in the NEC.

2.1.4 "Construction documents" refers to all drawings and narrative text a consultant develops for bid.

2.2 Outside Plant Cable

2.2.1 OSP cable consists of single-mode and copper cable.

2.2.2 OSP coaxial cable is not required.

2.2.3 The consultant must consult the Office of Technology Services for the types and counts of OSP cable.

2.2.4 The consultant must specify OSP cable consistent with the performance characteristics for OSP cable provided in the Parts & Materials section of this document.

2.3 Riser Cable

2.3.1 Riser cable consists of single mode fiber optic cable, copper cable, and coaxial cable.

2.3.2 The consultant must specify 24 single mode fiber optic cables from the MDF to each IDF.

2.3.3 The consultant must specify a 25-pair copper cable from the MDF to each IDF.

2.3.4 The consultant must specify one RG6 coaxial cable from the MDF to each IDF.

2.3.5 The consultant must specify riser cable that is consistent with the performance characteristics for riser cable provided in the Parts & Materials section of this document.

2.4 End-Station Cable

2.4.1 End-station cables are Category 6 UTP, Category 6A UTP, and RG11 coaxial cable, that extends from a MDF or IDF to an end-station.

2.4.2 Cable for data must be orange Category 6 UTP. Installers must terminate data cable with an orange Category 6 jack at the end-station and at the patch panel in the TR.

2.4.3 Cable for analog voice must be grey Category 6 UTP. Installers must terminate analog voice cable with a black Category 6 jack at the end-station and on a 110-punch block in the TR.

2.4.4 Cable for wireless access points must be yellow Category 6A UTP. The installer must terminate wireless access point cable with an RJ-45 at the wireless access point location and on a yellow Category 6A jack at the patch panel in the TR. The installer must provide a 15’ service loop at the wireless access point location.

2.4.5 Cable for surveillance cameras must be green Category 6A UTP. The consultant must specify that the installer must be terminate surveillance camera cable with an RJ-45 at the surveillance camera location and a green Category 6 jack at the patch panel in the TR. The installer must provide a 15’ service loop at the wireless access point location.

2.4.6 The consultant must specify the performance characteristics for end-station cable and terminators provided in the Parts & Materials section of this document.

2.4.7 A standard communication outlet for an office consists of two data jacks.

2.4.8 Each office space must have exactly one standard communications outlet for each desk. Any deviation from this standard must be approved by the University’s Office of Technology Services.

2.4.9 The consultant must offset Communication outlets on adjoining walls such that they are not exactly back-to-back.

2.5 Cable Pathways & Supports

2.5.1 This section describes interior cable pathways and supports.

2.5.2 Cable in all TR’s must be supported by ladder rack.

2.5.3 Cable in all major corridors must be supported by basket tray.

2.5.4 Cable in minor corridors must be supported by j-hooks.

2.5.5 There must be 12 inches of clearance above and to one side of all cable supports.

2.5.6 The consultant must specify cable supports sufficient to satisfy the initial capacity for the project plus a reasonable margin for growth given the potential use of the space it serves.

2.5.7 Installers must not attach cable supports to anything other than the building structure.

2.5.8 Installers must not attach anything to telecommunications cable supports.

Installers must not install anything other than telecommunications cable or low voltage cable specifically approved by the Office of Technology Services in telecommunications cable supports.

2.5.9 Penetrations through fire-rated walls intended to support 8 or fewer cables must use conduit with fire-stopping putty.

2.5.10 Penetrations through fire-rated walls intended to support more than eight cables must use EZ-Path fire barriers.

2.5.11 Penetrations through non-fire-rated walls must be conduits or sleeves.

2.5.12 Vertical chases outside of a TR must have:

a) Access panels on each floor.

b) Plywood on each interior wall.

2.5.13 The consultant must include 4 4-inch sleeved core holes inside each stacked TR's to create an open vertical chase within the stack of TR's.

2.6 Conduits & Fire Stopping

2.6.1 Conduit sleeves must be four (4) inch trade size minimum with a minimum of three (3) sleeves to connect the TC's vertically.

2.6.2 Sleeves must be Rigid Galvanized Steel for penetrations of concrete slabs, concrete walls, and CMU walls.

2.6.3 Sleeves for penetrations of stud walls must be EMT.

2.6.4 All sleeves must be rigidly installed using appropriate fittings and all masonry penetrations must be grouted.

2.6.5 Sleeves must project a minimum of six (6) inches beyond wall or floor surface.

2.6.6 All penetrations of fire rated construction must be fire stopped with fire stopping as specified earlier or exceed fire rating of the penetrated material.

2.6.7 Sleeves for penetration of walls and floors must have one hundred percent (100%) spare capacity, and must be fire stopped as per code.

2.6.8 Any section of conduit containing two (2) 90-degree bends, a reverse bend, of having length greater that one hundred (100) feet must have an accessible pull box.

2.6.9 All conduits must have a 3/32-inch polyethylene pull cord appropriately secured at each end and replaced if used.

2.6.10 No oval or square conduit fittings must be permitted.

2.6.11 No screw type fittings must be permitted.

2.6.12 All metallic conduit and raceways must be appropriately grounded as specified in the National Electric Code.

2.6.13 An AWG #6 ground wire will be installed in both vertical risers from the basement to the top floor.

2.6.14 This ground must be attached to the building's approved grounding point used for the building electrical service at one (1) point only.

2.6.15 A ground bus must be provided in each TC bonded to the communications ground system.

2.6.16 Each floor will be equipped with a center hung cable tray as Manufactured by OBO

Bettermann or equivalent from the telecommunications closet, above the suspended ceiling in corridors, to provide an access path to each communications outlet.

2.6.17 Three (3) 4" electrical metallic tubing (EMT) conduits will be installed to provide access to the center hung cable tray from the telecommunications closet.

2.6.18 The center hung cable tray must be installed as low as possible above the suspended ceiling and secured according to the National Electric Code.

2.6.19 If possible, at least 18" clearance above the center hung cable tray.

2.6.20 The telecommunications center hung cable tray should be on the opposite side of the ceiling space from cable ladder racks or other distribution used for electrical service.

2.6.21 Where possible, all 90-degree turns should be made by two (2) 45-degree turns.

2.6.22 Supports and fasteners must be used such that they provide an adequate safety factor.

2.6.23 All conduit/cable trays must be supported from the building structure and not from any other ductwork, pipes, ceiling tiles, or equipment.

2.6.24 All conduits should be a maximum of two (2) inches from any finished plywood wall.

2.6.25 Should ceiling space not allow for cable tray, contractor must install J-hooks, adequate for Category 6 cable, with a span of no greater than 4' from hanger to hanger.

2.6.26 Where cable tray or conduit is not provided, J-hooks adequate for Category 6 cable must be installed.

2.6.27 The J-hooks must be attachable to a floor slab through the use of a pre-threaded lead insert which is suitable for installation of a 3/8 inch "all-thread" rod in a predrilled ½ inch hole.

2.6.28 The threads of the closure bolt on the pipe hanger must be covered by 3/8-inch copper or aluminum tubing to protect the cabling sheaths.

2.6.29 Cables placed in hangers in the plenum ceiling area must be routed high and away from all other electrical and mechanical systems so as to avoid contact with light fixtures, ventilation ducts, sprinkler systems or plumbing piping, motors, or any other electrical devices.

2.6.30 The cable must not be run in parallel with any high voltage electrical wiring.

2.6.31 The maximum separation between support points for all cabling must be four (4) feet.

2.6.32 Lay in pipe hangers must be installed so as to accommodate maximum distance spacing.

2.6.33 Hangers must be installed at directional bend points so as to provide a maximum bend angle of 45 degrees for the supported cabling.

2.6.34 Contractor must install 3/32 inch O.D., 200lb. Strength, polyethylene pulling string in each empty conduit, and appropriately secured at each end.

2.7 Telecommunication Rooms

2.7.1 Locations

2.7.1.1 The consultant must specify a single MDF on the lowest floor.

2.7.1.2 The consultant must specify one or more IDFs as necessary given the layout of the building.

2.7.1.3 The consultant must vertically stack all TR's centrally in the building.

2.7.1.4 If the building is too wide to allow for a single stack that provides coverage for the entire building, the consultant must design multiple vertical stacks of TR's.

2.7.1.5 The consultant must minimize the number of TR's by serving multiple floors from a single TR where possible.

2.7.1.6 The consultant must locate TR's such that telecommunications cable can reach every point in the building with cables no longer than 90 meters run through the designed cable pathways.

2.7.1.7 If the MDF is located more than 50 feet from the point of penetration, the consultant must specify that each OSP conduit must extend to the MDF through RMT, as required by the NEC.

2.7.1.8 The consultant must design the dimensions of the hub rooms based on an estimate of each TR's capacity and the TR clearance requirements included in this document.

2.7.1.9 The consultant must specify all of these requirements in writing during the conceptual design phase.

2.7.1.10 The consultant must specify these requirements in writing during design development.

2.7.1.11 The consultant must specify each TR during construction document development.

2.7.2 Dimensions

2.7.2.1 The consultant must ensure that the dimensions of each TR conforms to the specifications in this section.

2.7.2.2 The number of racks required for a TR and the clearance requirements for those racks constrain the possible dimensions.

2.7.2.3 The capacity of a TR determines the required number of racks.

2.7.2.4 The initial number of data drops in a TR plus its potential for growth over the lifetime of the TR is the TR's capacity.

2.7.2.5 The consultant must determine the initial number of data drops for each TR.

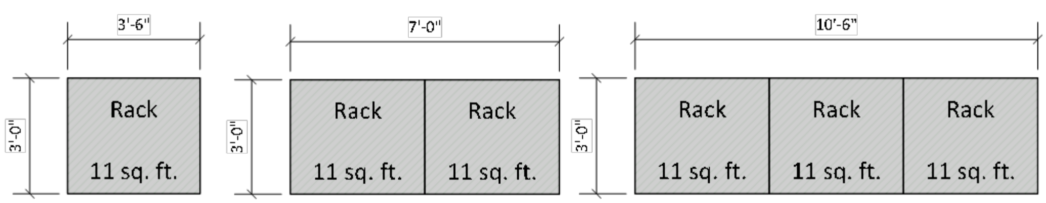
2.7.2.6 The consultant must use the following table to determine the number of racks for each TR.

Initial Capacity	Growth Potential	Capacity	# of Racks
<= 192	192	384	1
<= 384	384	768	2
<= 576	576	1,152	3
<= 768	768	1,536	4

2.7.2.7 The consultant must use 100% as the growth potential for a TR, as described in 2.7.2.6, unless the consultant can demonstrate that an increase or decrease is justified and the University approves the adjustment in writing.

2.7.2.8 The consultant must assume the footprint for all racks is 3 feet wide by 3 feet 6 inches deep, which includes vertical wire management on both sides of the rack.

2.7.2.9 The consultant must assume that side-by-side racks have their own vertical wire management on both sides and do not share a common vertical wire manager. For clarity, side-by-side racks have the footprints shown in the following diagrams.

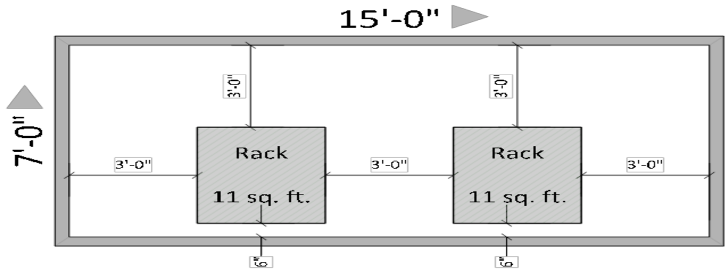


2.7.2.10 The consultant must estimate the capacity of each TR as its initial capacity plus an estimate of its potential for growth over the lifetime of the TR.

2.7.2.11 All racks must have a minimum 3 feet of clearance on the front, back, and one side.

2.7.2.12 The interior racks within a row of racks only require 3 feet of clearance in the front and back.

2.7.2.13 The 3 feet of clearance between racks placed one in front of the other, as would be the case for a narrow room, satisfies the clearance requirement for the back of the front rack and the front of the rear rack as illustrated in the following diagram.



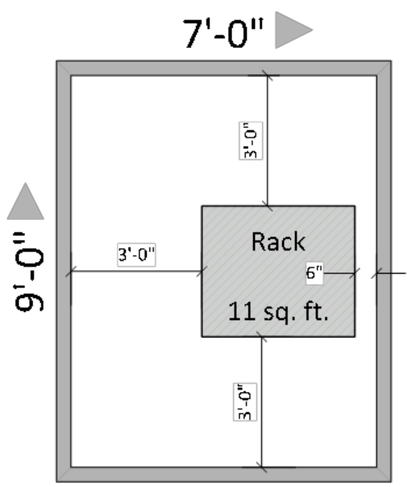
192 – 384 Day 1 Ports

2.7.2.14 If the room contains interior corners, columns, or other obstructions, the clearances apply to those features as well as the walls.

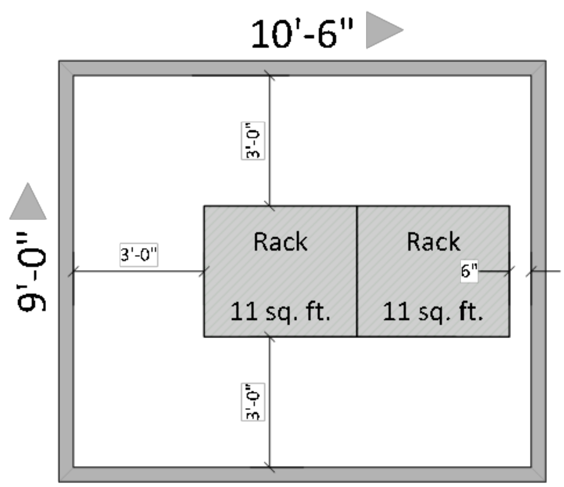
2.7.2.15 The clearance between a wall and a rack must take wall-mounted equipment into account. If wall mounted equipment such as 110 blocks, electrical circuits, etc., protrude 4" from the wall, the clearance between the rack and the wall must be 3'4".

2.7.2.16 Electrical circuits mounted on racks are included the specified rack footprints.

2.7.2.17 Within these constraints, and the spirit of these constraints, the consultant must configure the room in any size and shape. However, to illustrate the intent, the following diagrams are examples of acceptable rack configurations and room dimensions.



1 – 192 Day 1 Ports



193 – 384 Day 1 Ports

2.7.2.18 The consultant must decide upon the dimensions of each TR in conjunction with the architect and document them at each submission during conceptual design, design development, and construction document development.

2.7.3 Electrical Requirements

2.7.3.1 All circuits must be dedicated.

2.7.3.2 There must be one duplex 15A, 120V circuit with 15-R receptacles placed on the wall to the left or right of the hub room's entrance.

2.7.3.3 There must be one quad 15A, 120V, circuit, with 15-R receptacles placed on the back of the right-most rack if racks are in a row or the rear-most rack if racks are one in front of the other.

2.7.3.4 There must be two 20A, 220V, circuits, with a L6-20R receptacle placed on the back of every rack.

2.7.3.5 There must be one 30A, 220V, circuit with a L6-30R receptacle placed on the back of every rack.

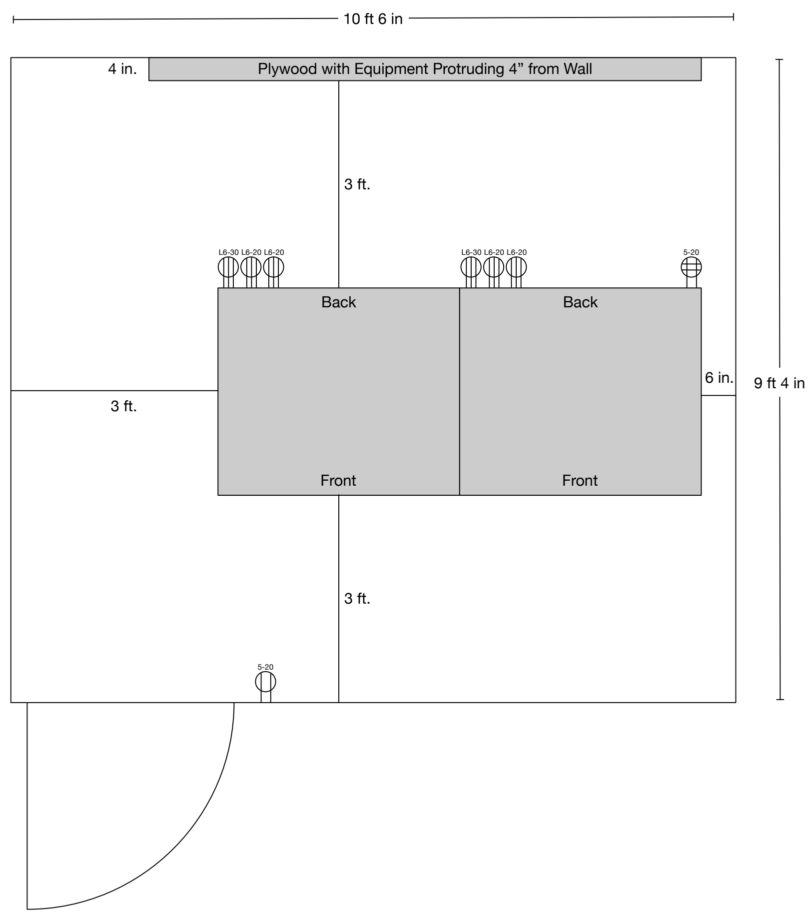
2.7.3.6 There must be a telecommunications-grounding bar located in each hub room that must be and attached to an earth ground.

2.7.3.7 All equipment racks must be grounded to the telecommunications-grounding bus bar.

2.7.3.8 For buildings with one or two TR's, the University will purchase and install a UPS unit for each rack in each TR.

2.7.3.9 For buildings with more than two hub rooms, the consultant must select an appropriately sized centralized flywheel UPS. This UPS must be in its own room and all circuits in each TR must connect to it either directly or via a sub panel.

2.7.3.10 All UPS units must be connected to circuits that are on a backup generator with an automatic transfer switch.



2.7.4 HVAC

The consultant must specify that TR's:

2.7.4.1 Must have sufficient cooling to maintain a maximum temperature of 78º F for the lifetime of the room.

2.7.4.2 Must not receive heat from the building's HVAC system during the winter.

2.7.4.3 Will generate 9,000 BTU/Hr. per rack, and use that figure to determine the TR's cooling requirements.

2.7.5 Access & Security

The consultant must specify that each TR:

2.7.5.1 Is accessible directly from a hallway.

2.7.5.2 Has card-swipe access.

2.7.5.3 Must not have windows.

2.7.5.4 Must have doors must swing out.

2.7.5.5 Must have doors made of solid wood or metal, without windows or vents.

2.7.5.6 Must not contain building controllers, such as but not limited to, fire alarm, door access, HVAC, and lighting controllers.

