

## **ADVISORY 29.0      IMPLEMENTATION OF SAFETY ENGINEERING IN THE CONSTRUCTION PROCESS**

Engineered safety controls are implemented most cost-effectively when integrated into the program planning process. Reviewing a project for inclusion of design elements affecting safety engineered design controls should be a part of the construction process and projects. All projects should include an environmental assessment for:

1. Investigation of current contaminants, processes, and
2. Environmental impact of demolition, new construction, and
3. Implementation of new safety designs and code compliance.

The execution of a successful construction or renovation project involves many factors including: safety and health of the University community members (faculty, staff, students, visitors), contractor personnel, and protection of the environment. To insure a high quality outcome, safety, health, and environmental issues should be addressed when construction or renovation projects are initially conceived in the program phase and guide the design team through every aspect of the planning effort.

Safety engineering integration in construction projects should accomplish the following purposes:

- Establish a framework for incorporating multiple performance objectives
- Include interdisciplinary objectives
- Ensure design flexibility for growth and change
- Lock-in scope, environmental quality, and costs
- Ensure a safe, healthful, and compliant work environment

All construction, renovation, or remodeling of any structure owned by the University of Cincinnati shall be designed and constructed according to all applicable codes and standards. The Public Employers Risk Reduction Act (PERRP) requires the University of Cincinnati to comply with all federal Occupational Safety and Health (OSHA) regulations for construction and workplace safety. In addition, the University is required to comply with U.S. Environmental Protection Agency (USEPA), Ohio Environmental Protection Agency (OEPA), and Ohio Department of Health (ODH) regulations.

These and other regulations are the basis for many of the Environmental Health and Safety Advisories posted on our web site (<http://ehs2.uc.edu/Advisories.html>) related to construction and renovation project activities including, but not limited to:

- Confined Space (Advisories 2.0 and 2.0.1)
- Control of Hazardous Energy Sources; Lockout and Tagout (Advisory 2.1)
- Asbestos Abatement (Advisories 3.0 through 3.10)
- Prevention of Adverse Health Effects from Exposure to Lead and Materials Containing Lead (Advisory 12.6)

- Generic Health & Environmental Specifications for the Abatement of Lead-Based Paint Within University of Cincinnati Buildings (Advisory 12.6.1)
- Hot Work: Welding or Cutting (Advisory 15.2)
- Job Site Safety Guidelines (Advisory 29.1)
- Construction Limits and Enclosures (Advisory 29.2)
- Construction Site Dust, Silica, and Silicosis Prevention (Advisory 29.3)
- Barriers and Engineering Controls for the Isolation and Containment of Construction Related Activities (Advisory 29.4)
- Identification of Underground and Concealed Utilities; Digging Permit (Advisory 29.5)

At the University of Cincinnati, several departments are involved in the planning and successful execution of construction and renovation projects: the client or requesting department or office, the Office of the University Architect, the Department of Facilities Management, and the Department of Environmental Health and Safety. Many projects involve the assistance of outside consultants including architects and engineers. Consultants and contractors working at the University of Cincinnati must be oriented to University Standards, policies and procedures, and be included in hazard communication discussions.

**Client (user) Department or Office**

Role:

- Initiate request for project
- Specifies materials used or processes which may require special considerations
- Initiate research of new technologies, techniques, materials use, unique adaptations and prototypes which require new construction or renovation

Responsibilities:

- Identify processes that will be performed in each area
- Identify materials that will be managed or used in the space
- Provide technical information to Environmental Health & Safety necessary for design controls and containment
- Ensure the safety of their personnel with proper management of their areas
- Decommissioning

**Office of the University Architect**

Role:

- Liaison with the State of Ohio Department of Administrative Services and State Architect's Office
- Together with the Office of General Counsel, Risk Management, Facilities Management, and Environmental Health & Safety develop University Standards
- Manage the capital planning and budget process
- Manage capital, planning, design, and construction.

