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FOR

CONTRACTOR’S PREQUALIFICATION PACKAGE FOR THE

QUEEN ANNE ACADEMIC CENTER RENOVATION AND ADDITION

AT THE

PRINCE GEORGE’S COMMUNITY COLLEGE, MARYLAND

PGCC PROJECT NO. CC-08-MC-12-437

July 31, 2015

STATE OF MARYLAND

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   c. Project Overview Plans and Renderings
   d. Green Building Plan/LEED Checklist

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   UNDER SEPARATE COVER:

4. Selected 95% Construction Document Drawings
<table>
<thead>
<tr>
<th>CLIENT</th>
<th>Prince George’s Community College</th>
<th>301.322.0900</th>
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PROJECT INTENT AND ARCHITECTURAL DESIGN NARRATIVE
Project Intent

The renovation of the existing Queen Anne Fine Arts building, combined with the development of the adjacent 2+ acre site for new purpose-designed spaces for the arts, represents Prince George’s Community College and the State of Maryland’s renewed commitment to the importance of arts in higher education. In addition to reinvigorating the existing building, the project will work to transform this area of the campus into a vibrant center for the arts, one that fosters and enables a wide range of cross collaborations amongst various disciplines. In developing a village-like facility that is connective and transparent, with entries welcoming students and visitors from multiple directions, the opportunity exists to create a new place on campus serving not only students and faculty of the arts, but also a campus-wide population.

Architectural Narrative

Prince George’s Community College will renovate and expand the existing Queen Anne Fine Arts Building to provide an educational environment that will allow the College to create a comprehensive Liberal Arts academic performance and communication curriculum. The renovated and expanded building will be named the Queen Anne Academic Center.¹ A renovated theater with exterior improvements, coupled with a new architecture encapsulating a wide variety of arts spaces, the new Queen Anne Academic Center will offer a welcoming presence from all vistas, both day and night. Landscaping, open space, pedestrian pathways, exterior lighting and new wayfinding, combined with parking conveniently located will make this a popular destination for students and the community alike. The new complex is to be sited at the center of campus surrounded by Kent Hall, Accokeek Hall, Marlboro Hall, Bladen Hall, and the Inner Ring Road.

The Queen Anne Fine Arts facility is currently comprised of 33,455 Gross Square Feet (GSF)/22,852 Net Assignable Square Feet (NASF) and contains the 800 seat Hallam Theater, which is used for both Theater productions and College-wide assembly functions, and also hosts a variety of Community productions. The building requires a full renovation for HVAC/Plumbing/Fire Protection and Electrical systems updates, ADA Accessibility, and general code compliance.

The new Queen Anne Academic Center will retain this building and Hallam Theater and expand the facility through a 140,564 GSF/ 76,704 NASF addition. The new addition will surround and integrate the design of the original building and create connections allowing for the movement of students/faculty, costumes, supplies and instruments back and forth. The new Academic Center will support and expand major departmental components to include Theatre, Dance, Music, Mass Communications, Communication, as well as an Art Gallery and other campus wide instructional uses.

A new lobby that runs the length of the Academic Center welcomes students coming from the main academic quad, via Bladen and Marlboro Halls as well as from Kent Hall to the North. A new plaza entry with special paving, landscape and lighting located west of the building allows for easy access from Parking Lot E across the Inner Loop Road, through a tall canopy of mature existing trees. The design anticipates the future transformation of the Loop Road into a pedestrian way. Ample accessible car and van parking for both the new Academic center and the campus at large is also provided here.

The building features three performance venues – Hallam Theater an 800 seat existing proscenium theater with fly tower; a 300 seat proscenium theater with fly tower; and a 150 seat flexible black box theater with a catwalk - all organized around a vibrant, welcoming interior public lobby.

¹ Educational Specifications, Queen Anne Academic Center Renovation and Addition, August 7, 2012
Visitors arriving for a performance find the Center’s ticket office as well as a coat check room, conveniently located close to the building’s main entry.

The lobby provides a popular gathering space for audiences before and after performances and during intermissions, but more importantly, it offers a “24/7” space for students to socialize, study, enjoy a snack or just relax between classes, fostering collaboration between disciplines. With natural and theatrical lighting enlivening the space, vibrant wall colors and tactile material finishes, an Art Gallery on display, and seating areas located throughout, the two story lobby is the heart of the building’s daily operations as well as a favorite stopping point for students going to and from the main parking lots to other spots on campus. Situated centrally in the lobby is a new café, featuring beverages and “grab and go” offerings. Seating is provided near the space itself, as well as at defined locations throughout the lobby. Also found off of the lobby are the Flexible Performance/Instructional Spaces, general classrooms, and conference rooms.

The second floor of the building has several overlooks onto the lobby, activating the space as a place to ‘see and be seen.’ A combination of colorful walls with large openings, theatrical style metal railings and a variety of sitting nooks, provide a place for students to gather before and after class while also allowing a “perch” from which to view the lobby’s happenings. The Radio Station has a prominent central spot at the nexus of circulation overlooking the cafe and en route to the faculty offices for Theater, Dance, Television Radio & Film, and Communications departments. This office suite contains a small reception and waiting area, workroom and conference room and breakroom nearby. The majority of offices feature windows to the exterior, while side windows allow some offices a level of connectivity to the light-filled two story lobby itself. Carpeting throughout as well as acoustical ceilings provide needed privacy and a more quiet setting than that found in other areas of the building. The location of these activities, immediately off of the lobby, enhances the accessibility of faculty to students – placing the faculty and students at the very core of the building – both physically as well as symbolically.

The Television, Radio and Film department occupies a zone at the east of the building that is functionally well situated to their needs. The ground floor contains the TV Studio suite with convenient access to the main loading dock. The second floor is accessed by either a stair or elevator nearby, and contains the Mass Communications Lab, the Music Production Studios, and the Radio Station, which has a prominent overlook onto the lobby. The TRF Classroom and Tech Center are also conveniently located here.

Overall, the second floor contains general classrooms, Instructional Lab 2, the Student Study Center, Student Tutor Center and the Adjunct Faculty Suite, with special attention given to the desired adjacencies of these spaces. The Dance Studios are located on a prominent corner of the building with views of the north quad and Kent Hall. Flooring in these studios consist of a multi layered (basket woven) sprung floor. The structure of the large Dance performance space is designed to allow the College to expand its academic offerings to include aerialist techniques in the future. Dressing Rooms are located on the second floor for Dance, Black Box and Proscenium Theaters, while first floor dressing rooms serve Hallam Theater. A variety of sizes of dressing rooms is provided, ranging from two person principal dressing rooms to 12 person dressing spaces that can be combined depending on the needs of the casts, the larger doubling as a classroom for instruction in make-up techniques (Instructional Lab 3).

The Music department is concentrated on the Third Floor – a reception area is located off the grand stair and elevator, and faculty offices, studios, and practice rooms are contained here. The Band Room, Choral Room, Percussion Lab, Music Technology Lab, Piano Lab and a variety of needed Instrument repair and storage spaces complete the Music program here. The Band Room is located on a prominent corner of the building, providing a dramatic location for Recitals and small concerts.
The main performance spaces and the Art Gallery are all located directly off of the lobby, and the upper level of Hallam Theater can be accessed either through an open grand stair or via an elevator. The “back of house” for these venues provides for easy movement of materials and sets into the spaces from both the loading dock as well as the scene shop. In many ways, this is the “work horse” of the building, a beehive of activity. It is here that the scene shop, changing rooms and the performer’s green rooms can be found - all of the spaces required to support the performance venues. Materials and finishes have been selected not only for their durability and ease of maintenance, but also to compliment the building’s architecture, creating a seamless look and feel to the Academic Center – both inside and out.

The architecture of the Academic Center begins with revitalizing the original Queen Anne Fine Arts Building, which will become the central orientation point for the new Arts programs constructed and connected around it. Transformed from its isolated exterior plaza, the original brick walls will become the integral backdrop for the new grand lobby, providing an outdoor-scaled study and hang-out space for students, faculty and the community during performances. The iconic exterior of the new Academic Center displays the vibrancy and transparency of the arts – creating a building that with its undulating roofs evokes movement, spontaneity and grace. The new architecture embraces the old through a respectful modern counterpoint that celebrates the original building.

The siting of the building has been planned to align with the overall objectives of the Campus Master Plan 2012-2022, and will set the stage for future campus expansion to the south and west. The main entry plaza is located opposite existing Lot E, where future van and ADA accessible parking will be located to conveniently serve the overall campus and the venues in Queen Anne. Care has been taken to site the building to preserve the stand of mature trees here and include them in the entry sequence into the building.

Surrounding the Academic Center, existing pedestrian routes through the campus have been retained and enhanced either alongside or through the building. At the North, the quad framed by Kent and Bladen Halls has been improved in scale by the new addition, which contains a prominent glass overlook onto the quad from the Dance Studio. The main loading dock for the Center is located facing the Inner Loop Road to the South, which allows for the creation of a new ‘greenway’ shared with Marlboro Hall along the east. This ‘greenway’ will provide an important connection to future buildings constructed to the south. This pathway features concrete paving material that can accommodate the occasional truck drop-off to the Hallam loading dock, while being welcoming to pedestrians at all times. New trees, lawns, and plantings surrounding the Queen Anne Academic Center will define this as a very special place in the landscape of the campus both now and in the future.
DURING CONSTRUCTION, ALL ROADS IN AND OUT OF THE CAMPUS ARE ANTICIPATED TO BE OPEN. CONTRACTOR TRAILERS FOR THE QUEEN ANNE PROJECT TO BE LOCATED AT THE CELL TOWER.
Existing Building Views

North

East

West

South
ALL EXISTING TREES TO BE FULLY PROTECTED DURING CONSTRUCTION

PLANTER WITH NEW AMERICAN ARBORVITAE

LOW CONCRETE SEAT WALL

BICYCLE RACK AND SEATING AREA

CONCRETE STAIR WITH HANDRAIL

SCORED, COLOR CONCRETE ENTRY PLAZA WITH ADA RAMP AND RAILING

CENTER FOR HEALTH STUDIES

ALL EXISTING TREES TO BE FULLY PROTECTED DURING CONSTRUCTION

SERVICE YARD WITH ARCHITECTURAL ENCLOSURE AND LANDSCAPE SCREENING

NEW CREPE MYRTLE TREES

NEW INKBERRY SHRUBS

NEW LEYLAND CYPRESS TREES

Site Acreage: 4.4 acres (191,483 SF)
First Floor Design Development  Dec. 8, 2014

- ADD ALTERNATE #5: Add wall and roll-up door inside scene shop storage
- ADD ALTERNATE #6: Add Art Gallery Pivot Wall

Department Legend
- PERFORMANCE SPACES
- PERFORMER SUPPORT
- INSTRUCTIONAL SPACE
- MUSIC SPACES
- BUILDING SUPPORT
- CIRCULATION
- ART DEPARTMENT SPACES
- TELEVISION RADIO & FILM
- PROGRAM BUILDING SUPPORT
- THEATER SUPPORT
- CAMPUS WIDE SPACES
- ELEVATOR
ADD ALTERNATE #1: FIT-OUT OF DANCE ROOMS
Lobby looking South
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GREEN BUILDING PLAN / LEED CHECKLIST
**LEED Credit Number** | **NAME OF CREDIT** | **Possible Points** | **Pursuing** | **Maybe** | **No** | **Notes** | **INTENT & REQUIREMENTS**
--- | --- | --- | --- | --- | --- | --- | ---
**Section 1 - Sustainable Site** | | | | | | | **Declared that project is not 1/2 mile of major highway, OPT 4: 1/4 mile of major highway**
| IEQc1 | Site Selection | 1 | 1 | 0 | 0 | 0 | Have we found any asbestos?
| IEQc2 | Stormwater Management | 1 | 1 | 0 | 0 | 0 | Achieve water reuse or stormwater Management
| IEQc3 | Quantity Control | 1 | 1 | 0 | 0 | 0 | Begin documenting if possible
| IEQc4 | Light Pollution Reduction | 1 | 0 | 1 | 0 | 0 | Can we move this to no?
**Section 1 TOTALS** | | | | | | | **24**
**Section 2 - Water** | | | | | | | **Reduce water use below calculated potable water demand. OPT 1: 50% of hardware - combine with Section 2.2**
| IEQp1 | Water Use Reduction | R | R | R | R | R | Reduce potable water reduction by
| IEQp1.1 | Water Efficiency | 2 | 2 | 0 | 2 | 0 | Limit or eliminate the use of potable water
| IEQp1.2 | no potable water use for irrigation | 2 | 2 | 0 | 0 | 0 | No potable water use for irrigation
| IEQp2 | Innovative Wastewater Strategies | 2 | 0 | 0 | 0 | 0 | Reduce water use below calculated
**Section 2 TOTALS** | | | | | | | **15**
**Section 3 - Energy** | | | | | | | **Decrease infiltration and leakage in CPT-15 to 5%**
| IEAc1 | Optimize Energy Performance | 18 | 4 | 2 | 13 | 0 | Based on preliminary energy model - Dec. 2014
| IEAc2 | On-Site Renewable Energy | 7 | 0 | 0 | 0 | 7 | Achieve on-site renewable energy
| IEAc3 | Enhanced Commissioning | 2 | 3 | 0 | 0 | 0 | Still pursuing
| IEAc4 | International Performance | 2 | 0 | 0 | 0 | 0 | Verify. Waiting on final systems.
| IEAc5 | Measurement & Verification | 1 | 0 | 1 | 0 | 0 | Check with Scott on Bowie M+V plan.
| IEAc6 | Green Power | 2 | 0 | 0 | 0 | 0 | Provide 30% non-bulding electricity
**Section 3 TOTALS** | | | | | | | **36**
**Section 4 - Materials and Resources** | | | | | | | **Maintain 95% of existing walls, floors, and roof. Structural, load-bearing**
| IEQc3 | Materials Reuse | 1 | 0 | 0 | 1 | 0 | May need to use temporary meters, can check utility bills as check.
| IEQc4 | Materials Reuse | 1 | 0 | 0 | 0 | 0 | Provide 5% non-bulding electricity
| IEQc5 | Materials Reuse | 1 | 0 | 0 | 0 | 0 | Reduce pollution and land
| IEQc6 | Light Pollution Reduction | 1 | 0 | 0 | 1 | 0 | Can we move this to no?
**Section 4 TOTALS** | | | | | | | **36**
**Section 5 - Indoor Environmental Quality** | | | | | | | **Less than 90% of interior non load bearing**
| IEQc1 | LEED Goal: Silver | R | R | R | R | R | Establish minimum indoor air quality
| IEQc2 | Enhanced Tobacco Smoke (ETS) control | R | R | R | R | R | Minimum of 5% of existing walls, floors, and roof. Structural, load-bearing
| IEQc3 | Indoor Air Quality Control | 1 | 0 | 0 | 0 | 0 | Reduce pollution and land
| IEQc4 | Increased Ventilation | 1 | 0 | 0 | 0 | 0 | Reduce pollution and land
| IEQc5 | Construction IAQ Management Plan | R | R | R | R | R | Reduce pollution and land
| IEQc6 | Construction IAQ Management Plan | R | R | R | R | R | Reduce pollution and land
| IEQc7 | Post-Occupancy | 1 | 0 | 0 | 0 | 0 | Reduce pollution and land
| IEQc8 | Low Emission Materials | 1 | 0 | 0 | 0 | 0 | Reduce pollution and land
| IEQc9 | Adhesives & Sealants | 1 | 0 | 0 | 0 | 0 | Reduce pollution and land
| IEQc10 | Paints & Coatings | 1 | 0 | 0 | 0 | 0 | Reduce pollution and land
<table>
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<tr>
<th>LEED Credit Number</th>
<th>NAME OF CREDIT</th>
<th>Possible Points</th>
<th>Pursuing</th>
<th>Maybe</th>
<th>No</th>
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<th>INTENT &amp; REQUIREMENTS</th>
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<td>83</td>
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<tr>
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<td></td>
<td>Individual lighting controls for 90%</td>
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<td>Achieve a line of sight to vision</td>
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<th>Section 6 - Innovation in Design Process</th>
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| Section 6 Totals   | Total          | 5  | 1   | 5   | 0  |       | |

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<td>Silver: 40 to 49 points</td>
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<tr>
<td>Gold: 50 to 79 points</td>
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<tr>
<td>Platinum: 80 to 110</td>
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Design Development Acoustical Narrative for:

Prince George’s Community College
Queen Anne Academic Center Renovation and Addition
Kettering, MD

Prepared for:
Pfeiffer Partners Architects, PC

JH #14-0629.00
December 3, 2014
INTRODUCTION

This document summarizes the acoustical criteria for the programmed spaces for the Prince George’s Community College Queen Anne Academic Center. This report will offer a general overview of acoustical criteria for the sound sensitive spaces. Project specific solutions and details will be developed in the coming phases as the design progresses. The following areas will be discussed:

- **Architectural Acoustics** – Refers to proper room square footage, volume and shape; need for and orientation of sound absorbing, reflecting and diffusing surfaces; need for and orientation of adjustable absorption systems. These criteria are determined based on the program requirements for each sound critical space.

- **Sound Isolation** – Refers to the construction of floors, ceilings and walls designed for acoustic separation between adjacent spaces and from external noise. The constructions are recommended based on the background noise criteria for each sound critical space in combination with the anticipated noise levels in adjacent spaces.

- **Building Systems Noise Control** – Refers to the proper devices and strategies to control excess noise and vibration associated with mechanical, electrical, and plumbing systems. Recommendations are based on proximity between noisy equipment and the sound critical spaces as well as the type of equipment used.

ARCHITECTURAL ACOUSTICS OVERVIEW

This section of the report contains descriptions of the different acoustical finishes as well as space and geometric volume requirements for all sound critical spaces. The recommended treatments and criteria are described for each space below.
Proscenium Theater

The 250 seat Proscenium Theater will be a performance space primarily for theatrical use. Reverberation time should be 1.2-1.4s fully occupied. Room height to deck should be approximately 37’.

A fixed overhead reflector canopy will be located over the forestage (along with and series of clouds over the house) and shaped in such a manner so that sound from the performers on the stage extension and orchestra pit is reflected out into the house. The materials are yet to be determined but thicknesses in the ½” to ¾” are optimal. Side walls of the hall shall be shaped to promote diffusion of sound. Acoustically absorptive panels (approximately 3500sf) will be required distributed within the space to meet the reverberation time goals. Surfaces shall be thick and massive to reflect sound in all frequencies. Carpeted aisles and reflective floor surfaces are required. Chairs are upholstered bottom and back with maximum 1-1/2” thick foam for the back and 2-1/2” foam for the seat. The seat backs and bottom pans should be wood.

Black Box Theater

The Black Box Theater will be a flexible space with retractable seating for approximately 200 audience members. The Black Box Theater will be a fixed acoustic environment with approximately 2500sf of 2” thick absorptive panels distributed throughout the room on the walls and ceiling. The target reverberation time is 1.2s unoccupied.

Hallam Theater

The 800 seat Hallam Theater is slated for renovation. Acoustical improvements should include the following:

- Remove heavy tile panels on side walls of theater and other existing acoustical materials on rear wall and on front of rail behind cross aisle.
- Addition of an acoustical shell on stage (basis of design: Wenger Forte shell system).
- Improved side and rear wall shaping to provide a more diffuse sound field.
- Addition of a solid forestage overhead reflector that extends out over the pit, angled to reflect natural sound out into the seating area. This reflector should be 1/2”-3/4” plywood or similar mass material.
- New chairs with upholstered bottom and back with maximum 1-1/2” thick foam for the back and 2-1/2” foam for the seat. The seat backs and bottom pans should be wood.
- Partial repair and reshaping of gypsum board/plaster ceiling.

Reverberation time criteria should be 1.5 seconds unoccupied.
Band Room

The Band room will be used primarily for instrumental music rehearsals. This room should not be perfectly square, with the length equal to 1.2 the width. The underside of the deck above should be set at 26 feet. Floor should be hard. A partially sound transparent, partially sound reflective ceiling will be required at approximately 18 feet. The walls below this elevation will receive evenly distributed 2” thick acoustical panels. The walls below the ceiling will be shaped to provide acoustical diffusion and prevent parallel wall conditions. Finally, the underside of the deck will be treated with 4” thick duct liner insulation in a checker board pattern covering approximately 50% of the surface area (1,100sf).

An adjustable acoustic system (either physical via movable drapes/panels or with an electronic acoustic enhancement system) should be utilized in the space for acoustic adjustability. Target reverberation time range is 0.8s – 1.2s.

Choral Room

The Choral room will be used primarily for choral music rehearsals. This room should not be perfectly square, with the length equal to 1.2 the width. The underside of the deck above should be set at 24 feet. A partially sound transparent, partially sound reflective ceiling will be required at approximately 18 feet. The walls below this elevation will receive evenly distributed 2” thick acoustical panels (approximately 350sf). The walls below the ceiling will be shaped to provide acoustical diffusion and prevent parallel wall conditions. Finally, the underside of the deck will be treated with 4” thick duct liner insulation in a checker board pattern covering approximately 50% of the surface area (approximately 600sf).

An adjustable acoustic system (either physical via movable drapes/panels or with an electronic acoustic enhancement system) should be utilized in the space for acoustic adjustability. Target reverberation time range is 1.0s – 1.3s.

Percussion Lab

Percussion Lab will be primarily used for percussion rehearsals. Ceiling should be a sound control gypsum board ceiling with a ceiling height of approximately 16 feet. Finishes should be primarily absorptive, 4” thick fabric wrapped fiberglass panels on 75% of the wall surfaces and 50% of the ceiling. Walls will be shaped for acoustic diffusion. Mirrors are recommended on one wall at waist height to allow students to see reflections of their hands playing these instruments during rehearsals.

Music Practice Rooms / Ensemble Practice / Studios

Music Practice Rooms will be primarily used for individual and small ensemble choral and instrumental rehearsals and lessons. Rooms should utilize hard floors, and 2” thick fabric wrapped fiberglass panels on the ceiling and distributed 2” thick panels on 50% of the total wall surface.

As an alternate, consider Wenger prefabricated SoundLok practice rooms with VAE Technology (variable acoustic enhancement) systems.
Music Classrooms

These classrooms should be treated with a high NRC (0.8 or higher) ACT and carpet floors.

Music Technology Lab

This classroom should be treated with a high NRC (0.8 or higher) ACT and carpet floors along with 2” thick fabric wrapped fiberglass panels distributed on 25% of wall surfaces.

Piano Labs

These classrooms should be treated with a high NRC (0.8 or higher) ACT and carpet floors.

Radio Broadcast

Radio Broadcast Booths will primarily be used as “live rooms” for speech, interviews, and general broadcast activity. These rooms should be acoustically “dead” with the majority of the wall and ceiling surfaces covered in 2” thick fabric wrapped fiberglass panels to control echo and reverberation.

Radio Control

Radio Control Room is primarily used for an operator to control a console for broadcast. These rooms should be acoustically “dead” with the majority of the wall and ceiling surfaces covered in 2” thick fabric wrapped fiberglass panels to control echo and reverberation.

Isolation Booths

Isolation Booths are used primarily for voice over work, and other speech overdubbing. The majority of the wall and ceiling surfaces should be covered in 2” thick fabric wrapped fiberglass panels to control echo and reverberation.

Radio / Music Production Suite

The Recording Suite is a highly sensitive space from an acoustical point of view. It requires a diffuse sound field in order to prevent standing waves or echoes from affecting the usage of the space. Interior gypsum board walls should be aggressively shaped in order to achieve this. This room should not have any parallel walls, and should utilize a combination of diffusive applied panels and sound absorptive panels on the walls and ceiling to create an optimum acoustical environment. Adjustable acoustical elements will be required to allow the users to “tune” the room to the desired acoustical environment for the specific recording session taking place. This can be in the form of acoustical drapery or sliding wall panels. The height of the room should be minimum 13’, and preferable 16’ high.
Radio / Music Control Room

Similar to the Production Suite, this control room will also require a diffuse sound field to do critical listening from near field monitors. It will incorporate rear wall diffusion panels to avoid reflections back to the operator/monitor area. Because this space is also used as a classroom, this criterion will be achieved through the use of a mix of acoustically absorptive and diffusive panels strategically distributed throughout the room. The height of this room should be a minimum of 13’ and preferably 16’ high.

TV News Broadcast Labs

Radio Broadcast Booths will primarily be used as filming labs for speech, interviews and general TV broadcast activity. These rooms should be acoustically treated with 100% coverage of 2” thick fiberglass (black duct liner board or similar) on the ceiling, and 50% coverage of 2” thick fabric wrapped fiberglass panels on the walls. Acoustical diffusion panels should be incorporated into the other 50% of the wall surfaces.

Central Command Center

Central Command Center is primarily used for an general operational control of broadcast and production activity. This rooms should be acoustically “dead” with the majority of the wall and ceiling surfaces covered in 2” thick fabric wrapped fiberglass panels to control echo and reverberation.

Instructional Labs I/II

Instructional Lab I is intended to be a teaching space to compliment the black box, with a lighting grid and other theatrical elements similar to those in the black box theater. Treatment should include 2” thick fiberglass on the 100% of the ceiling (duct liner board or similar) and 50% coverage of 2” thick fabric wrapped fiberglass panels on 50% of the wall surfaces.

Instructional Lab II is intended to act more like a traditional classroom space. Ceiling should be ACT and floor should be carpet.

Performance Space Control Rooms

Control rooms requires a “dry” acoustic environment as there is live monitoring taking place in this space. To achieve this, the floor finish will be scheduled as carpet and the ceiling finish as acoustical ceiling tile. In addition, the rear wall of the space should be treated with 2” thick fabric wrapped fiberglass acoustical panels.

Flex I/II

These spaces are intended to act as divisible (via operable wall panels) conference spaces. Ceiling should be ACT and floor should be carpet.
Dance Studios

The dance studios should have applied 2” thick fabric wrapped fiberglass panels on 50% of the total walls/ceiling area. One wall of each studio should be mirrored and have the ability to cover the mirrors with a tracked curtain.

Scene Shop

To help reduce noise buildup in the Scene Shop, the ceiling should be treated with 2” thick absorptive panels on 100% of the ceiling area.
SOUND ISOLATION OVERVIEW

All rooms listed above will require excellent sound isolation from surrounding sound sources. In order to achieve this, the construction of walls, ceilings and floors will need to be massive and airtight. In addition, doors and windows in sound critical spaces will need to achieve specific levels of acoustical performance. In the most sensitive areas, box-in-box constructions will be required.

BOX IN BOX CONSTRUCTION

Typical box in box construction consists of a floating interior light weight construction surrounded by a more rigid massive construction (typically fully grouted CMU) and is used to isolate high level sounds in tight spaces. Inside the masonry walls is a floating wood floor onto which is built a steel stud partition with 2 layers of 5/8” gypsum board and fiberglass batting in the studs. These studs are either free standing or resiliently braced back to the masonry wall, allowing them to “float” and eliminate potential paths for vibration transfer. For smaller practice rooms, CMU is not required both the “inner” and “outer” box envelopes are multi-layer gypsum board on steel studs with no rigid connection between stud walls.

Floating wood floors consist of a double layer of plywood laid over neoprene or fiberglass mounts. The air space between the isolation mounts is filled with fiberglass insulation and the perimeter of the wood floor is held back from the perimeter walls to maintain the resiliency and allow for expansion and contraction of the wood. The finish material for each space would be scheduled in addition to the plywood sub-floor previously described. For certain rooms, such as 3rd floor Band and Choral Rehearsal spaces, floating concrete floors are required for maximum sound isolation. This floor consists of a 4” concrete slab which is lifted or poured over a roll-out isolator system similar to the wood floating floors. Location of floating floors will be based primarily on vertical adjacency, especially when two sensitive spaces abut vertically.

Sound Isolation ceilings consist of multiple layers of gypsum board that are supported from the structure above with vibration isolation hangers. These hangers include a neoprene and spring element in series that prevent structure-borne noise transfer between the structure and the ceiling. The sound isolation ceilings in this project will all be scheduled to consist of two layers of gypsum board. The gypsum board is held back from the interior gypsum board partitions with a resilient perimeter isolation board to allow for ceiling movement. As an alternate, it may be possible to construct the ceiling framing directly to the floating walls, completing the floating interior box, without hangers provided no connection is made between this ceiling and the non-floating structures. Note that recessed fixtures must be avoided with this type of ceiling in order to ensure the acoustical performance of the ceiling assembly is not compromised.

Penetrations through the CMU are sealed air tight and all penetrations in the interior gypsum board are caulked air tight. Electrical connections to the inner box should use flexible conduit.

The doors in the box in box assembly are acoustical (STC Rated) door assemblies and are attached to the inner box construction only.
Box In Box Rooms

Based on the most recent Design Development layouts for the building (dated 11/7/14), the following rooms require special (in some cases partial) box in box construction. Note this information is provided for pricing purposes only, and wall types and adjacencies will be reviewed more thoroughly throughout construction documents.

<table>
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<th>Room</th>
<th>Floating Floor</th>
<th>Floating Walls - Type</th>
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<tr>
<td>Proscenium Theater</td>
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<td>See SD markups</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Lab I</td>
<td>N</td>
<td>Y – Gyp/Gyp</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Lab II</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
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<tr>
<td>TV News Labs</td>
<td>N</td>
<td>Y – Gyp/CMU</td>
<td>Y</td>
<td></td>
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<tr>
<td>Radio / Music Production Suite</td>
<td>Y/Conc</td>
<td>Y – Gyp/CMU</td>
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<td>Choral Room</td>
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<td>N - CMU</td>
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Floating Wall Descriptors:

Gyp/Gyp – double steel stud, multiple layer floating gypsum board construction

Gyp/CMU – fully grouted 8”-12” thick CMU, with floating multi-layer gyp walls framed clear of CMU

CMU/CMU – double 8”-12” thick fully grouted CMU with 2” airspace between CMU walls. Floating multi-layer GWB walls outboard of CMU walls. Note this is only necessary in adjacencies with potential loud and soft activity directly adjacent such as Choral and Band Room adjacencies.

Floating Floor Descriptors:

Wd – Wood floating floors on neoprene isolators – total thickness 4”
Conc – 4” thick concrete floating floors (jack up or formwork floating slabs on 2” isolators) – total thickness 6”

**Doors**

Jaffe Holden Acoustics will specify the location and type of acoustical doors required for the project (see attached markups). Door requirements will be continuously reviewed and updated as the program of the spaces is developed, and as the layout of spaces is finalized. As an overview and guideline for performing arts facility installations, the doors can be classified into three categories: Gasketed, STC and Oversized STC. Example specifications have been provided for each of these three types.

The first type is gasketed doors. These doors consist of a typical hollow metal door with a series of adjustable heavy-duty acoustical gaskets applied around the perimeter of the door as well as a drop bottom seal. Examples of acceptable seals are model #770 and #367 by Zero International.

The second type is STC rated doors. These doors consist of a door leaf, door frame and acoustical seal assembly that have been tested in a laboratory as a whole assembly and meet a specific sound transmission class (STC) rating.

The third type is oversized or specialized STC rated doors. These doors separate noise-sensitive spaces from adjacent spaces containing noise sources of a different kind and level. Some examples of these doors are oversized swing or sliding doors at stage houses, or STC rated operable partitions. These doors are also provided as an STC rated frame and leaf system, and all critical hardware (hinges, latches, etc.) is specified and installed by the STC door manufacturer at the factory.