2.7.6 Backboards

The consultant must specify:

2.7.6.1 Backboards on all walls of each TR.

2.7.6.2 Backboards are as specified in the Parts & Materials section of this document.

2.8 Radio Frequency Emissions

2.8.1 Overview

2.8.1.1 This section describes the University's requirements for operating radio frequency emitting equipment on campus.

2.8.1.2 The requirements are divided into interoperability and approval, and safety requirements.

2.8.2 Interoperability & Approval

2.8.2.1 The University operates a wireless network campus wide, indoor and outdoor, that makes extensive use of the public frequency bands at 2.4 and 5 GHz.

2.8.2.2 The University operates a public safety radio system at 700 MHz.

2.8.2.3 The University must approve the use of all radio frequency emitting equipment on campus before it is used.

2.8.2.4 The requestor must provide the University with all relevant information, including but not limited to, frequencies used, output levels, power level predictions, etc., required for the University to make an informed decision.

2.8.3 Safety Requirements

2.8.3.1 All equipment must comply with all applicable rules and regulations of the FCC, including without limitation, those related to radio frequency emissions and exposure.

2.8.3.2 From time to time, but not more often than once per calendar year, the University may require the owner to perform a radio frequency emissions study sufficient to allow the University to determine whether or not the system is in compliance with applicable FCC rules and regulations related to radio frequency emissions and exposure. The owner must provide that survey at no cost to the University.

2.8.3.3 Should any such study show levels violating FCC rules or regulations, the owner shall provide a plan for the University's re view, for controlling access to affected areas, including but not limited to, markers, signage, door locks, rails, and fences, or otherwise cure the FCC violations.

2.8.3.4 Until such plan is implemented, Licensor may, by written notice to Licensee require Licensee must immediately power down the portion of the equipment causing such violations of FCC rules and/or regulations.

3 PARTS & MATERIALS

This section contains a list of acceptable parts and materials. The University requires specific manufacturer and part numbers for some parts and materials. The University defines performance characteristic for all other parts and materials. Any manufacturer/part number meeting the specified performance characteristics is acceptable.

Design consultants must incorporate this information into their construction documents. Bidders bidding on a contract must use this information to select materials upon which they will base their bids. Contractors performing work must use this information to order the appropriate parts and materials.

3.1 Backboards

3.1.1 Backboards must be:

3.1.1.1 3/4 –inch fire resistant plywood with Class A surface.

3.1.1.2 A minimum of 4' x 8'.

3.2 Cable Supports

1. Cable supports for major hallways must be basket-type.
2. Cable supports for minor hallways must be j-hooks.
3. Cable supports for TR's must be ladder rack.
4. Acceptable Manufacturer: GS Metals or similar.

3.3 Connecting Blocks

1. All optical fiber cable in all Intermediate Distribution Frame (IDF) rooms must be terminated in fiber termination shelves.

Acceptable unit for IDF's: Corning (LANscape) CCH-03U w/CCH-CP12-91 connector panels

2. All optical fiber cable in the Main Distribution Frame (MDF) rooms must be terminated in fiber termination shelves and associated equipment.

Acceptable unit for IDF's: Corning (LANscape) CCH-03U

Multi-mode: CCH-CP12 - 91 connector panels

Single-mode: CCH-CP12 – 59 connector panels

Acceptable unit for MDF's: Corning (LANscape) CCH-04U

Multi-mode: CCH-CP12 – 91 connector panels

Single-mode: CCH-CP12 – 59 connector panels

3. All copper cabling must be Category 6.

   a. All Category 6 cable utilized for data must be terminated on 48 port Ortronics HDJ Series 48 Port Unloaded Flat Panel Patch Panel, Ortronics Part OR-PHDHJU48.

   a. Patch panel jacks designated for data or VoIP telephones must be Ortronics Clarity Category 6 High Density Jack, T568A/B, Orange, Ortronics Part # OR-HDJ6-43.

   b. Patch panel jacks designated for wireless access points must be Ortronics Clarity Category 6 High Density Jack, T568A/B, Yellow, Ortronics Part # OR-HDJ6-44.

   c. Patch panel jacks designated for security cameras must be Ortronics Clarity Category 6 High Density Jack, T568A/B, Green, Ortronics Part # OR-HDJ6-45.

OR-HDJ6-43 OR-HDJ6-44 OR-HDJ6-45

4. All analog lines will be terminated on 110 CAT6 blocks.

5. Quantities for all connecting blocks above will be specified by Towson University's Office of Technology Services in project scope of work.

3.4 Equipment Racks

a. Equipment racks must be Mighty Mo 20 Channel Rack, 6.5" Deep Channel, 7' High, 45RU, Tapped #12-24, Ortronics Part # OR-MM20706-B.

b. Vertical wire management must be Mighty Mo 20 Vertical Wire Managers with a Door, Otronics part #OR-MM20VMD710-B.

c. The contractor must provide four (4) Ortronics Mighy Mo 30 Bend Limiting Clips, Otronics part # OR-MM20BLC-B, per patch panel.

3.5 Fiber Optic Terminations

1. The installer must terminate all optical fiber cable installed with a split-ferrule alignment sleeve and a precision ceramic tip. All optical fiber connectors must meet the following technical specifications:

Optical Fiber Termination Specifications	
Connector Type:	SC
Fiber Outside Diameter:	124 microns Nominal
Loss Repeat:	<0.2 dB per 100 reconnects
Axial Load Minimum:	35 pounds
Temperature Stability:	-0.1 dB Maximum from –20 to +60 F

2. Acceptable Manufacturer: Corning

3.6 Fire Stopping

A fire stop system is comprised of: the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire stop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.

All penetrations i.e. riser, slots and sleeves, and cables, through fire-rated building structures (walls and floors) must be sealed with E-Z Path Series 33 Fire Stop Barrier. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure).

Any penetrating items such as cable tray, raceways and conduit, etc. must use fire stopping protection that must meet NFPA Life Safety Code #101, 6-2.3.6, "Penetrations and Miscellaneous Openings and Fire Barriers" and the NEC 300.21 "Fire Stopping" regulations and standards.

3.7 Horizontal Cable

3.7.1 Horizontal UTP Cable

Horizontal distribution cable for data must be plenum rated twisted pair. Cable for wireless access points must be Category 6A. All other data and telephone cable must be Category 6.

The maximum distance for horizontal distribution cable from the telecommunications closet to wall jack must not exceed 90 meters without prior approval from Towson University's Office of Technology Services.

The contractor must adhere to the following color-coding for twisted pair cabling:

- Wireless Access Point Cabling must be yellow.
- Security Camera Cabling must be green.
- All other data cabling must be orange.

Acceptable Manufacturer: Berk-Tek, Essex, or Mohawk

3.7.2 Horizontal Coaxial Cable

RG-6 Quad Shield, 75-Ohm Coaxial Cable, Plenum Rated
(Commscope: 2227K or equivalent)

Cable Construction
Center Conductor:
18AWG Copper-clad Steel
Nom. Dia.: .0403"

Dielectric:
Foam: FEP
Dia. over Dielectric: 0.170" Nom.

Inner Shield:
Foil: Aluminum/Poly Tape
Braid: 34 AWG Aluminum, 60% Coverage
Nom. Dia.: 0.312"

Outer Shield:
Foil: Aluminum/Poly Tape
Braid: 34 AWG Aluminum, 40% Coverage
Nom. Dia.: 0.332"

Jacket:
Kynar Flex or Flame Retardant-PVC
Dia. over Jacket: 0.260" +/- .0004"
Nom. Jacket Thickness: 0.016"

Electrical Properties:
Sparker Test: 2500VAC
Dielectric Test: Conductor to Shield – 2000VDC
Capacitance: 15.5 pF./Ft. Nom.
Impedance: 76.0 +/- 2.0 Ohms
Velocity/Prop.: 84.0% Nom.
DCR: Conductor: 28.6 Ohms/1000 Ft. Nom
Shield: 5.30 Ohms/1000 Ft. Nom.

Acceptable manufacturer: Commscope or other approved manufacturer.

3.8 J-Hook Pathways

1. All J-hook pathways must support cable runs with a maximum spacing specified as not greater than four feet (4') between J-hooks. Contractor must submit samples and cut sheets on proposed solutions for Towson University approval.

2. Acceptable Product: Caddy Cat J-Hooks

3.9 Outlet Boxes

1. All flush mount electrical J-boxes supporting standard voice/data/video communications must be flush-mounted double-gang galvanized steel boxes with single-gang raised tie covers.

2. All surface mounted boxes supporting standard voice/data/video communications must be double-gang Ortronics plastic boxes.

3. Acceptable Manufacturer: Ortronics

3.10 Outside Plant Cable

3.10.1 Outside Plant Fiber Optic Cable

Fiber Optic Cable Physical Characteristics
Cable Core

Building Interior	Air Core
Building Exterior	Filled core stable from –40F - +140F
Cable Composition	
Building Interior (Station, Plenum)	Flouropolymer Jacket
Building Interior (Station, Non- Plenum)	PVC Jacket
Building Interior (Riser)	PVC Jacket
Building Exterior (Riser)	Non-metallic dielectric
Cable Strength	Maximum pulling tension –600 lb.
Minimum Bend Radii	(<30% man. Pull tension) 10 times cable diameter (>30% max. pull tension) 20 times cable diameter
Fiber Identification	Color-coding system adequate to unambiguously identify each fiber. (See As-Built documentation) The words Fiber Optic Cable(s) must be imprinted on cable no more than one meter apart.

3.10.2 Acceptable manufacturer: any

3.11 Power Receptacles

ALL receptacle power for data equipment must be fed from standby power panels which are fed from standby or emergency generators via an automatic transfer switch.

1. Data equipment power must be run using all 10 AWG minimum stranded THHN wire in a ¾" minimum EMT conduit with compression fittings.

2. Required receptacles include 208 volt single phase NEMA L6-20 and / or NEMA L6-30 and 120 volt single phase quad NEMA 5-20 receptacles. All receptacles are to be mounted in a 1910 box. All receptacles must be mounted on the back of the equipment racks only.

NOTE: Before ordering or installing data power, contact Towson University's Office of Technology Services to verify the types of receptacles needed as well as quantities and locations of each type of receptacle.

3.12 Riser Cable

The structured cabling system with LAN equipment in each Main Distribution Frame (MDF) will require one 12-strand 8.3-micron single-mode optical fiber cable for backbone connectivity between the MDF and each Intermediate Distribution Frame (IDF). This cable must be jacketed as appropriate for use in a riser or plenum environment. Backbone optical fiber cable must be colored yellow to denote single-mode fiber.

3.12.1 Copper Riser Cable

1. All UTP riser copper cable supporting voice communications requirements must be standard 24-gauge, paired dual, semi-rigid PVC skin over foamed PE, and must meet the following technical specifications:

DC Resistance:	25.7 Ohms/1000 ft
Gauge:	24 AWG, solid copper conductor, twisted pair
Mutual Capacitance:	15.8 pF/ft
Characteristic Impedance:	650 Ohms @ 1 kHz 105 Ohms @ 1MHz

2. The attenuation of any pair must not exceed the following values:

Frequency (MHz)	Maximum Attenuation (dB per 305 m @ 20 deg. C.) (dB per 1000 ft @ 20 deg. C.)
0.002	0.8
0.008	1.5
0.064	2.8
0.256	4.0
0.512	5.6
0.772	6.7
1.0	7.6
4.0	15.4
8.0	22.3
10.0	25.0
16.0	32.0

3. The characteristic impedance of any pair must meet the following requirements:

Frequency (MHz)	Characteristic Impedance (Ohms.)
0.064	120 +/- 15%
0.128	110 +/- 15%
0.256	105 +/- 15%

>0.772	100 +/- 15%

4. The Near-End Cross talk (NEXT) coupling loss between pairs within a cable must be equal to or greater than the following:

Frequency (MHz)	NEXT Loss Worst Pair (dB @ 305 m) (dB @ 1000 ft)
0.150	52
0.772	41
1.576	37
3.15	32
6.3	28
10.0	25
16.0	23

5. Acceptable Manufacturer: Berk-Tek or Ortronics or other approved manufacturer

3.12.2 Fiber Optic Riser Cable

2. All backbone Optical Fiber must be 8.3-micron single-mode fiber.

Core Type:	Graded Index
Core Diameter:	8.3 (+/- 6) microns
Core Eccentricity:	1.5% Nominal – 7.5% Max.Core
Ovaity:	4% Nominal – 20% Max
Cladding Diameter:	125 (+/- 2) microns
Cladding Non-Circularity:	2% Maximum
Coating Diameter:	245 (+9/-13) microns
Refracting Index Delta:	2.0% (+/- .3%)
Numerical Aperture:	0.29
Bandwidth Windows:	Dual-850 nm – 3.5 dB
Maximum Attenuation:	850 nm – 3.5 dB 1300 nm – 1.5 dB
Typical Bandwidth:	850 nm – 400 MHz/km 1300 nm – 500 MHz/km

Maximum Field Loss:	0.5 dB

3. All fiber cable used must have the following physical characteristics:

Fiber Optic Cable Physical Characteristics	
Cable Core	
Building Interior	Air Core
Building Exterior	Filled core stable from –40F - +140F
Cable Composition	
Building Interior (Station, Plenum)	Flouropolymer Jacket
Building Interior (Station, Non- Plenum)	PVC Jacket
Building Interior (Riser)	PVC Jacket
Building Exterior (Riser)	Non-metallic dielectric
Cable Strength	Maximum pulling tension –600 lb.
Minimum Bend Radii	(<30% man. Pull tension) 10 times cable diameter (>30% max. pull tension) 20 times cable diameter
Fiber Identification	Color-coding system adequate to unambiguously identify each fiber. (See As-Built documentation) The words Fiber Optic Cable(s) must be imprinted on cable no more than one meter apart.

4. Acceptable Manufacturer: Any

3.12.3 Coaxial Riser Cable

RG-11 Quad Shield, 75-Ohm Coaxial Cable, Plenum Rated
(Commscope: 22827K or equivalent)

Cable Construction
Center Conductor:
18AWG Copper-clad Steel
Nom. Dia.: .0641”

Dielectric:
Foam: FEP
Dia. over Dielectric: 0.28” Nom.

Inner Shield:
Foil: Aluminum/Poly Tape
Braid: 34 AWG Aluminum, 60% Coverage

Nom. Dia.: 0.312”

Outer Shield:
Foil: Aluminum/Poly Tape
Braid: 34 AWG Aluminum, 40% Coverage
Nom. Dia.: 0.332”

Jacket:
Flame Retardant PVDF Jacket
Dia. over Jacket: 0.372”
Nom. Jacket Thickness: 0.020”

Electrical Properties:
Capacitance: 16pF/ft
Impedance: 76.0 +/- 3.0 Ohms
Velocity/Prop.: 84.0% Nom.
Max DC Loop Resistance 3.90 Ohms/1000 Ft. Nom

3.13 Splice Cases

All building entrance Splice Cases must be 3-M type closure and accessories.

3.14 Unspecified Equipment

1. Any item of equipment or material not specifically addressed on the drawings or in this document and required to provide a complete and functional PDS installation must be provided in a level of quality consistent with other specified items. Towson University must retain the right to review and approve all products not specified.

3.15 Voice/Data Jacks and Cover Plates

1. Jacks must be Ortronics TracJack OR-TJ600-23 (light orange in color) for data drops and Ortronics TracJack OR-TJ600 (white in color) for analog voice drops.

OR-TJ600-23

OR-TJ600

2. Faceplates must be white in color.

3. The "pin-out" wiring assignment for the 4 pair UTP copper cable for data communications at the outlet jack and at the TC connection must be consistent with EIA/TIA T568B. The "pin-out" wiring assignment for the 4 pair UTP copper cable for voice communications will be as specifically stated on Page 22, **Station Cabling and Installation**.

4. Back to back outlets in the same wall or thru-wall type boxes are not permitted. To maximize sound control, outlets on opposite sides of a common wall must be offset at least 6 inches.

5. Station outlet boxes must be installed at the same elevation as the other outlets in the room. As a general guideline. Mount the station outlet boxes as follows: (dimensions are from the finished floor to the center line of unobstructed outlets)

Standard Communications Outlet - 18"

Wall mounted, where wheel chair persons can only approach head-on - 4'0"

6. Video connectors should be "F" type with female connections on each end.

7. Standard Communication Outlet Layout

Standard Outlet w/o Video

Standard Outlet w/ Video

7. Acceptable Product: Ortronics TracJack

4 PART 4 – EXECUTION

4.1 General Execution Requirements

The contractor must execute all work in accordance with this document, BISCI, EIA/TIA, NFPA, NEC, and IEEE standards, whichever is most stringent. The requirements listed here highlight specific requirements which the University considers important or otherwise feels it needs to specifically state.

The contractor must:

1. Execute all work in accordance with this document, BISCI, EIA/TIA, NFPA, NEC, and IEEE standards, whichever is most stringent.

2. Install cable system in a manner that provides mechanical integrity for the cabling media and any associated frames and racks and allows for ease of access.

3. Install cable in cable trays, j-hooks, conduits, sleeves, and chases, when such supports exist.

4. Install appropriate carriers to support installed cabling where appropriate support does not exist.

5. Install cable support systems such as J-hooks or other carriers that do not provide continuous cable support at intervals no greater than 3 feet.

6. Install cable service loops above ceilings over jack locations.

7. Verify that installation sites are ready to begin work before beginning work.

8. Coordinate their work with Towson University and appropriate trades involved with project.

9. Verify the locations for ladder racks, equipment racks, patch panels, and wire management with the University's Office of Technology Services in all IDF and MDF's prior to beginning their installation.

4.2 Unacceptable Work

The University prohibits the following except where specifically indicated in construction drawings or scope of work, or when authorized by the University's Office of Technology Services in writing prior to execution. Specifically, the contractor must not:

1. Splice copper, coaxial, UTP, or any other telecommunications cable inside a building.

2. Install cable aerially.

3. Attach cable to anything other than the telecommunications cable support system.
4. Attach cable supports to anything other than the building structure.
5. Install cable or cable supports where interferes with the operation or maintenance of any other building systems or components, or impairs access to the same.
6. Lay cable on the ceiling grid, lighting fixtures, or other cables.
7. Attach cable support systems to anything other than the concrete deck
8. Install service loops for cable inside any IDF or MDF.
9. Exceed 25-lbs of pulling tension when installing a four-pair UTP cable.

4.3 Coordination with Other Trades

1. All cable in accessible spaces must be designed and installed for easy access. Cable paths above suspended ceilings, mechanical rooms, closets, etc., must not be blocked or covered in any way that would impede the addition of cable in the future.

