APPENDIX 10
STRUCTURAL DESIGN AND CONSTRUCTION CONSIDERATIONS FOR 'TECHNOLOGY DELIVERY SYSTEMS'

The following guidelines summarize important design issues regarding the delivery of technology, in some form of conduit, to various spaces in a building. These issues impact the placement of "technology pipelines" and the structural design and construction considerations of these pipelines that Architects, Engineers, and Contractors should consider in the design and construction of these spaces.

BACKGROUND

Mirroring a national trend, the inevitable trend at CU is to incorporate increasing amounts of technology into learning spaces, labs, lecture halls, professor offices and administration spaces. The technology is delivered to these spaces via wiring and cable housed in conduit runs that must be considered during the design and construction of all future projects.

CONDUIT PLACEMENT

Proper conduit placement is critical to the success of the project, both at project commissioning and in the future when inevitably, the building undergoes a "technology upgrade." The conduit can be placed in any one of the three potential locations:

- Conduit may be placed within the floor slab structure AND/OR,
- Conduit many be placed on top of the floor slab and accessed via a 4" (minimum) raised access floor in all areas where significant conduit is to be placed. In this application, the conduit is easily accessed and upgraded in the future AND/OR,
- Conduit may be suspended from the slab structure and punched through where required. In this application, the conduit is easily accessed and upgraded in the future.

Conduit placed within the floor slab structure has low first-cost but careful consideration must be taken to ensure enough conduit is placed for future upgrades and that the conduit placed permits adequately easy wire pulls. Vast amounts of conduit generally mean convoluted conduit runs that sometimes force difficult wire pulls as well as affecting the structural strength of the slab itself.

Conduit placed on the floor and beneath a raised access floor is easy to place and upgrade in the future but carry a higher first-cost that must be carried in the budget.

Conduit suspended from the floor slab are also easy to place and upgrade in the future and do not carry the high first-cost implications of a raised access floor.

DESIGN CONSIDERATIONS

The Structural Engineer shall account for conduit weight in the design of the structural system. Heavy concentrations of conduit could result in as much as 1-3 pounds per square foot (psf). This must be confirmed with the electrical engineer and/or the communications and technology consultants.
Conduit with slab:
1. The Structural Engineer shall account for conduit placed within the floor slab structure in the slab design.
2. Added concrete or steel reinforcing shall be clearly defined in the Contract documents where required by design.
3. Conduit spacing and placement within the slab shall be detailed on the Contract Documents and coordinated between members of the Architect/Engineer Team.
4. In general, a composite beam/slab system is more forgiving when it comes to conduit placement than a cast-in-place concrete slab system.

Conduit suspended from the slab:
1. Methods of suspending the conduit form the slab shall be defined on the Contract Documents.
2. Maximum point loads that are permissible to be suspended from the structure shall be defined on the Contract Documents.
3. Rather than allowing the Contractor to drill into the slab at random locations, the Project Team should consider specifying concrete inserts placed in a grid pattern embedded in the underside of cast-in-place slabs for installing suspended conduit, ductwork, and piping. The maximum permissible load that can be hung from any one insert shall be defined on the Contract Documents. The inserts could also be specified in a general fashion that would permit either conventional all-thread hangers or "Unistrut" components for heavier loads. A similar approach can be used for structural steel framed buildings.

CONDUIT COORDINATION

Coordination meetings shall be held between the UCB Project Manager, Architect, Structural Engineer, Electrical Engineer, and others as deemed appropriate to discuss and coordinate all major conduit runs placed within any floor slab.

Coordination should account for potential conduit layouts including addressing the inevitable crossing of some conduit runs. Trial conduit placement coordination drawings would be helpful at this stage to address problems.

PRECONSTRUCTION AND CONSTRUCTION:

The A/E Team shall require the Contractor to prepare "Coordination Drawings" showing all conduit placement within a floor slab (See Division 1, section 01042 reference Standards).

The A/E Team shall review the Coordination Drawings submitted by the Contractor and return them with any review comments to the Contractor within an agreed-upon time frame.

The A/E Team shall discuss their comments with the Contractor prior to construction in a pre-installation conference to insure that appropriate communication has occurred prior to
construction. The A/E Team and Contractor should pay particular attention to the placement of suspended conduit in conjunction with suspended Mechanical/Electrical/Plumbing in areas with limited ceiling heights.