Element Z General Design Requirements

Room Standards Z4020 Classrooms and Conference Rooms

PART 1 - GENERAL

1.01 OVERVIEW

- A. This document provides design and construction criteria for conference rooms, videoconference rooms, classrooms and other multimedia rooms at The University of Texas MD Anderson Cancer Center (Owner).
- B. Note that the detailed construction considerations for audiovisual systems provided in this document are based on the requirements for Standard Definition (SD) cameras, projection systems and other displays. MD Anderson is currently in the process of evaluating High Definition (HD) equipment for these systems. The HD projection systems require wider projection screens and the equipment is often larger and heavier.

PART 2 - DESIGN CRITERIA

2.01 GENERAL CHARACTERISTICS

- A. Locate rooms away from noise-generating activities taking place either outside or within the building. Locate rooms away from loud machinery, vending machines, labs and traffic areas as well as outside traffic noise.
- B. Provide ample space in room design for programmed seating configuration, presentation and support space such as furniture and equipment storage.
- C. There shall be no columns in any room. Columns placed within the room's interior space severely hamper room arrangement and student viewing of the instructor and visual aids.
- D. The front wall of the room behind the instructor area shall have no protrusions (structural or otherwise) into the room so that marker boards, projection screens or information displays can be installed across the entire wall of presentation area.
- E. Overall Mark II RC noise level shall be between 25(N) and 30(N) as a required goal for all presentation spaces.
- F. Consult with Owner on the use of power operators at all doors in major conference/meeting rooms with an occupant load of 50 or more, as well as use of hold-open features on selected doors in these spaces.

2.02 ROOM SHAPE AND CONFIGURATION

- A. Rectangular shaped rooms are appropriate for many types of instructor-led presentations or lectures.
 - 1. Length of room shall not exceed its width by more than 50 percent.

- 2. Generally locate presentation area and information displays on the narrow wall of the room. Rooms that are wider than they are deep usually present unacceptable viewing angles for information displays and for information written presentation surfaces.
- B. Wide room configurations may be appropriate to support seminar or group interaction among audience participants. This is relevant when curved or semi-circular rows are set up to encourage communications and easy eye-contact between participants.

2.03 ROOM SURFACES AND FINISHES

- A. In non-videoconference rooms the front wall (i.e. the wall at the presentation end of the room), shall be hard surfaced (e.g., gypsum board, masonry or wood) with no special acoustical shaping or treatment.
- B. In non-videoconference rooms the front three-quarters of each sidewall shall be constructed of hard (acoustically non-absorbent) materials (e.g. gypsum board, masonry or wood). These walls can be painted or vinyl-surfaced, but shall not employ fabric covering or any other acoustically absorbent finish.
- C. In non-videoconference rooms install acoustically absorbent finish on the rear one-fourth of the sidewalls and the entire rear wall in order to absorb useless reflections and to dampen standing waves The sound absorbent material shall have a Noise Reduction Coefficient (NRC) of 0.60.
- D. In videoconference rooms all of the walls shall be covered with acoustically absorbent materials with a NRC of 0.85.
- E. Painted surfaces in non-video conference rooms shall be light in color and durable finish to allow washing.
- F. Provide light colored, acoustically absorbent surfaces in non-videoconference rooms.
- G. All finishes used in videoconference rooms shall be either from a list of finishes that have previously been certified for use in other videoconference room projects or samples shall be submitted to MD Anderson Telehealth Services for certification. In general, acceptable videoconference finishes have a maximum reflectance of 60 percent, and provide no patterns or textures that will cause the TV camera to produce a moiré in the picture and be tan, blue or teal in color.
- H. Avoid black or white surfaces.
- I. Floors shall be carpeted with an anti-static, high traffic, commercial grade carpeting with no padding. Do not use bright reflective carpet finishes.
- J. Marker boards used in videoconference capable conference rooms and classrooms shall have a finish designed for use in videoconference facilities.
- K. The reflectance values of paints, vinyl coverings, laminates and other finish materials shall be selected to enhance ambient illumination and the illumination at work surfaces. The following values are recommended:

