

## 2. METHOD FOR PREPARING CONCEPTUAL COST ESTIMATES

In order to prepare concept phase estimates for proposed projects the shell of the building (Building Configuration) is to be considered separately from the interior use. The building systems which make up the shell cost are identified in Chapter One. The systems which make up the interior cost are also identified. There are some systems costs which are properly accounted for in both places since main service risers belong primarily with the shell cost for multi-story buildings. The description for building systems utilized in the Construction Cost Control Guidelines is called the Functional Format (or Systems Format).

### **FUNCTIONAL FORMAT**

This estimate format represents the components of construction as systems or assemblies. We must therefore think of the resultant costs in the same terms. Traditionally estimates have been done in the Trade Breakdown or Construction Specification Institute (CSI) Master Format, which has sixteen major categories. The CSI Master Format differs from the Functional Format in that it shows all similar materials and their costs in the same category, i.e., concrete for substructure, structure, deck fill, etc., are all included in Division 3-Concrete. The Functional Format, however, lends itself to the preparation of Early Stage/Concept Cost Analysis.

Following is a general breakdown indicating what is included within each section of a Functional Format.

Not all of the categories and items included within the descriptions below were used as part of the guidelines. *Section 1.1-Demolition, and Section 1.2-Site Work are not included. It is also presumed that a central plant outside of the building line contains all of the mechanical and electrical energy producing equipment. This plant and distribution to the building are therefore not represented in the costs found in later chapters.*

### **FUNCTIONAL FORMAT** (Description of Functional Inclusions)

1.1 Demolition: Building, Structure, paving and utilities.

1.2 Site Work: Clear and grub site excavation and fill, paving, surface site work, underground utilities, landscaping irrigation and offsite work.

2.1 Substructure: Piles, caissons, foundations, pile caps, grade beams, slabs on grade, wall and waterproofing below surface grade, columns below grade, structural slabs below surface grade.

3.0 Structure: Columns, structural beams and girders, slabs composite, slabs concrete, metal decks, concrete fills, wood floor systems, excluding all walls, whether structural or not.

4.1 Enclosure, Vertical: All exterior wall materials, skins, coating, fenestration, doors, interior surface of exterior walls, thermal insulation.

4.2 Enclosure, Horizontal: All roofing, sheet metal enclosures, insulation, roof penetrations.

4.3 Support Items: All items not capable of categorization, such as miscellaneous iron, sheet metal, rough hardware, caulking, waterproofing above grade.

5.1 Internals, Vertical: All internal wall materials, concrete, steel studs, wood studs, wallboard, plaster, emulsions, doors (interior), bases, borrowed lights, sound isolation.

5.2 Internals, Horizontal: All floor coverings, sound insulation, ceiling suspension systems, integrated systems, acoustical tile, gypsum wallboard, plaster, sound isolation (other than concrete fill).

5.3 Finishes, Special: Hard surfaces for walls and floors, tile, terrazzo, vinyl wall coverings, laminated plastics, tackable vinyl on gypsum board.

5.4 Interiors: Cabinets, including instructors podium, bench, etc., drapes, and window blinds, other items appended to walls, floors or ceilings.

6.0 Specialties: Chalk and tack board, toilet partitions, folding and demountable partitions, toilet accessories, fixed seating, built-in projection screens, signage.

7.0 Equipment: Restaurant, school, bank, hospital, gym, shop, material handling.

8.0 Special Construction: Any and all unusual construction items part of the general construction including: pools, incinerators, radiology shielding, raised (pedestal) floors, sloped or tiered floors.

9.0 Conveying: Elevator, dumb-waiters, escalators, belts, pneumatic tube systems, chutes, stairs.

10.1 Plumbing & Fire Protection: Equipment, fixtures, piping, valves, specialties & insulation, plumbing accessories, testing & permits, alarm & valve tree. FP piping, FP heads, FP specialties & permits, backflow preventers and fire pumps (where applicable). Site utilities are included under site work.

10.2 HVAC: Any and all equipment, boilers, chillers, air handling, terminal distribution items, controls, valves, thermostats, air dampers, actuators, duct work grills, registers, insulation, piping & insulation, valves, specialties, permits & testing.