4.4 Labeling

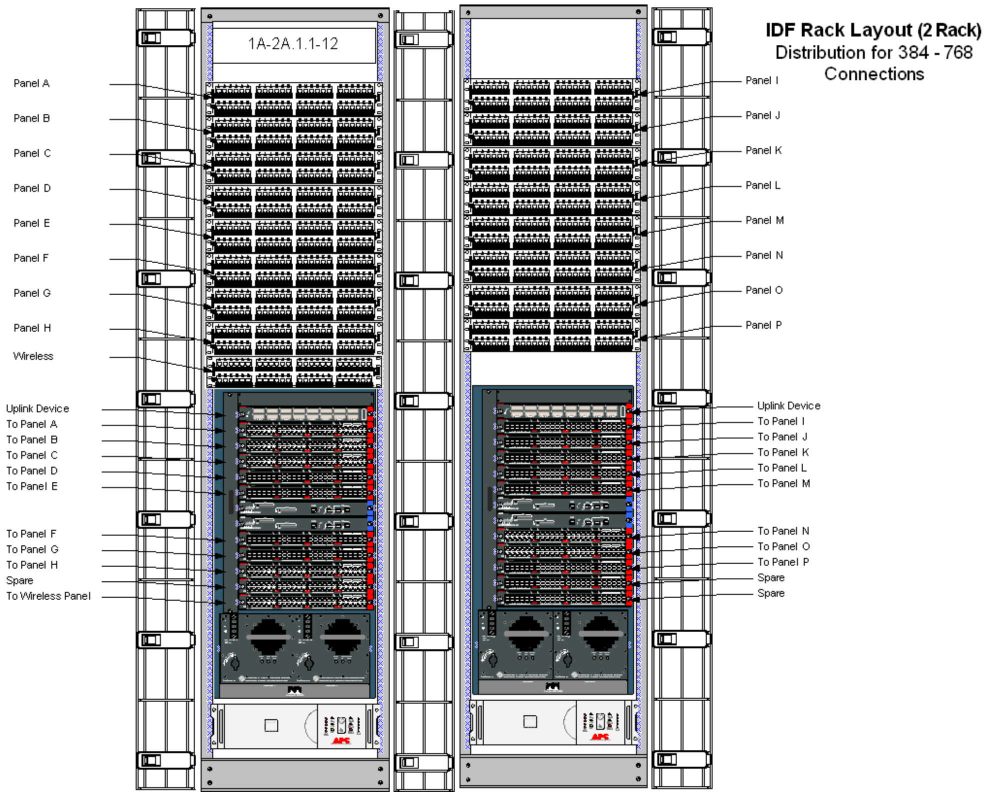
Towson University's labeling standard is based on the 606A labelling standard. As such, it uses specific identifiers, which are defined in this section.

4.4.1 TR ID

A TR ID's is a two-character identifier, such as "1A", "2C", or "3A", where the characters correspond to the floor number and a closet letter that uniquely identifies it on its floor. The contractor must obtain the list of TR ID's from the Office of Technology Services.

4.4.2 Patch Panel ID

A Patch Panel ID is a single capital letter that uniquely identifies a patch panel within a TR. Patch panel "A" is assigned to the top patch panel in the left-most rack. The other patch panels ID's are assigned alphabetically, from top to bottom of each rack, then from left-most rack to right-most rack. In cases where racks are one in front of the other, the labels go top to bottom of each rack, then from front-most rack to rear-most rack. The drawing below shows how to assign Patch Panel ID's.



4.4.3 Patch Panel Jack ID

The Patch Panel Jack ID is a zero-padded two-digit number that uniquely identifies a jack on a patch panel. Patch Panel ID's are 1-48. Most panels already have jack labelled 1-48. However, if the panel is not labelled, or labelled in another manner, the contractor label the panels jacks 1-48 with the top row being 1-24 from left to right and the bottom row being 25-48 from left to right.

4.4.4 End Station Jack ID

End Station Jack ID's identify a specific cable installed in a faceplate at the end station location. It has the following format: AA-BC, where AA is the TR ID, B is the Patch Panel ID, and C is the Patch Panel Jack ID. For example, "1B-C32" indicates the cable goes to the telecommunications room with TR ID "1B" and terminates on patch panel C, on patch panel jack 32.

For horizontal cable, the contractor must:

1) Request labeling instructions from the University's Office of Technology Services prior to the start of labeling if the construction document or scope of work does not contain labeling instructions.

2) Request that the University provide the 606A TR ID's for each telecommunications room prior to beginning work.

3) Affix a label to the left-hand side of each patch panel that contains the patch panel's Panel ID.

4) Affix a label containing the Patch Panel Jack ID under each patch panel jack if the patch panel does not already contain Patch Panel Jack ID's.

5) Affix a label in the label slot on each faceplate that provides the End Station Jack ID for each cable terminated in it.

6) Affix a label with the End Station Jack ID within 4 inches of the end of all end-station cables terminated with an RJ45 on the end-station side.

7) Print all labels with a label making device.

For riser cable, the contractor must:

1. Affix a label containing the Cable ID within 12 inches of:

    a. Entering and exiting an LIU.

    b. Entering and exiting a splice case.

    c. Entering and exiting a conduit, wall or floor penetration, or any other area where the cable disappears from view.

2. Affix an LIU Module Label to the outside of each LIU for each module where the contractor terminated a strand of fiber.

4.4.5 Fiber Optic Riser Cables

Each fiber optic riser cable has an identifier of the following form: AA/BB-CC, where AA is the TR ID of the MDF, BB is the TR ID of the IDF, and CC is a zero-padded 2-digit number that makes the label unique. For example, if the first cable run between TR 1A and 2B is 1A/2B-01, the second is 1A/2B-02, etc.

For each cable, the contractor must affix a label containing the cable's identifier within 12 inches of:

1. Entering an LIU.

2. Entering or leaving a splice case.

3. Entering or exiting a conduit, penetration, or any other area where it disappears from view.

The contractor must also affix labels to the LIU to indicate where the individual strands are terminated. These labels must be of the following form:

Module Letter: End Station Jack ID 1.A - End Station Jack ID.B, where A is the first strand number terminated on the module and B is the last.

For example, if a 48-strand cable is terminated in slots A, B, C, and D, the contractor must affix a label to the LIU that looks like this:

A: 1A/2B-01.1–12

B: 1A/2B-01.13-24

C: 1A/2B-01.25-36

D: 1A/2B-01.47-48

4.4.6 Fiber Optic OSP Cables

4.4.7 Copper Cables

4.5 Grounding and Bonding Requirements

The facility must be equipped with a Telecommunications Bonding Backbone (TBB). This backbone must be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor.

1. The TBB must be installed independent of the building's electrical and building ground and must be designed in accordance with the recommendations contained in the ANSI/TIA/EIA-607 Telecommunications Bonding and Grounding Standard.
2. The main entrance facility/equipment room in each building must be equipped with a telecommunications main grounding bus bar (TMGB).
3. Each telecommunications room must be provided with a telecommunications ground bus bar (TGB).
4. The TMGB must be connected to the building electrical entrance grounding facility. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.
5. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the MDF or IDF must be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors.
6. All wires used for telecommunications grounding purposes must be identified with a green insulation. Non-insulated wires must be identified at each termination point with a wrap of green tape. All cables and bus bars must be identified and labeled in accordance with the System Documentation Section of this specification.
7. All ladder rack installed in hallways must be grounded and bonded.

4.6 Testing and Inspection

1. Upon completion of the project, Towson University's OTS Technical Representative will perform a final inspection of the installed cabling system with the Contractor's Project Foreman. The final inspection will be performed to validate that all horizontal and back-bone cables were installed as defined in the drawing package, and that the installation meets the aesthetic expectations of the Owner.

2. Upon receipt of the test documentation, Towson University reserves the right to perform spot testing of a representative sample of the cabling system to validate test results provided in the test document. Towson University testing will use the same method employed by the contractor, and minor variations will be allowed to account for differences in test equip-ment. If significant discrepancies are found the contractor will be notified for resolution.

3. Prior to acceptance, all "As-Built" and technical documentation must be received and ap-proved by the University. As-built documentation must include the completed and notarized original copy of the Premises Distribution System Registration Document, if ap-plicable. All intra-building and inter-building wiring and equipment, and all site restoration must be installed and completed in accordance with Towson University and industry stand-ards. All wiring and equipment provided and/or installed under this contract must be tested as described under the terms of this contract and must be fully operational. After all work is complete, the Contractor must also provide Towson University with Structured Cabling System Certification for all communications work completed on the project.

4. Testing of all copper wiring must be performed prior to system cutover. 100 percent of the horizontal and rise wiring pairs must be tested for opens, shorts, polarity reversals, transpositions and presence of AC voltage. Voice and data horizontal wiring pairs must be tested from the information outlet to the TC. The Category 6 cable runs for data commu-nications must be tested for conformance to the specifications of EIA/TIA 568B Category 6. Testing must be done with a TIA/EIA TSB-67 UL Certified Level 2 test set. The Cat-egory 6 cable runs for voice communications must be tested for continuity only. Test must include length, mutual capacitance, characteristic impedance, attenuation, and near end and far end cross talk. The contractor, at no charge, must bring any pairs not meeting the requirements of the standard into compliance.

5. Fiber testing must be performed on all fibers in the completed end-to-end system. Testing must consist of a bi-directional end to end OTDR trace performed per EIA/TIA 455-61 for OSP and a bi-directional end to end power meter test performed per EIA/TIA 455-53A for ISP. The system loss measurements must be provided at 850 and 1310 nanometers for multimode fibers and 1310 and 1550 for single mode fibers.

6. Complete, end-to-end test results for all installed fiber & copper cabling must be submitted to Towson University in one (1) Microsoft Excel 2000 (.xls) soft copy file and one (1) hard copy.

4.7 System Performance

During the three (3) week period between final inspection and delivery of the test and as-built documentation, Towson University will activate the cabling system. Towson University will validate operation of the cabling system during this period.

4.8 Final Acceptance

Completion of the installation; in-progress and final inspections; receipt of the test and as-built documentation; and successful performance of the cabling system for a three (3) week period will constitute acceptance of the system.

4.9 As Built Documentation

1. The contractor must provide the following outside plant wiring information, prior to acceptance of the building by Towson University, for each of the specified media:

    a. End Station Jack Identification number (Copper).

    b. Cable design makeup (Copper).

    c. Cable lengths between splice points.

    d. Exact routing of cable (Copper).

    e. Splice location and identification (Copper).

    f. Bonding and grounding (Copper, Fiber, Coax).

    g. Location and description of all associated equipment (Copper).

    h. Location and description of all associated structures and obstructions (Copper).

2. The contactor must provide the following intra-building wiring information for each specified media prior to acceptance of the building by Towson University:

    a. Cable entrance locations and penetrations details (copper).

    b. Location and identification of all distribution closets and of all equipment located inside distribution closets (Copper).

    c. Terminal information, jack numbering, and pair count information at each distribution frame (Copper).

    d. Schematic drawings of riser (Copper).

    e. Routing of cable and termination information (Copper).

3. The Contractor must provide the following MDF wiring information prior to acceptance of the building by Towson University:

    a. Cable pair assignments per connector block.

    b. Identification of cable routing to MDF (1st Floor).

4. The Contactor must provide a complete listing of pair assignment records for copper wiring. Copper cable records must include the status of each copper pair.

5. The Contractor must provide Towson University with the operational and maintenance documentation of all telecommunications equipment installed under this contract.

6. Contractor must submit all drawings electronically utilizing AutoCAD version (xxx).

7. Cable test results will be submitted in Microsoft Excel 2000 spreadsheet (.xls) format.

4.10 Warranty

1. The contractor must warrant and guarantee to Towson University, without limitations or qualifications that all equipment, components, material and workmanship must perform in accordance with local and national codes and the specifications of this document.

2. The warranty period must be for two (2) years from the time of final acceptance by Towson University.

5 Glossary of Terms

ASTM	American Society for Testing and Materials
AWG	American wire gauge
BISCI	Building Industry Consulting Service International
CMP	Communications Plenum Cable
End Station device.	A location outside of a TR at which a person connects a data network or telephone
EIA/TIA (TIA)	Electronic Industry Association (EIA)/Telecommunications Industry Association
EMT	Electrical metallic tubing
FEP	Fluorinated Ethylene Propylene
IDF	Intermediate distribution frame
IEEE	Institute of Electrical and Electronics Engineers
Installer	A person or company that installs IT infrastructure defined in this document.
ISP	Inside Plant
MDF	Main distribution frame
NEC	National Electrical Code
NFPA	National Fire Protection Association
OFNP	Optical Fiber Nonconductive Plenum
OSP	Outside Plant
OTDR	Optical Time Domain Reflectometer
PBX	Private Branch Exchange
PE	Polyethylene
PVC	Polyvinyl Chloride plastic

RMT	Rigid Metallic Tubing
TGB	Telecommunications grounding bus bar
TMGB	Telecommunication's main grounding bus bar
TR	Telecommunications Room (an IDF or MDF)
UL	Underwriter's Laboratory
UTP	Unshielded twisted pair

6 Change Log

Appendix F

Net Assignable Office Space Standards

Towson University Net Assignable Square Feet Space Standards

OFFICES	Net Assignable Square Feet
President	300
Vice Presidents	250
Deans. Associate Vice Presidents	225
Associate and Assistant Deans, Assistant Vice Presidents	175
Department Chairs, Directors	150
Faculty, Professional Staff, Department Workrooms	120
Administrative Assistants	90
Graduate Assistant, Student Worker (typically shared spaces)	60
Conference Rooms (per person, average attend.)	25
Reception, Waiting Rooms (per person)	15
Computer Work Stations (table, PC, and printer)	15

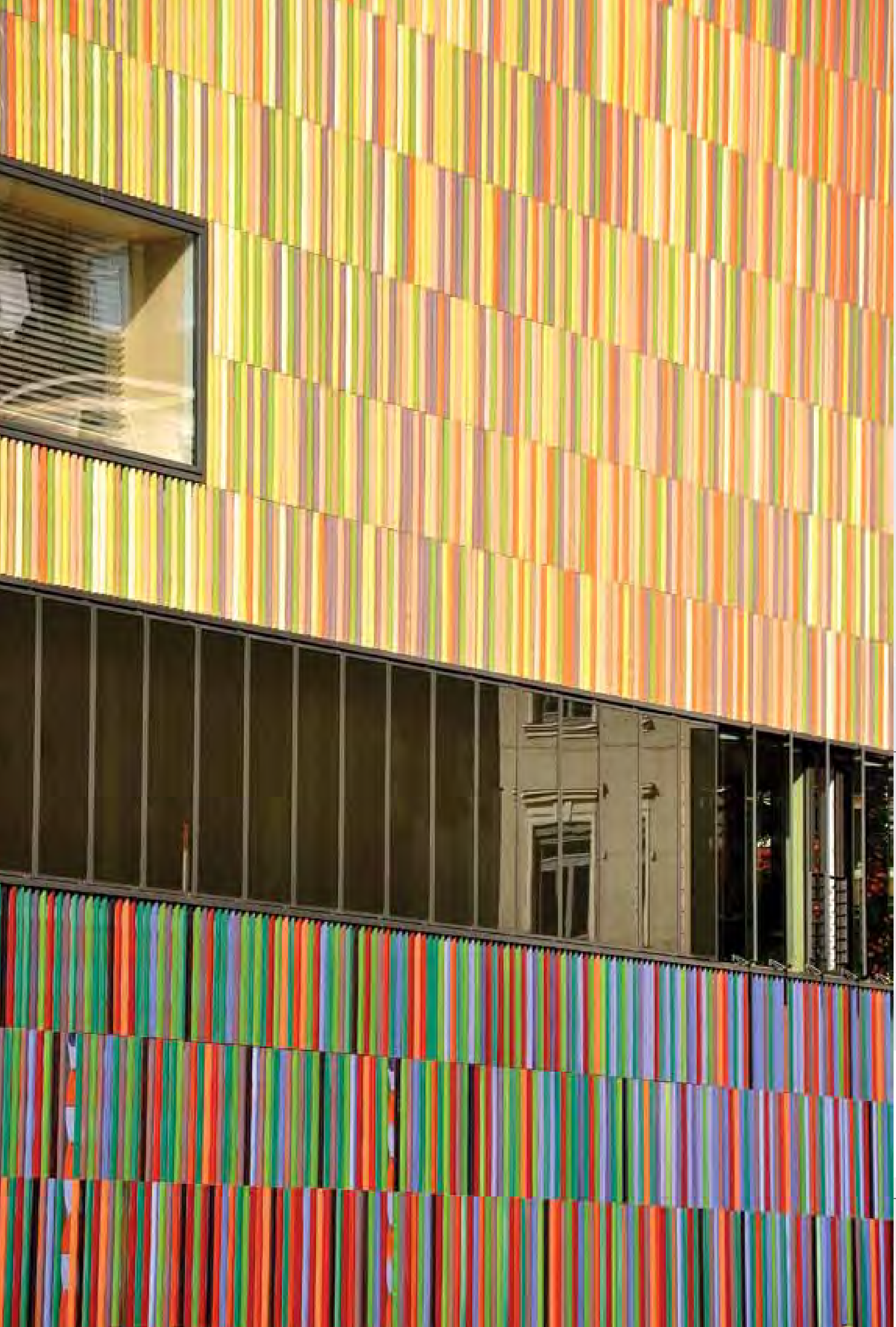
Note: Figures represent maximum number of square footage allowable. In some cases, due to building constraints, square footage may be less.

Appendix G

Bird Friendly Building Guide

Bird-Friendly Building Design

AMERICAN BIRD CONSERVANCY



The area of glass on a façade is the strongest predictor of threat to birds. The façade of Sauerbruch Hutton's Brandhorst Museum in Munich is a brilliant example of the creative use of non-glass materials. Photos: Tony Brady (left), Anton Schedlbauer (background)

The following have endorsed this document as the most current source for information about bird collisions:

Chicago Ornithological Society

NH Audubon

Lights Out Indy

Forsyth Audubon

Chicago Bird Collision Monitors

Safe Passage Great Lakes

New York City Audubon

Audubon Society of Portland, Founded in 1902

Bird-Safe Glass Foundation

FXFOWLE

PRENDERGAST LAUREL ARCHITECTS

ORNILUX Bird Protection Glass by ARNOLDGLAS

The cost of printing *ABC's Bird-Friendly Building Design* guidebook was supported by a generous grant from Arnold Glas, manufacturer of ORNILUX Bird Protection Glass. The funder had no role in the study design, data collection and analysis, decision to publish, or preparation of this document.

(Front cover) Boris Pena's Public Health Office building in Mallorca, Spain, sports a galvanized, electro-fused steel façade. Photo courtesy of Boris Pena

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Ruby-throated Hummingbird: Greg Lavaty

For updates and new information, see **collisions.abcbirds.org**

Issues of cost prompted Hariri Pontarini Architects, in a joint venture with Robbie/Young + Wright Architects, to revise a planned glass and limestone façade on the School of Pharmacy building at the University of Waterloo, Canada. The new design incorporates watercolors of medicinal plants as photo murals. Photo: Anne H. Cheung

41 Cooper Square in New York City, by Morphosis Architects, features a skin of perforated steel panels fronting a glass/aluminum window wall. The panels reduce heat gain in summer and add insulation in winter while also making the building safer for birds. Photo: Christine Sheppard, ABC

Executive Summary

Collision with glass is the single biggest known killer of birds in the United States, claiming hundreds of millions or more lives each year. Unlike some sources of mortality that predominantly kill weaker individuals, there is no distinction among victims of glass. Because glass is equally dangerous for strong, healthy, breeding adults, it can have a particularly serious impact on populations.