For this project, gasketed doors will typically be required at sound and light locks and STC rated doors at single point of entry to sound critical spaces and at mechanical rooms near sensitive areas.

**GENERAL PERFORMANCE SPACE ACCESS DOOR GUIDELINES**

- Public access doors into and out of auditoriums need to have quiet hardware so patrons may exit or enter during a performance without the door slamming and creating a disruption. For this reason, we recommend that the inner entry doors be equipped with push/pull and closer hardware only.

- No lock sets or panic bars should be installed on the inner doors of the sound lock. As a result, it is often necessary to create the required fire separation wall at an outer vestibule door where panic, fire-rated hardware may be used.

- Gasketing hardware is applied to the frame around the entire perimeter of the door, and at the astragal of double doors. The visual aspect of this hardware should be considered since the selection of gasket hardware determines the acoustic performance.

**Windows**

Windows in sound critical rooms need to include an integral air space and/or laminated panes. The exact type of glass and air spacing and frames depend on the location in the building, the percentage
of glass to wall, and the room’s adjacency to other sound critical rooms. Control rooms serving performance spaces will require STC 35 sliding assemblies (see example specification). These assemblies are typically center-parting. More details regarding these types of windows will be developed in later design phases.

Other critical windows will be those in the TV / Radio / Music Suites. These windows will be custom, double framed windows (to maintain the acoustical integrity of box-in-box construction) with an airspace of 4” or more and may be required to be angled to prevent unwanted acoustical reflections.

Operable Walls

The Flex I/II spaces should utilize STC-50 rated operable wall assemblies with full height plenum barriers.
BUILDING SYSTEMS NOISE CONTROL OVERVIEW

- This section of the report references different sources of noise and vibration, which can be classified as follows:

- **Airborne Noise** refers to noise radiated into the air by equipment sources such as fans and air handling units. Such noise may transmit through walls, floors, and ceilings to acoustically sensitive spaces.

- **Structureborne Noise** refers to equipment vibration that is mechanically coupled into the building structure and re-radiated into acoustically sensitive spaces as audible noise. Structureborne noise may also be generated when a component of a building structure is exposed to high levels of airborne noise.

- **Ductborne Noise** refers to noise generated primarily by fans in air handling systems that transmits to acoustically sensitive spaces via ductwork, where it can either emanate from the duct termination or ‘break out’ of the duct prior to its termination. Noise may also ‘break in’ to a duct.

DESIGN CRITERIA

The following criteria for maximum ambient noise levels due to operation of the building HVAC, plumbing, and electrical systems have been established for the acoustically sensitive spaces on the project. These criteria are established in terms of Noise Criterion (NC) ratings as described in ASHRAE 2001 Fundamentals Handbook, Chapter 7 (Sound and Vibration):

**NC 15 Spaces**

- Radio/Music Production Suite (including isolation booths and control rooms)

**NC 20 Spaces**

- Black Box Theater
- Proscenium Theater
- Hallam Theater
- TV/News Broadcast Labs
- Sound and Light Locks
### Radio Broadcast Suite

### NC 25 Spaces
- Lab I
- Recital Hall/Theatres Control Booths
- Band/Choral/Percussion Rehearsal Rooms
- Teaching Studios
- Music Technology Lab

### NC 30 Spaces
- Conference Rooms
- Music Practice Rooms
- Classrooms
- Flex I/II
- Central Command Center
- Dance Studios
- Piano Labs
- Lab II

### NC 35 Spaces
- Offices
- Green Room
- Dressing/Costume/Changing Rooms
- Lab III (Make-up)
- Gallery

### NC 35–40 Spaces
- Circulation/Public Spaces
- Scene Shop
- All Other Occupied Spaces
HVAC NOISE AND VIBRATION CONTROL

A. Central Heating and Cooling Equipment

1. Equipment Location
   Central cooling and heating equipment – such as chillers, cooling towers, pumps, and boilers – can generate substantial levels of noise and vibration that can potentially transmit to acoustically sensitive spaces via airborne, structureborne, and ductborne paths. The locations in the building have been determined based on the project requirements and will be isolated as required to achieve the NC criteria of the different spaces.

2. Equipment Notes:
   a. Chillers:
      Generally, chillers and other packaged refrigeration equipment employing reciprocating or screw type compressors are generally noisier than other types and should be avoided in acoustically sensitive applications. Centrifugal or scroll type compressors should be considered instead.
   b. Cooling Towers:
      i. Induced draft cooling towers typically may not be fitted with noise control devices, and should be employed only where radiated noise will not cause an adverse noise impact.
      ii. Where cooling tower radiated noise is a concern, forced draft units incorporating centrifugal fans, which may be fitted with noise control devices if required, should be considered.
   c. Pumps:
      i. To prevent excessive tonal noise from large chilled and condenser water pumps, the pump impellers should be sized for not more than 85% of their maximum diameter.
      ii. Large pumps should incorporate 12 inch long spool sections of pipe installed immediately at the suction and discharge connections to the pump, to facilitate installation of flexible pipe sections in the future should a noise problem develop. All valves and gauges should be on the piping side of the spool sections (away from the pump).
   d. Boilers:
      The combustion process in some boilers produces a strong low frequency noise that is carried through the flue system. In addition, clean-outs and other fittings in the flue system can cause high levels of turbulence noise. For these reasons, boiler flues should not be run in shafts adjacent to or in close proximity to acoustically sensitive space.

B. Air Distribution Systems
1. Overall System Considerations

   a. Air distribution systems serving noise sensitive assembly spaces should be single zone, low pressure, low velocity type. Variable airflow, if required, shall be accomplished with fan speed controls. Variable inlet vanes and other restrictive volume control devices should not be utilized.

   b. Fanwall technology should be used for AHU’s serving sound sensitive spaces. These systems are generally less noisy than traditional units that utilize large single fans, especially at lower frequencies which are more difficult to attenuate.

   c. Humidity levels in performance spaces have a considerable impact on the room’s reverberation time. Lower humidity levels decrease the decay time of sound, especially at higher frequencies. We typically recommend that a 40-50% humidity level be maintained for performance spaces. In dry climates, where it is harder to achieve this level, 30% would be acceptable. Humidity levels lower than 30% are not recommended and will have a severe impact on the acoustical quality of the room.

   d. Air distribution systems required to serve multiple zones may be Variable Air Volume (VAV) type. However, terminal devices must be located outside of the boundaries of acoustically sensitive spaces and above non-sensitive space. Refer to guidelines below for location and configuration of VAV terminal devices.

   e. A primary system design goal governing sizing and selection of ductwork and air distribution equipment serving noise sensitive spaces should be to minimize overall pressures throughout the system, and especially the system total static pressure. Since the fan is typically the predominant component of noise in an air handling system, and also since the noise output of a fan is highly sensitive to static pressure, minimizing the fan total static is the best approach to avoiding other expensive and complicated noise control measures.

2. Location of Air Handling Equipment

   a. Air handling equipment should be located remotely from acoustically sensitive spaces, with sufficient lengths of duct run to dissipate fan noise before entering the space served. The following table gives guidelines for minimum lengths of duct run between air handling equipment and acoustically sensitive spaces:
Table I – Minimum Duct Runs for Air Handling Equipment

<table>
<thead>
<tr>
<th>Noise Criterion</th>
<th>Minimum length of supply and return duct run between air handling equipment (fans / air handling units) and boundaries of space served</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC-15</td>
<td>75 ft.</td>
</tr>
<tr>
<td>NC-20</td>
<td>60 ft.</td>
</tr>
<tr>
<td>NC-25</td>
<td>45 ft.</td>
</tr>
<tr>
<td>NC-30</td>
<td>30 ft.</td>
</tr>
<tr>
<td>NC-35</td>
<td>20 ft.</td>
</tr>
</tbody>
</table>

b. Location of air handling equipment directly adjacent to (including above and below) acoustically sensitive spaces may require complicated and expensive sound isolation constructions or complete structural isolation, and should be avoided altogether. Under no circumstances may ductwork penetrate directly from a mechanical room into an acoustically sensitive space.

c. Should it not be feasible to provide the above lengths of duct run between the air handling equipment and space served, then special considerations will be required for the air handling equipment, such as utilization of quiet type fans, double wall insulated air handling unit casings, and incorporation of sound attenuator sections within air handling units.

d. The following table gives guidelines for minimum lengths of low pressure ductwork between VAV terminals and acoustically sensitive spaces:

Table II – Minimum Duct Runs for VAV Terminals

<table>
<thead>
<tr>
<th>Noise Criterion</th>
<th>Minimum length of low pressure supply ductwork to be incorporated downstream of VAV terminals before entering boundary of space served</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC-15</td>
<td>VAV systems should not be used</td>
</tr>
<tr>
<td>NC-20</td>
<td>25 ft., plus one horizontal elbow</td>
</tr>
<tr>
<td>NC-25</td>
<td>20 ft., plus one horizontal elbow</td>
</tr>
<tr>
<td>NC-30</td>
<td>15 ft., plus one horizontal elbow</td>
</tr>
<tr>
<td>NC-35</td>
<td>10 ft., plus one horizontal elbow</td>
</tr>
</tbody>
</table>

3. Fan Selection

a. In general, fans should be selected to operate in the range of peak mechanical efficiency. Do not select a fan at or to the left of the peak of the static pressure curve where fan operation becomes unstable and generates high levels of noise.
b. Deliberately oversizing a fan should not be pursued automatically as a strategy for minimizing fan noise.

4. Ductwork

a. General:
   i. Ductwork serving acoustically sensitive spaces should be designed for the smoothest possible airflow. Avoid obstructions in the airflow and abrupt changes in pressure and velocity.
   ii. To the extent possible, air distribution systems should be self-balancing, with pressures naturally equalized at outlets and inlets.
   iii. Balancing dampers should be provided only for trim volume control and should be located at least 4 duct diameters upstream of any supply or return openings.

b. Main Ductwork:
   i. To the extent possible, lengths of straight duct run (3-4 duct diameters) should be developed at the inlet and discharge of fans and air handling units. Abrupt transitions and fittings in close proximity to fan and air handling unit connections should be avoided.
   ii. To avoid excessive air turbulence, duct connections to air handling unit sections incorporating plenum fans should be on the top, bottom, or sides of the plenum; never on the end of the plenum opposite the fan.
   iii. Main trunk ductwork should be rectangular to maximize sound energy dissipation.
   iv. Elbows in main trunk ductwork should be mitered and fitted with turning vanes.

c. Distribution Ductwork Within Boundaries of Acoustically Sensitive Spaces:
   i. All elbows and junctions should be smooth radius or wye type.
   ii. Transitions should be smooth with maximum 15 degree included angle.
e. Air Velocities:
The following table outlines maximum ductwork air velocity guidelines for acoustically sensitive spaces:

<table>
<thead>
<tr>
<th>Noise Criterion</th>
<th>Net Velocity Through Air Device (*1)</th>
<th>Within 10 ft. of Air Device</th>
<th>Within 20 ft. of Air Device</th>
<th>Within 30 ft. of Air Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC-15 Supply</td>
<td>250</td>
<td>350</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>NC-15 Return</td>
<td>300</td>
<td>400</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>NC-20 Supply</td>
<td>300</td>
<td>400</td>
<td>550</td>
<td>700</td>
</tr>
<tr>
<td>NC-20 Return</td>
<td>350</td>
<td>450</td>
<td>550</td>
<td>700</td>
</tr>
<tr>
<td>NC-25 Supply</td>
<td>350</td>
<td>450</td>
<td>650</td>
<td>850</td>
</tr>
<tr>
<td>NC-25 Return</td>
<td>400</td>
<td>500</td>
<td>650</td>
<td>850</td>
</tr>
<tr>
<td>NC-30 Supply</td>
<td>450</td>
<td>550</td>
<td>800</td>
<td>1000</td>
</tr>
<tr>
<td>NC-30 Return</td>
<td>500</td>
<td>650</td>
<td>800</td>
<td>1000</td>
</tr>
<tr>
<td>NC-35 Supply</td>
<td>500</td>
<td>600</td>
<td>900</td>
<td>1200</td>
</tr>
<tr>
<td>NC-35 Return</td>
<td>600</td>
<td>750</td>
<td>900</td>
<td>1200</td>
</tr>
</tbody>
</table>

*1 Applicable to custom or architectural devices. For manufactured devices, refer to Grilles, Registers, and Diffusers below.

f. Attenuation of Ductborne Noise:
i. The full extent of supply and return ductwork serving acoustically sensitive spaces should be 1 in. internally acoustically lined.

ii. For preliminary budgeting purposes, main supply and return ductwork should be provided with 7 ft. medium pressure drop sound attenuators sized for 800 FPM (±) maximum (0.10 in. pressure drop).

iii. For preliminary budgeting purposes, low pressure supply ductwork downstream of VAV terminal devices should be provided with 5 ft. medium pressure drop sound attenuators sized for 1,000 FPM (±) maximum (0.10 in. pressure drop).

g. Grilles, Registers, and Diffusers
i. Ideally, grilles, registers, and diffusers should not be used in NC-15 spaces. Plaques and flared openings are preferred.

ii. Preliminarily, grilles, registers, and diffusers may be sized according to manufacturers’ published NC ratings for 5 points less than the background noise criterion established for a given space.

iii. Diffusers shall not incorporate dampers or other volume control devices.

iv. The use of perforated and plaque face type diffusers should be avoided.
h. Penetration of Ductwork Through Sound Isolation Assemblies

Penetrations of ductwork through mechanical room walls and slabs, as well as the boundary construction of acoustically sensitive spaces, should be sealed airtight. Generally, such penetrations should be treated with details commensurate with 2 hr. fire rated construction. Wherever sealant is used in such details, the sealant should be a permanently flexible type.

C. Vibration Isolation

1. Generally, all reciprocating and rotating equipment shall be vibration isolated from the building structure.

2. All piping 2” o.d. and larger which is connected to vibration isolated equipment shall be vibration isolated from the building structure for a distance of 50 feet or 100 pipe diameters from connected equipment, whichever is greater. Heat exchangers and expansions tanks shall also be vibration isolated.

3. Ductwork connections to air handling equipment shall be flexible.

4. The following table gives preliminary vibration isolation requirements. Isolator static deflections will be determined based on equipment location.

Table IV – Vibration Isolation Guidelines

<table>
<thead>
<tr>
<th>Equipment Types</th>
<th>Base Type</th>
<th>Isolator Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fans (including air handling, air conditioning, and heating / ventilating units)</td>
<td>Per Mfr</td>
<td>Spring</td>
</tr>
<tr>
<td></td>
<td>Floor/Roof Supported</td>
<td>Spring/Neoprene hanger</td>
</tr>
<tr>
<td></td>
<td>Suspended</td>
<td></td>
</tr>
<tr>
<td>Pumps &gt; 5 Hp (close coupled, end suction, and split case)</td>
<td>Conc. Inertia Base</td>
<td>Spring</td>
</tr>
<tr>
<td>Equipment Types</td>
<td>Base Type</td>
<td>Isolator Type</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-----------</td>
<td>---------------</td>
</tr>
<tr>
<td>Package boilers, steam generators</td>
<td>Per Mfr</td>
<td>Restrained</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring</td>
</tr>
<tr>
<td>Air Compressors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>up to 10 Hp</td>
<td>Per Mfr.</td>
<td>Spring</td>
</tr>
<tr>
<td>&gt; 10Hp</td>
<td>Conc. Inertia Base</td>
<td>Spring</td>
</tr>
<tr>
<td>Air Cooled Chillers</td>
<td>Per Mfr.</td>
<td>Restrained</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring</td>
</tr>
<tr>
<td>Heat Exchangers, expansion tanks</td>
<td>per Mfr.</td>
<td>Restrained</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring</td>
</tr>
<tr>
<td>Cooling Towers</td>
<td>per Mfr.</td>
<td>Restrained</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring</td>
</tr>
<tr>
<td>Mechanical and Domestic Piping</td>
<td>as req’d</td>
<td>Spring</td>
</tr>
<tr>
<td>Floor Supported</td>
<td></td>
<td>Spring/Neoprene Hanger</td>
</tr>
<tr>
<td>Suspended</td>
<td></td>
<td>Neoprene Pad</td>
</tr>
<tr>
<td>Steam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curb Mounted Roof Equip.</td>
<td></td>
<td>Spring isolation curb</td>
</tr>
<tr>
<td>Generators</td>
<td>per Mfr.</td>
<td>Restrained.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring</td>
</tr>
</tbody>
</table>

The above schedule is to be coordinated with equipment proposed for the project, and provided within specifications or drawings.
PLUMBING SYSTEM NOISE CONTROL

A. General:

1. With the exception of sprinkler systems, pipes conveying water, including roof drains, must not run within acoustically sensitive spaces. Where such pipe runs are unavoidable, the piping must be wrapped with insulation and flexible sound barrier material such as acoustical pipe lagging.

2. Toilets rooms and other spaces containing or served by plumbing should not be located directly adjacent to acoustically sensitive spaces. In the event that this cannot be achieved, resilient support and attachment of the piping and / or fixtures may be required and fixtures such as toilets should be adjusted to operate at the lowest possible pressures.

3. Penetrations of piping through equipment room walls and slabs should be sealed airtight. Generally, such penetrations should be treated with details commensurate with 2-hour fire rated construction. Wherever sealant is used in such details, the sealant should be a permanently flexible type.

ELECTRICAL SYSTEM NOISE AND VIBRATION CONTROL

A. Power:

1. Large transformers, equal to or greater than 500 kVA, should be located outside of the building on a pad that has no connection to the building structure. Those that must be located inside the building must be remote from acoustically sensitive spaces and preferably on grade and vibration isolated from the building structure. On-grade installations typically require neoprene mountings, while above grade installations typically require steel spring type mountings. Critical above grade installations may require pneumatic air springs.

2. Electrical equipment rooms containing small transformers, less than 500 kVa, and dimmer equipment rooms, should not be located directly adjacent to acoustically sensitive spaces. These pieces of equipment may require vibration isolation from the building structure. Such isolation typically consists of flexible neoprene mountings or hangers.

3. Switchgear rigidly connected to vibration isolated transformers should be isolated in the same way as the transformers and all conduit connections shall be flexible.
4. Electrical outlet boxes in the common walls of acoustically sensitive spaces that are adjacent to each other shall not be located back-to-back. The boxes shall be offset by at least one stud bay or 24 inches, whichever is greater. Similarly to other building systems, penetrations of conduit through equipment room walls and slabs, as well as the boundary construction of acoustically sensitive spaces, should be sealed airtight with similar details to those previously described.

B. Lighting

1. Florescent and metal halide fixtures are susceptible to noise due to interaction with their associated ballasts. For this reason, these types of fixtures should not be used in spaces having an NC rating equal to or lower than 25 unless electronic ballasts are utilized.

2. Lighting fixtures in acoustically sensitive spaces should not incorporate thin, lightweight aluminum baffle fins, which tend to vibrate sympathetically with certain sounds and thus create buzzing and rattling sounds. Samples of fixtures in question will need to be submitted for our review and testing.
TELECOMMUNICATIONS
270528 – Pathways for Communications Systems
271100 – Communications Equipment Rooms
271300 – Communications Backbone Cabling
271500 – Communications Horizontal Cabling
272100 – Data Communications Equipment
273100 – Voice Communications Equipment
273226 – Emergency Telephones
SECTION 27 0528
PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED
A. The Contractor shall provide all equipment, materials, labor, and services necessary to complete or perfect all parts of the backbone cabling system, and to ensure that it is in compliance with requirements stated or reasonably inferred by the Contract Documents, this Specification, and the Construction Drawings.

1.02 SCOPE OF WORK
A. This section includes minimum requirements for the following horizontal and backbone communications pathways as they relate to providing interior pathways not already provided by the project:
   1. Air-blown fiber tube cable
   2. Tube distribution unit
   3. Basket tray
   4. Cable supports
   5. Sleeves – non-fire-rated wall
   6. Sleeves – fire-rated wall
   7. Fire stop
B. This project consists of the construction of an addition and renovation to the existing Queen Anne Academic Center at Prince George's Community College.
C. The renovation and addition includes three (3) main Levels.
D. Along with the Main Telecom Room, there are four (4) additional Telecom Rooms, as well as a Service Entrance Room.
   1. Two (2) TRs are located on Level 1:
      a. Room T1-1 (Main TR)
      b. Room IT1-2
   2. Two (2) TRs are located on Level 2:
      a. Room 216
      b. Room T2-1.
   3. One (1) TR is located on Level 3:
      a. Room T3-1
   4. The Service Entrance Room is located on the south side of Level 1.
E. The building is supported by Airblown Fiber (ABF) cable.
   1. Outside Plant (OSP) ABF tube cables shall be installed from an existing MH to a Tube Distribution Unit (TDU) in the Service Entrance Room.
   2. Indoor tube cables shall be installed from the TDU in the Service Entrance Room to a TDU in the Main Telecom Room.
   3. Indoor tube cables shall also be installed from the Main Telecom Room to each of the other Telecom Rooms in the building.

1.03 QUALITY ASSURANCE
A. All pathways and associated equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
B. Contractor shall install work in accordance with the BISCI Telecommunications Distributions Methods Manual, as well as TE Connectivity and Sumitomo Installation, Testing, and Certification Guidelines.

C. Materials and work specified herein shall comply with the applicable requirements of:
   1. ANSI/TIA/EIA-598-C, Optical Fiber Cable Color Coding, 2005
   6. Institute of Electrical and Electronic Engineers (IEEE)
   7. Insulated Cable Engineers Association (ICEA).
   11. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, 2004
   15. NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, 2007
   16. NFPA 780, Standard for the Installation of Lightning Protection Systems, 2004
   20. TIA/EIA-568-C.0, Generic Telecommunications for Customer Premise.
   21. TIA/EIA-568-C-1, Commercial Building Telecommunications Cabling Standard.
   22. TIA/EIA-568-C-2, Balanced Twisted Pair Cabling Components Standard.
   24. TIA/EIA-569-B (including all addenda), Commercial Building Standards for Telecommunications Pathways and Spaces.
   25. TIA/EIA-569-B-1, Commercial Building Standard for Telecommunications Pathways and Space – Addendum 1 – Temperature and Humidity Requirements for Telecommunications Spaces, 2009
   28. TIA/EIA-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications.
   29. TIA/EIA-758-A (including all addenda), Customer-Owned Outside Plant Telecommunications Cabling Standard.
   30. TIA/EIA-942, Telecommunications Infrastructure Standard for Data Centers.
   31. Underwriters Laboratory (UL) or equivalent.
   32. Prince George’s Community College Cabling Standards.
1.04 SUBMITTALS
A. As part of the bid proposal, the Bidder shall submit proof that the company is currently a certified TE Connectivity Network Design and Installation (NDI) in good standing and has a minimum of five (5) years of experience on similar systems projects.
B. As part of the bid proposal, the Bidder shall submit proof that the company is currently a certified Sumitomo Licensed FutureFLEX Installer (LFI) in good standing and has a minimum of five (5) years of experience on similar systems projects.
C. As part of the bid proposal, the Bidder shall submit a complete and detailed bill-of-materials for this Section listing quantity, part number, manufacturer, part description, unit price, and extended price for each item the Contractor proposes to use in this project.
1. A Total Material Cost shall be provided at the end of the bill of materials.
2. A Total Labor Cost shall be provided at the end of the bill of materials.
3. A Total Other Cost shall be provided at the end of the bill of materials.
4. An Overall Total Cost shall be provided at the end of the bill of materials.
D. When requested by the Construction Manager, the Contractor shall submit manufacturers’ data sheets (cut sheets) for all proposed equipment in this specification section.
E. Upon final acceptance, the Contractor shall furnish a TE Connectivity Systems Performance warranty for all TE Connectivity products, applications, and workmanship for no less than 25 years from the date of acceptance.
F. Upon final acceptance, the Contractor shall furnish a Sumitomo FutureFLEX Performance warranty for all Sumitomo products, applications, and workmanship for no less than 25 years from the date of acceptance.

PART 2 PRODUCTS
2.01 AIR-BLOWN FIBER TUBE CABLE
A. Two (2) Air-blown fiber (ABF) tube cables shall be used to create a primary and redundant pathway for ABF cables from the splice cases in an existing manhole through a new ductbank to the new Service Entrance Room in the Queen Anne building addition.
B. ABF tube cables shall be wrapped with water-blocking tape and have a polyethylene jacket.
C. ABF tube cables shall be a 7-tube tube cables as shown on the “T” set of drawings.
D. Acceptable Manufacturer:
   1. Sumitomo FutureFLEX

2.02 TUBE DISTRIBUTION UNIT
A. Air-blown fiber (ABF) cable transitions or branching shall be accomplished using a Tube Distribution Unit (TDU) that is specifically designed for use in an optical fiber cabling infrastructure in an ABF application.
B. The TDU shall be appropriately sized for the number of tubes installed.
C. Appropriate TDU accessories, including bushings, plugs, caps, couplings, etc. shall be used to ensure that the installation meets all the requirements of the ABF application and installation.
D. Acceptable Manufacturers:
   1. Sumitomo FutureFLEX
   2. Other approved properly sized NEMA-type enclosure

2.03 BASKET TRAY
A. Tray supporting horizontal and backbone cables in hallways and telecommunications rooms shall be basket-type tray.
B. Tray shall be 18-inches wide by 4-inches deep, as shown on the drawings.
C. Tray shall include all connecting and support hardware to suit installation, including but not limited to runway supports, wall angle support brackets, adjustable splice kits, tee splice kits, splice extension clamp kits, vertical bend kits, corner support kits, and grounding strap kits.

D. Tray shall also include proper bends to maintain acceptable bend radii for all cables to be installed.

E. Acceptable Manufacturers:
   1. Chatsworth Products, Inc. #10250-718.
   2. Other approved equal.

2.04 CABLE SUPPORTS
A. Cable supports shall either be J-hook type supports or sling-type supports.
B. All supports shall be UL listed and comply with NEC and TIA requirements for structured cabling.
C. If J-hook type:
   1. Shall have galvanized finish.
   2. Shall be corrosion resistant.
   3. Shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables.
   4. Shall have flared edges to prevent damage while installing cables.
   5. Shall be rated to support both Category 6 copper and optical fiber cabling.
   6. Shall have an open top with rolled edges.
   7. Shall have a minimum of a 2-inch diameter loop.

D. If sling-type:
   1. Shall be suitable for plenum air handling spaces.
   2. Shall be constructed from steel and woven laminate or plastic.
   3. Shall have a static load limit of 100 lbs.
   4. Shall be rated to support both Category 6 copper and optical fiber cabling.
   5. Shall support no more than approximately 50 Category 6 cables each.

E. Acceptable manufacturers:
   1. Erico
   2. Arlington Industries
   3. Other approved equal

2.05 SLEEVES – NON-FIRE-RATED WALL
A. Where desired pathway has not penetrated a wall to facilitate cabling between spaces and cable routing path, and the wall is not a fire-rated wall, the Contractor shall provide appropriate sized metallic sleeve to appropriately penetrate the area.
B. The sleeve shall be sized using generally accepted cabling principles, using a 40% fill ratio.

2.06 SLEEVES – FIRE-RATED WALL
A. Where desired pathway has not penetrated a wall to facilitate cabling between spaces and cable routing path, and the wall is a fire-rated wall, the Contractor shall provide a sleeve that has the intumescent fire stop material as a manufactured part of the sleeve.

B. Shall be UL listed.
C. Shall provide ease of cable penetration and re-penetration.

D. Acceptable manufacturers:
   1. EZ Path
   2. Hilti Speed Sleeve
   3. Other approved equal

2.07 FIRE STOP
A. Fire stop shall be rated to match the rating of the space in which it is used.
B. Fire stop shall meet the project requirements as detailed in the appropriate architectural specification section.

C. Acceptable manufacturers:
   1. 3M
   2. Hilti
   3. Nelson
   4. Other approved equal

PART 3 EXECUTION

3.01 AIR BLOWN FIBER TUBE CABLE

A. All ABF tube cables shall be installed according to the specific installation instructions and requirements of the manufacturer.

B. To serve the building, a new 7-tube tube cable shall be installed from the existing manhole to a new Tube Distribution Unit (TDU) the new Service Entrance Room. Two (2) 7-tube tube cables shall then be installed to the Main Telecom Room and terminated in a new TDU as shown on the drawings. Finally, a single tube from each 7-tube tube cable shall be extended to the rack to facilitate the installation of the optical fiber cables to the rack.

C. The minimum bend radius of the tube cable shall be 20 times the cable diameter during installation and 10 times the cable diameter after installation.

D. All unoccupied tubes shall be plugged on both ends per manufacturer’s specifications.

3.02 TUBE DISTRIBUTION UNIT

A. A TDU shall be installed in each Telecom Room.

B. All TDUs shall be wall-mounted in an appropriate place to facilitate ease of installation and future growth as shown on the drawings.

C. Although a TDU location may be shown on drawings that are part of this project, prior to installing any TDUs, the Contractor shall meet with the owner to receive approval for TDU placement.

3.03 BASKET TRAY

A. Install basket tray in hallways or nearby and telecommunications rooms as shown on the drawings. In hallways, particular attention shall be given to coordination of tray with other above ceiling systems (i.e. sprinkler, HVAC, etc.).

B. Tray in hallways shall be installed such that it will ensure that no horizontal cable run exceeds 295 feet between the device location and the patch panel location in the serving Telecommunications Room.

C. Install basket tray in telecommunications rooms on walls and above racks as needed to facilitate routing of cables into racks. Exact location of trays in TRs is to be verified with the designer prior to installation.

D. Tray shall be properly supported per the manufacturer’s specifications.

E. Tray shall be installed such that it will accommodate the appropriate installation of horizontal Category 6 and coaxial cables, as well as copper, coaxial, and optical fiber backbone cables. Particular attention shall be given to cutting of tray and changing direction, especially with 90 degree turns, where appropriate tees and sweeps shall be used.

F. Tray shall be free of sharp edges. This shall be especially true if tray has to be cut during installation.

3.04 CABLE SUPPORTS

A. Wherever cable tray, conduit, or other designated telecommunications cabling pathway is not present, Contractor shall provide cable supports a maximum of 60 inches on center.

B. Ceiling ties and rods shall not be used to hang cable or cable supports.
C. Load cable supports as recommended by the manufacturer. Provide cable supports side by side on a common bracket where cable quantities require.
D. Do not install cables loose above lock-in type, drywall or plaster ceilings.
E. Cables shall be installed at least 3 inches above the ceiling and shall not touch the ceiling.

3.05 SLEEVES – NON-FIRE-RATED WALL
A. Appropriately anchor the sleeve on both ends.
B. Provide an appropriate bushing or other method to ensure that the edge of the sleeve is free of spurs or any sharp edges.
C. Install a large enough sleeve or a quantity of sleeves that will allow for future installation of cables.
D. Appropriately fire stop the sleeve after installation.

3.06 SLEEVES – FIRE-RATED WALL
A. Install sleeve per manufacturer’s instructions.
B. Install a large enough sleeve or a quantity of sleeves that will allow for future installation of cables.

3.07 FIRE STOP
A. The Contractor shall fire stop all sleeves, conduit openings, cable tray openings, etc. with an appropriate fire stop material rated for the particular application after the cable installation is complete. This shall include all telecommunications cabling openings, whether they have been used or not.
B. Installation, testing, and labeling of fire stop locations shall meet the project requirements as detailed in the appropriate architectural specification section.