Responsibilities:

- Develop University Policy and Standards
- Make decisions on selection
- Oversee budgets
- Oversee installation
- Coordination among projects, contractors, and University departments/offices
- Chair the Capital Advisory Committee and direct its proceedings
- Ensure State of Ohio compliance

**Department of Facilities Management**

Role:

- Operation and maintenance (O&M) of building systems
- Advisor to University Architect and Environmental Health & Safety on matters of life cycle analysis, upgrade, and replacement
- Support the Disaster Response Plan

Responsibilities:

- Develop and maintain a preventive maintenance program
- Report failed or out-of-compliance systems to Environmental Health & Safety
- Assist Environmental Health & Safety in emergencies
- Review construction documents
- Initiate new projects

**Department of Environmental Health & Safety**

Role:

- Ensuring environmental compliance
- Serving as a liaison between occupants and design/construction team
- Advisor on technical engineering controls, best practices, and standards
- Advisor on construction and operations & maintenance (O&M) safety
- Advisor on international, federal, state, and local environmental initiatives and impact.

Responsibilities:

- Maintain a database of materials and processes for hazard communication, abatement procedures and guidelines, and the resolution of safety problems
- Identify various code upgrade and standards compliance issues
- Review construction documents for inclusions of engineered design controls

- Develop and implement emergency procedures
- Provide worker hazard communication
- Initiate corrective action projects
- Materials management, mitigation, and abatement consultation and project management
- Liaison with outside agencies on environmental and occupational legislated areas.

### **Outside Consultant and Architect / Engineering Firms**

#### Role:

- Contract with the University or State of Ohio for oversight and implementation of the university project
- Compliance with the State of Ohio
- Development of the schematic design, design development, and construction document phases of the planning process
- Incorporating the design concepts of all (consensus building)
- Meeting budget constraints

#### Responsibilities:

- Provide guidance to University on implementing the performance-based specifications
- Managing the contract and contractors
- Compliance and management of the contract documents
- Flexibility to accommodate changing needs
- Meeting budget constraints and time frames

Renovation projects, especially those performed in buildings where areas outside the construction zone remain occupied, present the most severe challenges to the health and safety of the occupants and the successful completion of the total project. Designers planning renovation projects in older buildings should anticipate encountering: asbestos in insulation materials and floor tiles; lead in paint and plumbing connections; PCB's in paint, motor starters, capacitors, and transformers; mercury in fluorescent light tubes, high intensity discharge lamps, and laboratory sink drain lines; toxic sludge in old oil and gas tanks or waste sumps; and orphaned chemical substances abandoned by previous occupants of the space. The proper disposition of these items will require coordination with Environmental Health and Safety's Manager of Industrial Waste (556-4968).

An Internet web site <http://www.cdc.gov/niosh/elcosh/elcoshom.html> known as eLCOSH, the Electronic Library of Construction Occupational Safety and Health sponsored by the National Institute of Occupational Safety and Health (NIOSH) provides a wide variety of information on construction safety and health to further advise project team personnel.

Renovation and demolition projects also provide multiple opportunities for building materials to be recycled instead of consuming space in landfills or requiring the consumption of finite

resources to manufacture new building materials. All construction projects, renovation as well as new construction, have the potential for recycling the vast quantity of shipping and packaging materials used to protect new furnishings prior to installation. The designer must incorporate these recycling opportunities into the language of the construction documents so that the contractors performing the work know in advance the University's expectations for their compliance.