Bird kills at buildings occur across the United States. We know more about mortality patterns in cities, because that is where most monitoring takes place, but virtually any building with glass poses a threat wherever it is. The dead birds documented by monitoring programs or turned in to museums are only a fraction of the birds actually killed. The magnitude of this problem can be discouraging, but there are solutions if people can be convinced to adopt them.

In recent decades, advances in glass technology and production have made it possible to construct buildings with all-glass curtain walls, and we have seen a general increase in the amount of glass used in construction. Constructing bird-friendly buildings and eliminating the worst existing threats requires imaginative design and recognition that not only do birds have a right to exist, but their continued existence is a value to humanity.

New construction can incorporate bird-friendly design strategies from the beginning. However, there are many ways to reduce mortality from existing buildings, with more solutions being developed all the time. Because the science is constantly evolving, and because we will always wish for more information than we have, the temptation is to postpone action in the hope that a panacea is just round the corner, but we can't wait to act. We have the tools and the strategies to make a difference now. Architects, designers, city planners, and legislators are key to solving this problem. They not only have access to the latest building construction materials and concepts, they are also thought leaders and trend setters in the way we build our communities and prioritize building design issues.

This publication, originally produced by the NYC Audubon Society, and reconceived by American Bird Conservancy (ABC), aims to provide planners, aims to provide planners, architects, designers, bird advocates, local authorities, and the general public with a clear understanding of the nature and magnitude of the threat glass poses to birds. This edition includes a review of the science behind available solutions, examples of how those solutions can be applied to new construction and existing buildings, and an explanation of what information is still needed. We hope it will spur individuals, businesses, communities, and governments to address this issue and make their buildings safe for birds.

ABC's Collisions Program works at the national level to reduce bird mortality by coordinating with local organizations, developing educational programs and tools, conducting research, developing centralized resources, and generating awareness of the problem.

A bird, probably a dove, hit the window of an Indiana home hard enough to leave this ghostly image on the glass. Photo: David Fancher

Introduction

Why Birds Matter

For many people, birds and nature have intrinsic worth. Birds have been important to humans throughout history, often used to symbolize cultural values such as peace, freedom, and fidelity.

In addition to the pleasure they can bring to people, we depend on them for critical ecological functions. Birds consume vast quantities of insects, and control rodent populations, reducing damage to crops and forests, and helping limit the transmission of diseases such as West Nile virus, dengue fever, and malaria. Birds play a vital role in regenerating habitats by pollinating plants and dispersing seeds.

Birds are also a vast economic resource. According to the U.S. Fish and Wildlife Service, bird watching is one of the fastest growing leisure activities in North America, and a multi-billion-dollar industry.

The Legal Landscape

At the start of the 20th Century, following the extinction of the Passenger Pigeon and the near extinction of other bird species due to unregulated hunting, laws were passed to protect bird populations. Among them was the Migratory Bird Treaty Act (MBTA), which made it illegal to kill a migratory bird without a permit. The scope of this law, which is still in effect today, extends beyond hunting, such that anyone causing the death of a migratory bird, even if unintentionally, can be prosecuted if that death is deemed to have been foreseeable. This may include bird deaths due to collisions with glass, though there have yet to be any prosecutions in the United States for such incidents. Violations of the MBTA can result in fines of up to $500 per incident and up to six months in prison.

The Bald and Golden Eagle Protection Act (originally the Bald Eagle Protection Act of 1940), the Endangered Species Act (1973), and the Wild Bird Conservation Act (1992) provide further protections for birds that may be relevant to building collisions.

Recent legislation, primarily at the city and state level, has addressed the problem of mortality from building collisions and light pollution. Cook County, Illinois, San Francisco, California, Toronto, Canada, and the State of Minnesota have all passed laws or ordinances aimed at reducing bird kills, while other authorities have pushed for voluntary measures.

The International Dark Skies Foundation, an environmental organization whose mission is "to preserve and protect the nighttime environment" now actively supports legislation designed to protect birds by curbing light emissions.

Glass: The Invisible Threat

Glass can be invisible to both birds and humans. Humans learn to see glass through a combination of experience (how many of us at some time in our lives have walked into a glass door or seen somebody do so?), visual cues, and expectation, but birds are unable to use these signals. Most birds' first encounter with glass is fatal when they collide with it at full speed.

No one knows exactly how many birds are killed by glass – the problem exists on too great a scale, both in terms of geography and quantity – but estimates range from 100 million to one billion birds each year in the United States. Despite the enormity of the problem, however, currently available solutions can reduce bird mortality while retaining the advantages that glass offers as a construction material, without sacrificing architectural standards.

The hummingbird habit of 'trap-lining' – flying quickly from one feeding spot to another – causes collisions when flowers or feeders are reflected in glass. Photo: Terry Sohl

Lighting: Exacerbating the Threat

The problem of bird collisions with glass is greatly exacerbated by artificial light. Light escaping from building interiors or from exterior fixtures can attract birds, particularly during migration on foggy nights or when the cloud base is low. Strong beams of light can cause birds to circle in confusion and collide with structures, each other, or even the ground. Others may simply land in lighted areas and must then navigate an urban environment rife with other dangers, including more glass.

Birds and the Built Environment

Humans first began using glass in Egypt, around 3500 BCE. Glass blowing, invented by the Romans in the early First Century CE, greatly increased the ways glass could be used, including the first use of crude glass windows. Although the Crystal Palace in London, England, erected in 1851, is considered by

(Opposite) The White-throated Sparrow is the most frequent victim of collisions reported by urban monitoring programs. Photo: Robert Royse architects to mark the beginning of the use of glass as a structural element, the invention of float glass in the 1950s allowed mass production of modern windows. In the 1980s, development of new production and construction technologies culminated in today's glass skyscrapers.

Sprawling land-use patterns and intensified urbanization degrade the quality and quantity of bird habitat across the globe. Cities and towns encroach on riverbanks and shorelines. Suburbs, farms, and recreation areas increasingly infringe upon wetlands and woodlands. Some bird species simply abandon disturbed habitat. For species that can tolerate disturbance, glass is a constant threat, as these birds are seldom far from human structures. Migrating birds are often forced to land in trees lining our sidewalks, city parks, waterfront business districts, and other urban green patches that have replaced their traditional stopover sites.

The amount of glass in a building is the strongest predictor of how dangerous it is to birds. However, even small areas of glass can be lethal. While bird kills at homes are estimated at one to ten birds per home per year, the large number of homes multiplies that loss to millions of birds per year in the United States. Other factors can increase or decrease a building's impact, including the density and species composition of local bird populations, local geography, the type, location, and extent of landscaping and nearby habitat, prevailing wind and weather, and patterns of migration through the area. All must be considered when planning bird-friendly buildings.

Warblers, such as this Black-and-white, are often killed by window collisions as they migrate. Photo: Luke Seitz

Impact of Collisions on Bird Populations

About 25% of species are now on the U.S. WatchList of birds of conservation concern (www.abcbirds.org/abcprograms/science/watchlist/index.html), and even many common species are in decline. Habitat destruction or alteration on both breeding and wintering grounds remains the most serious man-made problem, but collisions with buildings are the largest known fatality threat. Nearly one third of the bird species found in the United States, over 258 species, from hummingbirds to falcons, are documented as victims of collisions. Unlike natural hazards that predominantly kill weaker individuals, collisions kill all categories of birds, including some of the strongest, healthiest birds that would otherwise survive to produce offspring. This is not sustainable and most of the mortality is avoidable. This document is one piece of a strategy to keep building collisions from increasing, and ultimately, to reduce them.

The Impact of Trends in Modern Architecture

In recent decades, advances in glass technology and production have made it possible to construct buildings with all-glass curtain walls, and we have seen a general increase in the amount of glass used in construction. This is manifest in an increase in picture windows on private homes and new applications for glass are being developed all the time. Unfortunately, as the amount of glass increases, so does the incidence of bird collisions.

In recent decades, growing concern for the environment has stimulated the development of "green" standards and rating systems. The best known is the Green Building Council's (GBC) Leadership in Energy and Environmental Design, or LEED. GBC agrees that green buildings should not threaten Wildlife, but until recently, did not include language addressing the threat of glass to birds.

Their Resource Guide, starting with the 2009 edition, calls attention to parts of existing LEED credits that can be applied to reduce negative impacts on birds. (One example: reducing light pollution saves energy and benefits birds.) As of October 14, 2011, GBC has added Credit 55: Bird Collision Deterrence, to their Pilot Credit Library (http://www.usgbc.org/ShowFile.aspx?DocumentID=10402), drafted by ABC, members of the Bird-safe Glass Foundation, and the GBC Site Subcommittee.

The Common Yellowthroat may be the most common warbler in North America and is also one of the most common victims of collisions with glass. Photo: Owen Deutsch

Essential to this credit is quantifying the threat level to birds posed by different materials and design details. These threat factors are used to calculate an index representing the building's façade and that index must be below a standard value to earn the credit. The credit also requires adopting interior and exterior lighting plans and post-construction monitoring. The section on Research in Appendix I reviews the work underlying the assignment of threat factors.

ABC is a registered provider of AIA continuing education, with classes on bird-friendly design and LEED Pilot Credit 55 available in face-to-face and webinar formats. Contact Christine Sheppard, csheppard@abcbirds.org, for more information.

Defining What's Good for Birds

It is increasingly common to see the phrase "bird-friendly" used in a variety of situations to demonstrate that a particular product, building, legislation, etc., is not harmful to birds. All too often, however, this term is unaccompanied by a clear definition, and lacks a sound scientific foundation to underpin its use.

Ultimately, defining "bird friendly" is a subjective task. Is bird-friendliness a continuum, and if so, where does friendly become unfriendly? Is "bird-friendly" the same as "bird-safe?" How does the definition change from use to use, situation to situation?

It is impossible to know exactly how many birds a particular building will kill before it is built, and so realistically, we cannot declare a building to be bird-friendly before it has been carefully monitored for several years. However, there are several factors that can help us predict whether a building will be particularly harmful to birds or generally benign, and we can accordingly define simple "bird-smart standards" that, if followed, will ensure a prospective building poses a minimal potential hazard to birds.

ABC's Bird-Friendly Building Standard

A bird-friendly building is one where:

- At least 90% of exposed façade material from ground level to 40 feet (the primary bird collision zone) has been demonstrated in controlled experiments[1] to deter 70% or more of bird collisions
- At least 60% of exposed façade material above the collisions zone meets the above standard
- There are no transparent passageways or corners, or atria or courtyards that can trap birds
- Outside lighting is appropriately shielded and directed to minimize attraction to night-migrating songbirds[2]
- Interior lighting is turned off at night or designed to minimize light escaping through windows
- Landscaping is designed to keep birds away from the building's façade[3]
- Actual bird mortality is monitored and compensated for (e.g., in the form of habitat preserved or created elsewhere, mortality from other sources reduced, etc.)

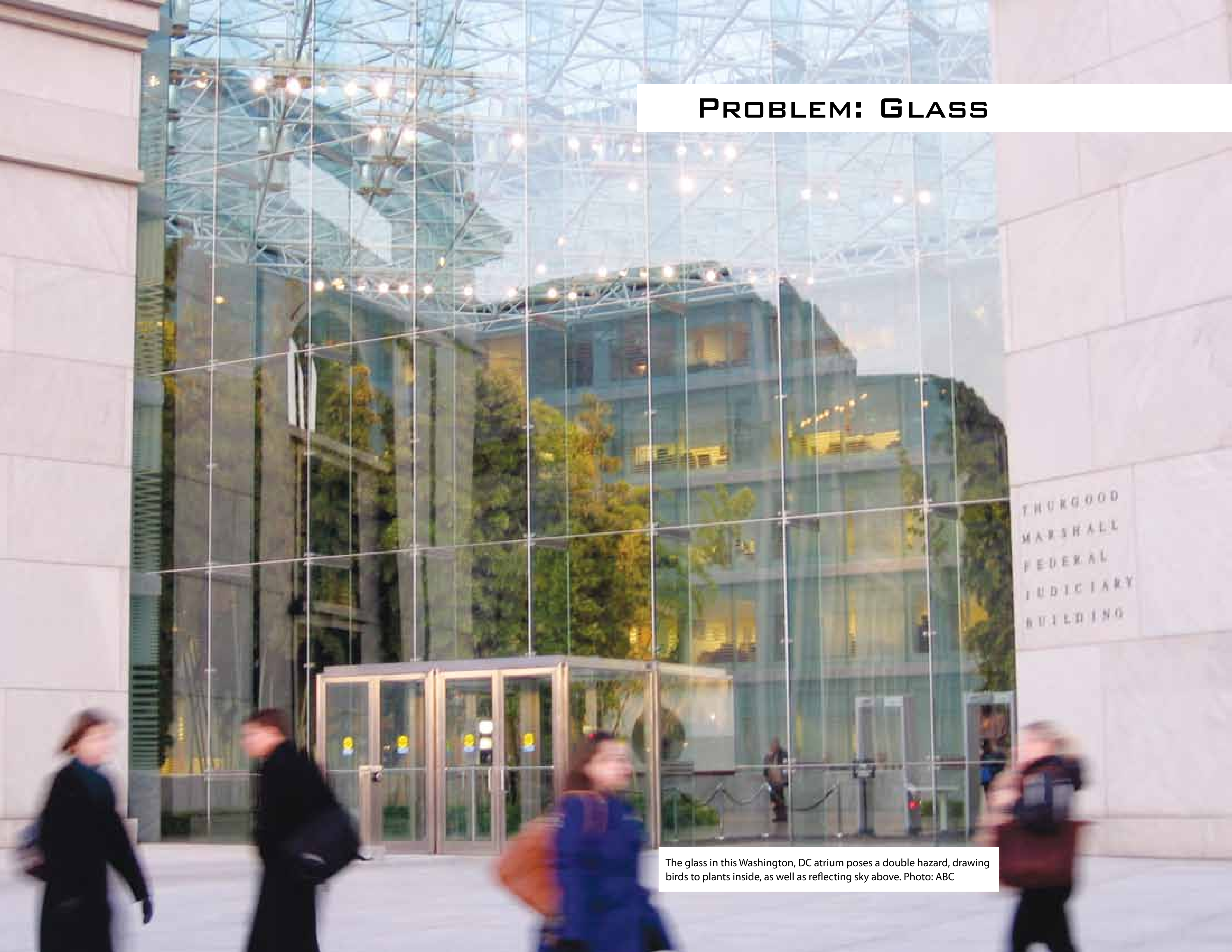
[1]See the section *Research: Deterring Bird Collisions* in Appendix I for information on these controlled studies.

[2]See the section *Solutions: Lighting Design* on page 31

[3]See *Landscaping and Vegetation,* Appendix I on Page 40

The Hotel Puerta America in Mexico City was designed by Jean Nouvel, and features external shades. This is a flexible strategy for sun control, as well as preventing collisions; shades can be lowered selectively when and where needed. Photo: Ramon Duran

Problem: Glass



The glass in this Washington, DC atrium poses a double hazard, drawing birds to plants inside, as well as reflecting sky above. Photo: ABC

The Properties of Glass

Glass can appear very differently depending on a number of factors, including how it is fabricated, the angle at which it is viewed, and the difference between exterior and interior light levels. Combinations of these factors can cause glass to look like a mirror or dark passageway, or to be completely invisible. Humans do not actually "see" most glass, but are cued by context such as mullions, roofs or doors. Birds, however, do not perceive right angles and other architectural signals as indicators of obstacles or artificial environments.

The glass-walled towers of the Time-Warner Center in New York City appear to birds as just another piece of the sky. Photo: Christine Sheppard, ABC

Reflection

Viewed from outside, transparent glass on buildings is often highly reflective. Almost every type of architectural glass, under the right conditions, reflects the sky, clouds, or nearby habitat familiar and attractive to birds. When birds try to fly to the reflected habitat, they hit the glass. Reflected vegetation is the most dangerous, but birds also attempt to fly past reflected buildings or through reflected passageways.

Transparency

Birds strike transparent windows as they attempt to access potential perches, plants, food or water sources, and other lures seen through the glass. Glass "skywalks" joining buildings, glass walls around planted atria, windows installed perpendicularly on building corners, and exterior glass handrails or walkway dividers are dangerous because birds perceive an unobstructed route to the other side.

Black Hole or Passage Effect

Birds often fly through small gaps, such as spaces between leaves or branches, nest cavities, or other small openings. In some light, glass can appear black, creating the appearance of just such a cavity or "passage" through which birds try to fly.

Factors Affecting Rates of Bird Collisions for a Particular Building

Every site and every building can be characterized as a unique combination of risk factors for collisions. Some, particularly aspects of a building's design, are very building-specific. Many negative design features can be readily countered, or, in new construction, avoided. Others, for example a building's location and siting, relate to migration routes, regional ecology, and geography–factors that are difficult if not impossible to modify.

Transparent handrails are a dangerous trend for birds, especially when they front vegetation. Photo: Christine Sheppard, ABC

Architectural cues show people that only one panel on the face of this shelter is open; to birds, all the panels appear to be open. Photo: Christine Sheppard, ABC

Large facing panes of glass can appear to be a clear pathway. Photo: Christine Sheppard, ABC

The same glass can appear transparent or highly reflective, depending on weather or time of day. Photo: Christine Sheppard, ABC

Building Design

Glass causes virtually all bird collisions with buildings. The relative threat posed by a particular building depends substantially on the amount of exposed glass, as well as the type of glass used, and the presence of glass "design traps". Klem (2009) in a study based on data from Manhattan, New York, found that a 10% increase in the area of reflective and transparent glass on a building façade correlated with a 19% increase in the number of fatal collisions in spring and a 32% increase in fall.

Type of Glass

The type of glass used in a building is a significant component of its danger to birds. Mirrored glass is often used to make a building "blend" into an area by reflecting its surroundings. Unfortunately, this makes those buildings especially deadly to birds. Mirrored glass is reflective at all times of day, and birds mistake reflections of sky, trees, and other habitat features for reality. Non-mirrored glass can be highly reflective at one time, and at others, appear transparent or dark, depending on time of day, weather, angle of view, and other variables, as with the window pictured below. Tinted glass reduces collisions, but only slightly. Low-reflection glass may be less hazardous in some situations, but does not actively deter birds and can create a "passage effect," appearing as a dark void that could be flown through (see page 11).

Building Size

As building size increases for a particular design, so usually does the amount of glass, making larger buildings more of a threat. It is generally accepted that the lower stories of buildings are the most dangerous because they are at the same level as trees and other landscape features that attract birds. However, monitoring programs accessing setbacks and roofs of tall buildings are finding that birds also collide with higher levels.