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- 1. Ceilings 70 percent 90 percent
- 2. Walls 40 percent 60 percent
- 3. Floors 30 percent 50 percent
- 4. Desktops 35 percent 50 percent

2.04 WALL CONSTRUCTION

- A. Mechanically isolate walls at top and bottom from building structure with a Neoprene seal.
- B. Extend walls from slab to slab in order to reduce noise paths into the room.
- C. In videoconference rooms double offset wall studs or sound channels shall be used so that the interior and exterior gypsum board is not attached to the same studs. This will minimize the transfer of noise from surrounding spaces.
- D. Use a double layer of gypsum board with the inner layer being 5/8-inch thick and the outer layer being minimum ½-inch thick. Use a 1/8-inch thick vinyl sound-block material in high noise areas for additional acoustical isolation.
- E. Stagger and individually float drywall seams. .

2.05 WINDOWS

- A. Minimize large window areas to provide light control and minimize exterior noise.
- B. All window treatments shall be opaque and capable of eliminating all outside light from reaching the information displays. Install window treatment with channels to provide light-tight abutment to window frame.
- C. Install motorized window shading system that can be integrated with external audio-visual control systems for each window.
- D. Window shades shall provide an acoustical isolation of Sound Transmission Coefficient (STC) of 30 or higher.

2.06 DOORS

- A. Locate doors in the back of the room away from presentation area to minimize disruption. Locate doors in rooms that require two egress points as far from presentation areas as possible.
- B. Doors shall be 2-inch thick, sound-rated, or at a minimum, solid core to prevent noise from entering the room.
- C. Equip doors with acoustically rated compressive seals.
- D. Doors shall be a minimum of three (3) feet wide and equipped with a vision panel made of shatterproof glass tinted to reduce light transmission. The area of the glass shall not exceed

100 square inches and shall be double-paned with acoustically rated seals. Doors without a glass panel shall have large door scope viewer "Peep Holes" installed at standard height as well as accessible height to provide a view into the room to check on on-going activities.

- E. Where use of poster carts is planned, provide at least one four (4) feet wide by eight (8) feet tall door (or equivalent double door with 12" inactive leaf) into the room. Provide the same oversized door for poster carts at a storeroom serving the classroom/conference room. Confirm use of poster cart with Owner's Project Manager.
- F. Louvers on doors in classrooms and conference areas are not permitted.

2.07 CEILINGS

- A. 9 foot minimum ceiling height shall be utilized for rooms that are 24 feet or less in length. In rooms where the programmed seating requirements, presentations space, and support space require a room deeper than 24 feet, the following considerations for ceiling height shall be used:
 - The length of the room determines the maximum usable size of the projection screens. The height of the projection screen shall be 1/4 of the room length plus a minimum 6-inch black border at the top of the screen. A 42 foot long room would require a projection screen that has a minimum 10.5 foot high projection area plus the 6-inch black top border. The minimum goal would be to provide a projection screen surface height 1/6 the length of the room.
 - 2. In a room with a flat floor, the bottom of the projection area of the screen shall be at least four (4) feet above the finished floor.
 - 3. The height of the ceiling for a room longer than 24 feet shall be determined by the height of the projection screen plus the 6-inch black top border. For the 42 foot long room the minimum ceiling height would be 10.5 feet + 6-inches + 4 feet = 15 feet.
 - 4. Rooms using tiered audience seating may have a lower ceiling.
- B. Install access hatches in the ceiling wherever gypsum board or plaster is used in order to facilitate access to otherwise inaccessible areas of the ceiling cavity.

