Western Michigan University – Office of Information Technology & Campus Planning, Design & Construction

Design Guidelines for Facilities Construction:

DESIGN GUIDELINE DG17-2 Room / Spaces and Facilities

GUIDELINE CONTENTS:

I. GENERAL

The communications room system consists of a main communications room or Building Entry Facility (BEF) and possibly several secondary or distribution communications rooms (CDRs). Under the TIA/BICSI-style structured cable

architecture used by WMU, individual user connections (voice, data, video) are supported by equipment in these rooms, which is in turn supported by direct connections to the BEF, where connections to the campus system or other off-site source occur. Refer to Drawing XXXX for the basic concept of the communications room tree and TIA and BICSI documents for more details.

Communications rooms house one or more standard 19-inch communications racks which hold passive cable terminations and equipment (active and passive) to support telephone, video, data network connectivity, and possibly other communications systems. In most cases, at least part of the equipment in each room is powered by a UPS to assure critical systems continue to function during power outages.

The building entry facility (BEF) is a specialized communications room. It houses the entry facilities that are the subject of a separate section, but often also contain the functions of a standard communications distribution room. It normally holds special electronic equipment to act as the core distribution center for all other building distribution equipment.

II. COMMUNICATIONS SPACES AS A SYSTEM

A. General Design Considerations

There will be an interconnected system of adequately sized and distributed communications rooms (CDRs) to support all forms of voice / telephone, data, audio/video and other required low voltage communications systems for the building.

The entire communications system will be dedicated for the sole use of low voltage communications systems.

The system will consist of a main communications room, or Building Entry Facility (BEF) in the basement or lower level and at least one subordinate communications distribution room (CDR) for each additional floor. The use of a single BEF/room or room to support multiple floors will be considered only for very small, lightly populated buildings.

The BEF is the focal point for all communications connections, outside and inside, for the building. It should be located on the lowest level of the building at a location allowing ready access for all outside communications connections to other campus buildings or outside facilities.

While WMU desires a robust communications system, and redundancy is a major factor in achieving this, we are not currently requesting any redundant duplication of CDRs or BEFs. This could be reconsidered under unusual circumstances. (This provision should not be interpreted to disallow creation of a second BEF-CDR system which could be desirable or required as an inherent function in a building addition, since it would not be created in proximity of the original BEF or solely for redundant purposes.)

Building additions or major renovations may result in a new CDR, which is the core point for several other CDRs but which gets connectivity from a BEF (and thus does not need over-voltage protection and other entry facilities and is not a true BEF). This space would be a special case and should be treated like a BEF in some ways, but not others.

III. MAIN COMMUNICATIONS ROOM / BUILDING ENTRY FACILITY (BEF)

A. General

The BEF is a specialized communications distribution room. This room supports outside cable path entries and acts as the core or root for all internal cable distribution paths.

Normally, the communications equipment will be no larger (and often smaller) than in a subordinate communications distribution room. The cable termination density may also be rather small for a simple building, but may be quite large for a large building with many CDRs.

The BEF often is used as a CDR in addition to its BEF functions. The extent of the CDR functions should be considered when defining the size and room facilities.

Whether or not the BEF room functions as a CDR, the minimal CDR facilities requirements listed below apply, and in some cases (grounding, power) may differ from secondary CDRs.

B. General Design Considerations

There will be only one main communications room or building entry facility (BEF) for a building.

The BEF will be the point of entry for all outside communications duct accesses.

The main communications room (or Building Entry Facility – BEF) will be at an outside wall whenever possible, fed directly from outside facilities through an adequate number of 4-inch ducts or an equivalent pathway.

The BEF of large buildings (>10,000 sq. ft.) will be at least 12’ x 10’. Additional space may be required for very large buildings. BEF of smaller buildings will be at least 8’x10’’.

The BEF, and specifically the over-voltage protection block, must be within 50 ft. of the point where the facilities enter the building to meet safety requirements. Facilities provisions (lighting, power, etc.) for individual communications rooms below also apply to the BEF.