### **Life Cycle Analysis**

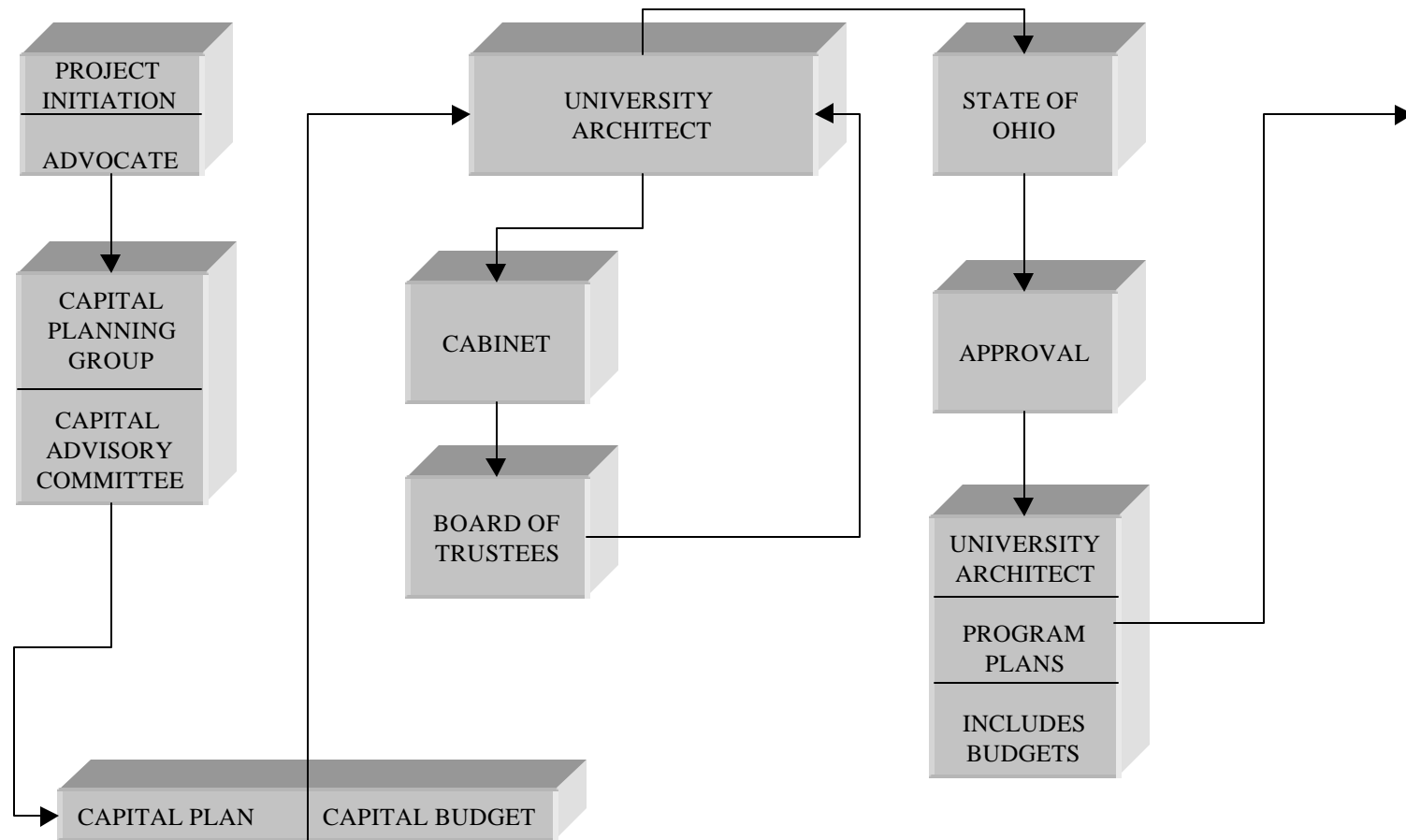
Life cycle analysis is an essential element in the planning process. Life cycle analysis is a technique used to determine the total lifetime cost of purchasing and maintaining an item or system and comparing the specific item or system and its price/cost against another alternative. Costs are broken-down into current and future dollars (the time value of money). The cost bases include:

1. Utility of life of the entities
2. Purchase price
3. Installation cost
4. Replacement cost (2 x labor + materials + opportunity or substitution cost of downtime)
5. Inflation factors at a given % per year
6. Comparison of the two (or more) alternate items.