END OF SECTION
SECTION 27 1100
COMMUNICATIONS EQUIPMENT ROOMS

PART 1 GENERAL

1.01 WORK INCLUDED
A. The Contractor shall provide all equipment, materials, labor, and services necessary to complete or perfect all parts of the telecommunications rooms and spaces that are part of this bid package, and shall ensure that they are in compliance with requirements stated or reasonably inferred by this Specification and the Construction Drawings.

1.02 SCOPE OF WORK
A. This section includes minimum requirements for the following equipment and cable installations in the Prince George’s Community College (PGCC) Queen Anne Academic Center Telecommunications Rooms.
   1. Floor-mounted 2-post rack
   2. Vertical cable manager
   3. Category 6 and Category 6A patch panels
   4. Category 6 and Category 6A patch cords
   5. Optical fiber patch panels
   6. Optical fiber patch cords
   7. 110-type termination blocks
   8. Grounding wire
   9. Fire stop

A. This project consists of the construction of an addition and renovation to the existing Queen Anne Academic Center at Prince George’s Community College.

B. The renovation and addition includes three (3) main Levels.

B. Along with the Main Telecom Room, there are four (4) additional Telecom Rooms, as well as a Service Entrance Room.
   1. Two (2) TRs are located on Level 1:
      a. Room T1-1 (Main TR)
      b. Room IT1-2
   2. Two (2) TRs are located on Level 2:
      a. Room 216
      b. Room T2-1.
   3. One (1) TR is located on Level 3:
      a. Room T3-1
   4. The Service Entrance Room is located on the south side of Level 1.

1.03 QUALITY ASSURANCE
A. All equipment installed in communications equipment rooms shall be done in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Specification shall be subject to the control and approval of the Owner’s Representative. Equipment and materials shall be of the quality and manufacturer indicated. The equipment specified is based on the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified, and shall be subject to approval prior to procurement and installation.

B. Contractor shall install work in accordance with the BISCI Telecommunications Distributions Methods Manual, as well as TE Connectivity and Sumitomo Installation, Testing, and Certification Guidelines.

C. Materials and work specified herein shall comply with the applicable requirements of:
   1. ANSI/TIA/EIA-598-C, Optical Fiber Cable Color Coding, 2005
6. Institute of Electrical and Electronic Engineers (IEEE)
7. Insulated Cable Engineers Association (ICEA).
11. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, 2004
15. NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, 2007
16. NFPA 780, Standard for the Installation of Lightning Protection Systems, 2004
20. TIA/EIA-568-C.0, Generic Telecommunications for Customer Premise.
21. TIA/EIA-568-C-1, Commercial Building Telecommunications Cabling Standard.
22. TIA/EIA-568-C-2, Balanced Twisted Pair Cabling Components Standard.
24. TIA/EIA-569-B (including all addenda), Commercial Building Standards for Telecommunications Pathways and Spaces.
25. TIA/EIA-569-B-1, Commercial Building Standard for Telecommunications Pathways and Space – Addendum 1 – Temperature and Humidity Requirements for Telecommunications Spaces, 2009
28. TIA/EIA-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications.
29. TIA/EIA-758-A (including all addenda), Customer-Owned Outside Plant Telecommunications Cabling Standard.
30. TIA/EIA-942, Telecommunications Infrastructure Standard for Data Centers.
31. Underwriters Laboratory (UL) or equivalent.
32. Prince George’s Community College Cabling Standards.

1.04 SUBMITTALS

A. As part of the bid proposal, the Bidder shall submit proof that the company is currently a certified TE Connectivity Network Design and Installation (NDI) in good standing and has a minimum of five (5) years of experience on similar systems projects.

B. As part of the bid proposal, the Bidder shall submit proof that the company is currently a certified Sumitomo Licensed FutureFLEX Installer (LFI) in good standing and has a minimum of five (5) years of experience on similar systems projects.
C. As part of the bid proposal, the Bidder shall submit a complete and detailed bill-of-materials for this Section listing quantity, part number, manufacturer, part description, unit price, and extended price for each item the Contractor proposes to use in this project.
1. A Total Material Cost shall be provided at the end of the bill of materials.
2. A Total Labor Cost shall be provided at the end of the bill of materials.
3. A Total Other Cost shall be provided at the end of the bill of materials.
4. An Overall Total Cost shall be provided at the end of the bill of materials.

D. Within 2 weeks after award, the Contractor shall submit manufacturers’ data sheets (cut sheets) for all proposed equipment in this specification section.

E. Upon final acceptance, the Contractor shall furnish a TE Connectivity Systems Performance warranty for all TE Connectivity products, applications, and workmanship for no less than 25 years from the date of acceptance.

F. Upon final acceptance, the Contractor shall furnish a Sumitomo FutureFLEX Performance warranty for all Sumitomo products, applications, and workmanship for no less than 25 years from the date of acceptance.

PART 2 PRODUCTS

2.01 FLOOR-MOUNTED 2-POST RACK
A. Each 2-post rack shall be approximately 19 inches wide by 7 feet high.
B. The 2-post rack frame shall be high strength aluminum construction.
C. The 2-post racks shall have attachment points spaced vertically according to the EIA-310-D Standard Universal hole pattern and shall provide a minimum of 44 RMU (rack-mount units).
D. Acceptable Manufacturers:
   1. CPI 48353-703

2.02 VERTICAL CABLE MANAGER
A. Vertical cable managers shall be provided for all 2-post floor-mounted racks.
B. On the outside, the vertical managers shall be approximately 6 inches wide x 8 inches deep by 7 feet high.
C. Between racks, the vertical managers shall be approximately 10 inches wide x 13 inches deep by 7 feet high.
D. Vertical cable managers shall have doors that swing open from either direction.
E. Vertical cable managers shall be able to appropriately attach to the 2-post floor-mounted racks.
F. Acceptable Manufacturers:
   1. CPI

2.03 CATEGORY 6 AND CATEGORY 6A PATCH PANELS
A. All patch panels supporting Category 6 cables shall be Category 6.
B. All patch panels supporting Category 6A cables (for wireless access points) shall be Category 6A.
C. All patch panels shall be angled.
D. Patch panels shall meet or exceed the following specifications:
   1. Shall meet Category 6 or Category 6A (wireless cables) standards.
   2. Shall have 48-ports.
   3. Shall be T568B wired.
   4. Shall have sufficient ports to provide at least 15% growth within each TR.
   5. Shall have a paired punch down sequence to allow pair twist within ½-inch of the termination.
   6. Shall have the ability to be rack-mounted.
   7. Shall be UL listed.
8. Shall be made of rolled edge black anodized aluminum construction.
9. Shall be from the same manufacturer as the other connectivity products (jacks, faceplates, etc.) used for this project.

E. Acceptable Manufacturer:
   1. TE Connectivity 1499601-2 (Category 6) or xxxxxxx-x (Category 6A)

2.04 CATEGORY 6 PATCH CORDS
A. Patch cords shall be 4-pair, factory-terminated, double-ended, 8-position to 8-position, center tuned modular, stranded conductors
B. Patch cords shall match the type of cable (Category 6 or Category 6A).
C. Patch cords shall be of the same manufacturer and type as the horizontal cable.
D. Acceptable Manufacturer:
   1. TE Connectivity

2.05 OPTICAL FIBER PATCH PANELS
A. Optical fiber patch panels shall meet or exceed the following specifications:
   1. Provide a minimum of 48 ports of connectivity.
   2. Shall be rack-mounted.
   3. Shall accept 6-pack and/or 8-pack adapter panels.
B. Acceptable Manufacturers:
   1. Sumitomo

2.06 OPTICAL FIBER PATCH CORDS
A. Both singlemode and multimode optical fiber patch cords are required for this project.
B. Singlemode patch cords supporting data connectivity shall be factory-terminated, double-ended, 2-strand OS2 cordage with LC connectors on each end.
C. Singlemode patch cords supporting video connectivity shall be factory-terminated, double-ended, 2-strand OS2 cordage with APC connectors on each end.
D. Singlemode patch cords supporting data connectivity shall be factory-terminated, double-ended, 2-strand OS2 cordage with LC connectors on each end.
E. Multimode patch cords supporting data connectivity shall be factory-terminated, double-ended, 2-strand 50/125 micron OM4 cordage with LC connectors on each end.
F. Acceptable Manufacturers:
   1. Sumitomo

2.07 110-TYPE TERMINATION BLOCKS
A. All copper termination blocks shall meet or exceed the following specifications:
   1. 110-type IDC style termination blocks.
   2. 50-pair, 100-pair or 300-pair block as appropriate.
   3. Include means to identify cables per ANSI/TIA/EIA-606
B. Provide connecting clip, designation strip, plastic covers and retaining clip necessary to terminate cables, including but not limited to:
   1. 4-pair connecting clip for horizontal copper cabling.
   2. 5-pair connecting clip for backbone copper cabling.
C. Acceptable Manufacturers:
   1. TE Connectivity
   2. Other approved equal.

2.08 GROUNDING WIRE
A. Shall be a minimum #6 AWG stranded copper.
B. Shall have green plastic insulation.
2.09 FIRE STOP
A. Contractor shall provide fire stopping protection that shall 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.
B. Fire stop shall be the putty type.
C. Fire stop shall be rated to match the rated of the space in which it is used.
D. Acceptable manufacturers:
   1. 3M
   2. Hilti
   3. Nelson
   4. Other approved equal

PART 3 EXECUTION
3.01 FLOOR-MOUNTED 2-POST RACK
A. In each TR (including the Main TR), a sufficient quantity of 2-post racks shall be installed to support the number of Category 6 cables terminating in that TR.
B. In each TR, and additional 2-post rack shall be provided for data hardware equipment.
C. Each row of 2-post racks shall be equipment with a 10” wide vertical cable manager between each rack and a 6” wide vertical manager on each end as shown on the drawings.
D. Prior to installation of any racks, the Contractor shall confirm the exact location of the 2-post racks to be installed in each location.
E. The racks shall be appropriately leveled and anchored to the floor.
F. The racks shall be appropriately grounded.
G. The racks shall be further supported by the installation of basket tray per the drawings.
H. The Contractor shall confirm the exact location of basket tray prior to its installation.

3.02 VERTICAL CABLE MANAGER
A. One (1) 10.5 inches wide vertical cable manager shall be installed between each rack as shown on the drawings.
B. One (1) 6 inches wide vertical cable manager shall be installed on each end of a row of racks as shown on the drawings.

3.03 CATEGORY 6 AND CATEGORY 6A PATCH PANELS
A. Category 6 patch panels shall be installed in each rack for the purposes of terminating all Category 6 horizontal copper cable.
B. The Contractor shall install enough Category 6 patch panels to provide termination of all Category 6 cabling, plus approximately 15%.
C. Additional Category 6A patch panels shall be installed at the bottom of the stack to terminate Category 6A cables supporting wireless access points.
D. All patch panels shall be appropriately labeled with an owner-accepted labeling scheme.
E. The exact location of the patch panels in the racks shall be confirmed with the owner or owner's representative prior to their installation.

3.04 CATEGORY 6 AND CATEGORY 6A PATCH CORDS
A. Contractor shall provide one (1) Category 6 patch cord for each Category 6 patch panel port (whether wired or spare).
B. Approximately one-third of the Category 6 patch cords shall be three (3) feet long, one-third shall be seven (7) feet long, and one-third shall be fifteen (15) feet long.
C. Contractor shall provide one (1) Category 6A patch cord for each Category 6A patch panel port (whether wired or spare).

D. Category 6A patch cords shall be seven (7) feet long.

E. Cabling Contractor shall not install any patch cords in the TRs. Rather, these shall be installed by the Data Communications Contractor after data switches have been installed.
   1. Patch cords shall be delivered to the General Contractor so they can be given to the Data Communications Contractor for installation.

3.05 OPTICAL FIBER PATCH PANELS
A. Install the optical fiber panels at the top of each rack.
B. Appropriately label all ports of the patch panels with Owner accepted labeling scheme.
C. Install blank adapter panels in all positions not used at time of installation for fiber terminations.

3.05 OPTICAL FIBER PATCH CORDS
A. Contractor shall provide fifty (50) singlemode OS2 optical fiber patch cords supporting data requirements.
B. Half of the optical fiber patch cords shall be three (3) meters long, while half shall be five (5) meters long.
C. Cabling Contractor shall not install any fiber optic patch cords in the TRs. Rather, these shall be installed by the Data Communications Contractor after data switches have been installed.
   1. Patch cords shall be delivered to the General Contractor so they can be given to the Data Communications Contractor for installation.

3.06 110-TYPE TERMINATION BLOCKS
A. Install 110-type blocks for copper backbone on the wall as shown on the drawings.
B. The exact location of the 110 blocks shall be confirmed with the owner or owner’s representative prior to their installation.

3.07 GROUNDING AND BONDING
A. Bond metallic equipment racks, conduits, cable tray, ladder racks, etc. to the provided telecommunications grounding busbar (TGB).
B. All connectors and clamps shall be mechanical type made of silicon bronze.
C. Terminals shall be solderless, copper long-barrel NEMA two bolt compression-type.
D. Bond the shield of shielded cable to the ground bar in communications rooms and spaces.

3.08 FIRE STOP
A. The Contractor shall fire stop all sleeves and conduit openings with an appropriate fire stop material rated for the particular application after the cable installation is complete. This shall include all telecommunications cabling openings, whether they have been used or not.
B. All vertical penetrations consisting of conduit, sleeves, or chases shall be fire stopped at the bottom of the penetration.
C. All horizontal penetrations consisting of conduit, sleeves of chases shall be fire stopped on both sides of the penetration.
D. Individual cable penetrations in plenum air return areas not enclosed in conduit shall be fire stopped.
E. Openings made in concrete floors shall be fire stopped using a tested system. Thickness or depth of fire stop materials shall be as recommended by the material manufacturer and backed by formal ASTM E-814 tests.
F. Plenum air return ceiling penetrations for conduit and cables shall be sealed with a system appropriate for the substrate and level of protection required.
3.09 MISCELLANEOUS REQUIREMENTS
A. All cables shall be neatly “dressed” in telecommunications racks.

3.10 RECORD DOCUMENTATION
A. Prior to final acceptance of the work, the Contractor shall submit two (2) sets of record documentation.
B. Record documentation shall include:
   1. Telecom Room layout drawings indicating final configuration of all TRs, with elevation drawings of rack and cabinet layouts, wall-mounted devices, basket tray routing, etc..
   2. Drawings shall be provided in both hard copy and in electronic format. The electronic format shall be the most recent version of AutoCAD.
C. Record documentation shall also include operation and maintenance manuals for all components of the system. Manuals shall include:
   1. Installation and Service manuals.
   2. Operating manuals.
   3. If not included in the above manuals, the Contractor shall provide:
      a) Maintenance schedules.
      b) Diagnostic procedures.

END OF SECTION
SECTION 27 1300
COMMUNICATIONS BACKBONE CABLING

PART 1 GENERAL

1.01 WORK INCLUDED
A. The Contractor shall provide all equipment, materials, labor, and services necessary to complete or perfect all parts of the multi-pair copper and composite optical fiber backbone cabling system, and to ensure that it is in compliance with requirements stated or reasonably inferred by this Specification and the Construction Drawings.

1.02 SCOPE OF WORK
A. The backbone cabling is that portion of the telecommunications cabling system that connects the Prince George’s Community College (PGCC) Queen Anne Academic Center building to the existing PGCC network, as well as between the Service Entrance Room, Main Telecommunications Room, and other Telecommunications Rooms (TRs) located throughout the facility. Backbone cabling consists of the actual transmission media, mechanical terminations, splice enclosures, intermediate and main cross-connects, and any patch cords or jumpers used for backbone-to-backbone connection.
B. This section includes the minimum requirements for the following:
1. Outside plant copper cable
2. Splice case for copper cable
3. Outside plant air-blown fiber cable
4. Optical fiber connectors
5. Optical fiber connector housing
6. Inside copper riser cable
7. Inside air-blown fiber riser cable
8. Coaxial riser cable
C. This project consists of the construction of an addition and renovation to the existing Queen Anne Academic Center at Prince George’s Community College.
D. The renovation and addition includes three (3) main Levels.
E. Along with the Main Telecom Room, there are four (4) additional Telecom Rooms, as well as a Service Entrance Room.
   1. Two (2) TRs are location on Level 1:
      a. Room T1-1 (Main TR)
      b. Room IT1-2
   2. Two (2) TRs are located on Level 2:
      a. Room 216
      b. Room T2-1.
   3. One (1) TR is located on Level 3:
      a. Room T3-1
   4. The Service Entrance Room is located on the south side of Level 1.

1.03 QUALITY ASSURANCE
A. All materials shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner’s Representative. Equipment and materials shall be of the quality and manufacturer indicated. The equipment specified is based upon the acceptable manufacturers listed.
B. Contractor shall install work in accordance with the BISCI Telecommunications Distributions Methods Manual, as well as TE Connectivity and Sumitomo Installation, Testing, and Certification Guidelines.
C. Materials and work specified herein shall comply with the applicable requirements of:

1. ANSI/TIA/EIA-598-C, Optical Fiber Cable Color Coding, 2005
6. Institute of Electrical and Electronic Engineers (IEEE)
7. Insulated Cable Engineers Association (ICEA).
11. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, 2004
15. NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, 2007
16. NFPA 780, Standard for the Installation of Lightning Protection Systems, 2004
20. TIA/EIA-568-C.0, Generic Telecommunications for Customer Premise.
21. TIA/EIA-568-C-1, Commercial Building Telecommunications Cabling Standard.
22. TIA/EIA-568-C-2, Balanced Twisted Pair Cabling Components Standard.
24. TIA/EIA-569-B (including all addenda), Commercial Building Standards for Telecommunications Pathways and Spaces.
25. TIA/EIA-569-B-1, Commercial Building Standard for Telecommunications Pathways and Space – Addendum 1 – Temperature and Humidity Requirements for Telecommunications Spaces, 2009
28. TIA/EIA-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications.
29. TIA/EIA-758-A (including all addenda), Customer-Owned Outside Plant Telecommunications Cabling Standard.
30. TIA/EIA-942, Telecommunications Infrastructure Standard for Data Centers.
31. Underwriters Laboratory (UL) or equivalent.
32. Prince George’s Community College Cabling Standards.

1.04 SUBMITTALS

A. As part of the bid proposal, the Bidder shall submit proof that the company is currently a certified TE Connectivity Network Design and Installation (NDI) in good standing and has a minimum of five (5) years of experience on similar systems projects.
B. As part of the bid proposal, the Bidder shall submit proof that the company is currently a certified Sumitomo Licensed FutureFLEX Installer (LFI) in good standing and has a minimum of five (5) years of experience on similar systems projects.

C. As part of the bid proposal, the Bidder shall submit a complete and detailed bill-of-materials for this Section listing quantity, part number, manufacturer, part description, unit price, and extended price for each item the Contractor proposes to use in this project.
   1. A Total Material Cost shall be provided at the end of the bill of materials.
   2. A Total Labor Cost shall be provided at the end of the bill of materials.
   3. A Total Other Cost shall be provided at the end of the bill of materials.
   4. An Overall Total Cost shall be provided at the end of the bill of materials.

D. Within 2 weeks after award, the Contractor shall submit manufacturers’ data sheets (cut sheets) for all proposed equipment in this specification section.

E. Upon final acceptance, the Contractor shall furnish a TE Connectivity Systems Performance warranty for all TE Connectivity products, applications, and workmanship for no less than 25 years from the date of acceptance.

F. Upon final acceptance, the Contractor shall furnish a Sumitomo FutureFLEX Performance warranty for all Sumitomo products, applications, and workmanship for no less than 25 years from the date of acceptance.

PART 2 PRODUCTS

2.01 OUTSIDE PLANT COPPER CABLE

A. Shall be a new 300-pair copper cable spliced to an existing multi-pair copper cable in MH installed and terminated in the Service Entrance Room on Surge Protection Blocks.

B. Shall be used in all outside and underground environments.

C. Conductors shall be solid annealed 24 AWG, ANMW copper.

D. Shall have an aluminum steel polyethylene (ASP) sheath and a core of solid-copper conductors, dual insulated with foam skin and plastic, surrounded by FLEXGEL III® filling compound.

E. The copper twisted pairs shall have a mutual capacitance at 1kHz of 15.7 nF/1,000 ft.

F. The cable shall be resistant to mechanical damage, lightning or damage from wildlife.

G. Jacket shall be black, polyethylene.

H. Jacket Marking shall including identifying information includes a telephone handset, cable code, pair count, AWG, date of manufacture and sequential length markings at 2 foot intervals.

I. Cable shall meet all the requirements of RUS PE-89.

J. Acceptable Manufacturers:
   1. Superior-Essex ANMW
   2. Other approved equal

2.02 SPLICE CASE FOR COPPER CABLE

A. Shall be the type specifically used for copper installations.

B. Shall be sized to accommodate the maximum number of cable pairs to be spliced and the type of connector to be used for splicing.

C. Shall be re-enterable.

D. Shall have actual end caps and extension sleeves that shall be based on the quantity and diameter of the feed cables to be spliced.

E. When assembled, the splice case shall be air and water tight.

F. Acceptable Manufacturers:
   1. 3M Better Buried Series
   2. Pre-Formed Line Products
3. Other approved equal

2.03 OUTSIDE PLANT AIR-BLOWN FIBER CABLE
A. Shall be specifically designed for use in an outside plant optical fiber cabling infrastructure application.
B. Shall be two (2) separate cables, one (1) primary and one (1) redundant.
C. Shall each consist of twenty-four (24) strands of singlemode OS2 optical fiber cable.
D. Shall be made up of central and stranded loose tube fiber cables.
E. Shall have tubes that contain water-blocking yarn.
F. Shall have a polyethylene outer sheath.
G. For singlemode optical fiber, cable shall have a maximum attenuation of 0.50 db/km @ 1310 nm; 0.50 db/km @ 1385 nm; 0.50 db/km @ 1550 nm.
H. Shall be installed in existing optical fiber splice case.
I. Acceptable Manufacturer:
   1. Sumitomo

2.04 OPTICAL FIBER CONNECTORS
A. The optical fiber connectors shall be LC.
B. All optical fiber connectors shall meet ANSI/EIA/TIA-604-3 standards.
C. Singlemode LC connectors shall be colored blue.
D. The connector shall have an optical axial pull strength of 2.2 N at 0 degree angle and an optical off axial pull strength of 2.2 N at a 90 degree angle, with a maximum 0.5 dB increase in attenuation for both tests when tested in accordance with ANSI/EIA/TIA-455-6B.
E. The connectors shall be mounted in a rack-mountable connector housing.
F. The maximum optical attenuation per each mated field installed connector pair shall not exceed 0.75 dB.
G. The total optical attenuation through the cross-connect from any terminated optical fiber to any other terminated fiber shall not exceed 1.5 dB.
   1. Single-mode shall have a return loss greater than or equal to 26 dB.
   2. The connectors shall sustain a minimum of 500 mating cycles without degrading this performance.
H. Acceptable Manufacturers:
   1. Sumitomo

2.05 OPTICAL FIBER CONNECTOR HOUSING
A. In the Main Telecom Room, shall be able to support up to (144) strands of optical fiber
B. In other Telecom Rooms, shall be able to support at least (48) strands of optical fiber.
C. Optical fiber connector housings shall meet the following minimum criteria:
   2. Mountable in equipment racks using EIA (1.75 inch) hole spacing.
   3. Suitable for loose tube, tight-buffered, and optical fiber ribbon cables.
   4. Includes a durable, clear polycarbonate lockable door.
D. Acceptable Manufacturers:
   1. Sumitomo

2.06 INSIDE COPPER RISER CABLES
A. Backbone copper riser and tie cables (mainly for analog voice applications) shall be 50-pair Category 3 copper cable as shown on the drawings.
B. Shall consist of a core of 24 AWG solid annealed bare copper conductors, color coded in accordance with telephone industry standards.

C. Conductors shall be twisted to form pairs. Cable having more that 25 pairs shall be assembled in units, each individually identified by color-coded unit binders.

D. The outer jacket shall consist of a fire retardant sheath that meets NEC low flame requirements.

E. Shall be CMR rated in the riser, and CMP rated if cables installed leave the stacked riser system.

F. Acceptable Manufacturers:
   1. TE Connectivity
   2. Other approved equal

2.07 INSIDE AIR-BLOWN FIBER RISER CABLES

A. Shall be tight buffered designed for installation in plenum, riser and horizontal environments.

B. Shall consist of twenty-four (24) strands of singlemode OS2 optical fiber cable.

C. Singlemode Fiber:
   1. Shall be class IVa Dispersion-Unshifted single-mode optical fibers complying with ANSI/EIA/TIA-492BAAA with fiber counts as indicated on drawings.
   2. The zero dispersion wavelength shall be between 1300 nm and 1324 nm. The ANSI/EIA/TIA-455-168 maximum value of the dispersion slope shall be no greater than 0.093 ps/km-nm². Dispersion measurements shall be made in accordance with ANSI/EIA/TIA-455-169 or ANSI/EIA/TIA-455-175.
   3. The nominal core diameter shall be 8.7 µm to 10.0 µm with a tolerance of +/- 0.5 um at 1300 nm when measured in accordance with ANSI/EIA/TIA-455-164 or ANSI/EIA/TIA-455-167.
   4. Transmission Characteristics:
      a) Maximum attenuation dB/Km @ 1310/1550 nm shall be as follows:
         (i) Inside Plant -1.0/1.0
         (ii) Outside Plant – 0.5/0.5
      b) The cutoff wavelength shall be less than 1279 nm when measured in accordance with ANSI/EIA/TIA-455-170

D. Acceptable Manufacturers:
   1. Sumitomo

2.08 COAXIAL RISER CABLES

A. The coaxial riser cables shall be UL-Listed, low-loss, quad shielded Series 11 cable (RG-11), and shall be plenum rated where required (otherwise riser rated).

B. Physical Characteristics:
   1. Center Conductor: 18 AWG solid copper-clad steel
   2. Dielectric: polyethylene
   3. Shielding: quad shield with 100% shield coverage

C. Transmission Characteristics:
   1. Nominal Impedance: 75 ohms
   3. Nominal Velocity of Propagation: 83%
   4. Nominal DC Resistance/1000 feet
      a) Center Conductor: 32.0 ohms
      b) Loop: 35.7 ohms

D. Acceptable Manufacturers:
   1. TE Connectivity
   2. Other approved equal
PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the schedule.
B. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.
C. Set all equipment to accurate line and grade, level all equipment and align all equipment components.
D. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.
E. No equipment shall be hidden or covered up prior to inspection by the Owner or Owner’s Representative. All work that is determined to be unsatisfactory shall be corrected immediately.
F. All work shall be installed level and plumb, parallel and perpendicular to other building systems and components.
G. The Contractor shall fire stop all penetrations made, used or provided for telecommunications installation in all fire-rated walls. Contractor shall also plug all telecommunications conduits in all telecommunications man-holes, and all conduit entries into buildings.
H. Storage and security of material and equipment shall be the responsibility of the Contractor.
I. Contractor shall make every effort to conserve wall space.

3.02 BACKBONE CABLES – GENERAL

A. All cables shall have been manufactured within 12 months of purchase date.
B. Contractor shall adhere to all manufacturers’ requirements regarding pulling tension, allowable lubricants, and bending radius.
C. Contractor shall be responsible for verifying that pathways are ready for occupancy prior to cable placement.
D. Contractor shall assume responsibility for any difficulties or damage to the cable during placement.
E. Pulling tensions shall not exceed those recommended by the cable manufacturer. Use a line tension meter during cable pull to provide accurate measurement of the force exerted on a cable as it is installed.
F. Cable shall be watched and inspected for sheath defects, as it is payed off the reel. Pulling operation shall be stopped and Owner or Owner’s Representative shall be notified if a defect or any other irregularity is found.
G. All OSP cables and associated materials shall be appropriately supported on racking in the MHs. If racking is not provided in the MHs, it is the responsibility of the cabling contractor to install racking to facilitate proper installation and bend radii of cables.
H. All OSP cables and associated materials shall be appropriately grounded in the MHs. If a grounding system is not provided in the MHs, it is the responsibility of the cabling contractor to install an appropriate ground rod and grounding strap in the MH to facilitate the proper grounding of all cabling and equipment.

3.03 OUTSIDE PLANT COPPER CABLE

A. The new 300-pair copper cable shall be appropriately spliced to pairs XXX of an existing multi-pair copper cable in MH-XXX.
B. In the Service Entrance Room, the new 300-pair copper cable shall be appropriately terminated on wall-mounted lightning protection blocks.
C. The 300-pair copper cable shall transition to an indoor cable and be extended to the Main Telecom Room where it will terminate on wall-mounted 110-type termination blocks.

D. All copper cables shall be appropriately tested, labeled, and documented.

3.04 SPLICE CASES
A. Outdoor splice cases shall be installed per the manufacturer’s specifications.
B. The Contractor shall be responsible for properly sizing the enclosure.
C. Splice case shall be filled with the appropriate encapsulant once work is complete.

3.05 OUTSIDE PLANT AIR-BLOWN FIBER CABLES
A. Two (2) OSP ABF cables shall be blown in an ABF tube cable.
B. OSP ABF cables shall be installed in fabric-type innerduct between the Main Telecom Room and the MH.
C. OSP optical fiber cables shall be spliced in existing fiber splice case to existing cables in MH-S002 as indicated on the Riser Diagram.
D. A service loop of 15’ shall be maintained at all cable ends.
E. All optical fiber cables shall be terminated on optical fiber patch panels (see 27 1100).
F. All optical fiber cables shall be tested, labeled, and documented.

3.06 INSIDE OPTICAL FIBER CABLES
A. All fiber optic cable shall armored or installed within innerduct placed in conduit or cable tray.
B. If conduit or tray is not available, cable shall be installed in “J-hooks” supported from building structure on 60-inch centers. If this type of installation is warranted, it shall be brought to the attention of the Construction Manager and shall be approved prior to installation.
C. A service loop of 15’ shall be maintained at all cable ends.
D. Vertical runs of fiber optic cable shall be secured a minimum of every 48 inches.
E. All optical fiber cables shall be terminated on optical fiber patch panels (see 27 1100).
F. All optical fiber cables shall be tested, labeled, and documented.

3.07 OPTICAL FIBER CONNECTORS
A. Adhere to all manufacturer installation guidelines.
B. Optical fiber pigtails shall be fusion-spliced to the optical fiber cable.
C. Connectors shall be installed with less than 0.75 dB of attenuation per mated pair.

3.08 INSIDE PLANT CABLES – GENERAL
D. Shall be of the size and type specified on the drawings.
E. Cable shall be continuous and without splices.
F. Contractor shall adhere to all manufacturers’ requirements regarding pulling tension and allowable lubricants.
G. The contractor shall be responsible for verifying all actual cable distances.
H. The contractor shall be responsible for verifying that conduits and raceways are “ready for occupancy” before cable placement.
I. The contractor shall assume the responsibility for any difficulties or damage to the cable during placement.
J. Placement shall conform to industry standards with regard to anchoring, cable support and separation from other facilities.
K. Cables and innerduct shall not sag or droop, but should be installed so as to maintain a flat plane with smooth transitions from one level or direction to another.
3.09 INSIDE COPPER RISER CABLES
A. A 50-pair copper riser cable shall be installed from the wall field near the 300-pair copper cable in the Main Telecom Room to a designated rack in the Main Telecom Room.
B. A 50-pair copper riser cable shall be installed from the wall field near the 300-pair copper cable in the Main Telecom Room to a designated rack in each of the other Telecom Rooms.
C. Copper cables shall be terminated as indicated on the drawings.
D. All inside cables shall be appropriately tested, labeled, and documented.