2.08 SEATING REQUIREMENTS FOR CLASSROOM CONFIGURATION

- A. For preliminary planning purposes, 20 square foot per person shall be used. This will allow for seating, circulation, media equipment, space requirements to meet accessibility standards and adequate lecture space. The room layout shall allow for a minimum of 4 feet between each row of tables.
- B. The first row of seating shall be a minimum of 1.5 times the width of the projection screen from the projection screen area. A projection screen 7.5 feet high would be 12 feet wide, placing the first row of seating at 18 feet from the projection screen.
- C. The room layout shall allow for no more than 10 people maximum in a row of adjoining tables. The maximum length of the first one or two rows of tables shall provide a viewing

angle no greater than 60 degrees from the far edge of the projection screen from the reference viewing point. Example: If you were sitting in the first seat on the left end of the first audience row your maximum viewing angle of the far right edge of the projection screen would be 60 degrees (when measured as the variance from a straight-on view).

- D. Tabletops shall have a non-glare, medium shade surface.
- E. In videoconference equipped classrooms provide tabletop surface finish with a 40 percent to 45 percent reflectance.
- F. Provide modesty or front panels on all fixed tables in tiered classrooms/auditoriums, where fixed seating is installed.

2.09 PROJECTION SCREENS

- A. There are two (2) types of projection systems used in MD Anderson classrooms and conference rooms, Front Projection and Rear Projection.
 - Front projection screens are utilized most often in the conference and classrooms. There
 are several front projection screen types found throughout the institution. The most
 common are wall mounted manually operated screens; next common are ceiling
 mounted (manually operated) screens and last are ceiling mounted (electrically
 operated). Final projection screen type selection will be provided by the Project
 team/Facility Program.
 - 2. When using front projection screens, the projector is located in front of the screen and is pointed towards the screen. Projectors used in front projection systems are typically ceiling mounted.
 - 3. There are a few rear projection screens within the institution, with most located in dedicated classrooms. Rear projection screens provide a higher contrast image than a front projection screen in high ambient lighting areas. Projectors are placed behind the screens and pointed at the rear of the screen. The image is projected onto the rear of the screen and is visible to the audience in the room. The light from the classroom passes through the rear screen and is not reflected back to the audience. Rear projection systems require a separate room behind the screen that is painted black and is kept completely dark. Typically the projector is pointed at a mirror that then reflects the image onto the screen. However, MD Anderson prefers direct projection system over maintenance-prone reflected mirror systems. Assistance from a consultant or rear screen manufacturer is required to setup a rear projection system.
 - 4. Front projection screens with a Matte White finish shall be provided for rooms with lighting controls with two or more zones. One of the zones must include all the non-directional lighting fixtures within 9 feet and in front of the projection screen. For rooms with a ceiling higher than 9 feet, the coverage of the zoned area must be increased.
 - 5. Front projection screens provided for rooms with little or no zoned control of the lighting and which have a high ambient light level across the room shall utilize a Cine-Grey type surface.

- 6. Projection screens that will be controlled by the audiovisual control system shall include a low voltage control option with a local 3 button control panel option.
- 7. Unless otherwise approved by Owner, all projection screens used in new construction shall have an aspect ratio of 16:10.

2.10 ACOUSTICAL SYSTEM

- A. Consider use of wall and ceiling treatments that improve intelligibility in the classroom and keep external noise as well as internal building noise from being audible inside the classroom
- B. Specify flooring with IIC (Impact Isolation Class) that prevents sound transmission.
- C. Specify walls with sound transmission class minimum rating of 50.
- D. Provide sound rated doors with acoustical door seals.
- E. Design ceiling surfaces to accommodate the required acoustical properties of the room.
- F. Arrange acoustical panels in the center of the room, with a gypsum board ceiling enclosing the acoustical panel area.
- G. Ceiling panels with a Noise Reduction Coefficient (NRC) of 0.65-0.85 and a minimum Sound Transmission Coefficient (STC) of 50 shall be used.
- H. Install access hatches in the ceiling wherever gypsum board or plaster is used to facilitate access to otherwise inaccessible areas of the ceiling cavity.
- I. Separate classrooms from external and internal sources of noise such as loading docks, parking lots, streets, mechanical and equipment rooms, vending areas, elevator, locker rooms and dining facilities.
- J. For occupied space on floors immediately above rooms equipped with videoconference or sound recording systems provide additional sound isolation on or below the floor to minimize sound transfer of noise from foot traffic, rolling carts, and closing doors, etc.
- K. Minimal acoustical requirements:
 - 1. RC Ratings:
 - a. General Classrooms: 30(N) or less
 - b. Auditorium/Lecture Hall: 25-30(N) or less
 - c. Distance Learning Classroom: 25-30(N) or less
 - 2. Reverberation Time:
 - a. General Classroom: RT60 of 0.4 seconds or less
 - b. Small Auditoriums: RT60 of 0.8 seconds or less

