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 M. D. Anderson Cancer Center (Owner).

B. Please 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. We are currently in the process of evaluating High Definition (HD) equipment for these systems. The HD projection systems require wider projection screens and the other equipment is often larger and heavier.

PART 2 - DESIGN CRITERIA

2.01 GENERAL CHARACTERISTICS

A. The rooms should be located away from noise-generating activities taking place either outside or within the building. The rooms shall be located away from loud machinery, vending machines, offices, labs and traffic areas as well as outside traffic noise.

B. Ample space shall be provided in the room design for the programmed seating configuration, presentation space and support space such as furniture and equipment storage.

C. Adequate ceiling height shall be provided to allow an unobstructed view of properly sized information displays. Sight lines must be verified.

D. 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.

E. The front wall of the room behind the instructor area should have no protrusions (structural or otherwise) into the room so that chalkboard, marker boards, projection screens or information displays can be installed across the entire wall of the presenter area.

F. There should be no decorative elements such as paintings or other artwork located within the presentation area of the room.

G. The overall noise criterion of less than 30 is required. The maximum sound level shall not exceed 35dBA. A NC-25 is our goal for all presentation spaces.
2.02 ROOM SHAPE AND CONFIGURATION

A. Architects, planners and contractors should consult with owner regarding room orientation requirements which may vary with intended room use.

B. In general, owner prefers flexibility in room orientation so end-users are able to rearrange furniture components to meet specific event requirements. Some events may require row and column configuration, curved or semi-circular rows, break-out workgroup seating or no seating at all. Architects, planners and contractors should consult with owner regarding specific room requirements.

C. Rectangular shaped rooms are appropriate for many types of instructor-led presentations or lectures.

1. The length of the room should not exceed its width by more than 50 percent.

2. The presentation area and information displays should generally be located 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 on the chalkboard/marker board.

D. 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), should be hard surfaced (e.g., sheetrock, masonry or wood) with no special acoustical shaping or treatment.

B. In non-videoconference rooms the front three-quarters of each sidewall should be constructed of hard (acoustically-non absorbent) materials (e.g. sheetrock, masonry or wood). These walls can be painted or vinyl-surfaced, but should 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 which reduces the room's "boominess". The sound absorbent material should have an NRC rating of 0.60.

D. In videoconference rooms all of the walls should be covered with acoustically absorbent materials with a NRC rating of 0.85.

E. Ceilings should be a light color.

F. In non-videoconference rooms painted surfaces should be light in color and should be a durable finish to allow washing.
G. In non-videoconference rooms acoustically absorbent surfaces should be light in color.

H. All finishes used in videoconference rooms have to be either from a list of finishes that have previously been certified for use in other videoconference room projects or samples have to be submitted to Telehealth Services for certification. In general, acceptable videoconference acceptable finishes have a maximum reflectance of 60 percent, 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.

I. In general, black or white surfaces should be avoided.

J. The floors shall be carpeted with an anti-static, high traffic, commercial grade carpeting with no padding. Bright reflective carpet finishes shall not be used.

K. Marker boards used in videoconference capable conference rooms and classrooms shall have a finish designed for use in videoconference facilities. Most marker board manufacturers offer a television-friendly finish.

L. The reflectance values of paints, vinyl coverings, laminates and other finish materials should be selected to enhance ambient illumination and the illumination at work surfaces. The following values are recommended:

1. Ceilings 70 percent - 90 percent
2. Walls 40 percent - 60 percent
3. Floors 30 percent - 50 percent
4. Desktops 35 percent - 50 percent
5. Chalkboards 20 percent - 30 percent

2.04 WALL CONSTRUCTION

A. Walls shall be mechanically isolated from the building structure and shall be isolated at the top and bottom with a Neoprene seal or equivalent.

B. Walls shall go 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 sheetrock is not attached to the same studs. This will minimize the transfer of noise from surrounding spaces.

D. Use a double layer of sheetrock with the inner layer being 5/8-inch sheetrock and the outer layer being ½-inch sheetrock. In high noise areas use a 1/8-inch thick vinyl sound-block material for additional acoustical isolation.