3.10 COAXIAL RISER CABLES
A. Unshielded twisted pair copper and coaxial riser cables shall be installed in conduit or cable tray. If conduit or tray is not available, cables shall be installed in “J-hooks” supported from building structure on 60-inch centers. If this type of installation is warranted, it shall be brought to the attention of the Construction Manager and shall be approved prior to installation.
B. Contractor shall secure all cables to TR backboard within 12 inches of all terminations.
C. Cables shall not be allowed to lie on ceiling or ceiling support structure. They must be anchored in such a way as to not interfere with other services or space access.
D. Coaxial cables shall be terminated with an F-type connector installed into the amplifier in each TR.
E. All inside cables shall be appropriately tested, labeled, and documented.

3.11 BACKBONE UTP COPPER CABLE TESTING
A. One hundred percent of the backbone copper cable pairs shall be tested for opens, shorts, polarity reversals, transpositions, and the presence of AC voltage.
B. The Contractor shall examine open and shorted pairs to determine if the termination has been done properly. If so, the Contractor shall tag bad pairs at both ends, and make note on the as-built documentation. If the problem is found to be due to termination error, the contractor shall correct the error and retest the pair(s) in question.
C. If any single copper backbone cable (under one sheath) contains more than one percent (1%) bad pairs, the Contractor shall remove and replace the cable at its expense.

3.12 BACKBONE OPTICAL FIBER CABLE TESTING
A. Testing procedures shall be in accordance with ANSI/TIA/EIA-568-C and ANSI/TIA/EIA-526.
B. Preparation
   1. Properly clean all connectors, adapters, and jumpers prior to testing.
   2. Ensure that the testing jumpers are of the same fiber core diameter and connector type as the fibers to be tested.
   3. The power meter shall be properly calibrated prior to testing. Contractor shall provide written confirmation of the calibration, with the power meter serial number, to the Owner, if requested. If this documentation is not available upon request, the Contractor shall re-test all optical fiber cables after documented calibration of the power meter is accomplished.
C. Testing
   1. All Singlemode optical fibers shall be tested at both 1310 nm and 1550 nm wavelengths for end-to-end insertion loss and bi-directional.
   2. The Contractor shall test all strands of outside plant (OSP) optical fiber cable with an approved Optical Time Domain Reflectometer (OTDR).
   3. The Contractor shall test all strands of inside and outside optical fiber riser cable with an approved Power Meter and Light Source.
   4. Ensure that the power meter and light source are set to the same wavelength prior to testing each fiber.
3.13 BACKBONE COAXIAL CABLE TESTING
A. Testing procedures shall be in accordance with industry standards for cable television (CATV).
B. Testing shall be end-to-end, from the RG-11 backbone cable through amplifiers, splitters, etc. through the RG-6 horizontal cable to the connector at the flat screen display location.

3.14 TEST RESULTS
A. Fiber Optic Cables:
   1. The Contractor shall test all fiber optic cables and submit all fiber test result data in an electronic format and provide one (1) hard copy of the test results showing graphically, the entire length of the fiber.
   2. Reports shall show circuit ID, cursor marks, total attenuation, date of installation and test used.
   3. The Contractor shall submit (1) copy of software capable of viewing the electronic test result files.
B. Backbone Copper Cables
   1. The Contractor shall test all backbone copper cables and submit test result information in an electronic format. Acceptable formats are the most recent version of Microsoft Word or Microsoft Excel.

3.15 LABELING
A. All cables and associated termination hardware shall be labeled according to the UMCP labeling standard. Prior to any permanent labeling, the Contractor shall review the labeling scheme with UMCP.
B. All backbone cables are to be labeled using a machine printed label at each end of the cable at approximately 12 inches of the termination point, and again at approximately 48 inches from the termination point. Handwritten labels shall not be used.
C. All wiring blocks, connector panels, or other termination points shall be labeled with the cable identifier as well as the pair or conductor identifier.
D. The labels shall denote, at a minimum, the starting and end points of the cable, as well as a unique cable identifier.
E. Note all labeling information on the as-built drawings.

3.16 RECORD DOCUMENTATION
A. Prior to final acceptance of the work, the Contractor shall submit two (2) sets of record documentation.
B. Record documentation shall include:
   1. Floor plan drawings indicating device locations, outlet numbering, installation details, and wire routing.
   2. Drawings shall be provided in both hard copy and in electronic format. The electronic format shall be the most recent version of AutoCAD.
C. Record documentation shall also include operation and maintenance manuals for all components of the system. Manuals shall include:
   1. Installation and Service manuals.
   2. Operating manuals.
   3. If not included in the above manuals, the Contractor shall provide Maintenance schedules and Diagnostic procedures.
PART 1 GENERAL

1.01 WORK INCLUDED
A. The Contractor shall provide all equipment, materials, labor, and services necessary to complete or perfect all parts of the horizontal cabling system, and to ensure that it is in compliance with requirements stated or reasonably inferred by the this specification, and the construction drawings.

1.02 SCOPE OF WORK
A. The horizontal cabling is that portion of the telecommunication cabling system that extends from the work area telecommunications outlet to the telecommunications room. In addition to satisfying all current telecommunications requirements, the horizontal cabling system shall facilitate ongoing maintenance and relocation requirements, as well as readily accommodating any future equipment and service changes. The horizontal cabling includes the horizontal cables, the mechanically terminated jacks/inserts, the faceplates that the jacks/inserts snap into in the work area, and the patch panels on which the cables terminate in the Telecommunications Rooms (TRs).
B. This section includes minimum requirements for the following:
   1. Category 6 UTP copper cable
   2. Category 6A UTP copper cable
   3. Information Outlets (Jacks)
   4. Coaxial cable
   5. Coaxial cable connectors and couplers
   6. Distribution amplifiers and splitters
   7. Standard faceplates
   8. Biscuit box
   9. Floor box / poke-through adapters
   10. Wall-phone faceplates
   11. Copper Patch Cables
   12. Testing equipment
   13. Labels

A. This project consists of the construction of an addition and renovation to the existing Queen Anne Academic Center at Prince George's Community College.
C. The renovation and addition includes three (3) main Levels.
B. Along with the Main Telecom Room, there are four (4) additional Telecom Rooms, as well as a Service Entrance Room.
   1. Two (2) TRs are location on Level 1:
      a. Room T1-1 (Main TR)
      b. Room IT1-2
   2. Two (2) TRs are located on Level 2:
      a. Room 216
      b. Room T2-1.
   3. One (1) TR is located on Level 3:
      a. Room T3-1
   4. The Service Entrance Room is located on the south side of Level 1.

1.03 QUALITY ASSURANCE
A. All materials shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Specification shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality...
and manufacturer indicated. The equipment specified is based upon the acceptable manufacturers listed.

B. Contractor shall install work in accordance with the BISCI Telecommunications Distributions Methods Manual, as well as TE Connectivity and Sumitomo Installation, Testing, and Certification Guidelines.

C. The Contractor shall strictly adhere to all Category 6 installation practices when installing unshielded twisted-pair cabling.

D. Materials and work specified herein shall comply with the applicable requirements of:
   1. ANSI/TIA/EIA-598-C, Optical Fiber Cable Color Coding, 2005
   6. Institute of Electrical and Electronic Engineers (IEEE)
   7. Insulated Cable Engineers Association (ICEA).
   11. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, 2004
   15. NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, 2007
   16. NFPA 780, Standard for the Installation of Lightning Protection Systems, 2004
   20. TIA/EIA-568-C.0, Generic Telecommunications for Customer Premise.
   21. TIA/EIA-568-C-1, Commercial Building Telecommunications Cabling Standard.
   22. TIA/EIA-568-C-2, Balanced Twisted Pair Cabling Components Standard.
   24. TIA/EIA-569-B (including all addenda), Commercial Building Standards for Telecommunications Pathways and Spaces.
   25. TIA/EIA-569-B-1, Commercial Building Standard for Telecommunications Pathways and Space – Addendum 1 – Temperature and Humidity Requirements for Telecommunications Spaces, 2009
   28. TIA/EIA-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications.
   29. TIA/EIA-758-A (including all addenda), Customer-Owned Outside Plant Telecommunications Cabling Standard.
   30. TIA/EIA-942, Telecommunications Infrastructure Standard for Data Centers.

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COMMUNICATIONS HORIZONTAL CABLEING
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31. Underwriters Laboratory (UL) or equivalent.
32. Prince George’s Community College Cabling Standards.

1.04 SUBMITTALS

A. As part of the bid proposal, the Bidder shall submit proof that the company is currently a certified TE Connectivity Network Design and Installation (NDI) in good standing and has a minimum of five (5) years of experience on similar systems projects.

B. As part of the bid proposal, the Bidder shall submit proof that the company is currently a certified Sumitomo Licensed FutureFLEX Installer (LFI) in good standing and has a minimum of five (5) years of experience on similar systems projects.

C. As part of the bid proposal, the Bidder shall submit a complete and detailed bill-of-materials for this Section listing quantity, part number, manufacturer, part description, unit price, and extended price for each item the Contractor proposes to use in this project.
1. A Total Material Cost shall be provided at the end of the bill of materials.
2. A Total Labor Cost shall be provided at the end of the bill of materials.
3. A Total Other Cost shall be provided at the end of the bill of materials.
4. An Overall Total Cost shall be provided at the end of the bill of materials.

D. Within 2 weeks after award, the Contractor shall submit manufacturers’ data sheets (cut sheets) for all proposed equipment in this specification section.

E. Upon final acceptance, the Contractor shall furnish a TE Connectivity Systems Performance warranty for all TE Connectivity products, applications, and workmanship for no less than 25 years from the date of acceptance.

F. Upon final acceptance, the Contractor shall furnish a Sumitomo FutureFLEX Performance warranty for all Sumitomo products, applications, and workmanship for no less than 25 years from the date of acceptance.

PART 2 PRODUCTS

2.01 CATEGORY 6 UTP COPPER CABLE

A. Except for wireless access points, all horizontal UTP copper cable shall be 23 AWG, Category 6.

B. All horizontal Category 6 UTP copper cables shall be plenum-rated for this entire project.

C. Category 6 cables shall meet the following specifications:
1. DC Resistance (ohms/1000 ft): 9.38
2. Mutual Capacitance (nF/100 m @ 1 kHz): 5.6
3. Operating Frequency (MHz): 500
4. Nominal Velocity of Propagation (% speed of light) 72.0

D. Category 6 cables shall meet the TIA standards for Category 6 cables tested at 250 MHz as follows:
1. Return Loss (RL): 17.3 dB
2. Near-End Crosstalk (NEXT): 38.3 dB
3. Power Sum NEXT (PSNEXT): 36.3 dB
4. Insertion Loss (IL): 32.8 dB/100m
5. Attenuation to Crosstalk (ACR): 5.5 dB/100m
6. Power Sum ACR (PSACR): 3.5 dB/100m
7. Attenuation to Crosstalk Ratio Far-end (ACRF): 19.8 dB/100m
8. Power Sum ACRF (PSACRF): 16.8 dB/100m
9. Longitudinal Conversion Loss / Transverse Conversion Loss (LCL / TCL) 26.0 dB

E. Acceptable Manufacturers:
1. TE Connectivity 610 Series (plenum)
2.02 CATEGORY 6A UTP COPPER CABLE
A. Category 6A UTP copper cable shall be used for all wireless access point locations.
B. All Category 6A UTP copper cables shall be plenum-rated for this entire project.
C. Category 6A cables shall meet the following Electrical Characteristics criteria:
   1. DC Resistance (max) (Ohms/100 m @ 20° C): 8.00
   2. DC Resistance Unbalanced (max) (Individual Pair %): 4.0
   3. Mutual Capacitance (nF/100 m @ 1 kHz): 6.0
   4. Operating Frequency (MHz): 500
   5. Nominal Velocity of Propagation (% speed of light) 67.0
D. Category 6A cables shall meet the TIA standards for Category 6A cables tested at 500 MHz as follows:
   1. Return Loss (RL): 15.2 dB
   2. Near-End Crosstalk (NEXT): 35.8 dB
   3. Power Sum NEXT (PSNEXT): 33.8 dB
   4. Insertion Loss (IL): 45.3 dB / 100m
   5. Attenuation to Crosstalk (ACR): -9.4 dB / 100m
   6. Power Sum ACR (PSACR): -11.4 dB / 100m
   7. Attenuation to Crosstalk Ratio Far-end (ACRF): 17.8 dB / 100m
   8. Power Sum ACRF (PSACRF): 14.8 dB / 100m
   9. Longitudinal Conversion Loss / Transverse Conversion Loss (LCL / TCL) 23.0 dB
E. Acceptable Manufacturers:
   1. TE Connectivity 640 Series (plenum)

2.03 INFORMATION OUTLETS
A. With the exception of terminating cables supporting wireless access points (which shall be Category 6A), all information outlets (jacks) shall be Category 6 and shall meet the requirements of the characteristics in list under Category 6 cable above.
B. Shall be 8P8C modular jacks that snap into user configurable faceplates meeting durability requirements specified in IEC 603-7.
C. Pin/Pair assignment shall be in accordance with T568B.
D. All Category 6 jacks for voice shall be white.
E. All Category 6 jacks for data shall be blue.
F. All Category 6A jacks for wireless data shall be blue.
G. Acceptable Manufacturers:
   1. TE Connectivity SL Series

2.04 COAXIAL CABLES
A. The coaxial cables installed from a TR to each work area outlet shall be UL-Listed, low-loss, quad shielded Series 6 cable, and shall be plenum rated where required (otherwise riser rated).
B. Physical Characteristics:
   1. Center Conductor: 18 AWG solid copper-clad steel
   2. Dielectric: polyethylene
   3. Shielding: quad shield providing 100% shield coverage
C. Transmission Characteristics:
   1. Nominal Impedance: 75 ohms
   3. Nominal Velocity of Propagation: 83%
4. Nominal DC Resistance/1000 feet
   a) Center Conductor: 32.0 ohms
   b) Loop 35.7 ohms

D. Acceptable Manufacturers
   1. TE Connectivity
   2. Other approved equal

2.05 COAXIAL CABLE CONNECTORS AND COUPLERS
   A. Coaxial connectors shall be female-to-female “F” type connectors with an attached crimp/ferrule designed to match the cable type. Compression sleeves and shells shall ensure a secure installation free of radiation.
   B. The “F” connectors be connected to a F connector coupler that shall be capable of being mounted in the same style faceplate as the UTP cable.
   C. Acceptable Manufacturers
      1. Ideal (connector)
      2. TE Connectivity (coupler)

2.06 DISTRIBUTION AMPLIFIERS AND SPLITTERS
   A. The Contractor shall provide the appropriate distribution amplifiers, splitters, etc. in the telecommunications rooms throughout the facility to provide connections for the RG-6 horizontal coaxial cables and RG-11 coaxial backbone cables.
   B. Splitters shall be solder back and meet the following minimum specifications:
      1. Bandwidth – 5 to 2,000 MHz
      2. RFI shielding – greater than -100 dB
      3. Impedance – 75 ohm
      4. Input return loss – 18 dB minimum
      5. Tap-to-tap isolation – 23 dB.
   C. Acceptable manufacturers:
      1. Blonder Tongue
      2. Toner
      3. Other approved equal

2.07 STANDARD FACEPLATES
   A. For general voice and data locations, faceplates shall be single gang, 2.75” x 4.5”.
   B. Faceplates shall have a designation strip holder.
   C. Faceplates shall be UL listed.
   D. Blanks shall be inserted to cover empty jack locations.
   E. Acceptable Manufacturers
      1. TE Connectivity

2.08 BISCUIT BOX
   A. For special cable termination types (wireless access points, inside emergency phones, other specialty connections above ceiling), install a 1-port or 2-port biscuit box as stated on the T drawings.
   B. Shall be constructed of high-impact, flame-retardant, thermoplastic material.
   C. Shall accept the same Category 6 jacks that specified in this project.
   D. Acceptable Manufacturers
      1. TE Connectivity
      2. Other approved equal
2.09 FLOOR BOX / POKE-THROUGH ADAPTERS
A. In several locations throughout the facility (labs, conference rooms, meeting rooms, etc.) floor boxes and poke-through devices are required. In these cases, Category 6 cables shall be terminated in these devices.
B. The appropriate adapter plate that is manufactured to be used for that device shall be used to terminate Category 6 cables.
C. The adapter plate shall have the capability to accept the same Category 6 jacks that specified in this project.

2.10 WALL PHONE FACEPLATES AND JACKS
A. Wall phone faceplates shall be provided at each wall phone location.
B. To support IP connectivity, the outlet for the wall phone faceplate shall be a Category 6 RJ-45 type (8P8C) jack.
C. Wall phone faceplates shall have tabs onto which a wall telephone can be appropriately attached.
D. Acceptable Manufacturers
   1. TE Connectivity

2.11 TEST EQUIPMENT
A. Use an approved testing device for all horizontal cables.
B. Acceptable manufacturers:
   1. Fluke
   2. Agilent
   3. Other approved equal.

2.12 LABELS
A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.
B. Shall be pre-printed or laser printed type.
C. Where used for cable marking, a label with a vinyl substrate and white printing area and a clear “tail” that self laminates the printed area when wrapped around the cable shall be provided. The label color shall be different than that of the cable to which it is attached.
D. Where insert type labels are used, provide clear plastic cover over label.
E. Provide plastic warning tape 6 inches wide continuously printed and bright colored 18” above all direct buried services, underground conduits and duct-banks.
F. Acceptable Manufacturers:
   1. Ideal
   2. Brother P-Touch
   3. W.H. Brady
   4. Other approved equal

PART 3 EXECUTION
3.01 CABLE INSTALLATION – GENERAL
A. All horizontal cabling shall be installed per the "T" set of drawings.
B. All wiring concealed in walls or soffits shall be installed in metal conduits.
C. All wiring above ceilings shall be installed in conduit, basket tray, or cable hangers.
D. If cable tray or conduit is not available, cables above accessible ceilings shall be supported 4 to 5 feet on center from cable hangers attached to the building structure.
E. The Contractor shall adhere to all ANSI/TIA/EIA and manufacturers’ installation instructions for the placement and termination of the cable. This includes without limitation pulling tension, bend radius, jacket stripping, and pair untwisting.
F. It is the intent that the maximum cable distance between the work-area outlet and the termination in the telecommunications room shall be 90 meters. If any horizontal cables are longer than 90 meters, these shall be brought to the immediate attention of the Owner or Owner’s Representative.

G. Cables shall have no physical defects such as cuts, tears or bulges in the outer jacket. Cables with defects shall be replaced.

H. The Contractor shall install cable in a neat and workmanlike manner. All cables shall be neatly bundled and tied in rooms. Leave sufficient cable for 90° sweeps at all vertical drops.

I. At each device location the cables shall be terminated on the appropriate insert mounted in an appropriate faceplate.

J. When placing cable, the Contractor shall maintain the following clearances from sources of electro-mechanical interference (EMI).

1. Power cable - 6 inches
2. Fluorescent Lights - 12 inches
3. Transformers - 36 inches

K. Cables with jackets that are chaffed or burned exposing internal conductor insulation, or that have any bare copper exposed (“shiners”) shall be replaced.

L. The Contractor shall fire stop all penetrations it makes through fire barriers.

3.02 JACKS AND FACEPLATES

A. All Category 6 cables shall be terminated with 8P8C modular jacks that snap into a faceplate, biscuit box, or floor box / poke-through adapter plate.

B. Outlet boxes shall be secured to the building with mechanical fasteners. Adhesive fasteners are not allowed.

C. Any unused openings in the faceplate shall be filled with blank inserts.

D. Termination shall be made so that pin/pair assignments are in accordance with T568B.

3.03 COAXIAL CABLE CONNECTORS AND COUPLERS

A. All connections shall be made with solderless connectors using a crimp tool specially designed to prepare the cable for the connectors.

3.04 DISTRIBUTION AMPLIFIERS AND SPLITTERS

A. The Contractor shall install the appropriate distribution amplifiers, splitters, etc. in the telecommunications rooms throughout the facility to provide connections for the RG-6 horizontal coaxial cables and RG-11 coaxial backbone cables.

B. The Contractor shall appropriate test the system from end to end to achieve a minimum signal output of 0 dB.

3.05 TESTING PROCEDURES

A. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C.

B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

C. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the manufacturers’ procedures, and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.
3.06 HORIZONTAL UTP CABLE TESTING
A. Testing shall conform to current industry standards for performance of 100 ohm Category 6 UTP cable and Category 6A UTP cable.
B. Testing shall be accomplished using a UL certified tester capable of performing a full complement of Category 6 or Category 6A tests.
C. Testing shall be performed after cables have been terminated and permanently labeled. The permanent cable address shall be used for all testing identification.
D. Any cable failing the prescribed certification testing shall be removed and replaced at the Contractor’s expense.
E. The Contractor shall provide Category 6 or Category 6A permanent link test results on all pairs of cable, including but not limited to cable length, wire map, near-end cross-talk (NEXT), Power Sum NEXT, attenuation to cross-talk ratio (ACR), Power Sum ACR, equal level far-end cross-talk (ELFEXT), Power Sum ELFEXT, and Return Loss.
F. Results shall be provided in an electronic format.

3.07 HORIZONTAL COAXIAL CABLE TESTING
A. Testing procedures shall be in accordance with industry standards for cable television (CATV).
B. Testing shall be end-to-end, from the RG-11 backbone cable through amplifiers, splitters, etc. through the RG-6 horizontal cable to the connector at the flat screen display location.
C. Testing shall confirm levels at the outlet location to be no less than 0 dB.

3.08 TEST RESULTS
A. The Contractor shall test all cables and submit all horizontal cable test result data in electronic format, with the resulting file formatted with one test result per 8.5-inch x 11-inch page.

3.09 LABELING
A. All horizontal cables are to be labeled using a machine printed label at each end of the cable at approximately 12 inches of the termination point, and again at approximately 48 inches from the termination point. Handwritten labels shall not be used.
B. All patch panel ports shall be labeled with the cable identifier.
C. Note all labeling information on the as-built drawings.

3.10 RECORD DOCUMENTATION
A. Prior to final acceptance of the work, the Contractor shall submit two (2) sets of record documentation.
B. Record documentation shall include:
   1. Floor plan drawings indicating device locations, outlet numbering, installation details, and wire routing.
   2. Drawings shall be provided in both hard copy and in electronic format. The electronic format shall be the most recent version of AutoCAD.
C. Record documentation shall also include operation and maintenance manuals for all components of the system. Manuals shall include:
   1. Installation and Service manuals.
   2. Operating manuals.
   3. If not included in the above manuals, the Contractor shall provide:
      a) Maintenance schedules.
      b) Diagnostic procedures.
PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all hardware, software, materials, plans, supplies, labor, training, maintenance, design, engineering, management, and supervision necessary to make the specified system and services fully operational.

B. All equipment provided by the Contractor shall be new, of current design, and shall provide the specific capabilities, software features, and functions which shall have been tested, accepted, utilized, and have the endorsement of at least five (5) other users for a period of at least six (6) months.

1.02 SCOPE OF WORK

A. This section describes the minimum capabilities and services for data communications equipment for the Prince George’s Community College Queen Anne Academic Center.

B. Requirements are included for the following:
   1. Core Data Switches
   2. Edge Switches
   3. CCTV Switch
   4. Uninterruptible Power Supplies
   5. Power Distribution Unit
   6. Wireless Access Point
   7. Room Monitor

C. Along with the Main Telecom Room, there are four (4) additional Telecom Rooms:
   1. Two (2) TRs are location on Level 1:
      a. Room T1-1 (Main TR)
      b. Room IT1-2
   2. Two (2) TRs are located on Level 2:
      a. Room 216
      b. Room T2-1.
   3. One (1) TR is located on Level 3:
      a. Room T3-1

1.03 QUALITY ASSURANCE

A. All equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Specification shall be subject to the control and approval of the Owner’s Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based on the acceptable manufacturers listed.

B. Contractor shall install work in accordance with Juniper Networks, Aruba Networks, and APC Installation, Testing, and Certification Guidelines.

C. Materials and work specified herein shall comply with the applicable requirements of:
   1. American Power Conversion (APC).
   2. Aruba Networks.
   3. Institute of Electrical and Electronic Engineers (IEEE)
   4. Juniper Networks.
   7. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, 2004
10. NFPA 76, Recommended Practice for the Fire Protection of Telecommunications Facilities, 2009
11. Underwriters Laboratory (UL) or equivalent.
12. Prince George’s Community College Voice and Data Standards.

1.04 WARRANTY
A. All materials and workmanship shall be warranted to be free from defects for a period of two (2) years following acceptance by the owner, with the exception of the wireless access points, which shall have the suggested manufacturer’s warranty.
B. If within two (2) years after the date of final acceptance of the installation, any of the work or equipment is found to be defective or not in compliance with the Contract Documents, the Contractor shall correct it promptly, including all parts and labor.

1.05 SUBMITTALS
A. As part of the bid proposal, the Bidder shall submit a letter of approval or other certification from the manufacturer indicating that the Contractor is a Juniper Networks Certified Installer.
B. As part of the bid proposal, the Bidder shall submit a letter of approval or other certification from the manufacturer indicating that the Contractor is an Aruba Networks Certified Installer (wireless).
C. Submit manufacturers’ data sheets for all proposed equipment (submit with bid).
D. Submit manufacturers’ instructions for storage, handling, protection, examination, preparation, operation, and installation of all products. Include any application conditions or limitations of use.
E. Submit for approval a detailed plan for the testing of all equipment and systems provided under this specification (submit 30 days prior to installation).
F. As part of the bid proposal, the Bidder shall submit a complete and detailed bill-of-materials for this Section listing quantity, part number, manufacturer, part description, unit price, and extended price for each item the Contractor proposes to use in this project.
   1. A Total Material Cost shall be provided at the end of the bill of materials.
   2. A Total Labor Cost shall be provided at the end of the bill of materials.
   3. A Total Other Cost shall be provided at the end of the bill of materials.
   4. An Overall Total Cost shall be provided at the end of the bill of materials.

PART 2 PRODUCTS

2.01 CORE DATA SWITCHES
A. The Contractor shall provide two (2) Core Data Switches for the Main Telecommunications Room.
B. The Core Data Switches shall be rack-mountable switches that have the capability to provide 40Gbps of connectivity.
C. The Core Data Switches shall be configured in HA mode mesh connected to the campus core network.
D. Each Core Data Switch shall be equipped with the appropriate uplink modules to provide two (2) 10G connections to the campus cores.
E. Each Core Data Switch shall be equipped with the appropriate modules to provide two (2) 10G connections to each of the Edge Switch stacks.
F. Acceptable manufacturer:
   1. Juniper Networks MX10 or most recent like Juniper Networks product.

2.02 EDGE SWITCHES
A. Each of the Telecommunications Rooms, including the Main Telecom Room, shall be populated with a minimum of two (2) (more if needed based on the number of Category 6 and Category 6A cables that have been installed to that TR) 48-port Edge Switches.

B. The Edge Switches shall be rack-mountable.

C. The Edge Switches shall be configured in virtual chassis mode.

D. The Edge Switch stack shall be populated with two (2) 10G modules that will connect the stack to the Core Switch.

E. Switches shall be appropriately connected with stacking cables.

F. Acceptable manufacturer:
   1. Juniper Networks EX4200-48PX or most recent like Juniper Networks product.

2.03 CCTV SWITCH
A. The Contractor shall place (1) CCTV Switch in each Telecommunications Room, including the Main Telecommunications Room for Stanley CCTV and door locks.

B. The CCTV Switch shall be rack-mountable.

C. The CCTV Switch shall be connected to the network with one (1) 1GB connection.

D. Acceptable manufacturer:
   1. Juniper Networks EX2200 or most recent like Juniper Networks product.

2.04 UNITERRUPTIBLE POWER SUPPLIES
A. In each of the Telecommunications Rooms, the Contractor shall provide at least one (1) Uninterruptible Power Supply (UPS).

B. All UPS units shall have the capability to be rack-mountable.

C. Each UPS shall be a minimum of a 6KVA 208V UPS with a 208V to 120V step-down transformer.
   1. Each UPS shall be appropriately sized to support the amount of data equipment installed in the Telecom Room.

D. If power is lost to the building, each UPS (or UPSs) shall provide approximately fifteen (15) minutes of uninterruptible power until the building backup generator takes over control of the building.

E. Each UPS shall be configured to provide Web/SNMP-based management over the network.

F. Acceptable Manufacturers:
   1. APC Smart UPS SURT6KRMXL3U-TF5
   2. Other approved equal

2.05 POWER DISTRIBUTION UNITS
A. All power distribution units (PDUs) shall meet or exceed the following specifications:
   1. Shall be rack-mounted.
   2. Shall have a nominal output voltage of 208V.
   3. Shall have a maximum total current draw per phase of 30A.
   4. Shall have a minimum of (16) IED 320 C13 output connections.
   5. Shall have a nominal input voltage of 200V, 208V, 230V.
   6. Shall have an input frequency of 50/60 Hz.
   7. Shall have an input connection of NEMA L6-30P.
   8. Shall have a maximum input current per phase of 30A.
   9. Shall meet UL 1363 and 1449 requirements.
B. Acceptable Manufacturers:
   1. APC AP7911A
   2. Other approved equal

2.06 WIRELESS ACCESS POINTS
A. Shall be 802.11ac compliant with integrated radio.
B. Shall provide a rate of up to 1.3 Gbps.
C. Shall support Power over Ethernet.
D. Shall provide security based on the IEEE 802.1X standard.
E. Shall have a multipurpose mounting bracket for mounting in different locations and configurations.
F. Shall include all required licenses.
G. If used outdoors, shall be equipped with appropriate lightning arrestors.
H. Acceptable Manufacturer:
   1. Aruba Networks AP225 (indoor); AP224 (outdoor), or most recent like Aruba product.

2.07 ROOM MONITOR
A. In each of the Telecommunications Rooms, the Contractor shall provide one (1) Room Monitor.
B. The Room Monitor shall be equipped with an integrated camera and sensors for temperature, humidity, airflow, dew point, camera motion, etc.
C. The Room Monitor shall support a number of protocols, including DHCP, DNS, HTTP, HTTPS, SMTP, SOCKS, and TCP/IP.
D. The Room Monitor shall have the capability to connect to the network via an integrated RJ-45 jack.
E. Acceptable Manufacturer:
   1. APC NetBotz Room Monitor 455 Security Camera without POE Injector

PART 3 EXECUTION
3.01 CORE DATA SWITCH
A. The Contractor shall coordinate the installation of network equipment with the PGCC Information Technology Department.
B. The Contractor shall provide equipment staging, deployment, installation, configuration, testing, and acceptance services for the Core Data Switch. This includes, but may not be limited to the following:
   1. removing equipment from its packaging
   2. inspecting the equipment
   3. installing the network switch equipment in the racks
   4. installing all appropriate modules
   5. ensuring that all equipment is in proper working order
C. The Contractor shall deliver all equipment to the site and install it in its final location.
D. The Contractor shall rack-mount the Core Data Switch in the Main Equipment Room.
E. The Contractor shall configure the Core Data Switch based on requirements of the PGCC Information Technology Department, including all programming required to make the switch operational on the PGCC network.
F. The Contractor shall install optical fiber patch cables as appropriate to connect the Core Data Switch to the optical fiber backbone, as well the Edge Switches in the configuration to provide a complete data network.
G. The Contractor shall test all equipment in accordance with the approved test plan, and provide written evidence of satisfactory completion of the testing.