- c. Large Auditoriums: RT60 of 1.5 seconds or less
- L. Use acoustically absorbent materials with an NRC rating of 0.85 or greater in I conference rooms.
- M. Acoustical Standard Testing Procedures
 - 1. Noise Criteria:
 - a. Room Criteria (RC) measures background noise in a building over the frequency range 16 Hz to 4000 Hz. This is a reference level based on a chart of frequency vs. sound pressure (dB) curves that displays sound levels perceived by the human ear as equal in magnitude. The highest RC curve touched by a plot is the sound RC level. RC curves apply to sound pressure levels in an occupied space, and sound power level performance of HVAC systems.



- b. Conditions: Windows and doors closed, with the HVAC on in the room and minimal external noise from adjacent locations.
- c. Acquire Data: With microphone at 48 inches above the finished floor and located in the middle of the instructor station location area at the front of the room.
- d. Standard: RC of 30(N) or less for classrooms, auditoriums and distance learning classrooms.
- 2. Reverb Time (RT60):
 - Reverberation time is the time required for the sound level in the room to decay 60 dB. In other words, it is the time needed for a loud sound to become inaudible after turning off the sound source.

- b. Conditions: Windows and doors closed, with the HVAC on in the room and minimal external noise from adjacent locations.
- c. Acquire Data: With microphone at 48 inches above the finished floor and located in the middle of the instructor station area at the front of the room.
- d. Standard: RT60 of 0.40 seconds or less for standard classrooms, RT60 of 0.80 for small auditoriums (100 to 200 seats) and RT60 of 1.50 seconds for large auditoriums (more than 200 seats).

2.11 MECHANICAL SYSTEMS

- A. Classrooms shall be maintained in accordance with the Owner's Design Guidelines regarding temperature and humidity.
- B. System components (fans, ductwork and diffusers) shall be selected to meet the required sound power levels for the designated space.
- C. Design the classroom HVAC systems to operate as a separate zone with controls to operate independently from other spaces within building. Projection booths, rear projection rooms and control rooms shall be equipped with separate HVAC systems or zoned independently of the classroom. HVAC for these rooms shall run 24x7 at a temperature of 72 degrees F with humidity of 45-to-55 percent.
- D. Place air-conditioning registers along the perimeter of the room and the air returns in the center, front or rear of the room. Select air devices to provide low velocity airflow in order to minimize airflow noise in the room. Provide return air transfer duct with an offset inlet/outlet configuration to isolate the room from the noise in the plenum air space. If the mechanical room is in close proximity to the classroom, evaluate the requirement for sound attenuators based upon the classroom NC criteria in Section 2.10, to reduce the mechanical system noise to meet these guidelines.
- E. Install and maintain mechanical systems (ducts and piping) along sidewalls for horizontal air flow into the room and to allow the front central area projection screens to be constructed as high as possible.
- F. Coordinate systems so that space is provided for classroom technology components that may require installation space above finished ceilings.
- G. Isolate equipment mounted adjacent to and above a classroom from vibration.
- H. Do not locate supply air or return air devices close to projection screens.
- I. Integrate systems that serve classrooms with the central monitoring system or energy management system.
- J. Do not locate fan coil units or other fan powered elements of the mechanical system in the classroom ceiling space.