The communications entry facilities installed in the BEF are treated in a separate DG.

IV. ALL COMMUNICATIONS AREAS

A. General

Most equipment for the modern communications system will be mounted in communications racks rather than on the wall. Rack-mounted communications equipment may extend to 2 ft. or more behind the rack face. Communications rooms need space for personnel to maintain this equipment and wall-mounted equipment. Cable passage to and rack needs to be present. Modern communications equipment may require substantial amounts of power and generate significant amounts of heat.

All CDRs must contain supporting facilities like lighting, power, grounding, etc., which are discussed as separate systems below.

B. General Design Considerations

Each floor should have at least one Communications Distribution Room for every 10,000 sq. ft. CDRs should be located near the center of the area they are intended to serve. Room locations and building floor and cable path arrangements must be coordinated so that no planned or possible individual horizontal communications connection will exceed the TIA-mandated 90 meter/295 ft. distance limitation when routed neatly through the communications cable support structure. (This should apply mindful of future growth and include the possibility of additional future outlets rather than being limited to only the specific communications outlets called out on current drawings.)

CDRs should be rectangular and directly stacked whenever possible.

All CDRs must be connected to the BEF by direct and adequately sized cable paths. Individual rooms on the same floor will have direct interconnecting cable paths.

Minimum room size should be 8’ x 10’. For large areas served, a size of 10’ x 12’ is preferred. Additional space should be added if it is known that special systems such as security or complex audio/visual centers will also use the room. Non-rectangular rooms must have enough usable wall and floor area to accommodate normal communications facilities and allow adequate personnel access rather than providing only “equivalent floor area”.

Communications distributions rooms should be designed as systems. CDRS should be laid out to allow full personnel access to both front and rear of all racks (mounted equipment may extend up to two feet behind rack face). Racks should be mounted approximately 6-9” away from the wall with power outlets on the wall approx. 18” high and 6-18” behind the rack vertical rails. Rack pairs will be arranged so cable terminations are in the right hand rack and electronics are in the left rack. We prefer the left rack (electronics) be adjacent to the wall, but overall room design may over-ride this. The racks should be smoothly integrated with the cable pathways. Walls may be used for routing cables between access openings and the rack system and to support some specialized systems.

Lightning should be positioned so it is neither blocked by nor blocks access to cable handling facilities.

Specific relative locations of conduit entries, plywood wall panels, communications racks, number and location of power outlets, etc. should be specified on drawings as much as possible.

C. Specific requirements

All systems will be installed in accordance with current NEC and other applicable codes in a manner satisfactory to authority having jurisdiction.

1. Access

CDRs will have a single entrance door opening directly into a primary building corridor. Rooms may be within major mechanical or maintenance areas within a building when this is appropriate, but must have direct access to the main service floor area with no intervening spaces or barriers.

CDRs will have fully opening doors that are at least 36” wide and 80” in height. In-swing doors, if used, must be removable. Out-swing doors must not be removable for security reasons. Doors must be lockable and will be keyed with Communications cores on building completion.

2. Surfaces

Floors will be designed to support loads of 100 lb/sq. ft. (4.8kPA) minimum.

Communication room walls will be covered with trade size ¾-inch fire-rated or treated plywood between approx. 1ft and 9 ft. above the floor. Areas of the wall containing the door, which are less than 4 ft wide, need not be covered.

- Exposed plywood faces will be coated with at least two coats of fire resistant white paint to match room.
- Plywood will be mounted to support loads of at least 25 lbs per sq. ft.
- There will be no false ceilings of any sort. Open height must reach 8ft 6in. minimum.

Environment and Limitation of Damage Exposure

Communications area should be dust-free and not subject to abnormal environmental stresses such as steam, water, or direct sunlight infiltration. Rooms will have tiled or otherwise finished dust-free anti-static floors. Gypsum board, concrete, or brick walls will be painted white before installation of required plywood to minimize dust.

