PART 1 – GENERAL

1.01 Function. The BDF in a building serves as the connection point between the entrance and riser cabling systems while IDFs serve as connection points between the riser and horizontal cabling systems. These rooms contain both passive components to accomplish these connections (cross-connect panels, fiber optic termination panels, punchdown blocks, etc.) as well as active communications electronics equipment. These electronics are typically data network switches and CATV transmission equipment.

1.02 Environment. In order to provide the proper environment for the equipment described above, the BDF/IDFs should be properly sized, cooled or ventilated, and lighted. In addition, they should be provisioned with appropriate electrical power for the equipment to be housed, and provide protection for the equipment from all outside environmental elements. In general, if one of these rooms is suitable for human occupancy (after all equipment has been installed), then it is probably suitable for the active equipment it is to contain.

1.03 Design organization. The AMEP aspects of construction of BDF/IDFs are generally completed by general, mechanical, and electrical contractors. Therefore, in new building projects, the designer will probably elect to specify all of this work within the architectural, mechanical, and electrical drawings and specifications within the project documents.

PART 2 – DESIGN GUIDELINES

2.01 Quality assurance.

- Standards. All work shall be in accordance with the latest edition of all applicable campus, State, and Federal regulations and codes. All work shall also be in accordance with the 2003 BICSI TDMM manual, 10th edition (chapters 7 and 8), with the TIA-569 standard and all addenda, and with the manufacturer’s recommendations.

2.02 General strategies.

- IDF size. In general, the designer should specify the dimensions of each IDF to match the equipment to be housed in that room. The designer should determine the number of equipment racks to be placed in each room using the principles outlined in Section 17110. Typically, these rooms are sized as follows:

1. Very small IDFs (those serving less than 20 outlets) will be equipped with wall mounted hardware. The minimum interior dimensions of these rooms are 3’-0” X 5’-6” with the door located on the one of the long walls.
2. Small IDFs (those serving between 20 and 80 outlets) will be equipped with two free-standing racks. The minimum interior dimensions of these rooms are 7’-6” X 7’-6”. The preferred interior dimensions for these rooms are 8’-0” X 10’-0”.
3. Large IDFs (those serving between 80 and 160 outlets) will be equipped with four free-standing racks. The minimum interior dimensions of these rooms are 12’-0” X 8’-0”. The preferred interior dimensions for these rooms are 8’-0” X 14’-6”.

- BDF size. In general, the designer should specify the dimensions of the BDF to match the equipment to be housed in that room. The designer should determine the number of equipment racks and the entrance terminal equipment to be placed in the BDF using the principles outlined in Section 17120. Typically, these rooms are sized as follows:
1. Very small BDFs. These rooms will typically serve only the smallest buildings (those with fewer than 20 outlets projected). Equipment will be wall mounted. The minimum interior dimensions for these rooms are 3’-0” X 5’-6” with two doors located on the one of the long walls.

2. Small BDFs. These rooms will typically contain one BDF25/50/100 rack and one cross-connect rack. The minimum interior dimensions of these rooms are 7’-6” X 9’-0”. The preferred interior dimensions for these rooms are 8’-0” X 10’-0”.

3. Large BDFs. These rooms will typically contain one BDF200 rack or larger, one BDF electronics/fiber rack, and one cross-connect rack. The minimum interior dimensions of these rooms are 8’-0” X 12’-0”. The preferred interior dimensions for these rooms is 8’-0” X 14’-0”.

4. Very large BDFs. These rooms will typically contain one BDF200 rack or larger, one BDF electronics/fiber rack, two cross-connect racks, and one additional electronics rack. The minimum interior dimensions of these rooms are 8’-0” X 14’-0”. The preferred interior dimensions for these rooms are 8’-0” X 17’-0”.

- Dedicated facility. The BDF/IDF should be used solely for equipment related to telecommunications functions. The room should not be used to house items related to any other function. This includes mechanical equipment, electrical panels or equipment, custodial supplies, storage items, etc. It should be completely isolated and secured from the adjacent spaces in the building. It should not contain a work desk for computer support personnel. Computer server equipment should be located in departmental space and not in BDF/IDFs.

In addition, controller-type equipment for auxiliary building systems which require either dial tone or network connections should not be located in the BDF/IDF. These include fire alarm dialers, security system controllers, card access controllers, campus debit card system controllers, building automation system controllers, and other similar devices.