2.12 LIGHTING SYSTEMS

- A. Lighting Goals:
 - 1. All room lighting configurations shall be verified by using a computer lighting design program such as those offered by Lumen Micro or Lightolier.
 - 2. Conference room non-videoconference: Measured at tabletop height 40 to 50 footcandles horizontal all across the seating area of the room and 0 to 8 foot-candles on the projection screens.
 - 3. Classroom non-videoconference: Measured at tabletop height 40 to 50 foot-candles horizontal all across the seating area of the room. Presentation area 40 to 50 foot-candles at lectern height of approximately 40-inches above the finished floor. Approximately 30 to 40 vertical foot-candles shall be provided at a height of 48-inches to 75-inches above the finished floor to provide lighting of the presenter and 0 to 8 foot-candles on the projection screens.
 - 4. Conference room videoconference capable: Measured at tabletop height 40 foot-candles horizontal minimum all across the seating area of the room. Measured from 40-inches to 80-inches above the finished floor 50 to 70 foot-candles vertical all across the seating area. This would be as you look towards the projection screen from the seating area. From the presentation area looking towards the seating area a minimum of 40 horizontal foot-candles at the lectern work surface height; 40 to 60 foot-candles vertical measured from 40-inch to 80-inch above the finished floor, and. 0 to 10 foot-candles on the projection screens. Wall wash on all but the projection screen wall shall have a wash of 30 to 50 foot-candles. Note: To achieve the required vertical lighting goals the tabletop horizontal foot-candle lighting levels will typically be 40 percent higher than the achieved vertical foot-candle level. For instance, if there are 50 vertical foot-candles of light at a seating location there would typically be 70 horizontal foot-candles of light on the tabletop at that location.
 - 5. Classrooms videoconference capable: Measured at tabletop height 40 foot-candles horizontal minimum all across the seating area of the room. Measured at 40-inches to 80-inches above the finished floor 50 to 70 foot-candles vertical all across the seating area. This would be as you look towards the projection screen from the seating area. From the presentation area looking towards the seating area 40 foot-candles minimum at the lectern work surface height of approximately 40-inches above the finished floor; 60 to 90 foot-candles vertical measured from 40-inches to 75-inches above the finished floor, and 0 to 8 foot-candles on the projection screens. Wall wash on all but the projection screen wall shall have a wash of 30 to 50 foot-candles. Note: To achieve the required vertical lighting goals the tabletop horizontal foot-candle lighting levels will typically be 40 percent higher than the achieved vertical foot-candle level. For instance if there 50 vertical foot-candles of light at a seating location there would typically be 70 horizontal foot-candles of light on the tabletop at that location.
 - 6. Videoconference capable rooms used for general meetings: In most cases the extra lighting for videoconferencing is provided through separate dimmer or switched controls.

Ensure that when these additional lighting fixtures are turned off that there is still a minimum of 40 horizontal foot-candles at tabletop height across the room.

- 7. The color temperature for all lighting fixtures shall be the same. The color temperature target goal is 3200 degrees Kelvin. Color temperature in the range of 3000 to 3500 degrees Kelvin is acceptable as long as all the fixtures are the same.
- B. Standard direct/indirect fluorescent luminaries will be used.
- C. Lighting fixture type, orientation, zoning and dimming control for non-videoconference equipped classrooms and conference rooms:
 - 1. Standard direct/indirect luminaries will be used. See Design Guideline Element D5022.
 - 2. Orient the luminaries where the length of the lamp is perpendicular to the projection screen. This orientation places the lowest light output node of the luminaries toward the projection screen.
 - 3. Provide two zones using wall dimmers for control unless otherwise directed. Zone 1 shall be all luminaries within 9 feet of the projection screen and in front of the projection screen. Zone 2 shall be all the other luminaries in the room. Place the wall dimmers at the standard location by the room entry doorway.
 - 4. In classrooms with 9 foot to 11.5 foot high ceilings, provide two adjustable compact fluorescent down lights to illuminate the lectern and presenter when the other lighting is dimmed. Place the down lights above and in front of the lectern location to achieve a lighting angle of 20 degrees to 30 degrees. The lighting goal here is from 20 to 45 horizontal foot candles. Place the dimmer for these lights on a wall adjacent to the lectern location.
- D. Lighting fixture type, orientation, zoning and dimming control for videoconference equipped classrooms and conference rooms:
 - 1. The lighting design guideline for videoconference equipped conference rooms is the same as items C 1, 2 & 3 above, with following exception:
 - a. In videoconference-equipped conference rooms, it is important to light the faces of the participants sitting at the conference table. In a conference room with a typical centered conference table there shall be a row of luminaries placed above the center line of the table. One of the fixtures shall be placed 2 feet in front of the presentation end of the conference table. This fixture will provide adequate light to illuminate the faces of the persons sitting at the end of the table.
 - 2. In videoconference capable conference rooms, asymmetrical fluorescent luminaries equipped with 1 percent electronic dimming ballast shall be provided. Asymmetrical luminaries direct the light away from the projection screens and provide adequate down light for general meetings and videoconferences. A sufficient number of asymmetrical fluorescent luminaries shall be provided over the seating area to provide a range of 40-60 vertical foot-candles as you look towards the presentation area. Adjustable fixtures with pattern adjustment capabilities shall be used to provide 60-80 vertical foot-candles at