11.0 Electrical: Any & all electrical equipment. HV switchgear, main switchgear, panelboards, transformers, circuit breakers, emergency generators, UPS systems, fixtures, wiring, voice, data and video cabling including fiber optic, conduit & raceway systems, miscellaneous devices such as assistive listening devices, fees, permits, testing, fire & life safety systems. Conduit etc. for interactive T.V. classrooms but not the equipment such as microphones, television cameras, monitors. Electrical site utilities are included under site work.

### Cost Models

The basis of the cost matrices are cost models. The cost models have been developed using several factors.

The outline specifications in Chapter 10 define the items included in each building system for each Building Configuration category and each Interior Use Category. The area indicated for specific use categories is used to factor unit cost and is not intended as a program guideline.

The cost model for each category has been developed based on the outline specification, the model area, the regional construction cost data base and on cost research information. The total cost for each building system, using the functional format, for each category was factored by the model area to produce unit cost. These unit costs are displayed in the cost matrices for use in preparing the estimates.

## Cost Matrices

Building Configuration (shell cost) are displayed in the Series A matrices. The following building configurations are included:

- A-1 Institutional, 1 Story, Classrooms/Offices.
- A-1a Institutional, 1 Story, Classrooms/Offices, 16'-0" minimum floor to structure above.
- A-2 Institutional, 1 Story, High Bay/Long Span, Field Houses/Gymnasiums.
- A-2a Institutional, 1 Story, High Bay/Long Span, Open Area Instructional and Laboratory
- A-3 Institutional, 2 Story, Classrooms/Offices.
- A-3a Institutional, 2 Story, Classrooms/Offices, 16'-0" minimum finished floor to finished floor.
- A-4 Institutional, Multi-story, 3 Thru 5 Stories, Classrooms/Offices,
- A-4a Institutional, Multi-story, 3 Thru 5 Stories, Lab.
- A-4b Institutional, Multi-story, 3 Thru 5 Stories, Classrooms/Offices, 16'-0" minimum finished floor to finished floor.
- A-5 Institutional, Multi-story, 6 Thru 10 Stories, Classrooms/Offices.
- A-5a Institutional, Multi-story, 3 Thru 5 Stories, Theater Complex.
- A-5b Institutional, Multi-story, 6 Thru 10 Stories, Lab.
- A-6 Institutional, 1 or 2 Stories, Below Grade, Classrooms/Offices (Bldg. Above).
- A-6a Institutional, 1 or 2 Stories, Below Grade, Lab (Bldg. Above).
- A-6b Institutional, 1 or 2 Stories, Entirely Below Grade, Classrooms/Offices (No Bldg. Above).
- A-7 Residential, 1 or 2 Stories.
- A-7a Residential, 1 or 2 Stories, Wood Frame.
- A-8 Residential, 3 Thru 5 Stories.
- A-9 Residential, 6 Thru 10 Stories.
- A-10 Parking Structures, (to 3 Levels).
- A-11 Parking Structures, (to 4 and 5 Levels).
- A-12 Parking Structures, 1 or 2 Stories, Below Grade.
- A-13 Pre-engineered Building/Greenhouse (550-1132 SF).
- A-14 Pre-engineered Building/Greenhouse (1132-2264 SF).
- A-15 Pre-engineered Building/Warehouse, 1 Story.

The interior costs are displayed in the Series B matrices and include the following categories. Each category is broken down to further account for differences in size and use of each broad category definition.

- Series 100** - Classroom Facilities
- Series 200** - Laboratory Facilities
- Series 300** - Office Facilities
- Series 400** - Study Facilities
- Series 500** - Special Use Facilities (athletic)
- Series 600** - General Use Facilities (non-athletic)
- Series 700** - Support Facilities
- Series 800** - Health Care Facilities
- Series 900** - Residential
- Series WXYZ** - Non-assignable Areas

## Defining the Project

At the Program and Conceptual stage of project initiation, information about the requirements for the project is generated by the user and recorded. How many classrooms of what specific size and use are required, how many faculty offices, conference rooms, laboratories, etc. All of these requirements should be recorded using the interior use categories established in the Postsecondary Education Facilities Inventory and Classification Manual as expanded for use in the Construction Cost Control & Professional Fee Guidelines (see chapter 9). The assignable area is determined by the programmer based on the users requirements.