Rooms will be well lighted

There will not be facilities for any building functions traversing BEF/TC spaces. Specifically, there will not be any water pipes within the interior space, routed horizontally on the floor directly above the room, or within the slab above or

below the room. Other non-related systems (pipes, ducts, etc.) passing through the spaces will be minimized.

There should be adequate climate control to maintain ambient temperature and humidity within a normal interior range: 64-75 degrees F., 50% +/- 15% relative humidity.

Heat load for network equipment can be estimated at roughly 325 W or 1100 BTU per hour per 25 jacks served by the room.

Each room will contain a smoke/fire sensor as part of the overall building fire system.

There will be no sprinkler outlets in communications rooms unless required by code. If sprinklers are required they will be of a dry type if possible, or of the most reliable or leak-resistant type available. If present, sprinkler heads will be placed over clear floor areas rather than over racks or other areas where leaks will drip directly onto electronic equipment. Any other possible precautions to protect communications equipment from accidental water damage will be used.

VI. COMMUNICATIONS GROUND SYSTEM

A. General Design Considerations

All CDRs must be equipped with good grounding access in the form of a solidly bonded copper busbar. All subordinate CDR busbars must be bonded together with 2/0-AWG copper wire to a central busbar (TMGB) in the BEF and to building structure as specified by codes and good-practice recommendations. The TMGB must be bonded to the main building electrical ground per codes. Metal components of the communications system should be bonded to room busbars as required by codes and good practice.

B. Specific Requirements

1. Products

In the BEF, the Telecommunications Main Grounding Busbar (TMGB) will be solid copper, ¼" x 4" x 20" minimum, with insulated 3" to 4" standoff wall mounts. BEFs in large buildings will be equipped with a larger plate if required to provide adequate space for the number of room and other anticipated ground cables.

Newton Instrument Co. part 003056 or similar approved by owner.

In CDRs, the Telecommunications Main Grounding Busbar (TMGB) will be solid copper, ¼" x 4" x 10" minimum, with insulated 3" to 4" standoff wall mounts.

Newton Instrument Co. Part 003058 or similar approved by owner.

Wire to building grounds and between busbars: 2/0-AWG green insulated stranded copper cable.

Lugs for building ground and inter-busbar grounds will be of two-hole crimp style.

2. Execution

Bonding wire for components will be minimum of 6-AWG green-insulated stranded copper. Bonding lugs will be crimped.

TC grounding Busbars will be mounted to the wall approximately 1.5 ft above floor at a centrally available location that will not impede personnel traffic or work. Inter-TC and other grounding wires will generally follow the same route as the communications cabling wherever possible.

Busbar connections will be grouped with busbar and building connections at one end and equipment grounding connections at the other end.

All room ground busbars will be tested using a Two-Point Test Method between them and the main building ground. The ohmic value shall be less than 0.1 ohm to be considered adequate.

VI. AC POWER OUTLETS

A. General Design Requirements

Communications distribution rooms need redundant emergency circuits to support communications equipment. Total power capability as reflected in the quantity, voltage, and current capacities of outlets will be a function of the planned quantity of user outlets.

For approximate power loads, one possible design guideline is to assume a power requirement of 10W per user jack. User support equipment is installed in 24- or 48- port increments. If practical, each communications equipment outlet should be capable of carrying the full projected load. The design can be refined with owner input as it progresses.

B. Specific Requirements

Each communications closet will be equipped with a minimum of two individual-circuits from emergency power for communications equipment.

- For 120 V circuits, standard quad outlet boxes will be used, 20A capacity.
- For 208 V. circuits, outlets will be L6-30 style, 30A capacity.

In addition to outlets intended for equipment in racks, there will be at least one general service quad-outlet box at standard height in a readily accessible room wall. Large rooms should have two or more general service outlets.

C. Products

- UPS system: owner will supply.
- Power distribution strip: owner will supply.