- Room location selection. When possible, the BDF should be located on the lowest floor of a building with IDF's stacked on each floor directly above it. In some larger buildings, multiple stacks of IDF's will be required. One key limiting factor in determining acceptable locations for BDF/IDFs is that current data communications technologies require that the length of the horizontal data cable link does not exceed 295 ft. (90m). A good rule of thumb to use in determining acceptable locations is the “250 ft. rule”. The pathway run from the outlet box farthest from a BDF/IDF back to where the wireway penetrates the wall of that BDF/IDF should not exceed 250 ft. It is imperative that this calculation includes allowances for the vertical conduit run from the wireway to the outlet box and for the vertical and horizontal deviations in the wireway routing which are common in construction projects. Since the selection of BDF/IDF locations will probably be done prior to specifying the exact routing of the pathway system, the designer is encouraged to use conservative estimating in determining maximum length of runs.

Typically, BDF/IDFs are located near the center of the building, near restrooms, elevators, or other service core spaces.

- Unacceptable locations. BDF/IDFs should not be located in areas subject to water infiltration, steam infiltration, excessive humidity from nearby operations, excessive heat, or direct sunlight (rooms should not have windows). They should also not be located too close to sources of significant EMI or hazardous substances.

- IDF interconnection. Only the standard riser pathway system as described in Section 17130 should be installed to interconnect the IDF's to the BDF. Pathways to interconnect multiple IDF's on the same floor as described by telecommunications industry standards are not to be installed at NC State.
- Room administration. NC State Comtech has final authority over access to and the use of all BDF/IDFs.

- Security. All BDF/IDFs will be keyed to the university lock system key M4C1A1. A limited number of keys will be provided to departmental offices, LAN support groups, and other parties who require access on an ongoing basis. For occasional access, this key can be checked out on a daily basis from Comtech.

- Accessibility. The designer should locate the BDF/IDFs such that they can be easily accessed by technicians without having to pass through lockable space. Typically, each will be located with a door exiting to a corridor or common area which can be reached by personnel possessing keys to the main building entrance door only. It is acceptable to locate these rooms with the door directly accessing the exterior of a building. However, extra effort must be made to ensure these doors are sealed properly from water, dirt, dust, and heat potentially present outside buildings.

Locating the doors of the BDF/IDFs so that they are to be entered from mechanical, electrical, or other similar space is unacceptable. Doors of BDF/IDFs should not be blocked by furniture or equipment, vending machines, trash or recycling bins, or other movable equipment restricting quick access by technicians.

2.03 Architectural requirements.

- General construction. BDF/IDFs can be constructed with materials similar to those used for basic office space construction, and can be matched to nearby spaces. In retrofit projects, these rooms should be constructed to match surrounding areas as closely as possible.

- Walls. The walls of each room should be installed to the deck above. Typically, walls will be constructed using 3 5/8” steel studs (25 GA at walls, 20 GA around door) at 16” O.C. with one layer of 5/8” thick type X (ASTM C-36) gypboard each side. 4” rubber cove base should be installed on all walls inside the room.

- Ceilings. The minimum height for ceilings in the BDF/IDFs should be 9’- 0”. However, when allowable by fire code, no ceiling should be installed in the rooms, and the walls should be run to the deck above. Where existing utilities prevent walls from being run to deck or where a ceiling is required to maintain a particular fire rating, a gypboard and stud construction ceiling should be installed as high as possible. In these cases, no wireway elbows should be installed above the ceiling unless made accessible by a ceiling hatch. Acoustic tile ceilings should not be installed in BDF/IDFs.

- Fire rating. In general, the walls of a BDF/IDF do not need to be fire rated assemblies. However, if any wall of the room is required to be a rated wall (i.e. the wall between the BDF/IDF and the corridor, or the wall between the BDF/IDF and a stairwell), that wall should be installed to comply with the rating required. The fire rating of the ceiling and floor of a BDF/IDF is no different than that required for similar occupied space.

- Interior doors. Typically, new interior BDF/IDF doors should be single 3'- 0” X 7'- 0” wood veneer doors (premium rotary cut birch finish), 5 ply on staved core, 20 minute rated (labeled), Weyerhauser, Inc., VT Industries, Inc., Algoma Hardwoods, Inc., Eggers, or equal. Door (and frame) color and style should match surrounding doors. Doors are to be provided pre-machined for three hinges and mortise lockset. Door frames will typically be hollow metal frame 16 GA cold rolled steel, with 2” head, 5 3/4” jamb, 4 1/4” throat. Frames are to be 20 minute rated (labeled), welded construction, prepped for three hinges and 4 7/8” ANSI standard strike. The door headers should be reinforced for installation of surface type closers. Doors should swing out, not into the BDF/IDFs. Doors and frames should match surrounding doors as closely as possible. The above specifications are for illustrative purposes only.
- Exterior doors. BDF/IDF doors which exit to the exterior of a building should be matched to other exterior utility doors. Typically, these will be 3'-0" X 7'-0" hollow metal doors with hollow metal frame of 16 GA cold rolled steel. Doors should swing out, not into the BDF/IDFs.