the presentation area as the presenter looks towards the seating area. One (1) or two (2) compact fluorescent down lights shall be used above the lectern to light the workspace on the lectern. Use wall wash luminaries to light all but the presentation walls for videoconferences. Adjustable pattern wall wash fixtures shall be used to light the wall behind the presenter without spilling onto the projection screen. References for asymmetrical luminaries are in located in Part 5 – References, at the end of this document.

- 3. Light Dimming capabilities are an integral part of all conference rooms and classrooms. In videoconference capable rooms the power requirements for the additional videoconference lighting often causes the rooms power requirements to exceed the State of Texas and City of Houston guidelines for "watts-per-square foot" ratings. This is allowed under State of Texas and City of Houston guidelines when the rooms are used for videoconferencing. A dimming system provides adequate control of the lighting to maintain the State of Texas and City of Houston ratings for all other uses. Typically the videoconference lighting can only be turned on from protected sections of the room's audiovisual control system control panels.
- 4. For small to medium videoconference capable conference rooms provide an electronic controlled dimming system such as the Lutron 3600 or ECO systems. Include an RS-232 audiovisual control system interface. Provide a minimum of 4 zones with one 5-button entry control panel and a multi-scene 3600 series wall mounted master controller. The master controller shall be located away from the entry door(s).
 - a. Zone 1 shall be the fluorescent luminaries immediately in front and to the side of the projection screen.
 - b. Zone 2-3 shall be the remainder of the fluorescent luminaries in the room.
 - c. Zone 4 shall be the adjustable pattern lighting for the lectern.
- For videoconference capable classrooms provide an electronic controlled dimming system such as the Lutron 7000 or ECO systems. Include an RS-232 audiovisual control system interface. Provide a minimum of 13 zones with 1 5-button entry control panel and a multi-scene 4600 series wall mounted master controller.
 - a. Zone 1 shall be the fluorescent luminaries immediately in front and to the side of the projection screen.
 - b. Zone 2-4 shall be the remainder of the fluorescent luminaries in the room.
 - c. Zone 5 shall be the compact fluorescent down light for the lectern.
 - d. Zone 5-6 shall be adjustable pattern fixtures for the presentation area.
 - e. Zone 7 shall be the wall wash luminaries behind the lectern.
 - f. Zone 8-10 shall be the wall wash fixtures on the rear and 2 sidewalls.
 - g. Zone 11 shall be the lighting in any technician control area.

- h. Zone 12-13 shall be for rear projection equipment rooms.
- 6. For divisible conference or ballrooms provide a partition location detection system so that room lighting controls are automatically configured as movable wall partitions are put in place or removed. Lutron has an option for partition location detection as part of their dimming systems. The partition location sensors must be carefully placed at the ends of the movable partition travel only. The sensors shall also be configured in the maintained mode and not the pulse mode.
- 7. In divisible conference or ballrooms with a movable partition sensor system, an advance lighting control is required. All sensor outputs shall be connected to the audiovisual control system for the room. The audiovisual control system would then be programmed to include the advanced lighting control.
- 8. Dimming systems that use the Lutron 7000 central controller shall provide laptop connection points in the conference or classroom and in the audiovisual equipment/control room.