E. Drywall seams should be staggered and each layer shall be taped and mudded individually.
2.05 WINDOWS

A. Large window areas provide light control and exterior noise problems and should be minimized.

B. All window treatments shall be opaque and capable of eliminating all outside light from reaching the information displays. Window treatment shall be installed with channels in order to provide a light-tight abutment to the window frame.

C. A motorized window shading system that can be integrated with external audio-visual control systems shall be installed for each window.

D. Window shades should provide an acoustical isolation of STC-30 or higher.

2.06 DOORS

A. Doors shall be located in the back of the room away from the presentation area in order to minimize disruption. In rooms that require two egress points, the doors should be located as far from the presentation area 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. Doors shall be equipped with acoustically rated compressive seals.

D. All doors shall be a minimum of three (3) feet wide and shall be equipped with a vision panel made of shatterproof glass and 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 should have a large door scope viewer “Peep Hole” installed to provide a view into the room to check on room activities.

E. Because ventilation louvers permit sound transmission, doors shall not contain louvers.

2.07 CEILINGS

A. A minimum 9-foot 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 then the following considerations for ceiling height shall be used.

1. The length of the room determines the maximum usable size of the projection screens. The height of the projection screen is 1/6 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 7 foot high projection area plus the 6-inch black top border.

2. In a room with a flat floor the bottom of the projection area of the screen must be at least 4 feet above the finished floor.
3. The height of the ceiling for a room longer than 24 feet is 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 7 feet + 6-inch + 4 feet = 11’6”.

4. Rooms using tiered audience seating can have a lower ceiling.

B. Access hatches must be installed in the ceiling wherever gypsum board or plaster is used 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 should be used. This will allow for seating, circulation, media equipment, space requirements to meet accessibility standards and adequate lecture space. The room layout should allow for a minimum of 4 feet between each row of tables. This allows sufficient room for walking and for moving chairs in and out of position.

B. The first row of seating should be a minimum of 1.5 times the width of the projection screen from the projection screen. A projection screen 7.5 feet high would be 10 feet wide placing the first row of seating at 15 feet from the projection screen.

C. The room layout should 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 should 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.

D. Tabletops shall have a non-glare, medium shade surface. Lights colors on tabletops cause reflections and eyestrain and are difficult to keep clean. Dark surfaces also cause eyestrain, especially when white paper is used on the tabletop.

E. Modesty panels or front panels for the tables should be used.

2.09 PROJECTION SCREENS

A. There are two (2) types of projections systems used in our classrooms and conference rooms, Front Projection and Rear Projection.

1. Front projection screens are seen most often in our 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.

2. When using the front projection screens the projector is setup in front of the screen and pointed towards the screen.

3. There are a few rear projection screens within the institutions 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 pitch dark. Typically the projector is pointed at a mirror that then reflects the image onto the screen. This effort reduces the depth of the room that would otherwise be required by a direct projection onto the rear projection screen. Assistance from a consultant or rear screen manufacturer is required to setup a rear projection system.

4. There are a number of different reflective surfaces available for the front projection screens. Our standard is a Matte White finish. A Matte White screen provides the widest viewing angle to the audience. As the reflective characteristics of the screen are increased the viewing angles get to be narrower. This increase in reflectance is referred to as screen gain. Matte White = a gain of 1.0. As you review the various manufacturers’ specifications you will find that the Matte White gain figure varies from 0 to 1.3. Due to the brilliance of today’s projectors a gain of 1.3 is the maximum we will consider.

5. Projection screens that will be controlled by the audiovisual control system should include a low voltage control option with a local 3 button control panel option.

2.10 ACOUSTICAL SYSTEM

A. Consider wall and ceiling treatments that improve intelligibility in the classroom and keep noise outside and internal building noise from being audible inside the classroom. Specify flooring with IIC (Impact Isolation Class) that prevents sound transmission. Specify walls with sound transmission class minimum rating of 50. Provide sound rated doors with acoustical door seals. The surface of the ceiling must be designed to accommodate the required acoustical properties of the room. The area of the ceiling to be acoustical tiled is a function of ceiling height. A 9 foot ceiling height typically requires that 40 – 50 percent of the total ceiling area to be acoustical tile. A ceiling height of 10 feet typically requires that 50 – 60 percent of the ceiling be acoustical tile and a ceiling height of 12 feet typically requires that 70 – 80 percent of the ceiling area be acoustical tile.