- Door hardware. Typically, interior door hardware should include:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Part Number</th>
<th>Or Equal?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinges</td>
<td>5 knuckle steel hinges, 4 1/2” X 4 1/2&quot;, US26D (dull chromium) finish, with oil impregnated bearings</td>
<td>McKinney Products Co.</td>
<td>TA2714</td>
<td>YES</td>
</tr>
<tr>
<td>Lockset</td>
<td>Storeroom/closet function steel mortise lockset, LWM series lever, US26D (dull chromium) finish, always requiring key to open</td>
<td>Corbin Russwin Architectural Hardware Co.</td>
<td>ML2057 LWM</td>
<td>YES</td>
</tr>
<tr>
<td>Cylinder</td>
<td>Mortise cylinder, steel, US26D (dull chromium) finish</td>
<td>Best Access Systems, Inc.</td>
<td>1E74</td>
<td>NO</td>
</tr>
<tr>
<td>Closer</td>
<td>Heavy duty, parallel arm closer, with extra duty arm, aluminum finish, using thru-bolt &amp; machine screw fasteners, aluminum finish</td>
<td>LCN</td>
<td>4111-3077EDA</td>
<td>YES</td>
</tr>
<tr>
<td>Kickplate</td>
<td>8” tall X (door width less 2”) stainless steel kickplate, US32D (satin stainless) finish</td>
<td>Rockwood Mfg. Co., Inc.</td>
<td></td>
<td>YES</td>
</tr>
<tr>
<td>Door silencers</td>
<td>Silencers for metal frame door, gray finish</td>
<td>Glynn-Johnson, Inc.</td>
<td>GJ64</td>
<td>YES</td>
</tr>
</tbody>
</table>

Door hardware should match that used for surrounding doors. The above specifications are for illustrative purposes only. All lock cores will be installed by the NCSU Facilities Operations.

- Seals. It is important that moisture and dust be kept out of BDF/IDFs. The electronics in these rooms are equipped with fans which pull in air to cool internal components. Excess moisture or dust will damage this equipment over time. The bottom of interior doors should be equipped with door shoes, solid door sweeps, brush door sweeps, or thresholds equipped with vinyl inserts as applicable to prevent water and dust from entering room underneath door. Exterior doors should be equipped with rubber or plastic gasketing or perimeter seal on top and side of door to provide a seal from external rain, humidity, and dust.

- Flooding. A potential source of flooding in the BDF occurs when the first telecommunications manhole outside the building is at a higher elevation than the BDF. Storm water collects in the manhole and gravity forces it through the entrance ductbank. While installation of water tight sealants inside the conduits usually prevent flooding, the BDF finished floor should be located higher than the top of the manhole, when feasible.

- Interior/finishes. The interior of each BDF/IDF should be completely painted with two coats of Glidden 4000 Hi-Hiding white latex paint or equal. Floors should be finished with 12” X 12” vinyl composition tiles, commercial grade, Armstrong Standard Excelon – polar white, or equal.

3/4” thick plywood is to be installed on all walls from 24” to 96” AFF. A section of plywood should also be installed above the door frame. Plywood is to be either fire retardant plywood with label side out or standard plywood painted with fire retardant white paint. If fire retardant plywood is used, the contractor shall have the designer approve the completed installation prior to the plywood being painted with the latex paint described above. If fire retardant paint is used, the
contractor shall paint all sides of the plywood. The contractor shall also provide a product
submittal for the paint to the designer for approval.

- **Signage.** An NCSU standard sign denoting room number and “Telecommunications” should be
  installed on or adjacent each BDF/IDF door. Signs should match existing signs in surrounding
  areas. For areas with no nearby signs, two 2” tall engraved plastic signs, black with white
  lettering, should be installed. One will denote the room number and the other
  “Telecommunications”.