Building Orientation and Siting

Building orientation in relation to compass direction has not been implicated as a factor in collisions, but siting of a building with respect to surrounding habitat and landscaping can be an issue, especially if glass is positioned so that it reflects vegetation. Physical features such as outcrops or pathways that provide an open flight path through the landscape can channel birds towards or away from glass and should be considered early in the design phase.

Design Traps

Windowed courtyards and open-topped atria can be death traps for birds, especially if they are heavily planted. Birds fly down into such places, and then try to leave by flying directly towards reflections on the walls. Glass skywalks and outdoor handrails, and building corners where glass walls or windows are perpendicular are dangerous because birds can see through them to sky or habitat on the other side.

Birds flying from a meadow on the left are channeled towards the glass doors of this building by a rocky outcrop to the right of the path. Photo: Christine Sheppard, ABC

Mirrored glass is dangerous at all times of day, whether it reflects vegetation, sky, or simply open space through which a bird might try to fly. Photo: Christine Sheppard, ABC

Plantings on setbacks and rooftops can attract birds to glass they might otherwise avoid. Photo: Christine Sheppard, ABC

Vines cover most of these windows, but birds might fly into the dark spaces on the right. Photo: Christine Sheppard, ABC

Reflections on home windows are a significant source of bird mortality. The partially opened vertical blinds seen here may break up the reflection enough to reduce the hazard to birds. Photo: Christine Sheppard, ABC

Reflected Vegetation

Glass that reflects shrubs and trees causes more collisions than glass that reflects pavement or grass (Gelb and Delecretaz, 2006). Studies have only quantified vegetation within 15-50 feet of a façade, but reflections can be visible at much greater distances. Vegetation around buildings will bring more birds into the vicinity of the building; the reflection of that vegetation brings more birds into the glass. Taller trees and shrubs correlate with more collisions. It should be kept in mind that vegetation on slopes near a building will reflect in windows above ground level. Studies with bird feeders (Klem *et al.*, 1991) have shown that fatal collisions result when birds fly towards glass from more than a few feet away.

Green Roofs and Walls

Green roofs bring habitat elements attractive to birds to higher levels, often near glass. However, recent work shows that well designed green roofs can become functional ecosystems, providing food and nest sites for birds. Siting of green roofs, as well as green walls and rooftop gardens should therefore be carefully considered, and glass adjacent to these features should have protection for birds.

Local Conditions

Areas where fog is common may exacerbate local light pollution (see below). Areas located along migratory pathways or where birds gather prior to migrating across large bodies of water, for example, in Toronto, Chicago, or the southern tip of Florida, expose birds to highly urban environments and have caused large mortality events (see Appendix II for additional information on how migration can influence bird collisions).

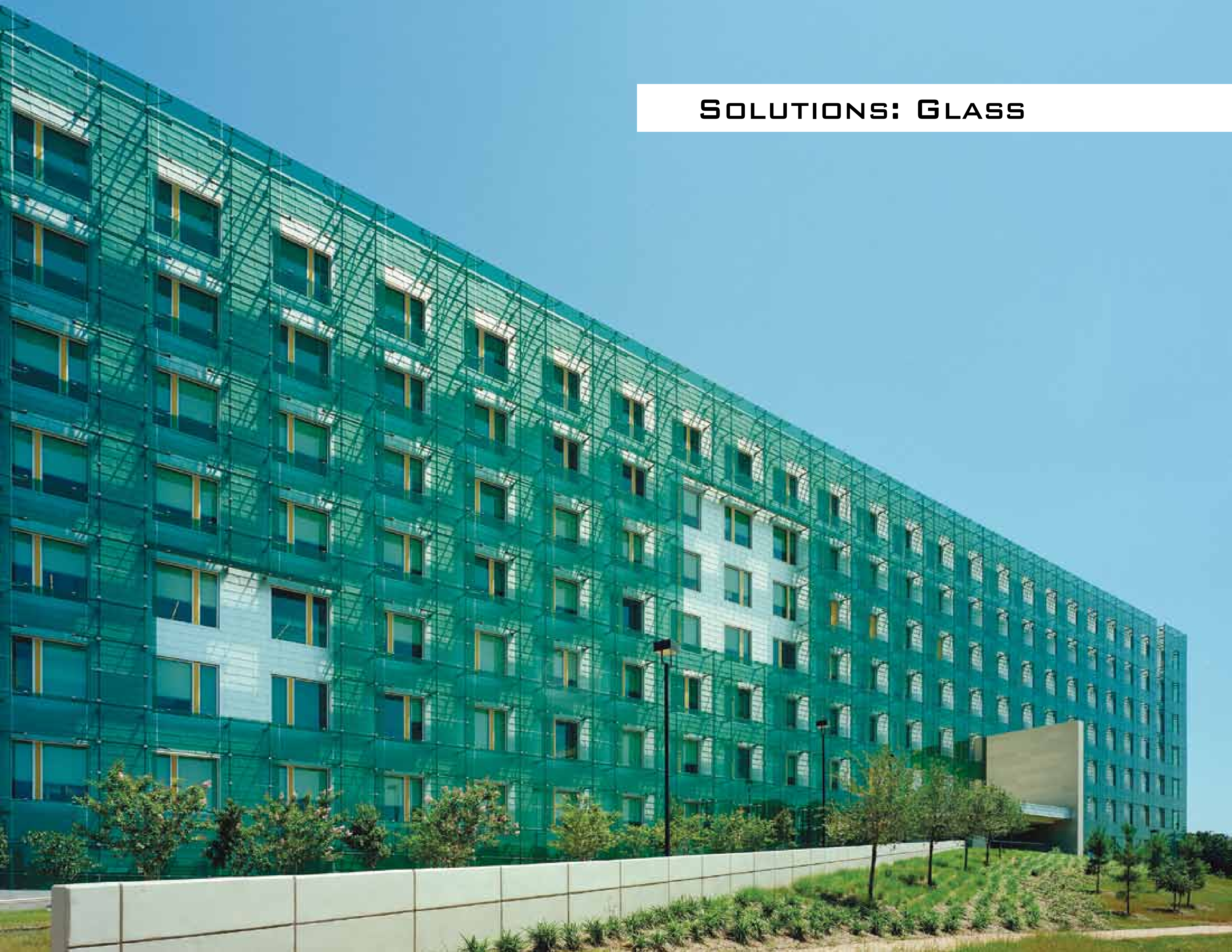
Lighting

Interior and exterior building and landscape lighting can make a significant difference to collisions rates in any one location. This phenomenon is dealt with in detail in the section on lighting.

Planted, open atrium spaces lure birds down, then prove dangerous when birds try to fly out to reflections on surrounding windows. Photo: Christine Sheppard, ABC

This atrium has more plants than anywhere outside on the surrounding streets, making the glass deadly for birds seeking food in this area.
Photo: Christine Sheppard, ABC

Solutions: Glass



It is possible to design buildings that can reasonably be expected not to kill birds. Numerous examples exist, not necessarily designed with birds in mind, but to be functional and attractive. These buildings may have windows, but use screens, latticework, grilles, and other devices outside the glass or integrated into the glass.

Finding glass treatments that can eliminate or greatly reduce bird mortality while minimally obscuring the glass itself has been the goal of several researchers, including Martin Rössler, Dan Klem, and Christine Sheppard. Their research, discussed in more detail in Appendix I, has focused primarily on the spacing, width, and orientation of lines marked on glass, and has shown that patterns covering as little as 5% of the total glass surface can deter 90% of strikes under experimental conditions. They have consistently shown that most birds will not attempt to fly through horizontal spaces less than 2" high nor through vertical spaces 4" wide or less. We refer to this as the **2 x 4 rule**. There are many ways that this can be used to make buildings safe for birds.

Designing a new structure to be bird friendly does not need to restrict the imagination or add to the cost of construction. Architects around the globe have created fascinating and important structures that incorporate little or no exposed glass. In some cases, inspiration has been born out of functional needs, such as shading in hot climates, in others, aesthetics; being bird-friendly was usually incidental. Retro-fitting existing buildings can often be done by targeting problem areas, rather than entire buildings.

(Opposite) The external glass screen on the GSA Regional Field Office in Houston, TX, designed by Page Southerland Page, means windows are not visible from many angles. Photo: Timothy Hursley

Emilio Embasz used creative lighting strategies to illuminate his Casa de Respira Espiritual, located north of Seville, Spain. Much of the structure and glass are below grade, but are filled with reflected light. Photo courtesy of Emilio Ambasz and Associates

FOA made extensive use of bamboo in the design of this Madrid, Spain public housing block. Shutters are an excellent strategy for managing bird collisions as they can be closed as needed. Photo courtesy of FOA

Facades, netting, screens, grilles, shutters, exterior shades

There are many ways to combine the benefits of glass with bird-safe or bird-friendly design by incorporating elements that preclude collisions without completely obscuring vision. Some architects have designed decorative facades that wrap entire structures. Recessed windows can functionally reduce the amount of visible glass and thus the threat to birds. Netting, screens, grilles, shutters and exterior shades are more commonly used elements that can make glass safe for birds. They can be used in retrofits or be an integral part of an original design, and can significantly reduce bird mortality.

Before the current age of windows that are unable to be opened, screens protected birds in addition to their primary purpose of keeping bugs out. Screens and nets are still among the most cost-effective methods for protecting birds, and netting can often be installed so as to be nearly invisible. Netting must be installed several inches in front of the window, so impact does not carry birds into the glass. Several companies sell screens that can be attached with suction cups or eye hooks for small areas of glass. Others specialize in much larger installations.

Decorative grilles are also part of many architectural traditions, as are shutters and exterior shades, which have the additional advantage that they can be closed temporarily, specifically during times most dangerous to birds, such as migration and fledging (see Appendix II).

Functional elements such as balconies and balustrades can act like a façade, protecting birds while providing an amenity for residents.

The façade of the New York Times building, by FX Fowle and Renzo Piano, is composed of ceramic rods, spaced to let occupants see out, while minimizing the extent of exposed glass. Photo: Christine Sheppard, ABC

External shades on Renzo Piano's California Academy of Sciences in San Francisco are lowered during migration seasons to eliminate collisions. Photo: Mo Flannery

For the Langley Academy in Berkshire, UK, Foster + Partners used louvers to control light and ventilation, also making the building safe for birds. Photo: Chris Phippen Ofis

The combination of shades and balustrades screens glass on Ofis Architect's Apartments on the Coast in Izola, Slovenia. Photo courtesy of Ofis

Instead of glass, this side of Jean Nouvel's Institute Arabe du Monde in Paris, France features motor-controlled apertures that produce filtered light in the interior of the building. Photo: Vicki Paull

A series of balconies, such as those pictured here, can hide glass from view. Photo: Elena Cazzaniga

Overhangs block viewing of glass from some angles, but do not necessarily eliminate reflections. Photo: Christine Sheppard, ABC

Reflections in this angled façade can be seen clearly over a long distance, and birds can approach the glass from any angle. Photo: Christine Sheppard, ABC

Awnings and Overhangs

Overhangs have been said to reduce collisions, however, they do not eliminate reflections, and only block glass from the view of birds flying above. They are thus of limited effectiveness as a general strategy.

UV Patterned Glass

Birds can see into the ultraviolet (UV) spectrum of light, a range largely invisible to humans (see page 36). UV-reflective and/or absorbing patterns (transparent to humans but visible to birds) are frequently suggested as the optimal solution for many bird collision problems. Progress in the search for bird-friendly UV glass has been slow, however, due to the inherent technical complexities, and because, in the absence of widespread legislation mandating bird-friendly glass, only a few glass companies recognize this as a market opportunity. Research indicates that UV patterns need strong contrast to be effective.

Angled Glass

In a study (Klem et al., 2004) comparing bird collisions with vertical panes of glass to those tilted 20 degrees or 40 degrees, the angled glass resulted in less mortality. For this reason, it has been suggested that angled glass should be incorporated into buildings as a bird-friendly feature. While angled glass may be useful in special circumstances, the birds in the study were flying parallel to the ground from nearby feeders. In most situations, however, birds approach glass from many angles, and can see glass from many perspectives. Angled glass is not recommended as appropriate or useful strategy. The New York Times printing plant, pictured opposite, clearly illustrates this point. The angled glass curtain wall shows clear reflections of nearby vegetation, visible from a long distance away.

Deeply recessed windows, such as these on Stephen Holl's Simmons Hall at MIT, can block viewing of glass from most angles. Photo: Dan Hill

Translucent glass panels on the Kunsthaus Bregenz in Austria, designed by Atelier Peter Zumthor, provide light and air to the building interior, without dangerous reflections. Photo: William Heltz

The glass facade of SUVA Haus in Basel, Switzerland, renovated by Herzog and de Meuron, is screen-printed on the outside with the name of the company owning the building. Photo: Miguel Marqués Ferrer

Dense stripes of internal frit on University Hospital's Twinsburg Health Center in Cleveland, by Westlake, Reed, Leskosky will overcome virtually all reflections. Photo: Christine Sheppard, ABC

Patterns on Glass

Patterns are often applied to glass to reduce the transmission of light and heat; they can also provide some design detail. When designed according to the 2 x 4 rule, (see p. 17) patterns on glass can also prevent bird strikes. External patterns on glass deter collisions effectively because they block glass reflections, acting like a screen. Ceramic dots or 'frits' and other materials can be screened, printed, or otherwise applied to the glass surface. This design element, useful primarily for new construction, is currently more common in Europe and Asia, but is being offered by an increasing number of manufacturers in the United States.

More commonly, patterns are applied to an internal surface of double-paned windows. Such designs may not be visible if the amount of light reflected from the frit is insufficient to overcome reflections on the glass' outside surface. Some internal frits may only help break up reflections when viewed from some angles and in certain light conditions. This is particularly true for large windows, but also depends on the density of the frit pattern. The internet company IAC's headquarters building in New York City, designed by Frank Gehry, is composed entirely of fritted glass, most of high density. No collision mortalities have been reported at this building after two years of monitoring by Project Safe Flight. Current research is testing the relative effectiveness of different frit densities, configurations, and colors.

The Studio Gang's Aqua Tower in Chicago was designed with birds in mind. Strategies include fritted glass and balcony balustrades. Photo: Tim Bloomquist

The dramatic City Hall of Alphen aan den Rijn in the Netherlands, designed by Erick van Egeraat Associated Architects, features a façade of etched glass. Photo: Dik Naagtegal

RAU's World Wildlife Fund Headquarters in the Netherlands uses wooden louvers as sunshades; they also diminish the area of glass visible to birds. Photo courtesy of RAU

External frit, as seen here on the Lile Museum of Fine Arts, by Ibos and Vitart, is more effective at breaking up reflections than patterns on the inside of the glass. Photo: G. Fessy

A detail of a pattern printed on glass at the Cottbus Media Centre in Germany. Photo: Evan Chakroff

While some internal fritted glass patterns can be overcome by reflections, Frank Gehry's IAC Headquarters in Manhattan is so dense that the glass appears opaque. Photo: Christine Sheppard, ABC

Opaque and Translucent Glass

Opaque, etched, stained, frosted glass, and glass block can are excellent options to reduce or eliminate collisions, and many attractive architectural applications exist. They can be used in retrofits but are more commonly used in new construction.

Frosted glass is created by acid etching or sandblasting transparent glass. Frosted areas are translucent, but different finishes are available with different levels of light transmission. An entire surface can be frosted, or frosted patterns can be applied. Patterns should conform to the 2 x 4 rule described on page 17. For retrofits, glass can also be frosted by sandblasting on site.

Stained glass is typically seen in relatively small areas but can be extremely attractive and is not conducive to collisions.

Glass block is extremely versatile, can be used as a design detail or primary construction material, and is also unlikely to cause collisions.

UN Studio's Het Valkhof Museum in Nijmegan, The Netherlands, uses translucent glass to diffuse light to the interior, which also reduces dangerous reflections. Photo courtesy of UN Studio.

Frosted glass façade on the Wexford Science and Technology building in Philadelphia, by Zimmer, Gunsul, Frasca. Photo: Walker Glass

Renzo Piano's Hermes Building in Tokyo has a façade of glass block. Photo: Mariano Colantoni

A dramatic use of glass block denotes the Hecht Warehouse in Washington, DC, by Abbott and Merkt. Photo: Sandra Cohen-Rose and Colin Rose

ABC BirdTape

ABC, with support from the Rusinow Family Foundation, has produced ABC BirdTape to make home windows safer for birds. This easy-to-apply tape lets birds see glass while letting you see out, is easily applied, and lasts up to four years.
For more information, visit www.ABCBirdTape.org

Photos : Dariusz Zdziebkowski, ABC

Internal Shades, Blinds, and Curtains

Light colored shades are often recommended as a way to deter collisions. However, they do not effectively reduce reflections and are not visible from acute angles. Blinds have the same problems, but when visible and partly open, they are more likely to break up reflections than solid shades.

Window Films

Currently, most patterned window films are intended for use inside structures as design elements or for privacy, but this is beginning to change. CollidEscape, a perforated window film similar to 3M™ Scotchcal™ Perforated Window Graphic Film, but designed to last for 10 years or more on the exterior surface of glass, is a well-known external solution. It covers the entire surface of a window, appears opaque from the outside, but still permits a view out from inside. Interior films, when applied correctly, have held up well in external applications, but this solution has not yet been tested over decades. A film with a pattern of narrow, horizontal stripes was applied to a building, in Markham, Ontario and successfully eliminated collisions. Another film has been effective at the Philadelphia Zoo's Bear Country exhibit (see photo on opposite page). In both cases, the response of people has also been positive.

Temporary Solutions

In some circumstances, especially for homes and small buildings, quick, low-cost, temporary solutions such as making patterns on glass with tape or paint can be very effective. Even a modest effort can reduce collisions. Such measures can be applied when needed and are most effective following the 2 x 4 rule. For more information, see ABC's informative flyer "You Can Save Birds from Flying into Windows" at www.abcbirds.org/abc

Decals

Decals are probably the most popularized solution to bird collisions, but their effectiveness is widely misunderstood.

Birds do not recognize decals as silhouettes of birds, spider webs, or other items, but simply as obstacles that they may try to fly around. Decals are most effective if applied following the 2 x 4 rule, but even a few may reduce collisions. Because decals must also be replaced frequently, they are usually considered a short-term strategy for small windows.

A single decal is minimally effective for collision prevention on a window of this size, as there is still a substantial amount of untreated glass. Photo: Christine Sheppard, ABC

Tape decals (Window Alert shown here) placed following the 2 x 4 rule can be effective at deterring collisions. Photo: Christine Sheppard, ABC

This window at the Philadelphia Zoo's Bear Country exhibit was the site of frequent bird collisions until this window film was applied. Collisions have been eliminated, with no complaints from the public. Photo courtesy of Philadelphia Zoo

Problem: Lighting

Each white speck seen here is a bird, trapped in the beams of light forming the *9/11 Tribute in Light* in New York City. Volunteers watch during the night and the lights are turned off briefly if large numbers of birds are observed. Photo: Jason Napolitano

Artificial light is increasingly recognized as a negative factor for humans as well as wildlife. Rich and Longcore (2006) have gathered comprehensive reviews of the impact of "ecological light pollution" on vertebrates, insects, and even plants. For birds especially, light can be a significant and deadly hazard.