B. The acoustical tile shall be arranged in center of the room with a sheetrock ceiling enclosing the acoustical tile area.

C. Ceiling tiles with a Noise Reduction Coefficient (NRC) of 0.65-0.85 and a minimum Sound Transmission Coefficient (STC) of 50 shall be used.

D. Access hatches must be installed in the ceiling wherever gypsum board or plaster is used to facilitate access to otherwise inaccessible areas of the ceiling cavity.

E. 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.

F. Minimal acoustical requirements:
1. NC Ratings:
   a. General Classrooms: NC 35 or less
   b. Auditorium/Lecture Hall: NC 25-30, or less
   c. Distance Learning Classroom: NC 25-30, 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

G. Overall noise criterion of less than 30 dBA is required, with the maximum sound level not to exceed 35 dBA.

H. In all conference rooms, use acoustically absorbent materials with an NRC rating of 0.85 or greater.

I. Acoustical Standard Testing Procedures

   1. Noise Criteria (NC):
      a. 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 NC curve touched by a plot is the sound NC level. NC curves apply to sound pressure levels in an occupied space, not equipment sound power levels.
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, AFF located in middle of the instructor station location area at the front of the room.

d. Standard: NC of 35 or less for classrooms. NC of 25-30 or less for auditoriums and distance learning classrooms.

2. Reverb Time (RT60):

a. 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, AFF located in 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 general building specifications regarding temperature and humidity.

B. System components (fans, ductwork and diffusers) shall be selected to meet the sound criteria of NC 20 to NC 25.

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 should 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 for low velocity air conditioning system 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 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 use fan coil units or other fan powered elements of the mechanical system in the classroom ceiling space.

2.12 LIGHTING SYSTEMS

A. Lighting goals. All room lighting configuration should be verified by using a computer lighting design program such as those offered by Lumen Micro or Lightolier.

1. Conference room non-video conference. Measured at tabletop height 40 to 50 foot-candles horizontal all across the seating area of the room. 0 to 8 foot-candles on the projections screens.
2. Classroom non-videoconference. Measured at tabletop height 40 to 50 foot-candles horizontal all across the seating area of the room. 0 foot-candles on the projection screens. 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 should be provided at a height of 48-inches to 75-inches above the finished floor to provide lighting of the presenter. 0 to 8 foot-candles on the projections screens.

3. 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. 0 to 10 foot-candles on the projections screens. Wall wash on all but the projection screen wall should 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.

4. 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 and 60 to 90 foot-candles vertical measured from 40-inches to 75-inches above the finished floor. 0 to 8 foot-candles on the projections screens. Wall wash on all but the projection screen wall should 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.

5. Videoconference Capable rooms used for general meeting. In most cases the extra lighting for videoconferencing is provide separate dimmer or switched controls. Make sure 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.

6. The color temperature for all lighting fixtures should 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. In non-videoconference capable classrooms both general fluorescent and compact fluorescent down lighting should be provided. Sufficient compact fluorescent down lights should be provided to provide an even 40-50 foot-candles of light across the seating area at tabletop height when the projection screen is used. In the presentation area directional lighting fixtures should be used to provide 40-50 foot-candles of light on the lectern and keep
the light from spilling on to the screen. One (1) or two (2) compact fluorescent down lights should be used above the lectern to light the workspace on the lectern. Provide two (2) adjustable compact fluorescent down lights that are located in front of the lectern approximately 30-inches apart to light the face of the presenter. The adjustable down lights should be placed to provide a lighting angle of 20 to 30 degrees. Care should be given to select luminaries that will provide a minimum light spill on to the projection screen.

C. In conference rooms equipped with standard recessed fluorescent luminaries and no down light fixtures the light fixtures within 6 feet of the projection screen should be on a separate switched circuit from the rest of the room lighting. This will allow the luminaries that reflect a large amount of light on to the projection screen to be turned off. The fluorescent luminaries should include large deep cell lenses.