2.13 DATA AND TELECOMMUNICATIONS REQUIREMENTS

- A. All conference rooms are to have a minimum three (3) data RJ-45 outlets and one (1) analog fax/audioconference telephone line outlet installed. These connections are to be installed in designated floor boxes in new construction, or mounted on the front wall below the projection screen in existing construction.
- B. All new construction classrooms will have a minimum of two (2) RJ-45 data outlets in each of the floor boxes, three (3) RJ-45 data outlets near the audiovisual support equipment racks, three (3) RJ-45 data outlets near the room technician control point and one (1) analog fax/audioconference line near the audiovisual support equipment racks. For existing classrooms the connections are to be installed in the wall box with the lectern connections or immediately next to the wall box.
- C. In rooms with fixed tables, each seating location will have a RJ-45 data outlet in a popup or rear mount assembly. If wireless LAN connections can be used in the area, then these RJ-45 data outlets would not be required.
- D. The Owner's Project Manager shall work with MD Anderson Telecommunications services to determine if wireless access points shall be installed in these areas. Where wireless access points are provided, consideration shall be given to the maximum number of notebook PC's that can be served from a single point, and the total number that require connection.
- E. In podiums equipped with multimedia equipment, include a small CISCO 8-port 10/100 data switch to consolidate the data wiring in the lecterns. Where multiple data ports are needed for the audiovisual support equipment another CISCO 24-port switch shall be included in the audiovisual system and located in the support rack.
- F. Provide the following fiber counts and types for the rooms listed.

- 1. Videoconference equipped Conference Rooms: minimum of 2 multimode and 2 single mode fiber ports located below the projection screen near the audiovisual equipment cabinet.
- 2. Distance Learning Classrooms: minimum of 4 multimode and 4 single mode fiber ports located above the equipment rack in the rear projection room or audiovisual control room or audiovisual equipment closet.

2.14 ELECTRICAL SYSTEMS

- A. Any audio-visual system requires clean, high quality AC power to operate correctly and reliably, with the lowest possible hum and noise as recommended by the equipment manufacturer. A conservative number of ac power circuits shall be dedicated exclusively to the audio-visual systems. A minimum growth of 25 percent shall be included in the electrical system design. AC power circuits in floor boxes are to be provided as audiovisual power circuits.
- B. For large conference rooms and all classrooms, a true isolation transformer is required, which is specifically designed for technical system power, and has isolated secondary windings. The shield of this transformer shall be tied directly to the technical system ground at the distribution panel not to the transformer case, which is tied to building ground.
- C. Unless an isolation transformer is provided, all circuits for the system shall be taken from the same phase, with a dedicated distribution panel for all audio-visual classroom circuits.
- D. An isolated, insulated ground of #00 AWG or larger copper shall be provided in a separate conduit, from the building ground at the transformer case to the room equipment electrical panel isolated ground bus and from the panel isolated ground buss to the video production and/or sound equipment rack(s) All grounds shall be connected as required by National Electrical Code.
- E. There shall be no power transformers or lighting dimmer panels located in the same room with audiovisual equipment.
- F. Each electrical outlet provided for audiovisual equipment is to include a dedicated ground and neutral wire.
- G. In rooms where portable projection equipment will be used install 4 standard power outlets close to projector connection to serve additional equipment.
- H. Ensure the Electrical Contractor properly implements that "Star" ground configuration. Ensure that ground wires from each outlet are isolated from conduit, neutrals, and each other, and are each "home-run" to the dedicated breaker panel for AV systems.
- I. Dedicated breaker panels shall be provided for audiovisual equipment where 24 or more circuits are required. In Classrooms and Conference Rooms with rear projection rooms or audiovisual equipment closets, the dedicated breaker panels shall be located in the rear projection room or audiovisual equipment closet. When a dedicated breaker panel provides circuits for multiple rooms, the panel shall be located in a central location near the room when possible.