Beacon Effect and Urban Glow

Light at night, especially during bad weather, creates conditions that are particularly hazardous for night-migrating birds. Typically flying at altitudes over 500 feet, migrants often descend to lower altitudes during inclement weather, where they may encounter artificial light from buildings. Water vapor in very humid air, fog, or mist refracts light, forming an illuminated halo around light sources.

There is clear evidence that birds are attracted to light, and once close to the source, are unable to break away (Rich and Longcore, 2006; Poot et al., 2008; Gauthreaux and Belser, 2006). How does this become a hazard to birds? When birds encounter beams of light, especially in inclement weather, they tend to circle in the illuminated zone, appearing disoriented and unwilling or unable to leave. This has been documented recently at the *9/11 Memorial in Lights*, where lights must be turned off briefly when large numbers of birds become caught in the beams. Significant mortality of migrating birds has been reported at oil platforms in the North Sea and the Gulf of Mexico. Van de Laar (2007) tested the impact on birds of lighting on an off-shore platform. When lights were switched on, birds were immediately attracted to the platform in significant numbers. Birds dispersed when lights were switched off. Once trapped, birds may collide with structures or each other, or fall to the ground from exhaustion, where they are at risk from predators.

While mass mortalities at very tall illuminated structures (such as skyscrapers) during inclement weather have received the most attention, mortality has also been associated with ground-level lighting during clear weather. Light color also plays a role, with blue and green light much safer than white or red light. Once birds land in lighted areas, they are at risk from colliding with nearby structures as they forage for food by day.

In addition to killing birds, overly-lit buildings waste electricity, and increase greenhouse gas emissions and air pollution levels. Poorly designed or improperly installed outdoor fixtures add over one billion dollars to electrical costs in the United States every year, according to the International Dark Skies Association. Recent studies estimate that over two thirds of the world's population can no longer see the Milky Way, just one of the nighttime wonders that connect people with nature. Together, the ecological, financial, and cultural impacts of excessive building lighting are compelling reasons to reduce and refine light usage.

Overly-lit buildings waste electricity and increase greenhouse gas emissions and air pollution levels, as well as posing a threat to birds. Photo: Matthew Haines

Houston skyline at night. Photo: Jeff Woodman

Solutions: Lighting Design

Reducing exterior building and site lighting has proven effective at reducing mortality of night migrants. At the same time, these measures reduce building energy costs and decrease air and light pollution. Efficient design of lighting systems plus operational strategies to reduce light "trespass" or "spill light" from buildings while maximizing useful light are both important strategies. In addition, an increasing body of evidence shows that red lights and white light (which contains red wavelengths) particularly attract and confuse birds, while green and blue light have far less impact.

Light pollution is largely a result of inefficient exterior lighting, and improving lighting design usually produces savings greater than the cost of changes. For example, globe fixtures permit little control of light, which shines in all directions, resulting in a loss of as much as 50% of energy, as well as poor illumination. Cut-off shields can reduce lighting loss and permit use of lower powered bulbs.

Most "vanity lighting" is unnecessary. However, when it is used, building features should be highlighted using down-lighting rather than up-lighting. Where light is needed for safety and security, reducing the amount of light trespass outside of the needed areas can help by eliminating shadows. Spotlights and searchlights should not be used during bird migration. Communities that have implemented programs to reduce light pollution have not found an increase in crime.

Using automatic controls, including timers, photo-sensors, and infrared and motion detectors is far more effective than reliance on employees turning off lights. These devices generally pay for themselves in energy savings in less than a year. Workspace lighting should be installed where needed, rather than lighting large areas. In areas where indoor lights will be on at night, minimize perimeter lighting and/or draw shades after dark. Switching to daytime cleaning is a simple way to reduce lighting while also reducing costs.

Shielded light fixtures are widely available in many different styles. Photo: Susan Harder

Reprinted courtesy of DarkSkySociety.org

Lights Out Programs

Birds evolved complex, complementary systems for orientation and vision long before humans developed artificial light. We still have much more to learn, especially the differences between species, but recent science has begun to clarify how artificial light poses a threat to birds, especially nocturnal migrants. These birds use a magnetic sense which is dependent on dim light from the blue-green end of the spectrum.

Research has shown that different wavelengths cause different behaviors, with yellow and red light preventing orientation. Different intensities of light also produce different

(Opposite) Fixtures such as these reduce light pollution, saving energy and money, and reducing negative impacts on birds. Photo: Dariusz Zdziebkowski, ABC

Shielded lights, such as those shown above, cut down on light pollution and are much safer for birds. Photo: Susan Harder

reactions. Despite the complexity of this issue, there is one simple way to reduce mortality: turn lights off.

Across the United States and Canada, "Lights Out" programs at the municipal and state level encourage building owners and occupants to turn out lights visible from outside during spring and fall migration. The first of these, Lights Out Chicago, was started in 1995, followed by Toronto in 1997. There are over twenty programs as of mid-2011.

The programs themselves are diverse. Some are directed by environmental groups, others by government departments, and still others by partnerships of organizations. Participation in some, such as Houston's, is voluntary. Minnesota mandates turning off lights in state-owned and -leased buildings, while Michigan's governor proclaims Lights Out dates annually. Many jurisdictions have a monitoring component or work with local rehabilitators. Monitoring programs can provide important information in addition to quantifying collision levels and documenting solutions. Toronto, for example, determined that if short buildings emit more light, they can be more dangerous to birds than tall building emitting less light.

Ideally, Lights Out programs would be in effect year round, saving birds and energy costs and reducing emissions of greenhouse gases. ABC stands ready to help develop new programs and to support and expand existing programs.

Distribution of Lights Out Programs in North America

Lights Out map legend

- **Red:** state ordinance
- **Yellow:** cities in state-wide programs
- **Turquoise:** program in development
- **Blue:** local programs

Downtown Houston during Lights Out. Photo: Jeff Woodman

Solutions: Legislation

Changing human behavior is generally a slow process, even when the change is uncontroversial. Legislation can be a powerful tool for modifying behavior. Conservation legislation has created reserves, reduced pollution, and protected threatened species and ecosystems. Initial efforts to document bird mortality and recommend ways to remediate collisions have more recently given way to legislation that promotes bird-friendly design and reduction of light pollution.

Most of these ordinances refer to external guidelines, rather than specifying how their goals must be achieved, and because there are many guidelines, created at different times and often specific to particular places, this can lead to contradiction, confusion, and cases of 'shopping' for the cheapest option. These ABC guidelines are intended to address collisions at a national level and may be distributed by other groups.

One challenge in creating legislation is to provide specific strategies and create objective measures that architects can use to accomplish their task. ABC has incorporated objective criteria into this document and created a model ordinance to be found in Appendix V .

ABC is willing to partner with local groups in creating additions to the Guidelines with local focus and to assist in promoting local, bird-friendly legislation.

Cook County, Illinois, was the first to pass bird-friendly construction legislation, sponsored by then-Assemblyman Mike Quigley.

United States Capitol, Washington, DC . Photo: stock.xchng

In 2006, Toronto, Canada, proposed a Green Development Standard, initially a set of voluntary guidelines to promote sustainable site and building design, including guidelines for bird-friendly construction. Development Guidelines became mandatory on January 1, 2011, but the process of translating guidelines into blueprints is still underway. San Francisco adopted Standards for Bird-safe Buildings in September, 2011. Listed below are some examples of current and pending ordinances at levels from federal to municipal.

Federal (proposed)

Illinois Congressman Mike Quigley (D-IL) introduced the Federal Bird-Safe Buildings Act of 2011 (HR 1643), which calls for each public building constructed, acquired, or altered by the General Services Administration (GSA) to incorporate, to the maximum extent possible, bird-safe building materials and design features. The legislation would require GSA to take similar actions on existing buildings, where practicable. Importantly, the bill has been deemed cost-neutral by the Congressional Budget Office. See http://thomas.loc.gov/cgi-bin/query/z?c112:H.R.1643.IH

State: Minnesota (enacted)

Chapter 101, Article 2, Section 54: Between March 15 and May 31, and between August 15 and October 31 each year, occupants of state-owned or state-leased buildings must attempt to reduce dangers posed to migrating birds by turning off building lights between midnight and dawn, to the extent turning off lights is compatible with the normal use of the buildings. The commissioner of administration may adopt policies to implement this requirement. See www.revisor.leg.state.mn.us/laws/?id=101&doctype=Chapter&year=2009&type=0

Song Sparrow: Greg Lavaty

State: Minnesota (enacted; regulations pending)

Beginning on July 1, 2010, all Minnesota State bonded projects – new and substantially renovated –that have not already started the schematic design phase on August 1, 2009 will be required to meet the Minnesota Sustainable Building 2030 (SB 2030) energy standards. See www.mn2030.umn.edu/

State: New York (pending)

Bill S04204/A6342-A, the Bird-friendly Buildings Act, requires the use of bird-friendly building materials and design features in buildings. See http://assembly.state.ny.us/leg/?bn=S04204&term=2011

City: San Francisco (enacted)

The city's Planning Department has developed the first set of objective standards in the nation, defining areas where the regulations are mandated and others where they are recommended, plus including criteria for ensuring that designs will be effective for protecting birds. See http://www.sf-planning.org/index.aspx?page=2506

City: Toronto

On October 27, 2009, the Toronto City Council passed a motion making parts of the Toronto Green Standard mandatory. The standard, which had previously been voluntary, applies to all new construction in the city, and incorporates specific Bird-Friendly Development Guidelines, designed to eliminate bird collisions with buildings both at night and in the daytime.

Beginning January 31, 2010, all new, proposed low-rise, non-residential, and mid- to high-rise residential and industrial, commercial, and institutional development will be required under Tier 1 of the Standard, which applies to all residential apartment buildings and non-residential buildings that are four stories tall or higher. See www.toronto.ca/planning/environment/greendevelopment.htm

THE NUMBER OF BIRDS KILLED BY COLLISIONS WITH GLASS EVERY YEAR IS ASTRONOMICAL.

Hundreds of species of birds are killed by collisions. These birds were collected by monitors with FLAP in Toronto, Canada. Photo: Kenneth Herdy

APPENDIX I: THE SCIENCE OF BIRD COLLISIONS

Magnitude of Collision Deaths

The number of birds killed by collisions with glass every year is astronomical. Based on studies of homes and commercial structures, Klem (1990) estimated conservatively that each building in the United States kills one to ten birds per year. Using 1986 United States Census data, he combined numbers of homes, schools, and commercial buildings for a maximum total of 97,563,626 buildings. Dunn (1993) surveyed 5,500 people who fed birds at their homes and recorded window collisions. She derived an estimate of 0.65-7.7 bird deaths per home per year for North America, supporting Klem's calculation.

The number of buildings in the United States has increased significantly since 1986, and it has been shown that commercial buildings generally kill more than ten birds per year, as would be expected since they have large expanses of glass (Hager *et al*., 2008; O'Connell, 2001). Thus, one billion annual fatalities is likely to be closer to reality, and possibly even too low.

Klem *et al*., (2009a) used data from New York City Audubon's monitoring of seventy-three Manhattan building facades to estimate 0.5 collision deaths per acre per year in urban environments, for a total of about 34 million migratory birds annually colliding with city buildings in the United States.

Patterns of Mortality

It is difficult to get a complete and accurate picture of avian mortality from collisions with glass. Collision deaths can occur at any time. Even intensive monitoring programs only cover a portion of a city, usually visiting the ground level of a given site at most once a day and often only during migration seasons. Many city buildings have stepped roof setbacks that are inaccessible to monitoring teams. Recognizing these limitations, some papers have focused on reports from homeowners on backyard birds (Klem, 1989; Dunn, 1993) or on mortality of migrants in an urban environment (Gelb and Delacretaz, 2009; Klem *et al*., 2009a, Newton, 1999). Others have analyzed collision victims from single, large-magnitude incidents (Sealy, 1985) or that have become part of museum collections (Snyder, 1946; Blem et al., 1998; Codoner, 1995).

There is general support for the fact that birds killed in collisions are not distinguished by age, sex, size, or health (for example: Blem and Willis, 1998; Codoner, 1995; Fink and French, 1971; Hager et al., 2008; Klem, 1989). However, some species, such as the White-throated Sparrow, Ovenbird, and Common Yellowthroat, seem to be more vulnerable than others, appearing consistently on top ten lists. Snyder (1946), examining window collision fatalities at the Royal Ontario Museum, noted that the majority were "tunnel flyers" – species that frequently fly through small spaces in dense, understory habitat. Recent work (J. A. Clark, pers. comm.) suggests that there may be species differences in attraction to light that could explain these findings. Interestingly, species well adapted to and common in urban areas, such as the House Sparrow and European Starling, are not prominent on lists of fatalities, and there is evidence that resident birds are less likely to die from collisions than migratory birds.

Collision mortality appears to be a density-independent phenomenon. Hager *et al*. (2008) compared the number of species and individual birds killed at buildings at Augustana College in Illinois with the density and diversity of bird species in the surrounding area. The authors concluded that total window area, habitat immediately adjacent to windows, and

A sample of collision victims from Baltimore.
Photo: Daniel J. Lebbin, ABC

behavioral differences among species were the best predictors of mortality patterns, rather than simply the size and composition of the local bird population.

From a study of multiple Manhattan buildings in New York City, Klem *et al* (2009a) similarly concluded that the expanse of glass on a building facade is the factor most predictive of mortality rates, calculating that every increase of 10% in the expanse of glass correlates to a 19% increase in bird mortality in spring, 32% in fall. How well these equations predict mortality in other cities remains to be tested. Collins and Horn (2008) studying collisions at Millikin University in Illinois concluded that total glass area and the presence/absence of large expanses of glass predicted mortality level. Hager *et al* (2008) came to the same conclusion. Gelb and Delacretaz's (2009) work in New York City indicated that collisions are more likely to occur on windows that reflect vegetation.

Dr. Daniel Klem maintains running totals of the number of species reported in collision events in countries around the world. This information can be found at: www.muhlenberg.edu/main/academics/biology/faculty/klem/aco/Country%20list.htm#World

He notes 859 species globally, with 258 from the United States. The intensity of monitoring and reporting programs varies widely from country to country, however. Hager (2009) noted that window strike mortality was reported for 45% of raptor species found frequently in urban areas of the United States, and represented the leading source of mortality for Sharp-shinned Hawks, Cooper's Hawks, Merlins, and Peregrine Falcons.

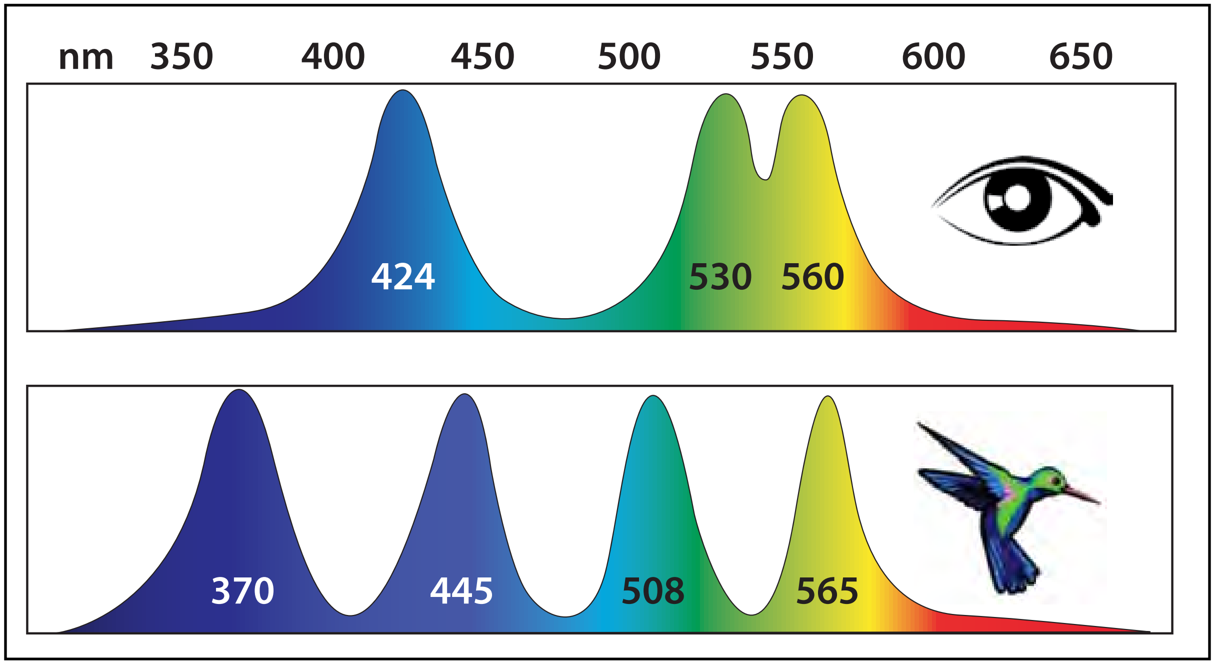
Avian Vision and Collisions

Taking a "bird's-eye view" is much more complicated than it sounds. To start with, where human color vision relies on three types of sensors, birds have four, plus an array of color filters that allow them to see many more colors than people (Varela *et al*., 1993) (see chart below). Many birds, including most passerines (Ödeen and Håstad, 2003) also see into the ultraviolet spectrum. Ultraviolet can be a component of any color (Cuthill *et al*., 2000). Where humans see red, yellow, or red + yellow, birds may see red + yellow, but also red + ultraviolet, yellow + ultraviolet, and red + yellow + ultraviolet, colors for which we have no names. They can also see polarized light (Muheim *et al*., 2006, 2011), and they process images faster than humans; where we see continuous motion in a movie, birds would see flickering images (D'Eath, 1998; Greenwood *et al*., 2004; Evans *et al*., 2006). To top it all off, birds have not one, but two receptors that permit them to sense the earth's magnetic field, which they use for navigation (Wiltschko *et al*., 2006).

Avian Orientation and the Earth's Magnetic Field

Thirty years ago, it was discovered that birds possess the ability to orient themselves relative to the Earth's magnetic field and locate themselves relative to their destination. They appear to use cues from the sun, polarized light, stars, the Earth's magnetic field, visual landmarks, and even odors to find their way. Exactly how this works – and it likely varies among

Comparison of Human and Avian Vision



Based on artwork by Sheri Williamson

species – is still being investigated, but there have been interesting discoveries that also shed light on light-related hazards to migrating birds.