Non assignable areas include corridors, restrooms, mechanical rooms, electrical rooms, janitor closets and the like. These spaces are categories WWW, XXX, YYY & ZZZ in the space types. The size of these spaces is determined by the programmer based on user requirements, the mix of uses contemplated, traffic, location on campus and other factors. Non assignable areas account for 30% to 50% or more of the total area of educational buildings based on these considerations.

The gross area is the sum of the assignable area plus the non assignable area. Occasionally discussion occurs concerning the thickness of walls and partitions. These items should be included in both assignable and non assignable allowances.

The building configuration is determined next based on gross area required for the intended use, the site space available and other factors.

## Combinations of Building Configuration Categories

There are cases when one building configuration category is not appropriate for the entire project. An example is a multi-story classroom/office building with a basement and a sub-basement. This building should be considered as a combination of two categories.

A-5 Institutional, Multi-Story 6 thru 10 stories, Classroom/Offices.

A-6 Institutional, 1 or 2 stories below grade, Classroom/Offices (Building Above).

The shell cost displayed in the matrices should be applied to the gross area of each part and the two extensions added to obtain the total shell cost.

A similar situation would exist where one wing of a building may be one category and the other wing some different category.

If the proposed building is an unusual configuration such as round, triangular, u-shaped or if the upper floors are to be significantly larger or smaller than lower floors the cost should be evaluated separately since the models assume normal aspect ratios.

The basis for the sub-structure and the structural systems (2.1 and 3.0) is concrete, including all columns, beams, floor and roof structural systems, unless otherwise noted. This is both the optimum structural system, given the variety of structures which are part of these guidelines, as well as a structural system frequently used in Arizona.

## Building Use (Interiors) Cost

Having determined the shell cost for the project the interiors cost should be considered next. Determine the total assignable area required for each interiors category from the program. It is recommended that service facility for educational spaces such as classrooms, (Series B-100) and laboratories (Series B-200) be priced the same as the specific use which it serves. If the program calls for storage, preparation, or service facility in conjunction with a lecture classroom for physics then the service facility would be priced under category B-115 (Lecture Classroom - to 200, Type B).

Apply the unit cost for each specific interior use category to the total assignable area (including service facility) for that category. The unassigned areas for categories WWW, XXX, YYY & ZZZ must be included in the interior use cost. The total interior cost is the sum of all extensions for interior use space.

#### Total Construction Cost

The total construction cost is the sum of the shell cost and the interior cost.

Contingency and inflation adjustment factors should be applied to the total construction cost as outlined in Chapter 4 and Chapter 6.

If Federal Funding is to be used the adjusted construction cost should be modified as outlined in Chapter 7.

There are two sets of matrices included in the guidelines. One set is applicable to projects located in the Phoenix and Tucson metropolitan areas and the other is applicable to projects located in the Flagstaff area. Projects located outside these areas will have costs different from those displayed in the matrices depending on location. Very remote sites will have higher cost due to transportation considerations.

The costs displayed in the matrices include subcontractor and general contractor overhead and profit, insurance, bonds, and general conditions. No additional allowance for these items is necessary.

#### Renovation Projects

The cost displayed in the matrices are for new construction projects only. The scope of renovation projects varies with each individual case and must be clearly defined in terms of the work to be accomplished. Demolition costs are almost always applicable to renovation projects and the extent and difficulty of demolition cannot be broadly defined. For these reasons renovation cost control guidelines cannot be formulated.

#### Small Projects

The cost in the guidelines are applicable to projects expected to cost at least \$1,000,000. The unit cost of smaller projects will be higher than the unit cost for larger projects due to the decreased purchasing discounts and the fixed cost for overhead and general conditions.

#### Items NOT included in Construction Cost Control Guidelines.

The following items are not covered and if required must be considered separately.

Site Work

Utilities Extensions

Land Acquisition

F/F/E Movable

Move-in Costs

Special fixed equipment

Electronic Equipment such as: telecommunications switches, microphones, television cameras, monitors, television sets, telephone hand sets, computers, servers, routers, hubs.

Parking Reserve

Utility Systems Reserve

Remodeling and Renovation

Demolition

Surveys and Geotechnical Investigations