3.02 EDGE SWITCHES

A. The Contractor shall coordinate the installation of network equipment with the PGCC Information Technology Department.

B. The Contractor shall provide equipment staging, deployment, installation, configuration, testing, and acceptance services for all Edge Switches. This includes, but may not be limited to the following:
   1. removing equipment from its packaging
   2. inspecting the equipment
   3. installing the network switch equipment in the racks
   4. installing all appropriate modules
   5. ensuring that all equipment is in proper working order

C. The Contractor shall rack-mount an appropriate number of Edge Switches in the Main Telecommunications Room, as well as the other telecommunications rooms in the facility to support the quantity of Category 6 and Category 6A cables terminated in that room.

D. The Contractor shall configure the Edge Switches based on requirements of the PGCC Information Technology Department, including all programming required to make the switches operational on the PGCC network.

E. The Contractor shall install optical fiber patch cables as appropriate to connect the Edge Switches to the optical fiber backbone, as well the Core Data Switches in the configuration to provide a complete data network.

F. The Contractor shall test all equipment in accordance with the approved test plan, and provide written evidence of satisfactory completion of the testing.

3.03 CCTV SWITCH

A. The Contractor shall coordinate the installation of network equipment with the PGCC Information Technology Department.

B. The Contractor shall provide equipment staging, deployment, installation, configuration, testing, and acceptance services for all Access Layer Switches. This includes, but may not be limited to the following:
   1. removing equipment from its packaging
   2. inspecting the equipment
   3. installing the network switch equipment in the racks
   4. installing all appropriate modules
   5. ensuring that all equipment is in proper working order

C. The Contractor shall rack-mount a CCTV Switch in the Main Telecommunications Room, as well as the other telecommunications rooms.

D. The Contractor shall configure the CCTV Switch based on requirements of the PGCC Information Technology Department, including all programming required to make the switches operational on the PGCC network.

E. The Contractor shall test all equipment in accordance with the approved test plan, and provide written evidence of satisfactory completion of the testing.

3.04 UNINTERRUPTIBLE POWER SUPPLY

A. The Contractor shall provide equipment staging, deployment, installation, configuration, testing, and acceptance services for each UPS provided. This includes, but may not be limited to the following:
   1. removing equipment from its packaging
   2. inspecting the equipment
3. installing the appropriate UPS equipment in the racks and cabinets that have been installed in the Telecommunications Rooms by others
4. installing all power cords, etc.
5. ensuring that all equipment is in proper working order

B. The Contractor shall rack-mount the appropriate UPS unit(s) in each TR where a switch is being installed.

C. The Contractor shall attach each UPS to the network so it can be appropriately managed and ensure that the UPS is indeed properly attached to the data network.

3.05 POWER DISTRIBUTION UNITS

A. The Contractor shall provide equipment staging, deployment, installation, configuration, testing, and acceptance services for each PDU provided. This includes, but may not be limited to the following:
1. removing equipment from its packaging
2. inspecting the equipment
3. installing the PDU in the racks that have been installed in the Telecommunications Rooms by others
4. installing all power cords, etc.
5. ensuring that all equipment is in proper working order

B. The Contractor shall rack-mount at least one (1) the PDU in each TR where a switch is being installed.

3.06 WIRELESS HEAT MAP SURVEY

A. Prior to installing any Access Points, the Contractor shall perform a predictive wireless heat map survey to pinpoint the location of all required Access Points to provide complete facility coverage.
1. Architectural AutoCAD files or PDF files of the facility can be provided.

B. The Contractor shall review the heat maps created with PGCC and the design team prior to installing any wireless access points.

3.07 WIRELESS ACCESS POINTS

A. The Contractor shall deliver all equipment to the site and install it in its final location.

B. The Contractor shall provide equipment staging, deployment, installation, configuration, testing, and acceptance services for the access points. This includes, but may not be limited to the following:
1. removing equipment from its packaging
2. inspecting the equipment
3. installing the wireless access points in the building
4. ensuring that all equipment is in proper working order

C. The Contractor shall provide a quantity of Wireless Access Points based on the preliminary locations shown on the T-set of drawings.

D. The Contractor shall appropriately install the Wireless Access Points in the locations determined by the heat map survey.
1. These locations shall be confirmed and coordinated with the PGCC Information Technology Department prior to installation

E. At each Wireless Access Point location and in each Telecom Room, the Contractor shall install Category 6A patch cables as appropriate to connect the Access Points to the network.

F. The Contractor shall test all equipment in accordance with the approved test plan, and provide written evidence of satisfactory completion of the testing.
3.08 ROOM MONITOR
A. The Contractor shall provide equipment staging, deployment, installation, configuration, testing, and acceptance services for each Room Monitor provided. This includes, but may not be limited to the following:
1. removing equipment from its packaging
2. inspecting the equipment
3. installing the Room Monitor
4. installing all power cords, etc.
5. ensuring that all equipment is in proper working order
B. The Contractor shall install one (1) Room Monitor in each TR such that it has a complete view of the door. Prior to installation, the Contractor shall verify the exact location with the PGCC IT Department.

3.09 DATA NETWORK EQUIPMENT TEST PLAN
A. The Contractor shall develop and submit a test plan which at minimum includes the following:
1. Verification of system power.
2. Verification of fan operation.
3. Verification of proper operation of all network interfaces.
4. Verification of proper LED operation.
5. Verify correct operation of all required protocols.
6. Verify connection to all required customer networks.
7. Demonstration of all system management capabilities.
8. Demonstration of the integration of all components included in this Section.
B. The A/E and Owner shall review the test plan and indicate its acceptance or rejection of the plan.
C. If the test plan is rejected, the Contractor shall revise the plan in accord with the Owner’s directions and publish the final version of the test plan.
D. Data Network equipment test
1. Upon completion of the installation of all equipment included in this specification, the Contractor shall perform all tests indicated in the approved test plan.
2. All testing performed under the approved test plan shall be accomplished in the presence of the Owner or designated Owner’s Representative.

3.10 TRAINING
A. Contractor shall provide up to four (4) hours of on-site training and orientation of Owner personnel to the new data networking system.
B. Training shall include, but will not be limited to:
1. Physical review of installed equipment.
2. Review of documentation and test results.
3. Additional customer requirement defined during the project.
C. Contractor shall also provide any training of owner technicians required to maintain the manufacturer’s warranty for the specified time period.
D. The Contractor shall be on call during the warranty period to answer any questions of the Owner.

3.11 RECORD DOCUMENTATION
A. Prior to final acceptance of the work, the Contractor shall submit two (2) sets of record documentation.
B. Record documentation shall include:
1. Floor plan drawings indicating device locations.
2. Functional block diagrams.
3. Drawings shall be provided in both hard copy and in electronic format. The electronic format shall be the most recent version of AutoCAD.

C. Record documentation shall also include operation and maintenance manuals for all components of the system. Manuals shall include:
   1. Installation and Service manuals.
   2. Operating manuals.
   3. If not included in the above manuals, the Contractor shall provide the following:
      a) Power up and power down procedures.
      b) Programming procedures.
      c) Maintenance schedules.
      d) Diagnostic procedures.

END OF SECTION
SECTION 27 3100
VOICE COMMUNICATIONS EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all hardware, software, materials, plans, supplies, labor, training, maintenance, design, engineering, management, and supervision necessary to make the specified systems and services fully operational.

B. All equipment provided by the Contractor shall be new, of current design, and shall provide the specific capabilities, software features, and functions which shall have been tested, accepted, utilized, and have the endorsement of at least five (5) other users for a period of at least six (6) months.

1.02 SCOPE OF WORK

A. This section describes the minimum capabilities and services for voice communications terminal equipment for the Prince George’s Community College (PGCC) Queen Anne Academic Center.

B. The telephone sets listed in this specification are for the Queen Anne Academic Center facility only.

C. Requirements are included for the following:
   1. Existing PBX System
   2. Office Telephone
   3. Wall-Mounted (Classroom) Telephone
   4. Executive Telephone
   5. Conference Telephone
   6. Emergency Telephone
   7. Licenses

1.03 QUALITY ASSURANCE

A. All equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Specification shall be subject to the control and approval of the Owner’s Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based on the acceptable manufacturers listed.

B. Contractor shall install work in accordance with the Avaya Installation, Testing, and Certification Guidelines.

C. Materials and work specified herein shall comply with the applicable requirements of:
   1. Institute of Electrical and Electronic Engineers (IEEE).
   2. Avaya Networks.
   5. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, 2004
   8. NFPA 76, Recommended Practice for the Protection of Telecommunications Facilities, 2009
   9. Underwriters Laboratory (UL) or equivalent.
   10. Prince George’s Community College Voice and Data Standards.
1.04 WARRANTY
A. All materials and workmanship shall be warrantied to be free from defects for a period of two (2) years following acceptance by the owner.
B. If within two (2) years after the date of final acceptance of the installation, any of the work or equipment is found to be defective or not in compliance with the Contract Documents, the Contractor shall correct it promptly including all parts and labor.

1.05 SUBMITTALS
A. As part of the bid proposal, the Bidder shall submit a letter of approval or other certification from the manufacturer indicating that the Installer is an Avaya Certified Installer.
B. As part of the bid proposal, the Bidder shall submit a complete and detailed bill-of-materials for this Section listing quantity, part number, manufacturer, part description, unit price, and extended price for each item the Contractor proposes to use in this project.
   1. A Total Material Cost shall be provided at the end of the bill of materials.
   2. A Total Labor Cost shall be provided at the end of the bill of materials.
   3. A Total Other Cost shall be provided at the end of the bill of materials.
   4. An Overall Total Cost shall be provided at the end of the bill of materials.
C. As part of the bid proposal, the Bidder shall submit data sheets (cut sheets) for telephone sets.
D. As part of the bid proposal, the Bidder shall include a preliminary system diagram showing each major component of the system and where it will be installed.
E. As part of the bid proposal, the Bidder shall provide an add/delete unit price for telephone sets.

PART 2 PRODUCTS
2.01 EXISTING PBX SYSTEM
A. PGCC is currently being serviced by an Avaya XXXX Voice over Internet Protocol (VoIP) voice communications system located in the XXXX building.
B. The Contractor will not have to provide any common equipment in the XXXX building. Rather, only telephones required for the new building are part of this scope of work.

2.02 OFFICE TELEPHONE
A. The Office telephone shall be a full-duplex hands-free, desktop telephone with high quality housing, microphone, and loudspeaker.
B. The Office telephone shall have a 2-port 10/100/1000Base-T built-in Ethernet switch.
C. The Office telephone shall support Power over Ethernet (PoE) according to IEEE 802.3af.
D. The Office telephone shall have the following control elements:
   1. [LIST FEATURES HERE]
E. Only Acceptable Product:
   1. Avaya XYZ (provide most recent model at time of installation)

2.03 WALL-MOUNTED TELEPHONE
F. The Wall-Mounted telephone shall have the following control elements:
   1. [LIST FEATURES HERE]
G. Only Acceptable Product:
   1. Avaya XYZ (provide most recent model at time of installation)

2.04 EXECUTIVE TELEPHONE
A. The Executive telephone shall be a full-duplex hands-free, desktop telephone with high quality housing, microphone, and loudspeaker.
B. The Executive telephone shall have a 2-port 10/100/1000Base-T built-in Ethernet switch.
C. The Executive telephone shall support Power over Ethernet (PoE) according to IEEE 802.3af.
D. The Executive telephone shall have the following control elements:
   1. [LIST FEATURES HERE]

E. Only Acceptable Product:
   1. Avaya XYZ (provide most recent model at time of installation)

2.05 CONFERENCE ROOM TELEPHONE

A. The Conference Room telephone set shall be an IP conference telephone.

B. The Conference room telephone set shall have the following features:
   1. 22 kHz CD-quality technology for life-like clarity and Intelligibility
   2. 20-foot (6.1 m) microphone pickup range; more with optional expansion microphones
   3. Resistance to interference from mobile phones and other wireless devices
   4. Ability to connect two units together for additional microphone pickup and speaker volume
   5. Large high resolution display and processing power for IP applications
   6. Integration with Polycom HDX® or equivalent high definition video conferencing systems
   7. Integrated Power over Ethernet (PoE) connectivity
   8. Applications Port for mobile device and computer connectivity

C. The Conference Room telephone set shall come equipped with expansion microphones.

D. Only Acceptable Product:
   1. Polycom SoundStation IP 7000 Conference Phone

2.05 ANALOG DEVICES

A. The system shall support a number of analog devices, including facsimile machines, emergency phones, elevator phones, and other special use phones.

2.06 LICENSES

A. The system configuration shall include workspace licensing for all telephone users.

B. Office telephone and executive telephone users will all require licenses to support voice messaging, multiple devices, instant messaging, unified messaging, and emergency responder.

2.07 EMERGENCY TELEPHONE

A. The Emergency telephone shall be an IP telephone.

B. The Emergency telephone shall be a full duplex VoIP emergency speakerphone.

C. The Emergency telephone shall have one (1) Push for Help button.

D. The Emergency telephone shall be a flush-mounted device approximately 7.375" wide, 7.125" high, and 2" deep.

E. The Emergency telephone shall have 1MB memory storage for phone numbers and audio messages.

F. Only Acceptable Product:
   1. Code Blue IP2501-s

PART 3 EXECUTION

3.01 EXISTING PBX SYSTEM

A. The Contractor shall ensure that no additional equipment is needed to support the new telephones to be installed in the XXX building.

B. The Contractor shall coordinate this effort with the PGCC IT Department prior to purchase or installation of any equipment.

3.02 TELEPHONE SETS

A. Contractor shall work with PGCC to finalize exact locations of all telephones and then place all telephones in their appropriate location.
B. All telephone sets for the facility shall be appropriately placed and connected to the system as configured in the final configuration.

C. Patch cord requirements for telephones sets at the workstation location shall be provided with the telephone and installed by this Contractor with the telephone.

D. Cross-connection of telephones sets in the Telecommunications Rooms shall be provided by this Contractor.
   1. Patch cords for cross-connections in the Telecommunications Rooms are being purchased and provided by the Cabling Contractor.

E. The Contractor shall provide and install (70) Office telephones, plus provide (7) spare Office telephones.

F. The Contractor shall provide and install (12) Wall-Mounted telephones, plus provide (1) spare Wall-Mounted telephone.

G. The Contractor shall provide and install (20) Executive telephones, plus provide (2) spare Executive telephones.

H. The Contractor shall provide and install (1) Conference Room telephones, plus provide (1) spare Conference Room telephone.

I. The Contractor shall provide and install (45) Emergency telephones, plus provide (4) spare Conference Room telephones.

J. After installation, the Contractor shall demonstrate that all telephones (system and station features) are operational.

3.03 ANALOG DEVICES
   A. [Verify this]

3.04 TRAINING
   A. The Contractor shall provide telephone set training for the end-users. The “train the trainer” method is not acceptable for initial training.

   B. User training classes are to be small in size and shall be tailored to the type and schedule of users. Training classes shall use operational VoIP sets and take place prior to system acceptance.

3.05 RECORD DOCUMENTATION
   A. Prior to final acceptance of the work, the Contractor shall submit two (2) sets of record documentation.

   B. At a minimum, record documentation shall include:
      1. A spreadsheet that details telephone location, telephone set type, class of service, etc.
      2. Operation and maintenance manuals (maybe be on a disc or on-line) for all components of the system.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK
A. This section includes the minimum requirements for equipment and installation of Emergency Telephones and associated hardware at the Queen Anne Academic Center.

1.02 QUALITY ASSURANCE
A. All equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Specification shall be subject to the control and approval of the Owner’s Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based on the acceptable manufacturers listed.
B. Equipment provided under this specification shall be installed and configured by a Talk-A-Phone certified dealer.
C. Materials and work specified herein shall comply with the applicable requirements of:
   1. Underwriters Laboratory or equivalent
   2. Federal Communications Commission
   3. National Electric Code (NEC)

1.03 WARRANTY
A. All materials and workmanship shall be warranted to be free from defects for a period of two (2) years following acceptance by the owner.
B. If within two (2) years after the date of final acceptance of the installation, any of the work or equipment is found to be defective or not in compliance with the Contract Documents, the Contractor shall correct it promptly including all parts and labor.
C. The Owner shall give notice to the Contractor of any defects promptly after the discovery of any defective condition.
D. These obligations shall survive termination of the construction contract.

1.04 SUBMITTALS
A. Submit manufacturers’ data sheets for proposed systems, and equipment.
B. Submit manufacturers’ instructions for storage, handling, protection, examination, preparation, operation, and installation of all products. Include any application conditions or limitations of use stipulated by any product testing agency.
C. Submit all applicable Material Safety Data Sheets.
D. Submit a detailed bill-of-materials listing all manufacturers, part numbers, and quantities that the Bidder proposes to use in this project.
PART 2 – PRODUCTS

2.01 GENERAL

A. The unit shall be a full duplex VoIP speakerphone, intercom and paging device using SIP standards that can be surface or flush mounted and constructed of heavy stainless steel. It shall have a single enclosure comprised of all electronics with serviceable speaker, microphone, single- or dual-button options and PCB components. It shall be available with an optional remote-mounted blue/beacon that serves to identify it from a great distance.

2.02 CONSTRUCTION

A. Surface Mount: The unit shall measure 7.375" W x 7.125" H x 2" D and be fabricated of 16-gauge stainless steel. The housing shall consist of two pieces, permitting back plate to be installed during the rough in and the faceplate/electronics during completion. The back shall have four holes for mounting hardware.

B. Flush Mount: The faceplate shall be fabricated of 12-gauge stainless steel, and the flush mount box shall be assembled to the faceplate and fabricated of 14-gauge painted steel. The flush mount box shall be 8.125" H and 4" deep. The faceplate shall be 9" square and provide an overlap to eliminate additional trim work.

C. The unit shall have a self-monitoring data button for activation and shall be labeled “PUSH FOR HELP”, “EMERGENCY” or “EMERGENCY/EMERGENCIA” with ADA-compliant Braille symbols.

D. An optional dual-button faceplate shall be available with a second self-monitoring button labeled “INFO” with ADA-compliant Braille symbols.

E. A stainless steel screen shall be mounted between the faceplate and the 3.5" weatherproof speaker for additional vandal resistance, and mounted via .50" stainless steel studs, locking washers and lock nuts.

F. Buttons shall be mounted in a cast aluminum bezel via retaining nut and rubber washer.

G. One .42" LED light and one .42" LED light will be utilized beneath CALLING and ANSWERED signals.

2.03 ELECTRICAL

A. All wiring shall be concealed within the enclosure and not be visible from the outside.

B. Power: PoE IEEE 802.3af.

2.04 FEATURES

A. Dual Account Registration for Redundancy

B. 1MB memory storage for phone numbers and audio messages

C. Phone numbers up to 255 digits long

D. SIP/IAX2 Protocol Support

E. STUN client for NAT transversal
UDP, TCP and TLS

G. 1 x IEEE 802.11 10/100 Ethernet Ports

H. Embedded web server

I. Security includes: HTTPS, Transport Layer Security (TLS), SRTP (RFC3711) SIPS, RTCP, VLAN and Password Protection

J. DTMF inband/out of band/INFO

K. One Active Touch™ data button inputs

L. One auxiliary NO output contact closures with programmable timing capability

M. Codec Support: G.711 uLaw/aLaw, G.726 fixed payload, G.726 (16kbps), G.726 (24kbps), G.726 (32kbps), G.726 (40kbps), G.722 (HD voice), G.729, DVI4 Narrowband/Wideband

N. Self-monitoring and fault reporting: communication service, button failure, speaker failure and microphone failure

O. Message playback options: Multiple and repeating options during call placed, multiple and repeating options during call received, and message playback during a call via DTMF commands

P. In Call Commands via DTMF: Auxiliary output control, speaker volume +/-, microphone volume +/- and message playback

Q. Built-in scripting language provides advanced button and diagnostic report programming

R. Built with powerful DSP technology

S. Enhanced speakerphone and microphone sensitivity

T. Operational temperature: -40 to +70 °Celsius (-40 to +158 °Fahrenheit)

U. Conformal coated PCB for environmental protection and operation

V. Corrosion resistant connectors

2.05 ACCEPTABLE PRODUCTS

A. Model IP2500 from Code Blue Corporation, no substitutions.

PART 3 - EXECUTION

3.01 SYSTEM INSTALLATION

A. The locations of the Emergency Telephones are found on the project drawings. The Contractor shall be responsible for conducting a detailed location by location review with the Owner and/or Owner’s Representative to finalize the exact locations for mounting.

B. Current Site Conditions: The Contractor shall verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions that will affect performance of the system to the Owner. The Contractor shall not take any corrective action without written permission from the Owner.

C. Where discrepancies in the construction documents or uncertainties in terms of the intent of the documents exist, contractor shall execute a written Request for Information and
forward it to the design team. Contractor shall not be relieved of its obligation under these documents due to its failure to request clarification or additional information in a timely manner.

D. The contractor shall be responsible for the hook-up to the unit, both power and telephone line.

E. All installation shall be as described in the manufacturer’s installation instructions.

F. Electrical and telephone line conduits should be run through the foundation and into the center hole of the tower.

3.02 SYSTEM CONFIGURATION AND SET-UP

A. The Contractor shall configure and program all Emergency Telephones.

B. The Contractor shall provide, configure and program all diagnostic features with any appropriate peripherals in the Security Command Center.

3.03 PERFORMANCE REQUIREMENTS

A. General: The Contractor shall perform pre-delivery testing, site testing, and adjustment of the completed system. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing.

B. Contractor’s Field Testing: The Contractor shall calibrate and test all equipment, verify operation, place the integrated system in service, and test the integrated system.

C. Performance Verification Test: The Contractor shall demonstrate that the completed system complies with the contract requirements. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown.

3.04 RECORD DOCUMENTATION

A. Prior to final acceptance of the work, the Contractor shall submit two (2) sets of record documentation.

B. Record documentation shall include:
   1. Floor plan drawings indicating device locations and wire routing.
   2. Functional block diagrams.
   3. Drawings shall be provided in both hard copy and in electronic format. The electronic format shall be the most recent version of AutoCAD.

C. Record documentation shall also include operation and maintenance manuals for all components of the system. Manuals shall include:
   1. Installation and Service manuals.
   2. Operating manuals.
   3. If not included in the above manuals, the Contractor shall provide:
      a) Power up and power down procedures.
      b) Programming procedures.
      c) Maintenance schedules.
      d) Diagnostic procedures.

END OF SECTION
PART ONE - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to the work specified in this Section.

B. Coordinate work of this Section with work of other Sections as required to properly execute the Work and as necessary to maintain satisfactory progress of the work of other Sections.

1.02 SCOPE OF SPECIFICATION

A. The following terms are defined for this specification section:
   1. “Owner” or “End User” is Prince George’s Community College
   3. “Systems” are the audio and video systems.
   4. “Designer” or “Systems Designer” is the designer of the audio and video systems: Jaffe Holden.
   7. “Contractor” or “Systems Contractor” is the specialty contractor responsible for the installation of the audio and video systems.

B. This specification covers all Systems as described below for the project. The objective is to provide professional systems, installed, acceptance tested, and ready for use.

C. The written specification and large format drawings AV000 through AV999 shall be collectively referred to herein as the Contract documents. System features which are mentioned in one part may not be shown in the others. In case of conflict between the written specification and the drawings, Contractor must seek clarification from the Systems Designer. In the event that the Contractor fails to obtain such clarification, the interpretation of the Systems Designer will prevail.

1.03 CONTRACTOR RESPONSIBILITY

A. Specification drawings are detailed only to the extent necessary to show design intent and signal flow. It is understood and agreed by the Contractor that the work herein described shall be complete in every detail to supply a complete working system.

B. Equipment not mentioned herein nor shown on drawings but necessary to meet this requirement shall be provided without claim for additional payment.

1.04 SUMMARY DESCRIPTION

A. The following Systems are included in the specification:
   1. Facility Wide Systems
2. Public, General Education, and Conference Systems
3. Hallam Theatre AV Systems
4. Art Gallery AV Systems
5. Dance Studio Performance and Rehearsal AV Systems
6. Music Department Performance and Rehearsal AV Systems
7. Theatre Department Performance and Rehearsal AV Systems
8. Television Radio & Film Production Systems

B. Refer to Appendix A for Complete AV Systems Descriptions

1.05 SCOPE OF WORK

A. Furnish all materials, labor and any engineering services to provide complete and professionally installed Systems in working order as described herein. Labor furnished shall be specialized and experienced in Systems installation.

B. Furnish all back boxes and enclosures.

C. Deliver to the job site all back boxes which are to be installed by others.

D. Furnish and install all wire and cable.

E. Furnish any additional items, not specifically mentioned herein, to meet system requirements as specified, without claim for additional payment. Such items may include hardware, transformers, line/distribution amplifiers and other devices for proper installation, interface, isolation or gain structure.

F. Furnish shop drawings and receive approval, prior to fabrication and installation.

G. Perform initial adjustments and verification tests. Submit verification test report.

H. Participate in acceptance tests and perform final adjustments.

I. Participate in user training.

J. Provide system documentation including copies of all relevant drawings and equipment manuals.

K. Provide maintenance services for the specified period from the date of acceptance.

L. Guarantee all equipment and components for the specified period from the date of acceptance.

M. Requirements and materials that apply to the work of others related to the Systems are listed to define and establish Systems requirements.

N. Work scope does not include the AC power system except as shown in the drawings.

O. Coordination with the Electrical Contractor is required to assure correct Systems conduit routing, Systems backbox locations, and clean power circuit locations as specified in Division 26 - Electrical.

P. See Work Scope Summary Table at the end of Part One (Paragraph 1.13).

1.06 SUBMITTALS

A. Pre-Bid Submittals

1. All Contractors submitting bids for the Systems specified herein must be qualified by the Systems Designer.
2. Not later than ten (10) days prior to the bid date, Contractor shall submit to the Systems Designer for approval, brochures containing a statement of the Contractor's qualifications. At minimum, this submittal shall include the following:
   a. A list of Systems of comparable size and scope to that described herein, completed by the Contractor in the last five (5) years. Indicate the project name and address, year of completion, and the name and phone number of a person to contact who is a representative of the Owner or User.
   b. A personal resume of formal education and experience of the staff member who would act as Leader for the Project
   c. A description of the Contractor's capabilities and facilities for rack assembly, shop fabrication, repair, and servicing of Systems
   d. A description of the Contractor's capabilities and facilities for generating CAD (or other high quality graphics) documentation for the Shop Drawings and As-Built Drawings

3. The following Contractors have submitted the required qualifications and have been approved to bid:
   a. TBD

B. Bid Submittals:
1. Contractors shall examine all drawings and read all divisions of this specification in order to avoid omissions and duplications and to ensure a complete job. No allowances shall be made for failure to read and understand these documents. Discrepancies between drawings and specifications or obvious omissions shall be referred to the Systems Designer for clarification before the bid date. Where discrepancies occur and pre-bid instructions have not been obtained, the contractor agrees to abide by the Systems Designer's decision.

2. Bid proposals shall include all work and all equipment as specified, as well as any other equipment and materials to be used in assembling the system.

3. Requests for clarification of specification intent shall be made, in writing, not later than ten (10) days prior to bid date.

4. No portion of the work herein may be assigned or sub-contracted to others unless the following requirements have been satisfied:
   a. The names of any proposed sub-contractors shall have been disclosed in the bid proposal.
   b. A statement of qualifications for each sub-contractor shall have been included with the bid proposal.
   c. All terms of this contract, including bidding and qualification requirements, shall apply to the sub-contractor.

5. The bid submittals shall include the following:
   a. The total Contract price
   b. The total price for Add Alternate #AV 01 (See Paragraph 2.02.D)
   c. An itemized list of all equipment and materials to be used in assembling the system
   d. Unit pricing for all items on the specified equipment list
   e. Lot pricing for miscellaneous items not on the specified equipment list
   f. A breakdown of the number of staff hours allotted for:
      1) Preparation of submittals, shop drawings, and system documentation
      2) On site coordination meetings and supervision
3) In shop engineering, fabrication, and assembly
4) On site fabrication, assembly, and installation
5) On site verification and acceptance testing

C. Shop Drawing Submittals:

1. Within sixty (60) days after contract award, submit five (5) copies of detailed shop drawings to the Architect for approval. All shop drawings shall be marked with the related drawing number when submitted. Do not begin installation or fabrication without the approval of the Architect and Systems Designer.

2. Review of shop drawings shall not constitute final approval of system function. Said review does not in any way relieve the Contractor from the responsibility of furnishing material or performing work as required by the Contract documents.

3. Failure of the Contractor to submit shop drawings in ample time for evaluation shall not entitle the Contractor to an extension of contract time, and no claim for extension by reason of such default will be allowed.

4. At minimum, the Shop Drawings shall include neatly bound copies of the following:
   a. Table of Contents
   b. Itemized list of all equipment and materials to be used in assembling the system
   c. Catalog cut sheets or data sheets for each listed item
   d. One-line signal flow diagrams for all sound reinforcement and auxiliary systems showing point to point wiring interconnection of all equipment with wire run numbers and patch bay designations. Show all transformers, switches, relays, control circuits, and modifications to equipment. Show all equipment items which are required for realization of the functions described herein.
   e. A complete list of all wire run numbers along with the termination location of each end of each wire run
   f. Detailed 3-wire schematic diagrams for any custom circuitry
   g. Detailed 3-wire schematic diagrams for typical connections between audio lines, patch bays, and rack mounted equipment
   h. Drawings of all items which are to be custom fabricated or modified. Drawings shall be of scale suitable for use in fabrication. They shall show materials, finishes and panel/control markings. Submit samples of lettering/label size and typeface to be employed on custom plates, panels and other equipment.
   i. Full size drawings illustrating the physical layout and labeling of patch bays
   j. Mechanical drawings of all assemblies, major sub-assemblies, racks, cabinets and enclosures
   k. Mechanical drawings showing proposed mounting details of all loudspeakers and associated rigging, and interface with adjacent architecture

5. The above listed drawings shall be produced on AutoCAD or similar computer graphics program. Scans or photocopies of the Systems Designer's specification drawings are not acceptable.

6. The use of electronic files from other sources (e.g., architectural backgrounds, Systems Designer's drawings, vendor-supplied panel drawings) will not absolve the Contractor of responsibility for ensuring that the Shop Drawings represent a completely engineered, coordinated solution. The Contractor has final responsibility for providing systems which conform to all requirements of this specification.
D. Substitutions:

1. Subsequent to Contract award, substitutions may be permitted, but only with the express written permission of the Systems Designer. The proposed substitutes must be equivalent to the specified products in quality, performance, construction, function and conformance to system objectives.

2. It is the responsibility of the Contractor to prove, to the satisfaction of the Systems Designer, that the proposed substitution is equal to the specified product, as demonstrated by submission of the following:
   a. List of advantages to the Owner
   b. Cost savings
   c. Printed specifications or laboratory test data
   d. Previous field experience

3. The Contractor shall list the unit price of each item proposed for substitution and indicate which specified items are to be deleted.

4. If the Systems Designer determines that the proposed product is not equal to the specified project, the Contractor shall supply the product specified in the Contract documents.

5. Where substitute materials or methods are approved, the Contractor shall make all adjustments to contingent work necessary to accommodate the substituted equipment, without claim for additional payment.

6. In the event that one or more of the products specified herein is unavailable, the Contractor shall make recommendations to the Systems Designer as to what substitutions are available to meet the intent of the specification.