Lines of magnetism between the north and south poles have gradients in three dimensions. Cells in birds' upper beaks, or maxillae, contain the iron compounds maghemite and magnetite. Micro-synchrotron x-ray fluorescence analysis shows these compounds in three different compartments, a three-dimensional architecture that probably allows birds to detect their "map" (Davila, 2003; Fleissner *et al*., 2003, 2007). Other magnetism-detecting structures are found in the retina of the eye, and depend on light for activity. Light excites receptor molecules, setting off a chain reaction. The chain in cells that respond to blue wavelengths includes molecules that react to magnetism, producing magnetic directional cues as well as color signals. For a comprehensive review of the mechanisms involved in avian orientation, see Wiltschko and Wiltschko, 2009.

Birds and Light Pollution

The earliest reports of mass avian mortality caused by lights were from lighthouses, but this source of mortality essentially disappeared when steady-burning lights were replaced by rotating beams (Jones and Francis, 2003). Flashing or interrupted beams apparently allow birds to continue to navigate. While mass collision events at tall buildings and towers have received most attention (Weir, 1976; Avery *et al*., 1977; Avery *et al*., 1978; Crawford, 1981a, 1981b; Newton, 2007), light from many sources, from urban sprawl to parking lots, can affect bird behavior and cause bird mortality (Gochfeld, 1973). Gochfeld (in Rich and Longcore, 2006) noted that bird hunters throughout the world have used lights from fires or lanterns near the ground to disorient and net birds on cloudy, dark nights. In a review of the effects of artificial light on migrating birds, Gauthreaux and Belser (2006) report on the use of car headlights to attract birds at night for tourists on safari.

Evans-Ogden (2002) showed that light emission levels of sixteen buildings ranging in height from eight to 72 floors correlated directly with bird mortality, and that the amount of light emitted by a structure was a better predictor of mortality level than building height, although height was a factor. Wiltschko *et al* (2007) showed that above intensity thresholds that decrease from green to UV, birds showed disorientation. Disorientation occurs at light levels that are still relatively low, equivalent to less than half an hour before sunrise under clear sky. It is thus likely that light pollution causes continual, widespread, low-level mortality that collectively is a significant problem.

The mechanisms involved in both attraction to and disorientation by light are poorly understood and may differ for different light sources (see Gauthreaux and Belser (2006) and Herbert (1970) for reviews.) Recently, Haupt and Schillemeit described the paths of 213 birds flying through beams uplighting from several different outdoor lighting schemes. Only 7.5% showed no change in behavior. Migrating birds are severely impacted, while resident species may show little or no effect. It is not known whether this is because of differences in physiology or simply familiarity with local habitat.

Steady-burning red and white lights are most dangerous to birds. Photo: Mike Parr, ABC

Light Color and Avian Orientation

Starting in the 1940s, ceilometers, powerful beams of light used to measure the height of cloud cover, came into use, and were associated with significant bird kills. Filtering out long (red) wavelengths and using the blue/ultraviolet range greatly reduced mortality. Later, replacement of fixed beam ceilometers with rotating beams essentially eliminated impact on migrating birds (Laskey, 1960). A complex series of laboratory studies in the 1990s demonstrated that birds required light in order to sense the Earth's magnetic field. Birds could orient correctly under monochromatic blue or green light, but longer wavelengths (yellow and red) caused disorientation (Rappli et al., 2000; Wiltschko *et al*., 1993, 2003, 2007). It was demonstrated that the magnetic receptor cells on the eye's retina are inside the type of cone cell responsible for processing blue and green light, but disorientation seems to involve a lack of directional information.

Fog increases the danger of light both by causing birds to fly lower and by refracting light so it is visible over a larger area. Photo: Christine Sheppard, ABC

Poot *et al*. (2008) demonstrated that migrating birds exposed to different colored lights in the field respond the same way they do in the laboratory. Birds were strongly attracted to white and red light, and appeared disoriented by them, especially under overcast skies. Green light was less attractive and minimally disorienting; blue light attracted few birds and did not disorient those that it did attract (but see Evans *et al*., 2007). Birds were not attracted to infrared light. This work was the basis for development of the Phillips "Clear Sky" bulb, which produces white light with minimal red wavelengths (Marquenie *et al*., 2008) and is now in use in Europe on oil rigs and at some electrical plants. According to Van de Laar *et al*. (2007), tests with this bulb on an oil platform during the 2007 fall migration produced a 50-90% reduction in birds circling and landing. Recently, Gehring *et al*. (2009) demonstrated that mortality at communication towers was greatly reduced if strobe lighting was used as opposed to steady-burning white, or especially red lights. Replacement of steady-burning warning lights with intermittent lights at locations causing collisions is an excellent option for protecting birds, as is manipulating light color.

Weather Impact on Collisions

Weather has a significant and complex relationship with avian migration (Richardson, 1978), and large-scale, mass mortality of migratory birds at tall, lighted structures (including communication towers) has often correlated with fog or rain (Avery et al., 1977; Crawford, 1981b; Newton, 2007) The conjunction of bad weather and lighted structures during migration is a serious threat, presumably because visual cues used by birds for orientation are not available.

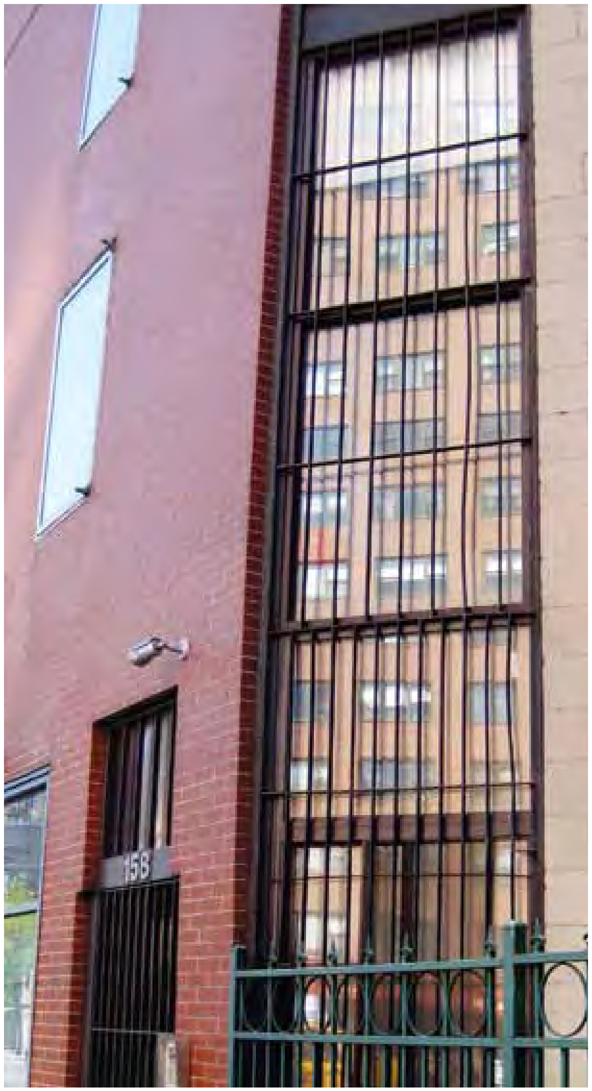
Lower floor windows are thought to be more dangerous to birds because they are more likely to reflect vegetation. Photo: Christine Sheppard, ABC

However, not all collision events take place in bad weather. For example, in a report of mortality at a communications tower in North Dakota (Avery *et al*., 1977), the weather was overcast, usually with drizzle, on four of the five nights with the largest mortality. On the fifth occasion, however, the weather was clear.

Landscaping and Vegetation

Gelb and Delacretaz (2006, 2009) evaluated data from collision mortality at Manhattan building facades. They found that sites where glass reflected extensive vegetation were associated with more collisions than glass reflecting little or no vegetation. Of the ten buildings responsible for the most collisions, four were "low-rise." Klem (2009) measured variables in the space immediately associated with building facades in Manhattan, as risk factors for collisions.

Both increased height of trees and increased height of vegetation increased the risk of collisions in fall. Ten percent increases in tree height and the height of vegetation corresponded to 30% and 13% increases in collisions in fall. In spring, only tree height had a significant influence, with a 10% increase



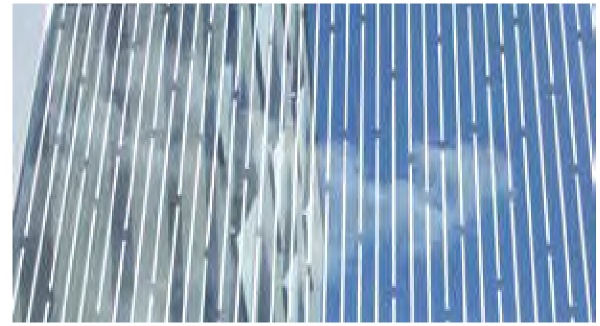
This security grille also creates a pattern that will deter birds from flying to reflections. Photo: Christine Sheppard, ABC

corresponding to a 22% increase in collisions. Confusingly, increasing "facing area" defined as the distance to the nearest structure, corresponded strongly with increased collisions in spring, and with reduced collisions in fall. Presumably, vegetation increases risk both by attracting more birds to an area, and by being reflected in glass.

Research: Deterring Collisions

Systematic efforts to identify signals that can be used to make glass visible to birds began with the work of Klem in 1989. Testing glass panes in the field and using a dichotomous choice protocol in an aviary, Klem (1990) demonstrated that popular devices like "diving falcon" silhouettes were only effective if they were applied densely, spaced two to four inches apart. Owl decoys, blinking holiday lights, and pictures of vertebrate eyes were among items found to be ineffective. Grid and stripe patterns made from white material, one inch wide were tested at different spacing intervals. Only three were effective: a 3 x 4 inch grid, vertical stripes spaced four inches apart, and horizontal stripes spaced about an inch apart across the entire surface.

In further testing using the same protocols, Klem (2009) confirmed the effectiveness of 3M™Scotchcal™ Perforated Window Graphic Film (also known as CollidEscape), WindowAlert® decals, if spaced at the 2 x 4 rule, as above, and externally applied ceramic dots or "frits," (0.1 inch dots spaced 0.1 inches apart). Window films applied to the outside surface that rendered glass opaque or translucent were also effective. The most effective deterrents in this study were stripes of highly reflective 40% UV film (D. Klem, pers. comm., March 2011) alternating with



Patterns on the outside of glass, such as that shown above, are more effective than patterns on an inside surface. Photo: Hans Schmid

A dense internal frit pattern on the glass of the Bike and Roll building, near Union Station in Washington D.C., makes it look almost opaque. Photo: Christine Sheppard, ABC

A pattern of narrow horizontal stripes has proven to be highly effective at deterring bird collisions, while covering only about 7% of the surface of the glass. Photo: Hans Schmid high UV absorbing stripes. Completely covering glass with clear or reflective window film that also absorbed UV marginally reduced collisions.

Building on Klem's findings, Rössler developed a testing program in Austria starting in 2004 and continuing to the present (Rössler and Zuna-Kratky, 2004; Rössler, 2005; Rössler, *et al*., 2007; Rössler and Laube, 2008; Rössler, 2009). Working at the banding center at the Hohenau Ringelsdorf Biological Station outside Vienna, Austria made possible a large sampling of birds for each test, in some instances permitting comparisons of a particular pattern under different intensities of lighting. This program has focused primarily on geometric patterns, evaluating the impact of different spacing, orientation, and dimensions. Birds are placed in a "tunnel," where they can view two pieces of glass: one unmodified, (the control) and the other with the pattern to be tested. Birds fly down the tunnel and are scored according to whether they try to exit through the control or the pattern. A mist net keeps the bird from hitting the glass and it is then released. The project focuses not only on finding patterns effective for deterring collisions, but on effective patterns that cover a minimal part of the glass surface. To date, some patterns have been found to be highly effective, while covering only 5% of the glass.

Building on Rössler's work, ABC has collaborated with the Wildlife Conservation Society and the Carnegie Museum to construct a tunnel at Carnegie's Powdermill Banding Station, primarily to test commercially available materials. This project has been supported by the Association of Zoos and Aquarium's Conservation Endowment Fund, the Colcom Foundation, and New York City Audubon. Results from the first season showed that making an entire surface UV reflective was not an effective way to deter birds. With UV materials, contrast seems to be important. Glass fritted in patterns conforming to the 2 x 4 rule, however, scored well as deterrents.

Most clear glass made in the United States transmits about 96% of light falling perpendicular to the outside surface, and reflects about 4%. The amount of light reflected increases at sharper angles – clear glass reflects about 50% of incident light at angles over 70 degrees. Light on the inside of the glass is also partly reflected and partly transmitted. The relative intensities of light transmitted from the inside and reflected from the outside surfaces of glass, plus the viewing angle determine if the glass appears transparent or mirrors the surrounding environment. Patterns on the inside surfaces of glass and objects inside the glass may not always be visible. These changeable optical properties support the

ABC's Chris Sheppard testing a bird in the tunnel at the Carnegie Museum's Powdermill Banding Station in southwestern Pennsylvania. Photo: Susan Elbin, 2011

The tunnel – an apparatus for safely testing effectiveness of different materials and designs for deterring bird collisions. Photo: Christine Sheppard, ABC

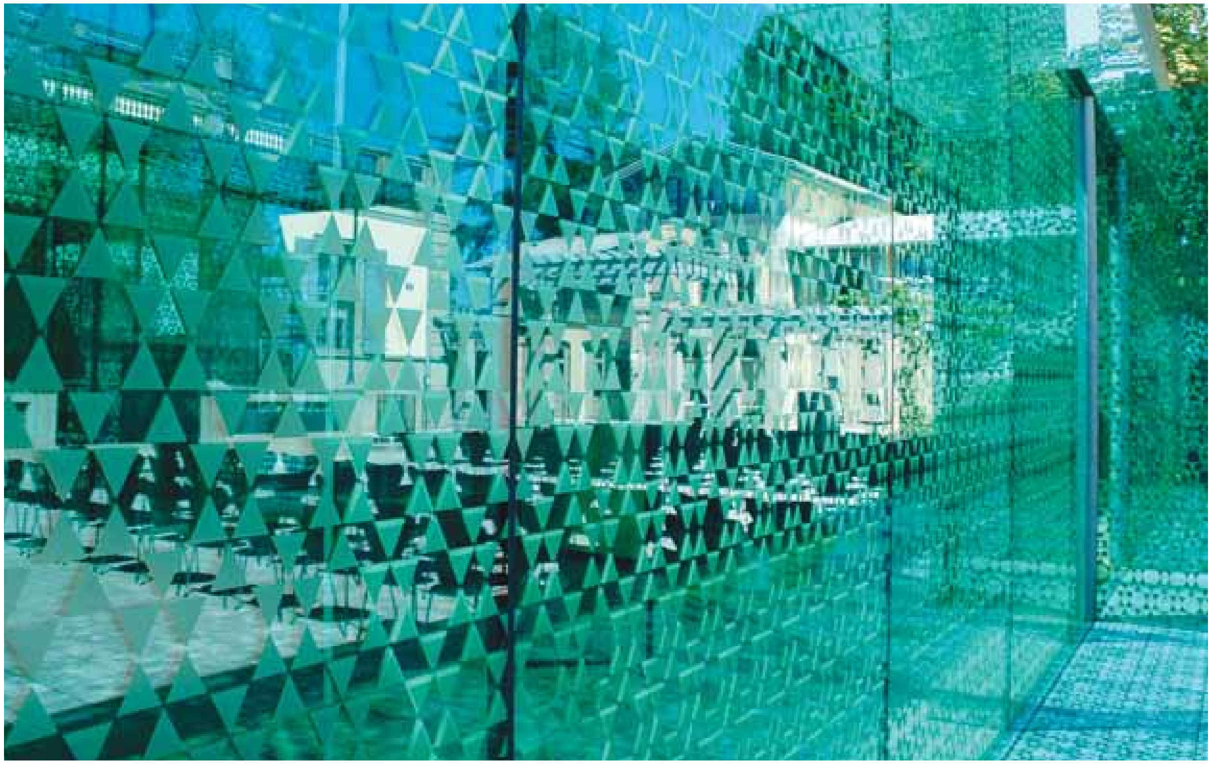
A bird's eye view of glass in the tunnel. Photo: Christine Sheppard, ABC argument that patterns applied to the outer surface of glass are more effective than patterns applied to the inner surface.

The majority of the work described here uses protocols that approximate a situation with free-standing glass – birds can see through glass to the environment on the other side, patterns tested are between the bird and the glass and patterns are primarily back-lit. While this is useful and relevant, it does not adequately model most glass installed in buildings. In that situation, light levels behind the glass are usually substantially lower than light falling on the outside surface. New protocols have been developed to test materials whose effectiveness depends on the glass being primarily front-lit. This includes UV patterns and frit patterns on the inside surfaces of insulated glass.

Ornilux Mikado's pattern reflects UV wavelengths. The spiderweb effect is only visible from very limited viewing angles. Photo courtesy of Arnold Glass

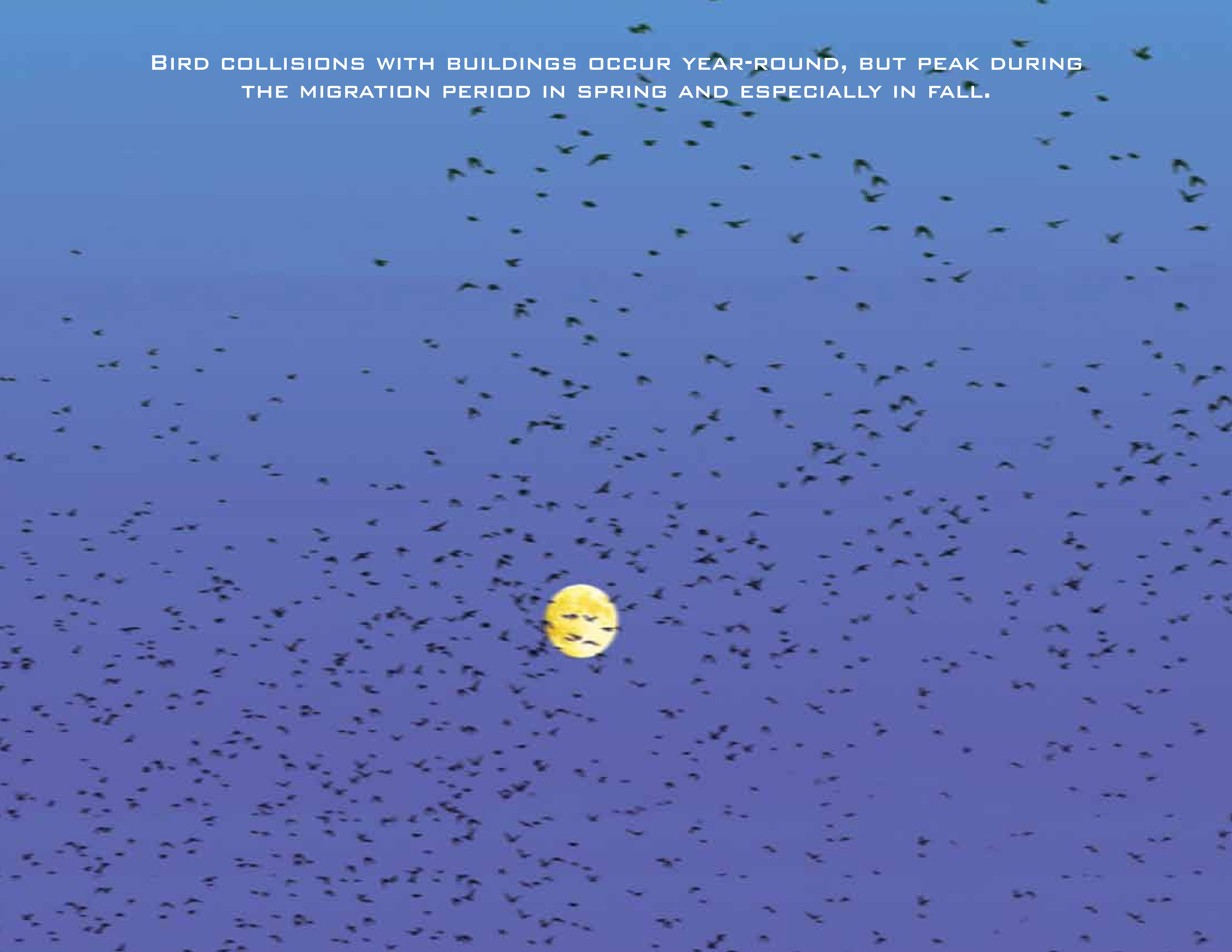
All-over patterns such as the one shown above are less effective at deterring collisions. Patterns with more contrast and distinct spaces, such as the one shown on the left, are much more effective. Photo: Christine Sheppard, ABC

A panel of fritted glass, ready for testing. Photo: Christine Sheppard, ABC



This glass facade, of a modern addition to the Reitberg Museum in Zürich, Germany, was designed by Grazioli and Krischanitz. It features a surface pattern formed of green enamel triangles, beautiful and also bird-friendly. Photo: Hans Schmidt

Bird collisions with buildings occur year-round, but peak during the migration period in spring and especially in fall.