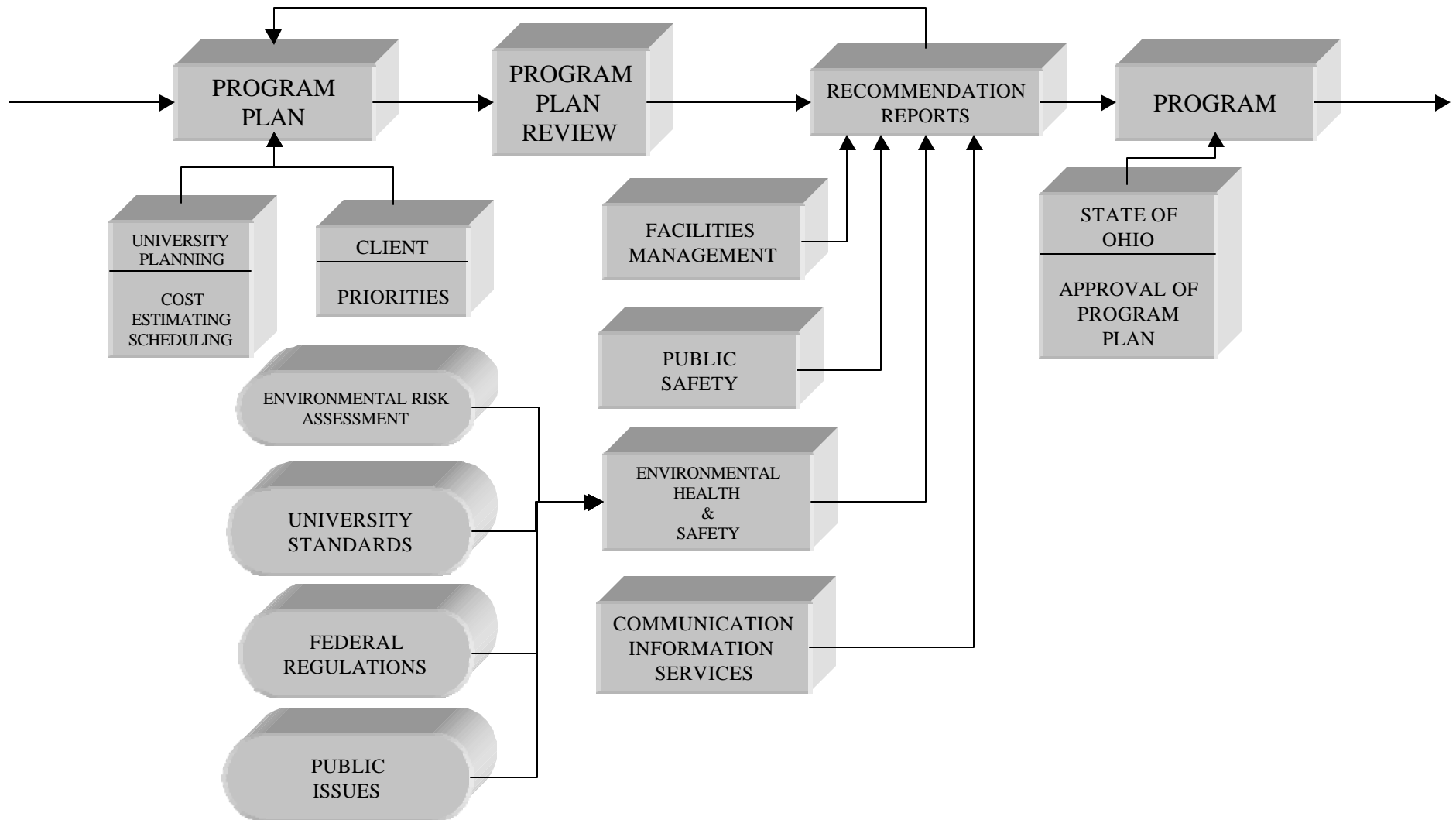
Life cycle analysis is also used to justify the initial capital expenditure of various options to guide the selection of an alternative with a longer useful life, thus assigning the true value over a longer time frame.

Safety, health and environmental issues are addressed at each stage of the project review process as shown on the following pages.