7. The Systems Designer reserves the right to substitute new products which become available subsequent to the issuance of the Contract Documents, provided that:
   a. The Contractor has not yet purchased the originally specified equipment.
   b. The substitute equipment shall not materially increase the Contractor's costs.

E. Samples:

1. Submit samples of substitute equipment to the Systems Designer as required to prove equivalency to items specified.

2. Submit samples of custom work, finishes or other materials as required by the Architect or Systems Designer to verify appearance and quality.

3. Costs for shipping samples shall be the responsibility of the Contractor.

F. Written Guarantee (See Paragraph 1.09)

G. Verification Test Report (See Paragraph 3.13)

H. System Documentation and Operation Manuals (See Paragraph 3.15)

1.07 JOB CONDITIONS

A. Keep the job adequately staffed at all times. Unless illness, loss of personnel or other circumstances beyond the control of the Contractor intervene, keep the same individual in charge throughout.

B. Cooperate with all appropriate parties in order to achieve well coordinated progress with the overall construction completion schedule and satisfactory final results.
C. Watch for conflicts with work of other contractors on the job and execute, without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or to preserve acoustic performance, symmetry, and pleasing appearance.

D. Immediately report to the Architect and Systems Designer, any design or installation irregularities, particularly architectural elements that interfere with the intended coverage angles of loudspeakers, so that appropriate action may be taken.

E. Do all cutting, patching and painting for proper and finished installation of the system and repair any damage done as a result of such installation. Clean up and dispose of trash from all Systems work areas.

1.08 QUALITY ASSURANCE

A. Parts listed shall be complete, type numbers accurate and equipment furnished shall conform to manufacturer's specifications.

B. All materials shall be new and shall conform to applicable provisions of Underwriters Laboratories and the American Standards Association.

C. Procure and pay for all permits, licenses and inspections and observe any requirements stipulated therein. Conform in all trades with all local regulations and codes.

D. Comply with federal, state and local labor regulations and applicable union regulations.

E. Installation shall conform to latest federal, state and local electrical and safety codes or those of other authorities having jurisdiction. Where conflicts exist, most stringent code or regulation shall apply.

1.09 GUARANTEE AND SERVICE

A. All systems and components shall be guaranteed free of defects in materials and workmanship for a period of one (1) year from the date of acceptance and shall be repaired or replaced within forty-eight (48) hours following report of such defects by the owner.

B. The Contractor shall be available on call and on eight (8) hour notice during the first month following acceptance of the system, to assist the Owner's representatives in any problems which may arise during the initial period of operation.

C. If, during the Guarantee period, any component is out of service for more than seven (7) consecutive days due to unavailability of parts or service, Contractor shall supply and install an identical new component. If an identical component is not available, Contractor will substitute equivalent equipment, with the approval of the Owner.

D. During the course of the Guarantee period, the Contractor shall provide a minimum of three (3) service visits to the site for inspection and adjustment of equipment. Contractor shall submit proposed schedule for these visits and shall notify Owner and Systems Designer in writing at least one month in advance of each visit.

1.10 INSURANCE

A. All equipment and materials shall be fully insured against loss or damage up until acceptance of the system by the Owner or until Owner relieves the Contractor in writing of this responsibility, whichever is earlier.

1.11 EXISTING CONDITIONS
A. Visit the site prior to making a bid. No subsequent allowance will be made due to failure to thus observe and verify conditions which may affect the work. Report to the Architect and Systems Designer any discrepancies among this specification and existing conditions and similarly report obvious omissions.

1.12 DEMOLITION

A. All existing system equipment, as well as surface mounted hardware, shall be removed by the Contractor and disposed of as directed by the Owner. System components such as embedded conduit may be abandoned.
## 1.13 WORK SCOPE SUMMARY TABLE

<table>
<thead>
<tr>
<th>ITEMS TO BE PROVIDED AND INSTALLED</th>
<th>Electrical Contractor</th>
<th>Systems Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Provide</td>
<td>Install</td>
</tr>
<tr>
<td>Main Power Service Panel Boards and Circuit Breakers</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Main Power Service Conduit and Conductors</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Main Power Service Terminations</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Audio &amp; Video Technical Power (AVTP) Transformers</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Transformer Conduit and Conductors</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Transformer Terminations</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>AVTP Isolated Ground Conduit and Conductors</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Isolated Ground Terminations</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>AVTP Distribution Panelboards and Circuit Breakers</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Distribution Panelboard Conduit and Conductors</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Distribution Panelboard Terminations</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>AVTP Standard Load Centers and Circuit Breakers</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Standard Load Center Conduit and Conductors</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Standard Load Center Terminations</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>AVTP Custom Sequencing Panelboards and Circuit Breakers</td>
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<td>x</td>
</tr>
<tr>
<td>Custom Sequencing Panelboard Conduit and Conductors</td>
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<td>x</td>
</tr>
<tr>
<td>Custom Sequencing Panelboard Terminations</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>AVTP Company Switches for Portable Equipment</td>
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<td>x</td>
</tr>
<tr>
<td>Company Switch Conduit and Conductors</td>
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<td>x</td>
</tr>
<tr>
<td>Company Switch Terminations</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>AVTP Outlet Devices for Branch Circuits delivered to Systems Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Racks and Devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Rack Back Boxes and Wall Plates</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Outlet Device Back Boxes</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Outlet Device Wall Plates</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Branch Circuit Conduit and Conductors</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Branch Circuit Termination</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### WORK SCOPE SUMMARY TABLE (continued)

<table>
<thead>
<tr>
<th>ITEMS TO BE PROVIDED AND INSTALLED</th>
<th>Electrical Contractor</th>
<th>Systems Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Provide</td>
<td>Install</td>
</tr>
<tr>
<td>Systems Equipment Racks and Devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metallic Conduit between Systems Devices and Systems Equipment Racks</td>
<td>x</td>
<td>x◊</td>
</tr>
<tr>
<td>Conduit Insulation Bushings between Metallic Conduit and Systems Equipment Racks</td>
<td>x</td>
<td>x◊</td>
</tr>
<tr>
<td>Systems Equipment Rack Cabling</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Systems Equipment Rack Terminations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems Device Back Boxes and Floor Boxes</td>
<td>x◊</td>
<td>x</td>
</tr>
<tr>
<td>Systems Device Metallic Conduit</td>
<td>x</td>
<td>x◊</td>
</tr>
<tr>
<td>Systems Device Cabling</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Systems Device Termination</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Empty Conduit (for temporary use)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Systems Cable Trays</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Systems Cable Sleeves</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Systems Pull Boxes</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Conduit Riser Diagram</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

◊ Installation criteria to be provided by Systems Contractor
PART TWO - EQUIPMENT

2.01 GENERAL EQUIPMENT

A. Whenever any equipment is specified by manufacturer and model number, it is for purposes of establishing a standard of quality, performance, construction and function.

B. All materials and equipment shall be new and of the latest design or model offered for sale by the manufacturer.

C. Equipment models provided shall operate at the required AC line voltage and frequency.

D. Contractor shall provide quantities as indicated in the equipment list, detail drawings, location drawings, schedule of terminations, and as required for a complete installation.

E. Audio & Video Wire and Cable
   1. All wire numbers listed in the drawings are Belden unless otherwise noted.
   2. All THHN conductors shall be stranded.
   3. Approved manufacturers: Alpha, Belden, Canare, Corning, Gepco, Mogami, West Penn, Whirlwind

F. Electrical Wire and Cable (including grounding conductors):
   1. Where conflict exists with any codes or ordinances, such codes and ordinances shall take precedence.
   2. Where conflict exists with electrical specifications, the higher standard or more stringent requirement shall apply.

G. Wiring Devices
   1. Specifications – Duplex Receptacles
      Grade: Specification, Hubbell IG5362 or equal
      Type: NEMA 5-20R
      Color: Orange
   2. Approved Manufacturers: Waber, Wiremold, Hubbell, Bryant, GE, Leviton

H. Electrical Plates and Panels:
   1. Specifications – Rack Mount Panels
      Material: 11 gauge steel or 1/8" Aluminum, minimum thickness
      Finish: Black or to match adjacent equipment
      Size: 19" wide, standard EIA mounting hole spacing, height as specified
   2. Specifications – Back Box Enclosures
      Material: Code grade steel
      Finish: Black or galvanized
      Size: As specified
   3. Specifications – Plug Box and Termination Panels
      Material: 11 gauge steel or 1/8" Aluminum, minimum thickness
      Finish: Black (unless instructed otherwise by Architect)
      Size: As specified

I. Audio Transformers
   1. All transformers shall be selected for proper interface and loading in the circuits as required by as-built conditions and per manufacturer's recommendations.
2.02 MAJOR EQUIPMENT
   A. Equipment provided shall be that specified herein within Appendix B or approved substitute (see Paragraph 1.06.D).
   B. Detailed performance specifications shall be those published by the manufacturer effective on the date of this document for all equipment listed below.
   C. Equipment List follows this document as Appendix B (TBD)

2.03 DETAIL DRAWINGS
   A. The drawings herein detail custom built equipment and system details.
   B. Furnish all materials and labor to provide complete and finished work even though not specifically shown on the drawings.
   C. Detail drawings are located in large format drawings AV500 through AV999.
PART THREE - EXECUTION

3.01 AUDIO SYSTEM REQUIREMENTS

A. Requirements herein refer to materials and work which are related to or part of the Systems. Where conflict exists with other specifications concerning such work or materials, this specification takes precedence unless otherwise approved in writing by the Owner.

3.02 INSTALLATION OF SYSTEMS

A. Locate all apparatus requiring adjustments, cleaning or similar attention so that it will be accessible for such attention. Equipment racks shall be positioned to permit full access for operation and service.

B. Furnish and install brackets, braces and supports. Minimum fastening or support safety factor shall be at least three (3). Design shall be to the approval of the Architect.

C. All supporting structures and enclosures supplied by the Contractor not having a standard factory paint finish shall be painted. Paint specifications will be supplied by the Architect or indicated herein.

D. Provide custom color or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be approved in writing by the Architect. This does not exclude equipment or materials where standard colors and finishes may be specified herein.

E. Finish of blank panels and custom assembly panels shall match adjacent equipment panels.

F. Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched or screened. Markings for these items are detailed in the drawings to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Systems Designer prior to marking.

G. The equipment specified herein is designed to operate in environments of normal humidity, dust and temperature. Protect equipment and related wiring where extreme environmental conditions can occur.

H. The standard reference for the layout and construction of the system shall be:


3.03 CONDUIT

A. Review and coordinate Systems conduit installation with the electrical contractor to ensure proper operation of the Systems.

B. All wiring shall be in conduit unless authorized by the Architect, approved by the Systems Designer, and permitted by code. Exceptions are short runs at equipment terminations where there is no means of connecting conduit to the equipment.

C. Where installed exposed, conduits shall be parallel with or at right angles to walls or ceilings and shall be supported from walls or ceilings by means of approved galvanized iron clamps or hangers. Conduit connections to equipment racks shall be insulated.

D. Minimum size conduit shall be 3/4 inch. All conduit shall be sized for maximum 40% fill or less if required by code.
3.04 **CONDUIT SEPARATION**

Systems wiring is divided into wiring groups according to their nominal voltage levels (refer to Schedule of Terminations):

<table>
<thead>
<tr>
<th>Wiring Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
</tr>
<tr>
<td>Group B</td>
</tr>
<tr>
<td>Group C</td>
</tr>
<tr>
<td>Group D</td>
</tr>
<tr>
<td>Group E</td>
</tr>
</tbody>
</table>

Note: These wiring groups must never be intermixed within a given conduit run!

A. Minimum conduit separation between conduits carrying wiring of different groups is as follows:

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
<th>Group E</th>
</tr>
</thead>
<tbody>
<tr>
<td>adjacent</td>
<td>6&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>adjacent</td>
</tr>
<tr>
<td>Group A</td>
<td>-</td>
<td>adjacent</td>
<td>12&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>Group C</td>
<td>-</td>
<td>-</td>
<td>adjacent</td>
<td>6&quot;</td>
</tr>
<tr>
<td>Group D</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>adjacent</td>
</tr>
<tr>
<td>Group E</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Ninety degree crossings in close proximity are acceptable.

B. Minimum conduit separation between conduits carrying Systems wiring and other electrical service conduit is as follows:

<table>
<thead>
<tr>
<th>Dimmer controlled lighting</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
<th>Group E</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot;</td>
<td>12&quot;</td>
<td>6&quot;</td>
<td>12&quot;</td>
<td>adjacent</td>
<td></td>
</tr>
<tr>
<td>SCR controlled services</td>
<td>24&quot;</td>
<td>12&quot;</td>
<td>6&quot;</td>
<td>12&quot;</td>
<td>adjacent</td>
</tr>
<tr>
<td>220/440V circuits</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>adjacent</td>
<td>adjacent</td>
<td>adjacent</td>
</tr>
<tr>
<td>All other services</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>adjacent</td>
<td>adjacent</td>
<td>adjacent</td>
</tr>
</tbody>
</table>

Note: Heavy current demands in or long parallel runs with the above services may dictate greater separations to avoid interference in the Systems.

C. Contractor shall promptly inform the Systems Designer in writing of conduit installation which does not conform to these requirements.

3.05 **ELECTRICAL POWER**

A. Review and coordinate electrical power system installation including grounding with the electrical contractor to ensure proper operation of the Systems.

B. Verify that all AC power circuits designated for Systems equipment are wired with correct polarity and isolated ground. Report in writing any discrepancies found to the Architect for corrective action.

C. Provide distribution of electrical power within the equipment racks with a minimum of one spare AC receptacle for each four in use per branch circuit.

3.06 **STEEL SUPPORTS**
A. Fabricate and install any supports so that the installation does not weaken or overload the building structure. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems. No drilling or cutting of concrete beams, joists, or structural steel, nor welding to structural steel, will be permitted except as authorized, in writing, by the Architect.

3.07 BOXES
A. With the exception of portable equipment, all boxes, conduits, cabinets, equipment and related wiring shall be held in place and the mounting shall be plumb and square.

B. All boxes shall be securely mounted to building structure. All boxes shall be installed so that wiring contained in them is accessible. Install blanking devices or threaded plugs in all unused holes.

C. Wiring groups and circuits shall be isolated as indicated herein. Common pull or junction boxes are not permitted except as authorized, in writing, by the Systems Designer.

D. Clean all box interiors before installing plates, panels or covers.

3.08 WIRING METHODS AND PRACTICES
A. Provide installation of all Systems wire and cable, ensuring proper:
   1. Pulling Tensions
   2. Quantities
   3. Types
   4. Lengths
   5. Routing
   6. Wire Group Separation
   7. Identification

B. The interconnection of all equipment requiring shielded cable shall be by Belden type 9451, or equivalent, unless otherwise specified.

C. Spare wire runs of each group and type shall be pulled to each termination location. The number of spares shall be ten percent of those in actual use or one, whichever is greater.

D. Splicing of cables is not permitted between terminations of specified equipment.

E. Do not pull wire or cable through any box fitting or enclosure where change of raceway alignment or direction occurs; do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, and rollers to protect cables from excess tension, abrasion or damaging bending during installation.

F. Provide wire pulling lubricants and pulling tensions in accordance with the wire and cable manufacturer's recommendations.

G. All wires shall be permanently identified at each wire end by marking with adhesive or crimp-on markers and a chart kept of each wire's function. This applies to wire within a rack assembly as well as wire running in conduit.

H. Wire ends should be wrapped with heat shrink tubing. Each shield or drain wire should be covered with heat shrink to avoid unintentional connections.

I. Use ring or tongue lugs on all barrier strip terminals. Do not exceed two lugs per terminal. Use crimping tools which are designed for the application or solder. Do not cut strands from conductors to fit lugs or terminals. Spare terminal blocks, equivalent to 10% of those in actual use, shall be provided.
J. Form, in an orderly manner, all conductors in enclosures and boxes, wire ways and wiring troughs, providing circuit and conductor identification. Tie using tie wraps of appropriate size and type. Limit spacing between ties to six (6) inches and provide circuit and conductor identification at least once in each enclosure.

K. Provide ample service loops at each termination so that plates, panels, patch bays, and equipment can be dismounted for service and inspection.

3.09 GROUNDING

A. Audio system wiring shall conform to the following procedures:

1. Audio equipment AC ground pins shall connect to AC isolated ground.
2. Audio equipment chassis shall connect to AC isolated ground or rack frames.
3. Audio rack frames shall connect to AC isolated ground bus in panelboard by means of #2 gauge (minimum) conductor.
4. Audio shields between AC powered pieces of equipment shall be connected to ground at one end only. Capacitively terminate as required.
5. Audio signal paths between AC powered pieces of equipment shall be connected using balanced lines and/or transformer isolation as required. No unbalanced signal paths may be connected to the patch bay.
6. Isolate all Systems wiring from racks, back boxes and conduit.
7. Isolate all Systems racks from conduit and other conductive surfaces. Use insulated bushings for conduit connections and a dielectric plinth between racks and conductive flooring materials.
8. AC isolated ground system shall be isolated from all other facility grounds.

B. All metallic conduit, boxes and enclosures shall be grounded in accordance with the current National Electrical Code.

C. Metallic enclosures containing active equipment shall be grounded with due regard for the minimization of electrical noise. This may include the provision of grounding conductors separate from the AC ground.

3.10 EQUIPMENT RACKS

A. The equipment racks shall be considered as custom assemblies and shall be assembled, wired and tested in the Contractor's shop. Assembly of racks on-site will not be permitted (except for shielded microphone and line wiring which must connect directly to the patch bays).

B. Placement of equipment in equipment racks, as shown in the drawings, is for maximum operator convenience. Verify any changes in placement of the equipment with the Systems Designer before assembly.

C. Racks shall be installed plumb and square without twists in the frames or variations in level between adjacent racks.

D. All wire, cable, terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled as to their function, circuit, or system. Labeling on manufactured equipment shall be by engraved plastic laminate or by thermal printer on adhesive tape, with white lettering on black background or dark background that is similar to panel finish.

E. Provide stiffeners to custom panels to prevent panel deformation during normal plugging or switching operations.

F. All wires and cables used in assembling custom panels and equipment racks shall be formed into harnesses which are tied and supported in accordance with accepted engineering practice.
G. Harnessed cables shall be combed straight, tie-wrapped every six (6) to ten (10) inches, and attached to the structure as necessary. Each cable that breaks out from a harness for termination shall be provided with an ample service loop to permit equipment removal from the racks without disconnecting.

H. Harnessed cables shall be formed in either a vertical or a horizontal relationship to equipment, controls, components or terminations.

I. Cable shields shall be connected to the isolated ground system with due regard for ground loops. (See Giddings reference book, Chapter 10)

J. All system components and related wiring shall be located with due regard for the minimization of induced electro-magnetic and electrostatic noise, for the minimization of wiring length, for proper ventilation, and to provide reasonable safety and convenience for the operator.

K. All rack mounted equipment, with front panel controls, shall be provided with security covers to avoid tampering with preset levels. If specific security covers are not included in the equipment list, the Contractor will provide the manufacturer’s security cover for each specified device or a suitable alternate.

L. Every device shall be installed with regard for proper polarity. Absolute polarity shall be maintained through the entire Systems chain.

M. Any electronic device which is connected to the patch bay must be balanced.

3.11 INITIAL ADJUSTMENT

A. Verify all circuits and extensions for correct connection, continuity and polarity. Absolute polarity shall be maintained between all points in the system.

B. Connector polarity shall be maintained except for terminations at equipment manufactured to other standards. In the event that manufactured equipment can be ordered with, or internally set to, various standards, the equipment shall be configured as follows:

1. Polarity for XLR style connector shall be: pin 2-high, pin 3-low, and pin 1-shield.

2. Polarity for TRS style connector shall be: tip-high, ring-low, and sleeve-shield.

C. Make all adjustments and modifications so that the system is operational.

D. Make all adjustments and modifications for system gain structure per recommendations of major component manufacturers.

3.12 VERIFICATION TESTS

A. Confirm that each individual wire and cable run (whether in a rack or in conduit) is identified with a unique number. These numbers are affixed to both ends of each cable and are clearly visible. Provide a complete list of these numbers along with the termination location of each end of the wire run.

B. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. A wide band oscilloscope shall be used to verify this condition.

C. Confirm that the system is free of audible clicks, pops, and other noises when any operating control is activated, with or without input signal.

D. For all microphone lines, tie lines, return lines and effect loudspeaker lines, confirm:

1. Proper circuits appearing at each termination location

2. Proper circuits appearing at each jack bay position

3. Continuity of all conductors

4. Proper polarity is maintained
5. Absence of shorts between conductors within each circuit
6. Absence of shorts between circuit conductors and conduit

E. Confirm that loudspeakers and mountings are free of buzzes and rattles when the loudspeaker is swept with sine wave tones over its rated bandwidth at one-half (1/2) its maximum rated power.

F. For all permanently mounted loudspeaker terminations, provide impedance measurement of each pair of loudspeaker lines with all loudspeakers connected and all amplifiers disconnected. These measurements shall be documented as editable tabular data listing impedance for each 1/3 octave band from 20 Hz to 20 kHz and shall be accurate to the nearest tenth of an Ohm.

G. For all intercom terminations, confirm proper operation by initiating and receiving audio communication and call light.

H. For each installed data network cable or fiber optic cable confirm conformance to the specified TIA/EIA performance standards.

I. For all electronic devices mounted in racks and connected to patch bays, confirm:
   1. Every input and output is balanced.
   2. Proper polarity is maintained throughout the entire audio path.
   3. Tip connection of each TRS jack is connected to the positive terminal of each corresponding input or output.

K. Confirm that there are no shorts between the Neutral and Isolated Ground conductors for each clean power circuit.

3.13 VERIFICATION TEST REPORT
A. Submit written report detailing the results of Initial Adjustments and Verification Tests. Report to include, at minimum, the following:
   1. Copies of all relevant drawings, charts, test instrument data, and photographs.
   2. PDF copies of all available manufacturers’ operation and service literature for each major system component.
   3. Written certification that the installation conforms to the requirements stated herein, is complete in all respects, and is ready for inspection, testing, and tuning.

B. This report shall be completed and submitted to the Systems Designer for review a minimum of five (5) days prior to Acceptance Testing and final tuning.

3.14 ACCEPTANCE TESTING
A. Acceptance Testing shall be performed by the Systems Designer during a period designated by the Architect. Contractor shall furnish a minimum of two (2) technicians for the acceptance testing period.

B. The minimum time required for Acceptance Testing is two (2) working days of dedicated quiet for each performance venue and recording studio and two (2) days for the classroom/rehearsal room systems. Coordinate this time period so that free access, work lighting, and electrical power are available on the site.

C. Ensure that Systems areas are in a clean and orderly condition ready for acceptance testing.

D. Provide test equipment (meeting the following minimum specifications) on site, at all times during Acceptance Testing. Prior to Acceptance Testing, provide the Systems Designer with a listing of the specific equipment to be made available.
   1. Oscilloscope: 10MHz Bandwidth, Sensitivity – 1mV/cm
   2. Digital Multi-meter: 1% Accuracy
3. Function Generator: 1MHz Bandwidth, Distortion < 1%
4. Real Time Analyzer: 1/3 Octave with microphone
5. Pink Noise Source: 20 Hz – 20 kHz Bandwidth
6. Impedance Sweep Meter: 20 Hz – 20 kHz Range, 1 Ohm – 50 kOhm
7. Polarity Checker: Mic, line, or loudspeaker level

Note: Systems Designers may choose to supply their own test equipment.

E. Be prepared to verify the performance of any portion of the system by demonstration, listening tests and instrumented measurements.

F. Make additional mechanical and electrical adjustments within the scope of the work and which are deemed necessary by the Systems Designer as a result of the Acceptance Tests. This may include realigning of loudspeaker systems, changes in system gain structures, grounding, filtering or interfaces.

G. Final acceptance will be contingent upon issuance by the Systems Designer of a letter of acceptance stating that the work has been completed and is in accordance with the contract documents.

H. Contractor will bear any costs incurred for additional Systems Designer's time and expenses due to failure to have the system functioning in accordance with specification requirements at the times scheduled for Systems Designer's Acceptance Testing and tuning.

3.15 SYSTEM DOCUMENTATION

A. Within thirty (30) days of the Acceptance Testing, prepare and submit a CD-ROM of the preliminary Operation and Maintenance manual for approval by the Systems Designer. Manual to include, at minimum, the following documents in PDF format:
   1. Table of contents
   2. Written Guarantee and service policy
   3. Basic power on/off and operational procedure
   4. Copies of all shop drawings which have been updated to include any changes made during the installation process
   5. All available manufacturers’ operation and service literature for each major system component
   6. One line signal flow diagram with all cable runs and patch points identified by alpha-numeric character
   7. Copy of the Verification Test report
   8. Copy of conduit riser diagram
   9. Copy of the final tuning settings as provided by the Systems Designer

B. Systems Designer will review the above system documentation. Upon approval, Contractor shall prepare and submit to the Owner:
   1. Five (5) copies of the final Operation and Maintenance manual on CD-ROM or Flash Disk
   2. Two (2) hard copies of the final Operation and Maintenance manual printed and neatly bound

C. Provide framed copy of the as-built signal flow diagram to be mounted in the control room. This diagram shall have all cable runs and patch points identified by alpha-numeric character.

END OF SECTION 27 41 00
INTRODUCTION

This document outlines the AV system criteria for the programmed spaces for the Queen Anne Academic Center at Prince George’s Community College. This report will offer a general overview of the AV systems included within each Arts Area of the facility. Project specific solutions and details will be developed in the coming phases as the design progresses, and included as part of the Construction Documents.

The AV systems have been designed from programming documentation and discussion with the end users, providing a highly flexible yet easy to use series of systems. These systems are designed to operate 24 hours a day, 7 days a week, and to facilitate continuous and simultaneous use of the entire Queen Anne Academic Center, be it for performance or pedagogic need.

To facilitate understanding, the document is broken down into sections as per the Programming documents. These sections are as follows:

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<td>Public, General Educational &amp; Conferencing Spaces</td>
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<td>6.</td>
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<td>7.</td>
<td>Theatre+</td>
</tr>
<tr>
<td>8.</td>
<td>TRF – Television Radio &amp; Film</td>
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</tbody>
</table>

*Dance Studios & Changing Rooms are part of Alternate A, but their descriptions are included herein for clarity.

+ The trap room fitout of the Proscenium Theatre is part of Alternate B, but the descriptions are included herein for clarity
1 - FACILITY WIDE SYSTEMS

The Queen Anne Academic Center is designed as a fully integrated facility for the visual, performing, audio and broadcast arts. To achieve this goal, many of the AV technical systems are interconnected, allowing fluid exchange of audio and video material for performance and pedagogical use. Systems that overlap operation, as well as systems that bridge performance venues in front-of-house and back-of-house areas are described below:

**Isolated Ground for AV systems**

All audio and video systems are powered by a separate Audio & Video Technical Power system (AVTP) to ensure noise-free operation. The AVTP system runs on a dedicated transformer and all associated outlets utilize dedicated isolated ground wires and hospital-grade outlets. The AVTP system is used only for audio and video equipment. The AVTP System also includes stage disconnects (company switches) in major performance spaces to facilitate outside events. Design of system and location of transformer (and if it is several) to be coordinated with the EE.

**Video Transport & Matrix System**

The Queen Anne Center features a Video transport and matrix system allowing staff and users a flexible and efficient approach to routing media feeds around the facility, for production, education or broadcast use. The system is designed to minimize the number of physical patches necessary for efficient operation, allowing more ease of use and higher operational efficiency by the users. The system uses a series of video input and output devices connected by a redundant fiber-optic ring. Interconnections are achieved through a control software, digitally connecting or disconnecting feeds from and to any room within the Center. Several of the key features are as follows:

- **Broadcast Use** – Each of the designated performance spaces allow portable HD cameras to be patched into the video matrix fiber ring. From the Matrix, each video and audio feed can be routed to the Central Command Center, allowing live Broadcast to campus-wide, or local access broadcast areas.
- **Archival Use** – The video and audio feeds from individual halls can also be recorded for live-to-tape, or for editing.

**Digital Intercom & Program/Page Matrix**

Communication is key for the creation of performance or visual art. The QAAC uses a state of the art digital intercom matrix to allow art makers an efficient, instantaneous ability to connect with other artists through multi-channel communication among technical operating personnel using headsets with boom-mounted microphones. Station and plugin ports are provided for all technical operating positions on the stages, and in booths and backstage support areas. Although each performance space has individual channels of intercom for their respective productions, the system can also combine communication needs between rooms, allowing the Arts Center to operate collaboratively – all at once, or in specified zones. Wireless capabilities are also included, allowing flexible and mobile communication needs in each performance space and support space.

The Intercom Matrix also controls all back of house program and page needs, providing support spaces (control rooms, shops, green & dressing rooms, etc) real time audio monitoring of activities taking place within the performance halls. The volume of the program feed can be adjusted locally, however a priority page system is in place to ensure any and all announcements or calls by the stage management team will be heard by the artists. For those support spaces that serve multiple performance halls, a key-locked local selector switch is provided allowing personnel to choose which feed is appropriate for the space at that time.

**Portable Equipment (FF&E)**

The Queen Anne Academic Center contains a great deal of portable equipment for performance AV use in the various halls. Much of this equipment is quite similar in nature and operation. Portable equipment is intended to be assigned to specific areas/rooms, however the operation of the facility relies on the sharing...
of certain types of equipment when areas/disciplines/halls are not in simultaneous use. This is done to provide the most efficient portable equipment solution for PGCC, and limit the amount of doubling up required.
2 - PUBLIC, GENERAL EDUCATIONAL & CONFERENCING SPACES

Lobby
Lobbies for performance spaces include monitoring capability (audio and video) to the adjacent performance hall, along with house manager page abilities. Video displays for digital signage, and latecomer show-relay are positioned adjacent to each performance space. Each lobby also has the ability to patch in and out of the Queen Anne Center AV system from facilities panels through the Central Command Center, although no stand-alone AV systems are planned for these spaces.

Front-of-House Support
The front-of-house support spaces have production intercom capabilities and selectable program and page feeds from the performance venues, allowing staff to monitor and communicate with backstage and stage management personnel as required. Designated front-of-house support spaces are as follows:
- Box Office
- Scheduling / Facility Director Office
- Coat Room
- Production & Technical Director Offices

Catering / Warming Kitchen
The catering prep kitchen has program feeds from the Flexible Instructional & Performance Spaces, allowing staff to monitor the activities within these rooms.

Flexible Instructional & Performance Spaces
The Flexible Instructional & Performance spaces are flexible, ballroom style rooms with operable partitions for breakout capabilities. Although portable equipment is intended for use in breakout mode, each flexible space has the following installed equipment:
- Flexible conference style audio system with ceiling mounted loudspeakers that can be zoned as necessary for spoken word, playback, and background music.
- Connections to the Central Command Center for audio and video patching

General Education Classrooms
Each of the general education classrooms contains technology as per PGCC Smart Classroom standards.

Conference Rooms
The conference rooms are outfitted with technology consistent with other smart conference rooms in modern PGCC buildings.
The following functional description encompasses a complete, new AV system within Hallam Theatre.

Performance Audio System
The audio system is designed to fill multiple requirements – subtle voice lift for lectures and drama, moderately higher outputs for reinforced music, full-bandwidth audio for cinema screening and controlled vocal imaging and sound effects for musical theater.