- J. All audio, video and control electrical circuits shall be fed from "clean" legs of the transformer, free of high inductive loads. There shall be no elevator motors, compressor motors, blower motors, etc. on the side of the power transformer that feeds the media equipment.
- K. Electrical boxes are to be staggered and shall not be placed "back to back" on any interior room surfaces.
- L. Utilization of overhead cable trays shall be considered for cable routing in audiovisual support equipment rooms and above the conference or classroom ceilings.
- M. In rooms where the data/video projector is to be ceiling mounted, a flush in the ceiling 120VAC-power outlet is required. Location of the outlet to be determined during design.
- N. Provide convenience outlets in the front of the room.
- O. Coordinate special requirements for plasma display screens; ensure power and A/V connections are located behind display screen
- P. Audiovisual flush mounted floor boxes are to be installed in new construction. The preferred floor boxes are FSR Inc. FL-600 series. The floor box installations are to include one conduit for 120VAC power, one 1-inch-conduit for data and a minimum of two 1¼-inch-conduits for the audiovisual connections. The actual number of required conduits shall be determined during the design phase of the Project. All floor boxes shall be confirmed with Owner's Planner Designer.
 - 1. Conference rooms in new construction shall include a minimum of one (1) floor box located generally under the proposed location of the conference table. The floor box audiovisual conduits are to terminate in a minimum of a 4-gang wall box on a wall to be determined in the conference room.
 - 2. Classrooms in new construction shall include the following:
 - a. Three (3) floor boxes evenly distributed in the presentation area.
 - b. One floor box located approximately under the third row of seating centered on line with the center of the projection screen.
 - c. The classroom floor box installation shall include one (1) 120VAC power conduit, one (1) 1-inch-conduit for data and three (3) 1¹/₄-inch audiovisual conduits. The audiovisual conduits are to terminate in a gutter box in the general vicinity of the audiovisual support equipment racks.

2.15 OTHER CONSIDERATIONS

- A. Provide a minimum of one MDA-TV connection in all conference rooms and classrooms. In locations without access to MDA-TV provide connections to local cable-TV systems or satellite downlinks.
- B. In conference rooms the MDA-TV connection shall be on the wall below the projection screen or near the lectern connection panel. Place connection on lectern panel if possible.

- C. In classrooms there shall be MDA-TV connections at the lectern location and audiovisual equipment support racks.
- D. In classroom with floor boxes provide one MDA-TV outlet in the front of the room in the center floor box and the podium connection floor box.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

- A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.
- B. Obtain approval from Facilities Interiors Team (FIT) for all finish schedules prior to issuance of Construction Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. For renovation projects, refer to Owner's Master Construction Specifications and Interior Finishes Standards.

PART 5 - REFERENCES

- A. Mark Lighting, http://www.marklighting.com/, preferred by MD Anderson.
 - 1. VC2A Teleconference Series recessed directional lighting system.
 - 2. VC2B Teleconference Series recessed directional lighting system.
 - 3. VC2C Teleconference Series recessed directional lighting system.
- B. Lightolier Lighting, http://www.lightolier.com/.
 - 1. 2x2 Recessed Videoconferencing luminaries.
 - 2. 2x4 Recessed Videoconferencing luminaries.
- C. Focal Point Lighting, http://focalpointlights.com/
 - 1. Vision series luminaries.
- D. ICIA Classroom & Conference Room Lighting Design Seminar, InfoComm 2003, Orlando, Fl.
- E. Ninth Edition IES Standards

- F. National Clearinghouse for Educational Facilities, NCEF
- G. Classrooms 4p. 2000
- H. Lighting for Schools 6p. 2001
- I. Multipurpose Spaces 2p. 2000
- J. "Facilities Design Criteria for the Construction and Renovation of Multimedia Classrooms" Case Western University, 1997.
- K. "Technology Enhanced Classrooms", Florida State University, March, 2002.
- L. Davis, Don and Carolyn, Sound System Engineering, Indiana: Howard W. Sams & Co. Inc., 1975.
- M. Recent MD Anderson building projects that include conference and classroom space.

PART 6 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	20190301	Original Issuance	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z4020