### 2.04 Mechanical requirements.

- **Environmental requirements.** Each BDF/IDF should be equipped with an HVAC system to keep
  the room at or below 75°F and 55% relative humidity after all electronic equipment is installed.
  For design purposes, the typical heat generation per room will range from 5000 to 7000
  BTU/hour. Rarely is excess humidity a problem except when rooms are located in humid areas in
  retrofit projects.

  A variety of systems may be utilized to reach the above goal. The designer should carefully
  analyze the existing system in a building to determine the best mechanism to use. The
  temperature and humidity of the air in nearby spaces as well as the amount of electronics
  envisioned for a particular BDF/IDF should be considered in determining design alternatives.
  Some systems that have been used in BDF/IDFs in campus buildings include:

  1. Stand alone split systems dedicated solely to the BDF/IDFs in the building.
  2. Window type (commercial grade) or through the wall units.
  3. Incorporation into the existing comprehensive HVAC system in the building. (This
     option should be selected for new buildings.)

- **HVAC controls.** All active HVAC systems installed in BDF/IDFs should be able to be controlled
  separately from the system in the remainder of the building. The system controls should be
  accessible to personnel inside the BDF/IDF. In addition, they should be thermostat controllable
  from within the room. As required by applicable codes, fire dampers or similar mechanisms
  should be installed through rated walls.

- **Fire protection.** Each BDF/IDF should be equipped with either a smoke detector or heat detector,
  of same manufacturer and product line used elsewhere in the building. The detector should be
  located as to not interfere with or be blocked by light fixtures or cable ladder racks. For buildings
  equipped with sprinkler systems, a sprinkler head is to be installed in each BDF/IDF. Wire cages
  should be installed around the sprinkler head to prevent accidental operation or damage to the
  head itself.

- **Co-location of other utilities.** Ducts, conduits, and piping from other building systems (HVAC,
  sprinkler, electrical, etc.) should not be routed through or above the ceiling of BDF/IDFs. If any
  water piping is installed in or above the ceiling area of a BDF/IDF, drainage pans or troughs with
  adequate drain piping should be installed to protect equipment in the room from water leaks.
  These should be installed high enough so as not to interfere with cable ladder racks.

### 2.05 Electrical requirements.

- **Lighting requirements.** Fluorescent lighting fixtures should be installed in each BDF/IDF to
  provide a minimum of 50 foot-candles measured 3 ft. AFF. Typically, one pendant mounted
  fluorescent light fixture should be installed between the front of the row of equipment racks and
  the wall, and one between the rear of the row of equipment racks and the wall. For rooms with
  more than three equipment racks, additional fixtures will be needed.
The designer should denote the exact location of fixtures on the drawings to ensure that they do not interfere with or are interfered by the cable ladder racks. Fixtures should not be installed directly above these ladder racks, but instead in spaces between the ladder racks to provide maximum lighting coverage for the room. Since the ladder racks usually are installed directly adjacent walls, the lighting fixtures are usually located 12” from the walls. Finally, the fixtures should be located between 8'- 6” and 10'- 0” AFF. In some locations, an additional wall mounted fixture may be necessary. These should be installed so that the top of the fixture is below 6’- 6” AFF since cable ladder racks are installed at 7’- 0” AFF.

The typical pendant mounted fixtures are four lamp, 2’ X 4’ fixtures with acrylic prismatic lens, equipped with electronic ballast and T-8 bulbs. The typical wall mounted fixtures are two-tube fixtures with acrylic prismatic lens, equipped with electronic ballast and T-8 bulbs. All of the fixtures in a room should be controlled from a single pole switch located just inside the door of the room. Switch shall be NEMA specification grade, 20A, 120-277V, Hubbell, Inc., mfg. part number 1221, or equal with stainless steel cover plate.

- Power requirements. Two duplex receptacles each should be located on each wall of the BDF/IDF except the wall containing the door. The receptacles should be NEMA 5-20R, 20A, 125V with steel cover plate. Receptacles should be wall mounted at 6’- 0” AFF except in very small BDF/IDFs (12” AFF).

Each room should be provisioned with two separate 20A branch circuits. One duplex outlet on each wall should be wired to the first branch circuit, with the second outlet on that wall wired to the second branch circuit. Each outlet box should be labeled with a permanent marker (no adhesive labels) as follows: “room number where panel is located/panel number/circuit number”. For panels located in corridors, denote the room number of the nearest door. No convenience electrical outlets will be installed in BDF/IDFs.

- Emergency power. BDF/IDFs are not required to be connected to a generator based emergency power system. Installation of UPS and surge suppressor equipment to support data electronics installed in these rooms is described in Sections 17110 and 17120.

End of Section