- Left/center/right (“LCR”) main loudspeakers are installed above and around the proscenium to provide the majority of sound to the audience. The loudspeaker system is based around three identical line-source arrays.
- Supplemental loudspeakers extend the reach and frequency content of the LCR arrays. Typically these supplemental loudspeakers are from the same manufacturer as the main arrays to help facilitate uniform voicing.
  - Left and right subwoofers extend low-frequency content for music and effects. These are integrated with the main left and right arrays.
  - Small loudspeakers along the orchestra pit rail provide imaging and intelligibility in the first few rows of seating. These speakers will transition between the stage face and the orchestra pit lift to accommodate multiple configurations.
  - Over-audience fills ensure uniform coverage at the margins of the main array coverage.
- Connections for surround-sound effects and monitor loudspeakers are provided around the stage and orchestra pit, in the catwalks and around the seating areas. These are used to connect portable loudspeakers, as needed.
- Connections for microphones and other input devices are provided around the stage and in the catwalks.
- A mixing area will be located in the audience chamber at the rear of the seating areas. This allows for in-house mixing of audio-critical shows (musical theatre and popular music events) with minimal loss of seats or sightline issues.

Hearing Assistance System
This system transmits stage sound or other selected program material by means of infrared or radio frequency carrier to individual receivers provided for the hearing impaired. Alternate uses of the infrared system include transmission of a second language or of audio descriptions for the sight impaired.

Intercom System
The system will have the capabilities and connections available to the overall Digital Intercom Matrix for the Queen Anne Center as described in the Facility Wide Systems section of this document.

Live Room Microphone System
A stereo microphone suspended in the audience chamber picks up signals from all performances, both amplified and unamplified. Signals from this source are distributed to a number of auxiliary systems, including hearing assistance, intercom, and the Program/Page Matrix. In addition, this source can be used to feed an archival recording system.

Performance & Production Video
Video functions include lecture projection use (such as PowerPoint), digital video, cinema, archival recording, and local-access broadcast.

- A semi-permanent screen is flown from a stage batten.
- A primary projector is mounted at the rear of the theater for high-resolution video playback, primarily for cinema and lecture use.
- A permanent high-resolution camera is provided mounted to a catwalk, along with a lower-resolution camera capable of infrared imaging.
- Connections for portable video (for temporary displays and camera locations) are provided around the stage and orchestra pit, in the catwalks and around the seating areas. These are used to connect portable devices, as needed.
- Interconnections will be available to connect video and broadcast feeds to and from the Central Command Center.

**Theater Booth and Rack Rooms**

- The control booth houses live mixing and playback equipment, including:
  - A medium format digital mixing console. This console can be relocated to the house mix position (see above) when needed.
  - Playback and recording on CD as well as hard-disk based effects playback.
  - The primary patch-bays used to interconnect the various input and output locations around the theater.
  - Booth audio, including monitoring for the audio and lighting operators and the stage manager.
- An audio rack room is provided for:
  - The digital signal processors (“DSP”) used to time align, “tune” and control the main loudspeaker systems. These devices are selected for compatibility with the primary mix console and loudspeakers.
  - Control and processing for the auxiliary systems, which includes ADA-compliant listening assistance, production intercom and backstage and lobby program and paging systems (see also below).
  - The video distribution and patching systems.
  - Amplifiers for the main and auxiliary audio systems.

**Hallam Theater Loose Equipment**

Wired and Wireless Microphones, DI boxes, cables, stands, effects loudspeakers and monitor wedges appropriate to the program are provided.

**Dressing/Changing Rooms**

Each of the Hallam dressing rooms contains selectable program/page feeds from the Hallam Theatre, as well as selectable feeds from the other performance spaces as required. This system provides audio relay of activities taking place within the halls, and can accept stage manager page, as discussed in section Facility Wide Systems of this document.
The Art Gallery of the Queen Anne Center is used as an exhibition space for student and outside work. It also serves as an extension to the lobby, and place for small receptions.

**Performance Audio Systems**

The Art Gallery includes an installed audio system to be used for presentations, light background music, and local announcements.

- Ceiling / Grid mounted loudspeakers provide primary coverage to the Gallery.
- A permanently installed wireless microphone system allows several channels of reinforcement for quick setup and tear down of presentations.
- System can be adjusted to allow “quiet zones” for specific locations during media-driven installations.
- Audio infrastructure is provided to allow portable audio equipment to be set up for specific art installations or presentations. Although the equipment is considered temporary in nature, the infrastructure is designed so as to provide as installed a look as possible when deployed.
- Full connectivity to the Central Command Center is provided, allowing the Gallery to send and receive media information from other spaces within the Queen Anne Academic Center.

**Performance Video Systems**

The Art Gallery includes an installed video system to be used for presentations.

- An installed, ceiling-mounted projection screen is provided in a presentation zone.
- Video infrastructure is provided throughout the Gallery on facilities panels to allow portable equipment (flat-panel displays; projectors; etc) to be set up for specific art installations or presentations. Although the equipment is considered temporary in nature, the infrastructure is designed so as to provide as installed a look as possible when deployed.
- Full connectivity to the Central Command Center is provided, allowing the Gallery to send and receive media information from other spaces within the Queen Anne Academic Center.

**Control Rack**

A control rack is provided within the Gallery Storage space. This rack houses control & AV playback equipment, including:

- A small format digital mixing console with automixing capabilities.
- Digital Signal Processing & Amplifier for loudspeakers
- CD player
- Blu-ray player
- Patch bays for connection of sources to facilities panels for presentation or art installation.
- Empty rack space for secure mounting of additional equipment installed for temporary arts installations.
ADD-ALTERNATE NOTE

The Dance Studio fit-out is included as Alternate A. At minimum, the Dance Studios shall be fit with conduit paths from projected rack positions, back to the nearest major rack room within the Queen Anne Center. Also, conduits to Changing Rooms will be included, however no infrastructure will be fit-out within the studios themselves.

The following functional description encompasses Add-Alternate A. The Queen Anne Center contains dance facilities for instructional, rehearsal, and performance use. The Dance Center consists of two dance studios, changing rooms, and support spaces.

Dance Studio 1

Dance Studio 1 is a 2400 sq foot studio serving firstly as the primary instructional studio for all dance activities at PGCC. In addition, the space is outfitted for performance use.

Performance Audio System

The audio system is designed to be a high impact, high fidelity system for dance instructional use, and contains the following equipment:

- Left / Right ("LR") main loudspeakers positioned on one wall, providing even SPL throughout the room. These loudspeakers are the primary loudspeakers for instructional use, and serve as stage monitor speakers in performance.
- Supplemental subwoofers located in the grid area to increase the overall bandwidth of the sound system.
- Auxiliary LR Audience loudspeakers positioned in the grid areas, providing sound reinforcement to the audience areas.
- Audio infrastructure is provided to allow portable audio equipment to be set up for specific presentations or for performance needs.
- Full connectivity to the Central Command Center is provided, allowing the Studio to send and receive media information from other spaces within the Queen Anne Academic Center.

Performance Video System

The installed video system is intended for instructional use with infrastructure available for portable video requirements. The system contains the following equipment:

- An installed, ceiling-mounted electric roller projection screen positioned on the instructor wall of the space.
- An installed, ceiling-mounted projector – this projector is mounted on a lift to protect it from damage when not in use.
- Video infrastructure is provided throughout the Studio on facilities panels to allow portable equipment (flat-panel displays; projectors; cameras; etc) to be set up for specific performance needs.
- Full connectivity to the Central Command Center is provided, allowing the Studio to send and receive media information from other spaces within the Queen Anne Academic Center.

Hearing Assistance System

This system transmits stage sound or other selected program material by means of infrared or radio frequency carrier to individual receivers provided for the hearing impaired. Alternate uses of the infrared system include transmission of a second language or of audio descriptions for the sight impaired.
Intercom System
In addition to providing local intercom support for performances, the intercom system will have the capabilities and connections available to the overall Digital Intercom Matrix for the Queen Anne Center as described in the Facility Wide Systems section of this document.

Live Room Microphone System
A stereo microphone suspended studio picks up signals from all performances, both amplified and unamplified. Signals from this source are distributed to a number of auxiliary systems, including hearing assistance, intercom, and the Program/Page Matrix. In addition, this source can be used to feed an archival recording system.

Control Rack
A wall-mounted control rack is provided at one corner of the instructor wall. This rack houses control & AV playback equipment, including:

- A small format mixing console.
- Digital Signal Processing & Amplifier for loudspeakers
- CD player
- Blu-ray player
- Patch bays for connection of sources to facilities panels for portable equipment connections.

Dance Studio 2
Dance Studio 2 is an 1800 sq foot studio serving primarily as a dance instructional studio.

Instructional Audio System
The audio system is designed to be a high impact, high fidelity system for dance instructional use, and contains the following equipment:

- Left / Right (“LR”) main loudspeakers positioned on one wall, providing even SPL throughout the room.
- Supplemental subwoofers located in the grid area to increase the overall bandwidth of the sound system.
- Full connectivity to the Central Command Center is provided, allowing the Studio to send and receive media information from other spaces within the Queen Anne Academic Center.

Instructional Video System
The installed video system is intended for instructional use with infrastructure available for portable video requirements. The system contains the following equipment:

- An installed, ceiling-mounted electric roller projection screen positioned on the instructor wall of the space.
- An installed, ceiling-mounted projector – this projector is mounted on a lift to protect it from damage when not in use.
- Full connectivity to the Central Command Center is provided, allowing the Studio to send and receive media information from other spaces within the Queen Anne Academic Center.

Control Rack
A wall-mounted control rack is provided at one corner of the instructor wall. This rack houses control & AV playback equipment, including:

- A small format mixing console.
- Digital Signal Processing & Amplifier for loudspeakers
- CD player
- Blu-ray player
- Patch bays for connection of sources to facilities panels for portable equipment connections.

**Changing Rooms**

The Dance Changing, Locker, & Shower rooms contain program and page feeds from Dance Studio 1. These support spaces can be re-patched to accept program feeds from other performance spaces within Queen Anne Academic Center.

**Dance Department Loose Equipment**

Wired and Wireless Microphones, DI boxes, cables, stands, effects loudspeakers and monitor wedges; portable video equipment; portable musical instruments; and other equipment appropriate to the program are provided.
Band & Choral Rehearsal Rooms; Percussion, Music Technology & Piano Labs; General Music Classrooms

The Music rehearsal rooms, General Classrooms and Labs are specialty classrooms, and contain Smart Classroom technology as per PGCC Standards. In addition, each of the rehearsal / Lab spaces contain critical listening and projection equipment appropriate to the size and programming of the room as follows:

Critical Listening System
The audio system is designed to provide critical listening to archival and mastered audio tracks. In addition, it provides audio playback for the projection system:

- Left / Right ("LR") main loudspeakers flown from the front wall of the space. These loudspeakers will provide high impact, accurate, studio grade sound for critical listening activities.
- Connections will be available to provide patching each room to and from the Central Command Center; Recital Hall Control Booth; and Radio / Music Production Suite Control Room.

Classroom Video
Video functions include classroom and lecture projection use (such as PowerPoint), digital video and cinema playback:

- A motorized rollup screen is mounted in the ceiling.
- A primary projector is mounted on a projection lift within the ceiling.

Control Rack
A control rack is provided housing control & playback equipment, including:

- A small format digital mixing console.
- Playback and recording on CD and hard-disk.
- Blu-ray player
- Connections for outside video (such as cameras, playback devices, and laptops)
- Control panel for classroom systems
- Amplifiers for the main audio systems.

Music Department Loose Equipment
Wired and Wireless Microphones, DI boxes, cables, stands, effects loudspeakers and monitor wedges; portable video equipment; portable musical instruments; and other equipment appropriate to the program are provided.
7 - THEATRE

Proscenium Theatre

Performance Audio System
The audio system is designed to fill two primary requirements – playback of sound effects for theatrical productions and reinforcement of performers in production as required. Additionally, the system is setup to provide reinforcement and playback assistance for classroom and presentation use, with very little change-over need. The audio system contains the following equipment:

- Left / Center / Right (“LCR”) main loudspeakers that can be flown in various positions around the prosenium arch, allowing the system to be designed to suit the needs of the production.
- Supplemental loudspeakers extend the reach and frequency content of the LR arrays. Typically these supplemental loudspeakers are from the same manufacturer as the main arrays to help facilitate uniform voicing.
  - Subwoofers extend low-frequency content for music and effects. These are integrated with the main left and right arrays.
  - Small portable loudspeakers along the stage edge provide imaging and intelligibility in the first few rows of seating during productions requiring reinforcement.
- Connections for surround loudspeakers are provided around the audience area. These are used to connect portable loudspeakers, as needed to suit the production sound design requirements.
- Connections for monitor loudspeakers are provided around the stage area. These are used to connect portable loudspeakers, as needed to suit the production sound design requirements.
- Connections for microphones and other input devices are provided around the stage and in the house.
- A temporary mixing connection will be provided in a designated area at the rear of the house. This allows for in-house mixing of audio-critical shows.

Hearing Assistance System
This system transmits stage sound or other selected program material by means of infrared carrier to individual receivers provided for the hearing impaired. Alternate uses of the infrared system include transmission of a second language or of audio descriptions for the sight impaired.

Intercom System
Along with local intercom capabilities, the system will have the capabilities and connections available to the overall Digital Intercom Matrix for the Queen Anne Center as described in the Facility Wide Systems section of this document.

Live Room Microphone System
A microphone suspended in the audience chamber picks up signals from all performances, both amplified and unamplified. Signals from this source are distributed to a number of auxiliary systems, including hearing assistance, intercom, lobby, and the Program/Page matrix.

Performance & Production Video
Video functions include performance and lecture projection use (such as PowerPoint), digital video, cinema, and local-access broadcast.

- A fixed screen is provided to be flown from a batten as needed.
- A primary projector is mounted at the rear of the hall for high-resolution video playback, for both production and lecture use.
- A permanent high-resolution camera is provided mounted to a catwalk, along with a lower-resolution camera capable of infrared imaging.
- Connections for portable video (for temporary displays and camera locations) are provided around the stage and orchestra pit, in the catwalks and around the seating areas. These are used to connect portable devices, as needed.
- Interconnections will be available to connect video and broadcast feeds to and from the Central Command Center, and Campus Broadcast Facilities through use of the Video Transport & Matrix System as described in the Facility Wide Systems section of this document.

**Control Booth and Rack Rooms**

- The control booth houses live mixing and playback equipment, including:
  - A small format digital mixing console. This console can be relocated to the house mix position when needed.
  - Playback and recording on CD and hard-disk.
  - The primary patch-bays used to interconnect the various input and output locations around the theater.
  - Booth audio, including monitoring for the audio and lighting operators and the stage manager.
- An audio rack room is provided for:
  - The digital signal processors (“DSP”) used to time align, “tune” and control the main loudspeaker systems. These devices are selected for compatibility with the primary mix console and loudspeakers.
  - Control and processing for the auxiliary systems, which includes ADA-compliant listening assistance, production intercom and backstage and lobby program and paging systems (see also below).
  - The video distribution and patching systems.
  - Amplifiers for the main and auxiliary audio systems.

**Proscenium Theatre Loose Equipment**

Wired and Wireless Microphones, DI boxes, cables, stands, effects loudspeakers and monitor wedges appropriate to the program are provided.

**Blackbox Theatre**

Blackbox Theatres have unique requirements due to the flexibility required for productions presented in different arrangements. As such, the loudspeakers and video projection equipment is loose and portable, allowing the artists to position and connect the equipment to suit the needs of that particular production. To facilitate this flexibility, AV facilities panels are located throughout the stage deck and catwalk areas, providing identical infrastructure to any arrangement required by the production.
The Blackbox Theatre within the Queen Anne Center will serve the needs of the Theatre and Music departments, providing a performance space with variable acoustics, suitable for any performance by these departments.

**Performance Audio System**
The audio system is designed chiefly to provide playback of sound effects for theatrical productions. Additionally, the system is setup to provide reinforcement and playback assistance for classroom and presentation use, with very little changover need. The audio system contains the following equipment:

- Portable Main loudspeakers that can be flown in various positions within the room, allowing the system to be designed to suit the needs of the production.
- Supplemental loudspeakers extend the reach and frequency content of the main loudspeakers. Typically these supplemental loudspeakers are from the same manufacturer as the main arrays to help facilitate uniform voicing.
  - Subwoofers extend low-frequency content for music and effects.
- Connections for surround loudspeakers are provided around at every AV facilities panel. These are used to connect portable loudspeakers, as needed to suit the production sound design requirements.
- Connections for microphones and other input devices are provided at each AV facilities panel.
- A temporary mixing connection will be provided in a designated area of the stage deck. This allows for in-house mixing of audio-critical shows.

**Hearing Assistance System**
This system transmits stage sound or other selected program material by means of infrared carrier to individual receivers provided for the hearing impaired. Alternate uses of the infrared system include transmission of a second language or of audio descriptions for the sight impaired.

**Intercom System**
Along with local intercom capabilities, the system will have the capabilities and connections available to the overall Digital Intercom Matrix for the Queen Anne Center as described in the Facility Wide Systems section of this document.

**Live Room Microphone System**
A microphone suspended in the audience chamber picks up signals from all performances, both amplified and unamplified. Signals from this source are distributed to a number of auxiliary systems, including hearing assistance, intercom, lobby, and the Program/Page matrix.

**Recording Microphone System**
To accommodate music performance recording, several studio-quality microphones are suspended in the theatre to pick up the sound of performances for archival and critical recording purposes. Signals from these sources will route to archival recording equipment within the booth. These signals can also be routed to the Central Command Center, and Radio / Music Production Suite Control room for more advanced recording and editing purposes.
Performance & Production Video

Video functions include performance and lecture projection use (such as PowerPoint), digital video, cinema, and local-access broadcast.

- A folding fixed screen is provided to be flown or positioned on legs as required.
- A portable projector is provided to be positioned as required for the needs of the production.
- A permanent high-resolution camera is provided mounted, along with a lower-resolution camera capable of infrared imaging.
- Connections for portable video (for temporary displays and camera locations) are provided at each AV facilities panel, in the catwalks and around the stage deck. These are used to connect portable devices, as needed.
- Interconnections will be available to connect video and broadcast feeds to and from the Central Command Center, and Campus Broadcast Facilities through use of the Video Transport & Matrix System as described in the Facility Wide Systems section of this document.

Control Booth and Rack Rooms

- The control booth houses live mixing and playback equipment, including:
  - A small format digital mixing console. This console can be relocated to the house mix position when needed.
  - Playback and recording on CD and hard-disk.
  - The primary patch-bays used to interconnect the various input and output locations around the theater.
  - Booth audio, including monitoring for the audio and lighting operators and the stage manager.
- An audio rack room is provided for:
  - The digital signal processors (“DSP”) used to time align, “tune” and control the main loudspeaker systems. These devices are selected for compatibility with the primary mix console and loudspeakers.
  - Control and processing for the auxiliary systems, which includes ADA-compliant listening assistance, production intercom and backstage and lobby program and paging systems (see also below).
  - The video distribution and patching systems.
  - Amplifiers for the main and auxiliary audio systems.

Blackbox Theatre Loose Equipment

Wired and Wireless Microphones, DI boxes, cables, stands, effects loudspeakers and monitor wedges appropriate to the program are provided.

Theatre Support Spaces

Dressing/Changing Rooms

Each of the dressing rooms contains selectable program/page feeds from the Proscenium Theatre, Blackbox Theatre, Lab 1, and Hallam Theatre. This system provides audio relay of activities taking place
within the halls, and can accept stage manager page, as discussed in section Facility Wide Systems of this document.

**Green Rooms**
The Green Room spaces have production intercom capabilities and selectable program and page feeds from designated Theatre performance spaces, allowing flexible use for any event taking place within the Queen Anne Center. The Green Rooms also have video displays able to show video relay feeds from each designated performance space, or any space within Queen Anne Center through the Central Command Center.

**Costume Shop Suite**
The Costume Shop spaces have production intercom capabilities and selectable program and page feeds from designated Theatre performance spaces (Proscenium, Blackbox, Lab1, Hallam), allowing flexible use for any event taking place within the Queen Anne Center. Spaces to be included are: Costume Shop, Costume Fitting Room, Costume Shop Storage, Wardrobe/Laundry Room, and Costume Shop Office.

**Scene & Electrics Shop Suite**
The Scene and Electrics Shop spaces have production intercom capabilities and selectable program and page feeds from designated Theatre performance spaces (Proscenium, Blackbox, Lab1, Hallam), allowing flexible use for any event taking place within the Queen Anne Center. Spaces included are: Electrics Shop (must have multiple Intercom positions, for sound and lights), Scene Shop, Scene Shop Storage, Scene Shop Office.

**Ancillary Space**
Any storage space located adjacent to a performance space have production intercom capabilities and selectable program and page feeds from designated Theatre performance spaces, allowing flexible use for any event taking place within the Queen Anne Center. These capabilities allow for potential overflow/backstage/quickchange/crossover space requirements.

**Theatre Instructional Classrooms**

**Instructional Lab 1 (TET LAB 1)**
The Practical Lab 1 contains a flexible and portable AV system, with numerous connections points located throughout the pipe grid and stage deck levels. The system will be completely portable in nature, with potentially a fixed equipment rack located within the room. This room is intended to primarily be an instructional space.

**Instructional Lab 2**
Instructional Lab 2 is a design studio for the classroom style instruction of theatre technology. This classroom features Smart Classroom technology as per PGCC standards, as well as contains student computer workstations, and critical listening and video capabilities:

**Critical Listening System**
The audio system is designed to provide critical listening to sound effects. In addition, it provides audio playback for the projection system

- Left / Right (“LR”) main loudspeakers flown from the front wall of the space. These loudspeakers will provide high impact, accurate, studio grade sound for critical listening activities.
- Connections will be available to provide patching each room to and from the Central Command Center; Proscenium Control Room; Blackbox Control Room; Lab 1 Rack.
Classroom Video

Video functions include classroom and lecture projection use (such as PowerPoint), digital video and cinema playback.

- A motorized rollup screen is mounted in the ceiling.
- A primary projector is mounted on a projection lift within the ceiling.

Control Rack

A control rack is provided housing control & playback equipment, including:

- A small format digital mixing console.
- Playback and recording on CD and hard-disk.
- Blu-ray player
- Connections for outside video (such as cameras, playback devices, and laptops)
- Control panel for classroom systems
- Amplifiers for the main audio systems.

Instructional Lab 3 (Makeup)

Instructional Lab 3 is a working instructional studio for the makeup arts. In addition, this room serves as the primary makeup room for production use within the Theatre performance halls. This classroom features Smart Classroom technology as per PGCC standards.

Theatre Department Loose Equipment

Wired and Wireless Microphones, DI boxes, cables, stands, effects loudspeakers and monitor wedges; portable video equipment; intercom beltpacks and headsets; and other equipment appropriate to the program are provided.
Television News Broadcast Lab & Control Room

The Television Broadcast Lab is used primarily for students’ practical application of the video broadcast arts. The space is a working, professional level instructional lab with state of the art broadcast tools and equipment matching the equipment located in the primary campus broadcast production suite.

- Broadcast camera infrastructure to connect camera equipment to control and switching equipment within the control room
- Audio tie lines for wired audio needs
- Wireless microphone and IFB equipment
- Control room has direct link to Central Command Center for local distribution and patching to Campus Master Broadcast Center (off-site)

Rack

The Television Production Suite contains a rack room for the stable and quite operation of Broadcast equipment. This room also contains patching capabilities to the Central Command Center.

Radio Broadcast Labs

The Radio Broadcast labs serve primarily for students’ practical application of the radio broadcast arts. In addition, these labs operate as the studio spaces for PGCC’s two radio stations (one Streaming, one over-the-air). The spaces and equipment allow for independent studio operation (2 studios), as well as linking capabilities for a control room / producer driven radio environment.

Radio Broadcast Studio Equipment

The Radio Broadcast equipment is of professional quality to current industry standards.

- Audio mixing console specialized for Radio Broadcast use in each studio
- Networked master console in Control Room for larger radio – producer style operations.
- Automation computers and software for efficient radio station operation
- Broadcast quality microphones and playback equipment
- Commentary panels for use by guests and show hosts in a producer-driven radio show environment.
- Intercommunication capabilities with other spaces (TRF and beyond) for potential live radio broadcast from any performance space within the facility

Rack Room

The Radio Broadcast Production Suite contains a rack room for the stable and quite operation of recording equipment. This room also contains patching capabilities to the Central Command Center.

Radio / Music Production Suite

The Radio / Music Production Suite servers as an instructional audio recording studiolab, allowing students to create, edit, manipulate, and produce audio art for classroom work or broadcast. The space also has connections to the Central Command Center and all other performance spaces, allowing live recording in a studio grade control room.

Live Room
The Live room of the Radio/Music Production Suite is used for the live recording of instruments, voiceovers, sound effects, and musical ensembles. The space features three Isolation Booths for selective recording.

**Control Room**
The Control Room of the Radio/Music Production Suite contains the control, mixing, and processing equipment for the Suite and contains the following:

- Recording Console of Studio Grade
- Hard-disc based Recording software
- Out-board processing and recording equipment
- Microphones and accessories to complement a recording studio
- Patch bays for interconnection of audio signals from the Live room.
- Intercommunication capabilities with other spaces (TRF and beyond) for recording from any performance space within the facility

**Rack / Tape Room**
The Radio/Music Production Suite contains a rack room for the stable and quite operation of recording equipment. This room also contains patching capabilities to the Central Command Center.

**Tech Center – Equipment room & Engineering area**
The Equipment and Engineering rooms serve as storage, distribution, and repair points for loaner equipment issued to students for instructional use. This space also contains access to the Whisper Rooms – portable isolation modules for student recording project use.

**Mass Communication Lab**
The Mass Communication Lab is a technical, computer based lab for instructional and student use of programs and equipment of the Television Radio & Film Program. Equipment for the student workspaces is not part of this document. Instructional equipment conforms to PGCC Smart Classroom standards for instruction, and contains the following specialty equipment:

**Critical Listening System**
The audio system is designed to provide critical listening to sound effects. In addition, it provides audio playback for the projection system

- Left / Right (“LR”) main loudspeakers flown from the front wall of the space. These loudspeakers will provide high impact, accurate, studio grade sound for critical listening activities.
- Connections will be available to provide patching each room to and from the Central Command Center; Proscenium Control Room; Blackbox Control Room; Lab 1 Rack.

**Classroom Video**
Video functions include classroom and lecture projection use (such as PowerPoint), digital video and cinema playback.

- A motorized rollup screen is mounted in the ceiling.
- A primary projector is mounted on a projection lift within the ceiling.

**Control Rack**
A control rack is provided housing control & playback equipment, including:
- A small format digital mixing console.
- Playback and recording on CD and hard-disk.
- Blu-ray player
- Connections for outside video (such as cameras, playback devices, and laptops)
- Control panel for classroom systems
- Amplifiers for the main audio systems.

**Central Command Center**

The Central Command Center serves as the primary routing point for all Performance Audio & Video interconnections throughout the Queen Anne Academic Center. Permanent and temporary feeds are routed into this room, for additional distribution, production, broadcast or recording use. The heart of this system is the Digital Video Transport and Matrix, described in the Facilities Wide Systems section. The Command Center consists of the following equipment:

- Production switchers for the monitoring and processing of signals from the halls
- Flat-panel displays to show current views and preview/program displays
- Recording decks (VTR) for editing or Live-to-tape recording
- Computers for the monitoring and control of the Video Transport Matrix and Digital Intercom Matrix.

**Rack Room**

The Central Command Center has an adjacent Rack Room containing the head-end equipment for all Facility Wide systems, as well as patch bays for the physical interconnection of spaces as necessary. This space also contains a physical connection to the Campus Broadcast Center (off site).

**TRF Loose Equipment**

The Television Radio & Film Program has loose/portable equipment as required for the program. This equipment will be similar in manufacturer and grade to the current PGCC TRF equipment inventory.

END OF 27 41 00 - APPENDIX A
SECURITY
281300 – Electronic Access Control
283200 – Video Surveillance
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE OF WORK
   A. This section includes the minimum requirements for equipment and installation of an Access Control System (ACS) and associated hardware in the Queen Anne Academic Center at The Prince George’s Community College (PGCC). The College currently uses the BASIS V system.
   B. Contractor shall provide all readers, reader interfaces, access control panels, and all other hardware and software necessary to provide a full, complete and functioning system.
   C. Contractor shall provide all licenses required by any manufacturer in order to provide a fully functioning system.

1.03 QUALITY ASSURANCE
   A. All equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Specification shall be subject to the control and approval of the Owner’s Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based on the acceptable manufacturers listed.
   B. Materials and work specified herein shall comply with the applicable requirements of:
      1. Underwriters Laboratory or equivalent
      2. Federal Communications Commission
      3. National Electric Code (NEC)

1.04 WARRANTY
   A. All materials and workmanship shall be warranted to be free from defects for a period of two (2) years following acceptance by the owner.
   B. If within two (2) years after the date of final acceptance of the installation, any of the work or equipment is found to be defective or not in compliance with the Contract Documents, the Contractor shall correct it promptly including all parts and labor.
   C. The Owner shall give notice to the Contractor of any defects promptly after the discovery of any defective condition.
   D. These obligations shall survive termination of the construction contract.

1.05 SUBMITTALS
   A. Submit manufacturers' data sheets for proposed systems, and equipment.
   B. Submit manufacturers' instructions for storage, handling, protection, examination, preparation, operation, and installation of all products. Include any application conditions or limitations of use stipulated by any product testing agency.
   C. Submit all applicable Material Safety Data Sheets.
   D. Submit a detailed bill-of-materials listing all manufacturers, part numbers, and quantities that the Bidder proposes to use in this project.
PART 2 – PRODUCTS

2.01 GENERAL

A. All access control system components shall be part of the existing BASIS V system. Contractor shall furnish all license upgrades required to accommodate the equipment furnished under this contract.

B. Materials and Equipment: Units of the same type of equipment shall be products of a single manufacturer. All material and equipment shall be new and currently in production. Each major component of equipment shall have the manufacturer's model and serial number in a conspicuous place. Equipment shall conform to UL 294 and UL 1076.

C. Enclosures: System enclosures shall be metallic as shown.
   1. Interior Terminal Device: All terminal devices to be used in an interior environment shall be housed in an enclosure that provides protection against dust, falling dirt, and dripping non-corrosive liquids.
   2. Exterior Terminal Device: All terminal devices to be used in an exterior environment shall be housed in an enclosure that provides protection against conditions as specified under UL 294 performance requirements for outdoor use equipment, and shall be undamaged by the formation of ice on the enclosure.
   3. Interior Electronics: All system electronics to be used in an interior environment shall be housed in enclosures meeting the requirements of NEMA 250 Type 12.
   4. Exterior Electronics: All system electronics to be used in an exterior environment shall be housed in enclosures meeting the requirements of NEMA 250 Type 4. Enclosures exposed to direct sunlight shall be finished with white polyester powder coating; and shall be equipped with a sunshield finished to match the enclosure. Sunshield shall be mounted to protect the top of the enclosure from direct sun and shall extend at least 1-inch beyond the edges of the enclosure on all sides.
   5. Hazardous Environment Equipment: All system electronics to be used in a hazardous environment shall be housed in enclosures which meets the requirements of paragraph "Hazardous Environment."

D. Tamper Provisions: Enclosures, cabinets, housings, boxes, and fittings of every description having hinged doors or removable covers, and which contain circuits or connections of the ACS equipment or power supplies, shall be provided with cover operated, corrosion resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened or removed.