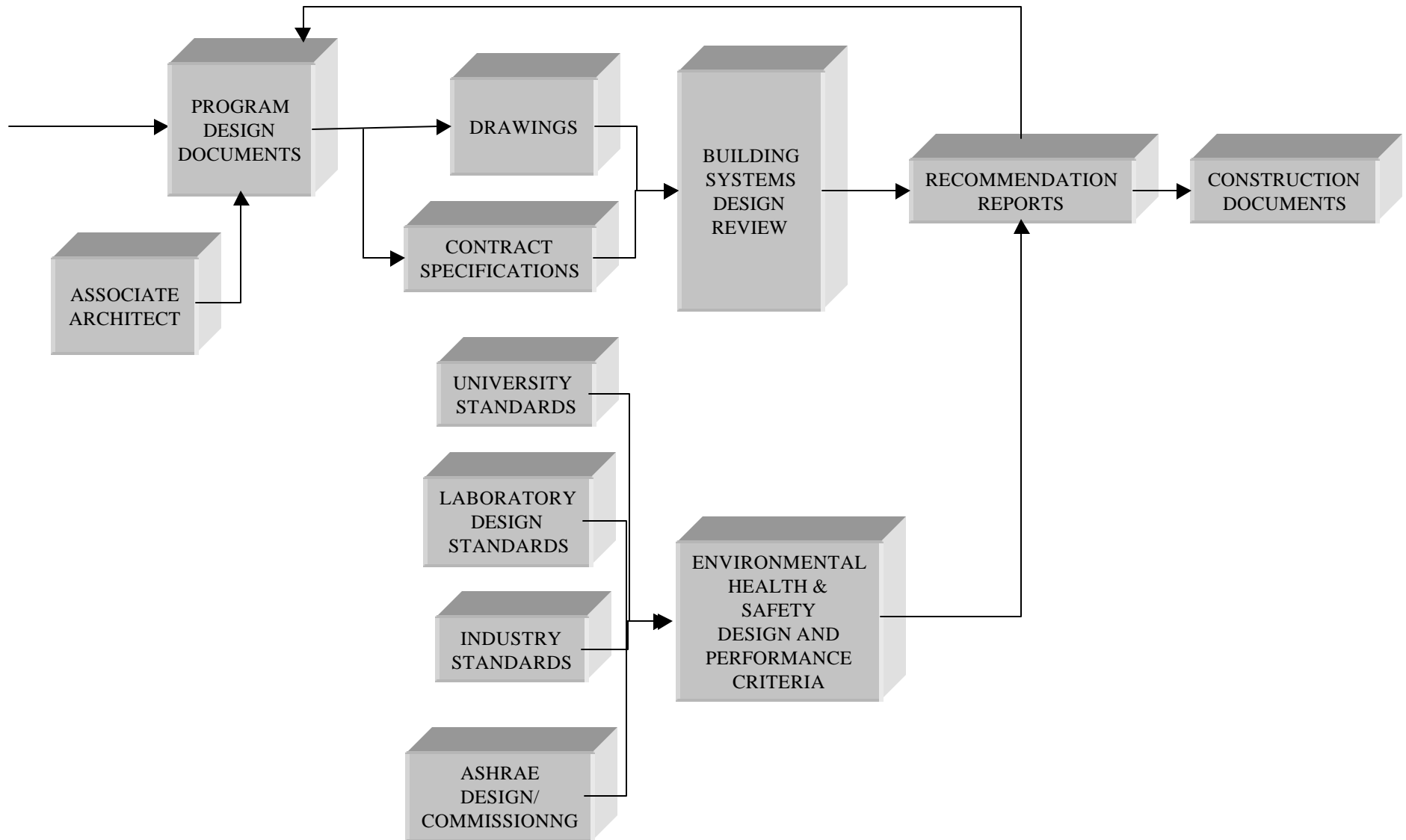
# CAPITAL PROCESS



# PROGRAM PROCESS



# REVIEW PROCESS





# CONSTRUCTION PROCESS