D. Execution

There shall be no shared neutral in communications power circuits.

VII. COMMUNICATIONS RACK SYSTEM

A. General

Most equipment in WMU communications is installed in racks rather than on walls as in earlier telecommunications systems. Consequently, the quantity, location, and accessibility of good communication bays is critical. Similarly, it is necessary that the rack bays have good access to power and good lighting. Good cable paths for all communications cables is important, since the quantity of cables involved may be large, leading to the need to support large cable volumes and weight in an organized way.

B. General Design Requirements

Every TC should be equipped with one or more floor-mounted communications rack and cable management system sized to support cable terminations and electronics. Available rack area should be sufficient to hold all riser (copper and fiber) cable terminations, all horizontal cable terminations, support electronics to activate every jack, and power distribution in the form of a outlet strips and a UPS system, possibly with additional batteries.

A single rack should support no more than 144 (3*48) jacks (not outlets or users). For higher densities, two racks must be used. Dual racks are preferred whenever space is available, regardless of load. For high-density closets, racks should always be installed in pairs, with one for cable and one for power. For more than 480 jacks, four racks should be installed. If more than 960 jacks are expected, WMU OIT should be consulted.

Additional separate rack space should be provided as required for any additional special systems not directly a part of the communications system. OIT should be consulted early in the process about the suitability of any system possibly sharing communications space, and how such needs will be accommodated.

See other DGs for information on mounting equipment in racks.

C. Specific Requirements

1. Products

Communications equipment rack: 7 ft high, 19 inch wide, aluminum with EIA tapped holes, 0.25” channels, 1000 lb. weight capacity: Chatsworth Products Model 46353 – 503.

Vertical cable management: 6-inch wide channels with opening, permanently attached latches: Chatsworth Products 11729-503.

Horizontal cable management: AMP/Tyco Part 558329-1 (1-u) or 558331-1 (2-u).

2. Execution

Racks will be securely and permanently bolted to the floor per manufacturers specifications.

Rack system will be braced at the top to minimize sway and augment floor bolts for heavy loads by secure connection to cable trays or separate braces.

Individual rack system components will be bonded together by appropriate approved means. Racks or bays will be bonded to room ground busbar.

Racks will be mounted to allow a minimum of 3 ft. of space at both front and rear for equipment and personnel access. Equipment depth may be assumed to be 2 ft. from front of rack.

Racks will be equipped with vertical cable management. Wide vertical dual-sided sections will be installed on sides of individual racks, between adjacent racks, and at the ends of rows of racks. Racks and vertical cable management sections will be securely fastened to form a single system.

A neat, well-supported cable tray will be installed between each cable tray system accessing the room and the equipment rack system. A cable tray with appropriate capacity will be installed between each wall adjacent to or near floor or ceiling entry conduits, in-floor trays, or other entry paths and the rack system, to provide a path for cables using these entries to reach the rack system.

VIII. LIGHTING

A. General Design Requirements

Illumination will be uniform and of a level of at least 500 lux (50 foot-candles) measured at 3.3” above floor.

Lighting will consist of overhead fixtures controlled by a switch near the door.

B. Specific Requirements

Execution

Lighting fixtures will have bottom surface a minimum of 8ft. 6in. above floor.

Light fixtures will be coordinated with overhead cable trays and other fixtures to ensure light is not obstructed. Similarly, light fixtures must not obstruct access to cable trays or other fixtures or equipment.

IX. OTHER ASSOCIATED FACILITIES

A. Cable tray

Cable tray extensions, fixtures, etc. needed to neatly support or dress cables will be from the same manufacturer and system, or clearly compatible with, previously installed components.

B. Fire stopping

On completion of all other work, all cable tray, conduit, and pass-through openings are properly fire-stopped as required by codes.

Wherever possible, WMU OIT prefers fire-stop products, which require little or no special attention as cables are added or removed. Examples include Specified Technologies Inc. (STI) EZ-Path.

END OF SECTION