E. Locks and Key-Lock-Operated Switches: All locks required to be installed on system enclosures for maintenance purposes shall be UL listed, round-key type, with three dual, one mushroom, and three plain pin tumblers or conventional key type lock having a combination of five cylinder pin and five-point three position side bar. The locks shall be so arranged that the key can only be withdrawn when in the locked position. All maintenance locks shall be keyed alike and only two keys shall be furnished for all of these locks.

F. System Component Design: ACS components shall be designed for continuous operation. All electronic components shall be solid state type, mounted on printed circuit boards conforming to UL 796. Circuitry shall not be so densely placed as to impede maintenance.

G. Product Safety: ACS components shall conform to applicable rules and requirements of NFPA 70 and UL 294. ACS components, shall be equipped with instruction plates including warnings and cautions, describing physical safety, and special or important procedures to be followed in operating and servicing ACS equipment.
H. Special Test Equipment: The Contractor shall provide all special test equipment, special hardware, software, tools, and programming or initialization equipment needed to start or maintain any part of the system and its components. Special test equipment is defined as any test equipment not normally used in an electronics maintenance facility.

2.02 FIELD HARDWARE DEVICES

A. The Access Control System shall be equipped with the access control field hardware required to administer all access granted/denied decisions. All field hardware must be designed to meet UL requirements. Depending upon the configuration, the Access Control System field hardware must be able to include any or all of the following components:

B. Intelligent System Controller (ISC) –
C. Reader Interface Module (DRI) –
D. Card Readers –
E. Field Hardware Power Supplies
   1. Power Supplies for field hardware shall be designed specifically for the SYSTEM equipment installed. These power supplies shall be regulated, isolated versions for the ISC, ICM, Card Readers and other equipment. Each version shall be available in UPS with battery back-up and non-UPS models. All power supplies shall be housed in locked enclosures that also allow mounting space for the ISC, ICM, SRI, DRI or other device/panel required.

2.03 WIRE AND CABLE

A. Contractor shall furnish and install all cabling required to provide a complete and functioning system.
B. All cables shall be as required by the manufacturer and suitable for the distances encountered.
C. All cables shall be suitable and listed for the environment in which they are installed.

PART 3 – EXECUTION

3.01 GENERAL

A. All installations shall be in accordance with manufacturers’ installation documents and be compliant with all local, State, and National codes.
B. Contractor shall furnish and install all components, cables, and other items required to provide a full and functioning system with the capabilities intended as evidenced in the construction documents.
C. Where discrepancies in the construction documents or uncertainties in terms of the intent of the documents exist, contractor shall execute a written Request for Information and forward it to the design team. Contractor shall not be relieved of its obligation under these documents due to its failure to request clarification or additional information in a timely manner.
D. Current Site Conditions: The Contractor shall visit the site and verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions that will affect performance of the system to the Owner. The Contractor shall not take any corrective action without written permission from the Owner.
3.02 EQUIPMENT

A. Panels
   1. The Control Panel, the Door Reader Modules, expansion boards, and power supplies are to be installed in the Security Closet in appropriately sized lockable metal enclosures. The enclosures shall be labeled with the type of component, and the devices served by that component.
   2. Contractor to make all required network connections. Any required IP address shall be provided to the contractor by the University for programming of the Network connection.
   3. All cable connections to be standard direct cable connections.

B. Field Devices
   1. Card Readers to be mounted (appropriately attached to wall) as shown on the construction drawings.

3.03 SYSTEM PROGRAMMING

A. All programming shall be provided by a BASIS V certified programmer.

B. Contractor shall meet with appropriate PGCC personnel to establish the system programming required for the system. This shall include the configuration of all switches as well as any BASIS V configuration required. This will include, without limitation, the establishment of all doors on the existing BASIS V platform.

C. Contractor shall document these requirements for review, comment, and approval by the Owner and the Design Team.

D. Upon approval of the configuration requirements, contractor shall configure the systems as documented.

3.04 RECORD DOCUMENTATION

A. Prior to final acceptance of the work, the Contractor shall submit two (2) sets of record documentation.

B. Record documentation shall include:
   1. Floor plan drawings indicating device locations and wire routing.
   2. Functional block diagrams.
   3. Drawings shall be provided in both hard copy and in electronic format. The electronic format shall be the most recent version of AutoCAD.

C. Record documentation shall also include operation and maintenance manuals for all components of the system. Manuals shall include:
   1. Installation and Service manuals.
   2. Operating manuals.
   3. If not included in the above manuals, the Contractor shall provide:
      a) Power up and power down procedures.
      b) Programming procedures.
      c) Maintenance schedules.
      d) Diagnostic procedures.
3.05 TESTING

A. Prior to final acceptance of the work, the Contractor shall perform and document the following minimum testing:
   1. Verify that all equipment provided is functioning to manufacturers’ specifications.
   2. Verify that all access control and alarm signals are transmitting properly.
   3. Verify that the components integrate with existing University systems.
   4. Verify that all access controlled doors are properly responding to the following test conditions:
      a) Valid card read
      b) Invalid card read
      c) Door forced open
      d) Door ajar/Door held open

B. Contractor shall document its testing in a report that includes the following minimum information:
   1. Date of Test
   2. Location of Test
   3. Name of Person Performing Test
   4. Type of Test
   5. Outcome of Initial Test
   6. Remedial Action Taken in Event of Failure
   7. Date of Re-Test
   8. Outcome of Re-Test

3.06 VERIFICATION TESTING

A. At the time of substantial completion, but before final acceptance, contractor shall participate in verification testing to be performed by the Owner and its representative.

B. Verification testing shall include a review of the results of the Contractor Testing, as well as any additional operational or functional testing desired by the Owner.

C. Any item or function that fails to meet the requirements of these documents shall be promptly repaired or replaced and re-tested prior to final acceptance by the Owner.

END OF SECTION
PART 1 – GENERAL

1.01 SCOPE OF WORK

A. This section includes the requirements for equipment and installation of a Video Surveillance system and associated hardware in the Queen Anne Academic Center at The Prince George’s Community College (PGCC). The College currently uses the Endura system from Pelco and this system shall be the one installed.

B. Contractor shall provide all cameras, camera mounts, recording devices, network switches, patch cords, and all other hardware and software necessary to provide a full, complete and functioning system assuming that PGCC has the Endura base server and Administrative client.

C. Contractor shall provide all licenses required by any manufacturer in order to provide a fully functioning system. Provide a quantity of licenses equal to the number of cameras provided.

D. Contractor shall fully configure the existing Endura system so that it incorporates all of the items included in the construction of the new facility. Contractor shall coordinate with the Owner prior to this configuration to determine naming conventions, time schedules, and any other parameters available on the system.

1.02 QUALITY ASSURANCE

A. All equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Specification shall be subject to the control and approval of the Owner’s Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based on the acceptable manufacturers listed.

B. Materials and work specified herein shall comply with the applicable requirements of:
   1. Underwriters Laboratory or equivalent
   2. Federal Communications Commission
   3. National Electric Code (NEC)

1.03 WARRANTY

A. All materials and workmanship shall be warranted to be free from defects for a period of two (2) years following acceptance by the owner.

B. If within two (2) years after the date of final acceptance of the installation, any of the work or equipment is found to be defective or not in compliance with the Contract Documents, the Contractor shall correct it promptly including all parts and labor.

C. The Owner shall give notice to the Contractor of any defects promptly after the discovery of any defective condition.

D. These obligations shall survive termination of the construction contract.

1.04 SUBMITTALS

A. Submit manufacturers’ data sheets for proposed systems, and equipment.

B. Submit manufacturers’ instructions for storage, handling, protection, examination, preparation, operation, and installation of all products. Include any application conditions or limitations of use stipulated by any product testing agency.

C. Submit all applicable Material Safety Data Sheets.

D. Submit a detailed bill-of-materials listing all manufacturers, part numbers, and quantities that the Bidder proposes to use in this project.
PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Units of the same type of equipment shall be products of a single manufacturer. All material and equipment shall be new and currently in production. Each major component of equipment shall have the manufacturer’s model and serial number in a conspicuous place.

B. The Contractor shall provide all special test equipment, special hardware, software, tools, and programming or initialization equipment needed to start or maintain any part of the system and its components. Special test equipment is defined as any test equipment not normally used in an electronics maintenance facility.

C. The Contractor shall furnish the system complete and ready for operation.

D. Using the College’s network backbone, all devices shall communicate to the existing Pelco server.

E. All system components for this section shall be part of the Endura system or approved by Pelco for use with the system.

F. Contractor shall include any and all licenses required by any manufacturer to complete the installation of the equipment specified herein.

2.02 NETWORK STORAGE MANAGER

A. The network storage manager shall record video and audio streams from IP cameras and video encoders on the network.

B. The network storage manager shall incorporate the server functions and storage elements into a purpose-built chassis.

C. The network storage manager shall use RAID 6 parity across the storage drives to protect recorded data against a hard disk drive failure.

D. The network storage manager shall only use enterprise-level hard disk drives specifically rated for operation in RAID systems.

E. The network storage manager chassis shall be designed for video surveillance recording applications and encompass redundancy at all vital points:
   1. Redundant, hot swappable power supply modules
   2. Redundant, hot swappable system fans
   3. Hot swappable O/S drive
   4. Hot swappable CPU fans

F. The network storage manager chassis shall be designed for online service and maintenance and cannot be removed from the rack when hard disk drives, fans, power supplies, or operating system drives must be replaced.

G. The network storage manager shall be built upon a reliable and robust Linux® operating system.

H. The network storage manager shall support a guaranteed recording throughput of 250 Mbps per storage device with a minimum of 64 Mbps of read throughput. This throughput shall be guaranteed under normal and error (RAID rebuild) conditions.

I. The network storage manager shall support any number of cameras so long as the maximum throughput required is less than 250 Mbps.

J. The network storage manager shall support the recording of MPEG-4 and H.264 baseline, and high profile streams from standard resolution and megapixel cameras.

K. The network storage manager shall support continuous, scheduled, alarm/event (including analytics alarms), motion, and manual recording. Pre- and post-alarm periods shall be configurable up to the total capacity of the system.
L. The network storage manager shall support bookmarking and locking/unlocking of video content on the drives.

M. The network storage manager shall support privacy tools that allow administrators to establish maximum retention times for normal, alarm, and locked video.

N. The network storage manager shall support an intelligent video grooming protocol that can reduce the frame rate of recorded video as the video ages. Administrators shall have the flexibility to determine whether to groom alarm video or leave it at its real-time level.

O. The network storage manager shall have the ability to report all diagnostic events, including software status diagnostics to a centralized user interface. In addition, Simple Network Management Protocol (SNMP) traps shall be available for monitoring through a third-party SNMP management console.

P. The network storage manager shall be fully managed from a remote workstation, including the ability to configure settings and update firmware and software.

Q. The network storage manager shall be capable of interfacing with the APC® Smart-UPS® using a USB connector. The network video recorder shall receive status and control signals from the uninterruptible power supply (UPS) when it is in backup mode. This function shall inform the operator about the amount of charge remaining and trigger a controlled shutdown when the charge becomes zero.

R. The network storage manager shall meet or exceed the following design and performance specifications.

S. Storage Configuration – Provide sufficient DASD for the storage of video from all cameras installed as part of this specification assuming:
   1. MPEG 4 compression
   2. Resolution - 2048 x 1536
   3. Frame Rate – 15 fps
   4. Motion Percentage – 50%
   5. Days of Recording – 30

T. Acceptable Product – Pelco Endura NSM-5200 Network Storage Manager

2.03 STANDARD CAMERAS

A. The indoor network dome camera shall offer multiple simultaneous video streams with up to 3 megapixel (MPx) 2048 x 1536 resolution, auto iris and varifocal lens.

B. The indoor network dome camera shall provide a manual 3-axis (pan/tilt/rotation) positioning to allow adjustment for optimum camera rotation and placement.

C. The indoor network dome camera shall provide options for clear and smoked lower dome.

D. The indoor network dome camera shall provide SureVision™ technology that seamlessly delivers extended Wide Dynamic Range (WDR), low-light performance, and anti-bloom technology, operating simultaneously.

E. The indoor network dome camera shall feature an unsupervised/supervised alarm input, relay output and line level/external microphone input connections and built-in microphone.

F. The indoor network dome camera shall provide a removable, local storage medium (Micro SD) for scheduled and event-based recording of images.

G. The indoor network dome camera shall provide a service video stream in addition to and independent of the video streams.

H. The indoor network dome camera shall provide advanced low-light capabilities for day/night models with sensitivity down to 0.005 lux in color and 0.0013 lux in monochrome.

I. The indoor network dome camera shall support industry standard Power over Ethernet (PoE) IEEE 802.3af, Class 3 to supply power to the camera over the network.
J. The indoor network dome camera shall provide Wide Dynamic Range (WDR) up to 100 dB with dynamic adjustments through the User Interface.

K. The indoor network dome camera shall have a mechanical IR cut filter mechanism for increased sensitivity in low-light installations. Set points for the IR cut filter feature shall be configurable through an embedded Web browser.

L. The indoor network dome camera shall support H.264 High, Main or Base profiles, using constrained variable bit rate (CVBR) as the default, variable bit rate (VBR), or constant bit rate (CBR) with target range.

M. The indoor network dome camera shall support two simultaneous, configurable video streams. H.264 and MJPEG compression formats shall be available for primary and secondary streams with selectable Unicast and Multicast protocols.

N. The indoor network dome camera shall support configurable frame rates, bit rates and group of pictures (GOP) structures for additional bandwidth administration.

O. The indoor network dome camera shall provide high reliability with ≥ 200,000 POH MTBF.

P. The indoor network dome camera shall be conformant to the ONVIF, Profile S and support open architecture best practices with a published API available to third-party network video recording and management systems.

Q. The indoor network dome camera shall provide 802.1x port security to establish point-to-point access through a wired or wireless port using Extensible Authentication Protocol (EAP). Supported EAP methods shall include EAP-MD5, EAP-TLS, EAP-TTLS, EAP-PEAP and EAP-FAST.

R. The indoor network dome camera shall support SNMP v2c and v3.

S. The indoor network dome camera shall support IPv6 configurations in conjunction with IPv4.

T. The indoor network dome camera shall provide Auto or Manual exposure settings for adjusting the amount of light detected by the camera sensor.

U. The indoor network dome camera shall provide user-selectable configurations for day/night auto mode. Transitional levels shall be used to set the desired light level for transitioning to night mode. Transition detect time shall control the length of time that the camera is exposed to a light level before changing to color or monochrome mode.

V. The indoor network dome camera shall provide flicker correction.

W. The indoor network dome camera shall provide motorized zoom capabilities with a Web browser interface for remote configuration and administration.

X. The indoor network dome camera shall provide autofocus capabilities with a Web browser interface for remote configuration and administration. The automatic autofocus shall be triggered when the camera detects an environmental temperature change within 9°F (5°C) and when the camera changes from color to monochrome or vice versa. User-selectable options for full-range auto-focus and quick auto-focus shall be available.

Y. The indoor network dome camera shall support 16 window blanks to conceal user-defined privacy areas that cannot be viewed by an operator.

Z. The indoor network dome camera shall provide I-Frame interval configuration to increase or decrease the number of I-Frames per second.

AA. The indoor network dome camera shall provide User and Group settings to assign permissions and access levels to the camera. The camera shall provide local management where the camera manages the access levels or remote mode where the camera authenticates the user through a Lightweight Directory Access Protocol (LDAP) server.

BB. The indoor network dome camera shall provide Adaptive Motion analytic to intelligently detect motion within a user-defined field of view. Such behaviors shall trigger an alarm.
embedded analytic shall support customized profiles allowing multiple configurations for varying conditions.

CC. The indoor network dome camera shall provide Camera Sabotage analytics to detect changes in the camera’s field of view, including obstruction of the lens and unauthorized movement of the camera. Such behaviors shall trigger an alarm. The embedded analytic shall support customized profiles allowing multiple configurations for varying conditions.

DD. The indoor network dome camera shall be plenum-rated per 2008 NEC article 300.22(C)(2) for in-ceiling mounted applications.

EE. The indoor network dome camera shall provide a 3/4-inch NPT conduit attachment on the back box for in-ceiling mounted applications.

FF. The indoor network dome camera shall attach to a standard single-gang electrical box for surface mounted applications.

GG. The indoor network dome camera shall provide a 3/4-inch NPT conduit attachment for pendant mounted applications.

HH. The indoor network dome camera shall be capable of firmware upgrades through a network using a software-based device utility.

II. The indoor network dome camera shall meet or exceed the following design and performance specifications.

1. Camera Specifications
   a. Imaging Device  1/3-inch
   b. Imager Type  CMOS
   c. Imager Readout  Progressive scan
   d. Maximum Resolution
      1. 4:3 Aspect Ratio  3.0 MPx (2048 x 1536)
         1.9 MPx (1600 x 1200)
         1.2 MPx (1280 x 960)
         0.5 MPx (800 x 608)
         0.3 MPx (640 x 480)
         0.08 MPx (320 x 240)
      2. 16:9 Aspect Ratio  1080p MPx (1920 x 1080)
         720p MPx (1280 x 720)
         0.5 MPx (800 x 448)
         0.2 MPx (640 x 352)
         0.06 MPx (320 x 176)
   e. Signal-to-Noise Ratio  >60 dB
   f. Auto Iris Lens Type  DC drive
   g. Electronic Shutter Range  1~1/77,000 sec
   h. True Wide Dynamic Range  Up to 100 dB
   i. White Balance Range  2,000° to 10,000°K
   j. Sensitivity 3~9 mm  f/1.2; 2,850°K; SNR >20 dB
      1. Color (33 ms)  0.1 lux
      2. Color (500 ms)  0.005 lux
      3. Mono (33 ms)  0.05 lux
      4. Mono (500 ms)  0.0013 lux
   k. Sensitivity 9~22 mm  f/1.6; 2,850°K; SNR >20 dB
      1. Color (33 ms)  0.4 lux
      2. Color (500 ms)  0.009 lux
      3. Mono (33 ms)  0.09 lux
      4. Mono (500 ms)  0.002 lux
   l. Day/Night Capabilities  Yes
m. Mechanical IR Cut Filter  Yes, (ON/OFF/AUTO selectable), with different set points on lux
n. Available Languages  Chinese, English, French, German, Italian, Portuguese, Russian, Spanish, and Turkish

2. Lens Specifications  
a. Lens Type  Built-in; varifocal  
b. Focal Length  f/1.2, 3 ~ 9 mm, or f/1.6, 9 ~ 22 mm  
c. Focus  Autofocus, motorized  
d. Zoom  Remote  
e. Auto Iris Type  DC drive P-iris lens

3. Video Specifications  
a. Video Streams  Multiple simultaneous streams with up to 2 different configurations plus service stream; the second stream is variable based on the setup of the primary stream
b. Available Resolutions  Two configurable streams as follows:
   1. 4:3 Aspect Ratio  
      - 3 MPx (2048 x 1536)
      - 1.9MPx (1600 x 1200)
      - 1.2 MPx (1280 x 960)
      - 0.5 MPx (800 x 608)
      - 0.3 MPx (640 x 480)
      - 0.08 MPx (320 x 240)
   2. 16:9 Aspect Ratio  
      - 1080p MPx (1920 x 1080)
      - 720p MPx (1280 x 720)
      - 0.5 MPx (800 x 448)
      - 0.2 MPx (640 x 352)
      - 0.06 MPx (320 x 176)

c. Frame Rate  Up to 30, 25, 15, 12.5, 10, 5, 1 (depending on the coding, resolution, and stream configuration)
d. Video Encoding  H.264 High, Main, or Base profiles and MJPEG  
e. Bit Rate Control  Constrained variable bit rate (CVBR), constant bit rate (CBR), and variable bit rate (VBR) with target range  
f. Service Stream  JPEG stream; the aspect ratio will be consistent with the independent streams  
g. Supported Protocols  TCP/IP, UDP/IP (Unicast, Multicast IGMP), UPnP, DNS, DHCP, RTP, RTSP, NTP, IPv4, IPv6, SNMP v2c/v3, QoS, HTTP, HTTPS, LDAP (client), SSH, SSL, SMTP, FTP, ARP, ICMP, and 802.1x (EAP)
h. Users  
   1. Unicast  Up to 20 simultaneous users depending on the resolution settings  
   2. Multicast  Unlimited H.264  
i. Security Access  Password protected  
j. Software Interface  Web browser view and setup  
k. Pelco System Integration  Digital Sentry 7.3 (or later); Endura 2.0 (or later); DX4700/DX4800  
l. Open API  Pelco API or ONVIF Profile S  
m. Mobile Application  Integrated with Pelco Mobile Application  
n. Minimum PC Requirements  
   1. Processor  Intel® Core™ i3 processor, 2.4 GHz
2. Operating System  Microsoft® Windows® 7 (32- and 64-bit), or Windows Vista®; or Mac OS® X 10.4 (or later)
3. Memory  4 GB RAM
4. Network Interface  100 Mbps (or greater)
5. Monitor Minimum of 1024 x 768 resolution, 16- or 32-bit pixel color resolution
6. Web Browser Internet Explorer® 7.0 (or later) or Mozilla® Firefox® 3.5 (or later); Internet Explorer 8.0 (or later) is recommended for configuring analytics
7. Media Player Pelco Media Player or QuickTime® 7.6.5 for Windows 7, XP, or Vista; or QuickTime 7.6.4 or Mac OS X 10.4 (or later)

4. Electrical Specifications  
   a. Network Port RJ-45 for 100Base-TX, Auto MDI/MDI-X 
   b. Accessory Port Micro B USB connector for Pelco accessories 
   c. Cable Type Cat5 cable or better for 100Base-TX 
   d. Input Power PoE (IEEE802.3af, Class 3) 
   e. Power Consumption 8.5 W nominal 
   f. Current Consumption 350 mA maximum 
   g. Local Storage Micro SD 
   h. Alarm Unsupervised/supervised modes 
      1. Unsupervised Detects open or closed alarm state 
      2. Supervised Detects open and short alarm state with external 1 kohm resistor 
   i. Input 3.5 VDC maximum, 3.5 mA maximum 
   j. Audio 
      1. Streaming Bidirectional; full or half duplex 
      2. Input/Output Line level/external microphone input; 600-ohm differential, 1 Vp-p max signal level; built-in microphone 
      3. Compression G.711 PCM 8 bit, 8 kHz mono at 64 kbit/s 

5. Analytic Specifications  
   a. Required Systems for Pelco Analytics 
      1. Pelco Interface WS5200 Advanced System Management Software on an Endura 2.0 (or later) system; Digital Sentry version 7.3 (or later) 
      2. Open API The Pelco API can transmit behavior alarm data to third-party applications. 

6. Mechanical Specifications  
   a. Dome Attenuation 
      1. Clear Zero light loss 
      2. Smoked f/1.0 light loss 
   b. Pan/Tilt Adjustment 
      1. Pan 355° 
      2. Tilt 180° 
      3. Rotation 360° 

7. Environmental Specifications  
   a. Operating Temperature −10° to 50°C (14° to 122°F) 
   b. Cold Start −10°C (14°F)
c. Operating Humidity 20% to 80%, RH noncondensing

8. Certifications
   a. CE, Class A
   b. FCC, Class A
   c. UL/cUL Listed
   d. KCC
   e. CCC
   f. C-Tick
   g. CB
   h. Compliant with applicable immunity sections of EN 50155, EN 50121-3-2, and EN 50121-4
   i. Cisco® Medianet Media Service Proxy 2.0 compatible
   j. ONVIF Profile S Conformant
   k. MTBF ≥ 200,000 POH (Reporting standard is RELEX Modeling)

JJ. The indoor network dome camera shall meet or exceed the following design and performance specifications. Mounting device – Cameras furnished shall be capable of being installed in one of the following mounting types as indicated on the construction drawings:
1. Surface Mount
2. Flush Mount in wall or ceiling
3. Pendant Mount
4. Corner Mount
5. Pole Mount

KK. All mounting hardware including without limitation, pipes, flanges, screws, etc. shall be furnished and installed by the contractor.

LL. Basis for Design – Pelco IME Series Fixed Dome Network Camera

2.04 360-DEGREE CAMERAS

A. General
   1. The 360-degree network camera is WDR (Wide Dynamic Range), dual encoder (H.264 & MJPEG), 12 Megapixel resolution, Omn-Directional Day/Night IP camera, designed to provide an all-in-one solution with four integrated 3-Megapixel WDR sensors, IK-10 vandal resistant dome and housing, rated IP66 for water and dust protection, to use camera for indoor and outdoor applications.

B. Hardware
   1. Lens options shall include the following IR corrected, F1.6, M12 lenses: 2.8mm, 4.0mm, 6.0mm, 8.0mm, 12.0mm, 16.0mm.
   2. The camera shall utilize four high sensitivity 3-Megapixel WDR CMOS sensors with 1/3.2" optical format, progressive scan and Active Pixel Count: 2048(H) x 1536(V) pixel array
   3. The camera shall have die-cast aluminum chassis with IK-10 vandal resistant dome. Entire enclosure to be rated minimum IP66 for water and dust protection.
   4. The camera shall have four individually adjustable 2-axis camera gimbals with 360° pan and 90° tilt for easy and accurate positioning.

C. Imaging
   1. The camera shall combine four image sensors for a user configurable field of view.
   2. The camera shall allow for multiple lens options for a user configurable field of view.
   3. The camera shall have dual standard compression support with simultaneous streaming of both H.264 and MJPEG formats.
   4. Each sensor of the camera shall feature automatic exposure, automatic multi-matrix white balance, shutter speed control to minimize motion blur, programmable resolution, brightness, saturation, gamma, sharpness and tint.
5. The camera’s shutter speed shall be 1ms - 500ms.
6. The camera shall feature selectable 50/60 Hz flicker control, windowing, simultaneous delivery of full-field view and zoomed images at video frame rate, instantaneous electronic zoom, pan and tilt, and electronic image rotation by 180 degrees.
7. The camera shall have multi-streaming support of up to 8 non-identical concurrent streams (different frame rate, bit rate, resolution, quality, and compression format).
8. The camera shall have wide dynamic range up to 100 dB and a maximum SNR of 51 dB.
9. The camera shall have privacy masking, the ability to select multiple regions of an arbitrary shape to block the video. The camera shall have extended motion detection grid, a higher granularity grid of 1024 distinct motion detection zones. User can select between 64 zone based motion detection and extended motion detection to provide backward compatibility with the existing Video Management System (VMS) integration. This feature shall support RTP, HTTP and TFTP protocols, as well as the on-camera web interface.
10. The camera shall feature streaming of the full field of view (FOV) and simultaneous multiple regions of interest (ROI) for forensic viewing and archiving.
11. The camera shall provide 21 levels of compression quality for optimal viewing and archiving.
12. It shall be possible to program the camera in binning mode to output lower resolution images: i.e. 4096(H) x 768(V) pixels (1/4 full resolution) at 17 FPS.
13. The camera shall provide flexible cropping (Resolution windowing down to 1x1 pixels for JPEG and 2x2 pixels for H.264).
14. The camera shall be able to save bandwidth & storage by running at 1/4 full resolution.
15. The camera shall feature MoonLight™ mode - extended exposure and noise cancellation.
16. The camera shall be able to support Picture-in-Picture: simultaneous delivery of full field of view and zoomed images.

D. Video
1. Video frame rate (up to):
   a) 5.2FPS @ 8192x1536
   b) 17 FPS @ 2048x1536
2. Video frame rate in binning mode up to:
   a) 17 FPS @ 4096x768

E. Electrical
1. General purpose opto-coupled input and output.
2. Power over Ethernet (PoE): PoE 802.3af
3. Auxiliary Power 12-48V DC, 24VAC
4. Power consumption: PoE – Class 3; auxiliary- 14W max

F. Networking
1. The camera shall be equipped with a 100 Mbps LAN connector.

G. Environmental
1. Operating temperature -40˚C (-40 °F) to +50˚C (122 °F)
2. Stable image temperature 0˚C (32 °F) to +50˚C (122 °F)
3. Storage temperature -40˚C (-40 °F) to +60˚C (140 °F)
4. Humidity 0% to 90% (non-condensing)

H. Illumination
1. Color (non-binning): 0.5 Lux @ F2.0
2. Color (binning): 0.25 Lux @ F2.0
3.  B/W: 0 Lux, IR sensitive (with additional IR light source)

I.  Basis of Design – Arecont Vision AV12176DN with lens and mount type as indicated

PART 3 - EXECUTION

3.01 GENERAL

A.  The Contractor shall install all system components in accordance with the manufacturer's instructions, and shall furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from affecting system operation.

B.  Installation and configuration programming shall be accomplished by Pelco Endura certified personnel.

C.  Current Site Conditions: The Contractor shall verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions that will affect performance of the system to the Owner. The Contractor shall not take any corrective action without written permission from the Owner.

D.  Where discrepancies in the construction documents or uncertainties in terms of the intent of the documents exist, contractor shall execute a written Request for Information and forward it to the design team. Contractor shall not be relieved of its obligation under these documents due to its failure to request clarification or additional information in a timely manner.

E.  System Programming

1.  All programming shall be provided by Pelco Endura certified programmer.

2.  Contractor shall meet with appropriate PGCC personnel to establish the system programming required for the system. This shall include the configuration of all switches as well as any Endura configuration required. This will included, without limitation, the establishment of all cameras on the existing Endura platform.

3.  Contractor shall document these requirements for review, comment, and approval by the Owner and the Design Team.

4.  Upon approval of the configuration requirements, contractor shall configure the systems as documented.
3.02 PERFORMANCE REQUIREMENTS
A. General: The Contractor shall perform pre-delivery testing, site testing, and adjustment of the completed system. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing.
B. Contractor’s Field Testing: The Contractor shall calibrate and test all equipment, verify operation, place the integrated system in service, and test the integrated system.
C. Performance Verification Test: The Contractor shall demonstrate that the completed system complies with the contract requirements. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown.

3.03 TRAINING
A. Contractor shall provide eight (8) hours of training and orientation of customer personnel to the new ACS.
B. Training shall include, but will not be limited to:
   1. Physical review of installed equipment.
   2. Review of documentation and test results.
   3. Additional customer requirement defined during the project.
C. Contractor shall also provide any training of owner technicians required to maintain the manufacturer’s warranty for the specified time period.
D. The Contractor shall provide one site visit after system acceptance to provide remedial training and system adjustments that may be required. This visit shall be coordinated and scheduled with the owner.
E. The Contractor shall be on call during the warranty period to answer any questions of the Owner.

3.04 RECORD DOCUMENTATION
A. Prior to final acceptance of the work, the Contractor shall submit two (2) sets of record documentation.
B. Record documentation shall include:
   1. Floor plan drawings indicating device locations and wire routing.
   2. Functional block diagrams.
   3. Drawings shall be provided in both hard copy and in electronic format. The electronic format shall be the most recent version of AutoCAD.
C. Record documentation shall also include operation and maintenance manuals for all components of the system. Manuals shall include:
   1. Installation and Service manuals.
   2. Operating manuals.
   3. If not included in the above manuals, the Contractor shall provide:
      a) Power up and power down procedures.
      b) Programming procedures.
      c) Maintenance schedules.
      d) Diagnostic procedures.

END OF DOCUMENT
95% CD DRAWINGS LIST
(Note: Only drawings highlighted in yellow are included for information in the Contractor’s Prequalification Package)
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