D. In videoconference capable conference rooms asymmetrical fluorescent luminaries equipped with 1 percent electronic dimming ballast should 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 50-70 vertical foot-candles as you look towards the presentation area. Adjustable fixtures with pattern adjustment capabilities should 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 should 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. Use wall wash fixtures to light markerboards. References for asymmetrical luminaries are in addendum at the end of this document.

E. 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 guideline 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.

1. For non-videoconference capable conference rooms and classrooms as a minimum provide wall-mounted dimmers for at least 4 zones.
   a. Zone 1 shall be the fluorescent luminaries immediately in front and to the side of the projection screen.
   b. Zone 2 shall be the rest of the fluorescent luminaries in the room.
   c. Zone 3 shall be the compact fluorescent down lights above the seating area.
d. Zone 4 shall be the compact fluorescent down light and adjustable pattern fixtures for the presentation area.

2. For small to medium videoconference capable conference rooms provide an electronic controlled dimming system such as the Lutron 3600 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 should 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 rest of the fluorescent luminaries in the room.
   c. Zone 4 shall be the adjustable pattern lighting for the lectern.

3. For videoconference capable classrooms provide an electronic controlled dimming system such as the Lutron 7000 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 rest of the fluorescent luminaries in the room.
   c. Zone 5 shall be the compact fluorescent down light for the lectern.
   d. Zone 5-6 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.

4. 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 should also be configured in the maintained mode and not the pulse mode.

5. In divisible conference or ballrooms with a movable partition sensor system and advance lighting control is required all sensor outputs should be connected to the audiovisual control system for the room. The audiovisual control system would then be programmed to include the advanced lighting control.
6. Dimming systems that use the Lutron 7000 central controller should provide laptop connection points in the conference or classroom and in the audiovisual equipment/control room.

2.13 DATA AND TELECOM 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 box 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 Jacks would not be required.

D. The project manager should work with IS network services to determine if wireless access points should be installed in these areas.

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 is included in the audiovisual system and located in the support rack.

F. Provide the following fiber counts and types for the rooms listed.

1. Conference Rooms: minimum of 2 multimode fiber ports located below the projection screen

2. General Classrooms: minimum of 2 multimode fiber ports located below the projection screen

3. Distance Learning Classrooms: minimum of 4 multimode and 4 singlemode 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 should 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 room and all classrooms a true isolation transformer is required, specifically designed for technical system power, with 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 and from the panel ground buss to the equipment rack(s) All grounds will be connected as required by National Electrical Code.

E. There should 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 should be provided for audiovisual equipment where 24 or more circuits are required. In Classrooms and Conference Rooms with rear projection rooms are audiovisual equipment closets the dedicate panels should be located in the rear projection room or audiovisual equipment closet. When a dedicated breaker panel provides circuits for multiple rooms the panel should be located in a central location near the room when possible.

J. All audio, video and control electrical circuits should 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 must be staggered and shall not be placed "back to back" on any interior room surfaces.

L. Overhead cable trays should 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 floor boxes are to be installed in new construction. The preferred floor boxes are FSR Inc. FL-600s. 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 are to be determined during the design phase of the Project.

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 should include one (1) 120VAC power conduit, one (1) 1-inch-conduit for data and three (3) 1¼-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 should 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 should 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.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

PART 5 - REFERENCES

   1. VC2A Teleconference Series recessed directional lighting system.
   2. VC2B Teleconference Series recessed directional lighting system.
   3. VC2C Teleconference Series recessed directional lighting system.

   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


M. Recent M. D. Anderson building projects that include conference and classroom space.

PART 6 - DOCUMENT REVISION HISTORY

<table>
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<th>Issue</th>
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<td>01-01-07</td>
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<td>Rev. 1</td>
<td>11-01-07</td>
<td>Part 1, added Note “B”; revised Section 2.02 Room Shape; Section 2.07 deleted ceiling tile requirements; added new Section 2.10 Acoustical System w/ ceiling tile requirements; added requirements to Section 2.11 Mechanical Systems; added fiber count requirements to Section 2.13 Data and Telecom; added requirements to Section 2.14 Electrical Systems.</td>
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END OF ELEMENT Z2060