APPENDIX II: BIRD MIGRATION

Bird collisions with buildings occur year-round, but peak during the migration period in spring and especially in fall when millions of adults and juvenile birds travel between breeding and wintering grounds. Migration is a complex phenomenon, and different species face different levels of hazards depending on their migration strategy, immediate weather conditions, availability of food, and human-made obstacles encountered on the way.

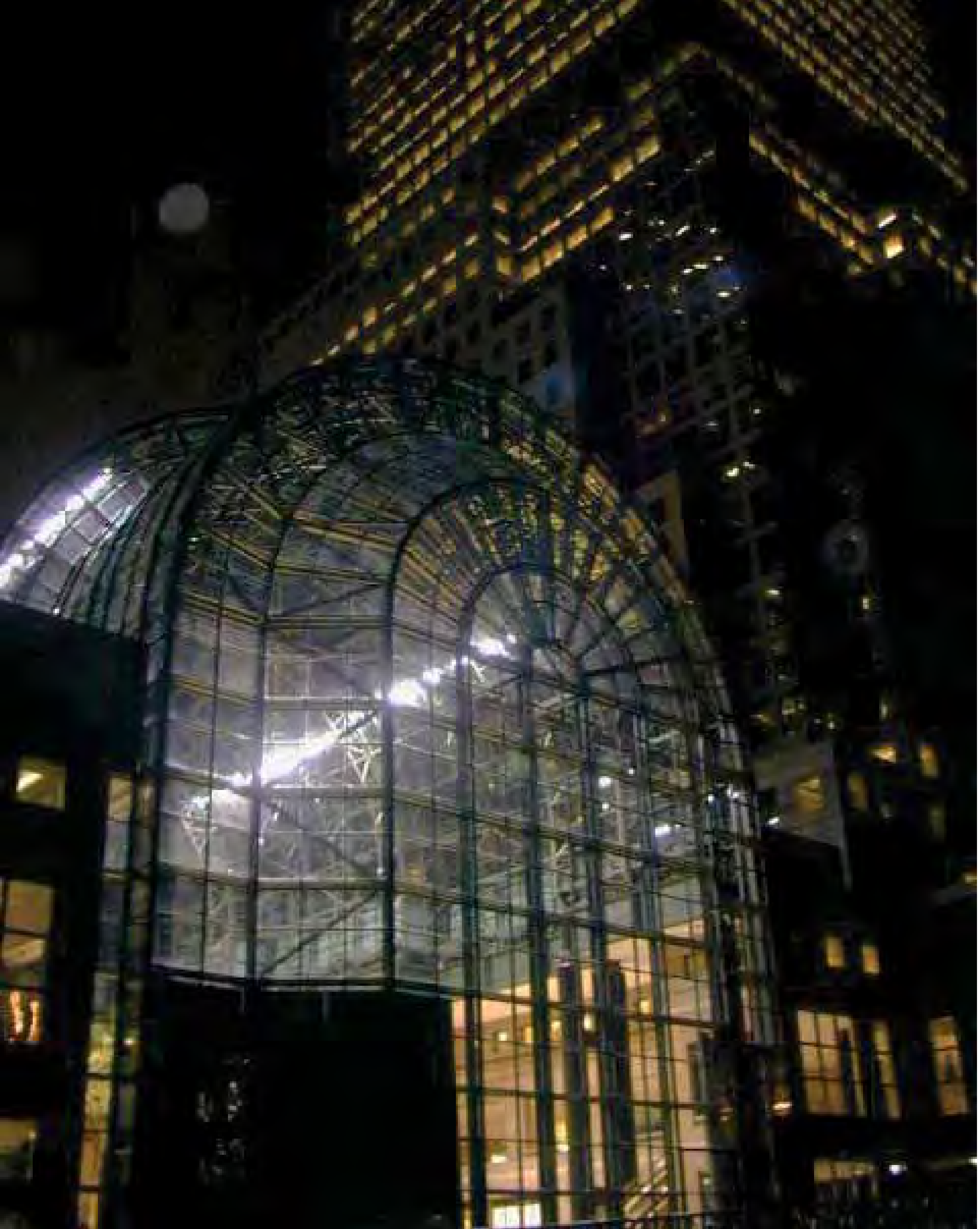
Many species have a migratory pattern that alternates flight with stopovers to replenish their energy stores. Night-flying migrants, including many songbirds, generally take off within a few hours of sunset and land after midnight but before dawn (Kerlinger, 2009). Once birds have landed, they may remain for several days, feeding and waiting for appropriate weather to continue. During that time, they make flights around the local area, hunting for good feeding sites. Almost anywhere they stop – in cities, suburbs or business parks – they run the risk of hitting glass. Most collision monitoring programs involve searching near dawn for birds that have been killed or injured during the night. Programs that also monitor during the day, however, continue to find birds that have collided with windows (Gelb and Delecretaz, 2009; Olson, pers. comm; Russell, pers. comm; Hager, 2008). These diurnal collisions are widespread, and represent the greatest number of bird deaths and the greatest threat to birds.

Diurnal Migrants

Daytime migrants include raptors such as the Broad-winged Hawk and Merlin that take advantage of thermal air currents to reduce the energy needed for flight. Other diurnal migrants, including Red Knots, Canada Geese, and Sandhill Cranes, fly in flocks, and their stopover sites are localized because of their dependence on bodies of water. This means that daytime migration routes often follow land forms such as rivers and mountain ranges as well as coastlines. Birds tend to be concentrated along these routes or "flyways." Some songbird species such as the American Robin, Horned Lark, and Eastern Kingbird also migrate during the day. Diurnal migrant flight altitudes are generally lower than those of nocturnal migrants, putting them at greater risk of collisions with tall buildings.

As seed dispersers, birds such as the Cedar Waxwing play an important role in maintaining many types of habitat. Photo: Chip Miller

Larger birds, such as the Sandhill Crane, migrate in flocks during the day. Photo: Alan Wilson



Nocturnal Migrants

Many songbirds migrate at night, possibly to take advantage of cooler temperatures and less turbulent air, and because they hunt insects or find berries during daylight hours. Generally, these birds migrate individually, not in flocks, spread out across most of the species' range, although local geography may channel birds into narrower routes. Songbirds may fly as many as 200 miles in a night, then stop to rest and feed for one to three days, but these patterns are strongly impacted by weather, especially wind and temperature. Birds may delay departure, waiting for good weather. They generally fly at an altitude of about 2,000 feet, but may descend or curtail flight altogether if they encounter a cold front, rain, or fog. There can be a thousand-fold difference in the number of birds aloft from one night to the next. Concentrations of birds may develop in "staging areas", where birds make ready to cross large barriers such as the Great Lakes or Gulf of Mexico.

Another collision victim – a Yellow-shafted Flicker, found on a Baltimore street. Photo: Daniel J. Lebbin, ABC, October 2008

The glass walls of this atrium, coupled with night-time illumination, create an extreme collision hazard for birds. Photo courtesy of NYC Audubon

Night-migrating songbirds, already imperiled by habitat loss, are at double the risk, threatened both by illuminated buildings when they fly at night (see Appendix I) and by daytime glass collisions as they seek food and shelter.

Millions are thus at risk as they ascend and descend, flying through or stopping in or near populated areas. As city buildings grow in height, they become unseen obstacles by night and pose confusing reflections by day. Nocturnal migrants, after landing, make short, low flights near dawn, searching for feeding areas and running a gauntlet of glass in almost every habitat, from cities to suburbs, and increasingly, exurbs. When weather conditions cause night fliers to descend into the range of lighted structures, huge kills can occur around tall buildings. Urban sprawl is creating large areas lit all night that may be causing less obvious, more dispersed bird mortality.

Local Movements

Glass collisions by migrating songbirds are by far the best known, but mortality of other groups of birds is not insignificant. Fatalities from collisions have been reported for 19 of 42 raptor species in both urban and non-urban environments, with collisions being the leading known cause of death for four species in cities, including the Peregrine Falcon. Breeding birds encounter glass as they search for nest sites or food, patrol territories or home ranges, or flee predators. Mortality increases as inexperienced fledglings leave the nest and begin to fly on their own.

Collisions are the leading known cause of death in city-dwelling Peregrine Falcons. Photo: Peter LaTourrette

The mirrored glass of this office building reflects nature so perfectly that it is easy to see how birds mistake reflection for reality. Photo: Christine Sheppard, ABC

Reflections don't have to be of something attractive to trick birds – as they fly around real buildings in search of food, they may also try to fly around reflected buildings. Photo: Christine Sheppard, ABC

American Woodcock are often victims of collisions. This bird hit a window in Washington D.C. in March, 2011. Photo: Dariusz Zdziebkowski, ABC

Often, only part of a building is responsible for causing most of the collisions. Evaluation and documentation can help develop a program of remediation targeting that area. This can be almost as effective as modifying the entire building, as well as being less expensive. Documentation of patterns of mortality and environmental features that may be contributing to collisions is essential. Operations personnel are often good sources of information as they may come across bird carcasses while performing regular maintenance activities. People who work near windows are often aware of birds hitting them. Initiating regular monitoring not only documents mortality patterns, but also provides a baseline for demonstrating improvement. The following questions can help guide the evaluation and documentation process by identifying features likely to cause collisions.

Seasonal Timing

Are collisions happening mostly during migration or fledging periods, in winter, or year round? If collisions happen only during a short time period, it may be possible to apply inexpensive, temporary solutions during that time and remove them for the rest of the year.

Some birds will attack their own reflections, especially in spring. This is not a true collision. Territorial males, especially American Robins and Cardinals, perceive their reflection as a rival male. They are unlikely to injure themselves, but temporarily blocking the offending window from the outside should resolve the problem.

Diurnal Timing

Are collisions happening at a particular time of day? The appearance of glass can change significantly with different light levels, direct or indirect illumination, and sun angles. It may be possible to simply use shades or shutters during critical times (see Appendix II).

Weather

Do collisions coincide with particular weather conditions, such as foggy or overcast days? Such collisions may be light-related. It may be possible to create an email notification system, asking building personnel to turn off lights when bad weather is forecast.

COMPARISON OF DIFFERENT RETROFIT OPTIONS

Material	Effectiveness	Cost	Application	Appearance	Longevity	Upkeep
Seasonal, temporary solutions	*****	$	*	*	na	na
Netting	*****	$$	**	***	****	***
Window film	*****	$$$	****	*****	***	****
Screens	*****	$$	***	****	*****	****
Shutters	*****	$$$	***	****	*****	****
Grilles	*****	$$$	****	*****	*****	****
Replace glass	*****	$$$$$	*****	*****	*****	****
5 stars/$ =	highly effective	expensive	easy	attractive	long-lasting	minimal

Robins are frequently killed by glass on buildings near meadows and lawns. Photo: Christine Sheppard, ABC, July 2009

The white stripes on this glass wall are an easy way to make a very dangerous area safe for birds. Photo: Hans Schmid

While patterns on the exterior surface of glass are most effective, blinds and curtains can help disrupt reflections. Partially open blinds, like those seen here, are most effective. Photo: Christine Sheppard, ABC

Location

Are there particular windows, groups of windows, or building facades that account for most collisions? It may be cost effective to modify only those sections of glass. Is glass located where birds fly between roosting or nesting and feeding sites? Are there areas where plants can be seen through glass – for example, an atrium, courtyard, or glazed passageway? Are there architectural or landscaping features that tend to direct birds towards glass? Examples might be a wall or rock outcropping, or a clear pathway bordered by dense vegetation. Solutions here might include using a screen or trellis to divert flight paths. Are there fruit trees, berry bushes, or other plants near windows that are likely to attract birds closer to glass? These windows should be a high priority for remediation. The glass itself can be modified, but it may also be possible to use live or inanimate landscaping elements, to block the view between food sources and windows.

Local Bird Populations

What birds are usually found in the area? Local bird groups or volunteers may be able to help characterize local and transitory bird populations, as well as the most likely routes for birds making short flights around the area.

Local bird-watchers can be a source of detailed information about local birds and their movements. Photo: Chip Miller


The Indigo Bunting is a common summer resident and migrant in the eastern United States. Photo: Barth Schorre

The American Birding Association (www.aba.org/resources/birdclubs.html), Bird Watchers Digest (www.birdwatchersdigest.com/bwdsite/connect/birdclubs/clubfinder.php?sc=migrate), Audubon chapters (http://www.audubon.org/search-by-zip), and Birding.com (www.birding.com/organizations.asp) are good places to start finding such resources. Nearby universities, colleges, and museums may also be helpful.

Research

Research on songbirds, the most numerous victims of collisions, has shown that horizontal spaces must be 2" or narrower, to deter the majority of birds. Vertical spaces must be 4" or narrower. This difference presumably has to do with the shape of a flying bird with outstretched wings. Within these guidelines, however, considerable variation is possible when devising bird-friendly patterns. We recommend that lines be at least ¼" wide, but it is not necessary that they be only vertical or horizontal. Contrast between pattern and background is important, however, be aware that the background – building interior, sky, vegetation – may change in appearance throughout the day. Effective patterns on the exterior surface of glass will combat reflection, transparency and passage effect. In the case of handrails or other applications viewed from both sides, patterns should be applied to both surfaces if birds can approach from either side.


There are many quick, easy, and cost-effective ways to deter collisions on a short term basis. Here, tape stripes, stenciled, and free hand patterns in tempera paint on home windows. Photo: Christine Sheppard, ABC


This Barn Swallow flying sideways through a barn door perfectly illustrates the 2 x 4 rule. Photo: Keith Ringland.

Madrid's Vallecas 51, designed by Somos Arquitectos, uses open-celled polycarbonate panels – a sustainable and recyclable skin that presents no threat to birds. Photo: Victor Tropchenko

APPENDIX IV: EXAMPLE POLICY

ORDINANCE

Sponsored by: [list names]

WHEREAS, birds provide valuable and important ecological services,

WHEREAS, [location] has recorded [ ] species of resident and migratory bird species,

WHEREAS, birding is a hobby enjoyed by 64 million Americans and generates more than $40 billion a year in economic activity in the United States,

WHEREAS, as many as one billion birds may be killed by collisions with windows every year in the United States,

WHEREAS, reducing light pollution has been shown to reduce bird deaths from collisions with windows,

WHEREAS, new buildings can be designed to reduce bird deaths from collisions without additional cost,

WHEREAS there exist strategies to mitigate collisions on existing buildings,

WHEREAS, bird-friendly practices often go hand-in-hand with energy efficiency improvements,

And **WHEREAS** [any additions specific to the particular location]

NOW, THEREFORE, BE IT ORDAINED, by [acting agency]

[title of legislation and other necessary language]

(a) In this section the term "Leadership in Energy and Environmental Design (LEED)" means a green building rating system promulgated by the United States Green Building Council (USGBC) that provides specific principles and practices, some mandatory but the majority discretionary, that may be applied during the design, construction, and operation phases, which enable the building to be awarded points from reaching present standards of environmental efficiency so that it may achieve LEED certification from the USGBC as a "green" building,

(b) [acting agency] does hereby order [acting department] to take the steps necessary to assure that all newly constructed buildings and all buildings scheduled for capital improvement are designed, built, and operated in accordance with the standards and requirements of the LEED Green Building Rating System Pilot Credit #55,

(c) The USGBC releases revised versions of the LEED Green Building Rating System on a regular basis; and [acting department] shall refer to the most current version of the LEED when beginning a new building construction permit project or renovation.

(d) New construction and major renovation projects shall incorporate bird-friendly building materials and design features, including, but not limited to, those recommended by the American Bird Conservancy Guidelines for Bird-friendly Design.

(e) [acting department] shall make existing buildings bird-friendly where practicable.

The U.S. Census Complex in Suitland, Maryland, designed by Skidmore, Owings, Merrill, features a *brise soleil* that shades the curtain wall. Wavy vertical fins of marine-grade, white oak reduce sun glare while eliminating glass reflections. Photo: Esther Langan

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The World Trade Center of New Orleans, designed by Edward Durrell Stone, uses a simple bird-friendly strategy – almost all windows have exterior shutters. Photo: Christine Sheppard, ABC

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The steel mesh enveloping Zurich's Cocoon in Switzerland, designed by Camenzind Evolution Ltd, provides privacy and protects birds, but still permits occupants to see out. Photo: Anton Volgger

External shades, as shown here on the Batson Building in Sacramento, California, designed by Sym Van der Ryn, are a simple and flexible strategy for reducing bird collisions, as well as controlling heat and light.
Photo courtesy of MechoShade

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The Institute Arabe du Monde in Paris, France provides light to the building interior without using glass. Photo: Joseph Radko, Jr.

The Orange Cube, a commercial and cultural complex, was designed by Jacob + McFarlane Architects as part of redevelopment of the harbor in Lyons, France. The external skin virtually eliminates threats to birds while permitting natural illumination of the interior and sightlines for those inside. Photo © Nicolas Borel

(BACK COVER) The Wexford Science and Technology Building in Philadelphia, designed by Zimmer, Gunsul, Frasca, uses opaque glass to provide light without glare, making it safe for birds. Photo courtesy of Walker Glass

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