

# III. Design Standards

## A. General Requirements

### 1. Building Codes

1.1 All designs shall as a minimum meet the International Building Code. Circumstances as determined by the owner will require the design go beyond the International Building Code.

1.2 Other applicable Codes include but are not limited to: International Fire Code, International Plumbing Code, International Mechanical Code, National Electrical Code, and International Energy Conservation Code.

### 2. Sustainable Design

#### 2.1 Sustainable Design Principles

The incorporation of sustainable design principles into the design of remodeling and new construction is to ensure quality construction, reduce long term operating costs, and reduce negative environmental impacts. Effective sustainable design begins when the project is conceived, and continues through the project's design and construction process. The design team shall recommend to the owner sustainable design opportunities to be considered as a part of the project. Items for consideration include:

- 2.1.1 Design spaces in a flexible manner so that they can be cost effectively reconfigured to accommodate a wide range of potential future uses. Be careful as to the use of bearing walls.
- 2.1.2 Maintain and renovate existing buildings to their maximum energy efficiency possible. Reduce thermal loads entering the building. Consider the building envelope design carefully including glazing selection, vapor barrier location, wall construction, and building shape.
- 2.1.3 Orient buildings to make optimal use of site conditions such as passive solar, airflow, lighting, vegetative, and topographic conditions. Make usable outdoor spaces. Select and position landscape materials to aid in achieving energy efficiency, using native or well-adapted species when appropriate. Take advantage of trees to reduce cooling loads and use hedges or shrubs to block winter winds or help channel cool summer breezes into the building. Protect existing landscaped spaces to the greatest extent possible.

- 2.1.4 Maximize on-site storm water management. Direct run-off from rainfall events and limit off-site drainage whenever possible. Use plant material and terrain to slow and absorb run-off, filter sediments, and facilitate control. When appropriate, consider overland flows and ponds to temporarily impound water and allow a slower rate of release. Maximize pervious surfaces to permit water infiltration whenever possible. Use natural drainage ways whenever possible.
- 2.1.5 Minimize the use of landscape irrigation systems.
- 2.1.6 Integrate a daylighting system with other building systems and the overall building design. Maximize lighting efficiencies and design for specific tasks. Light the minimum area for the minimum time (i.e. occupancy sensors), integrating local control overrides.
- 2.1.7 Use properly sized and efficient heating and ventilating systems. Complicated high cost systems that are difficult to operate, maintain, and repair are to be avoided. Determine how and when the building is in use and determine the acceptable range of interior temperature and light levels. Design the interior environmental systems to function within these parameters keeping in mind the need to be adaptable. Focus on reducing energy use during no or low use periods (i.e. overnight). Maximize local thermostat and lighting controls to the greatest extent feasible.
- 2.1.8 Use recyclable products and those with recycled material content whenever feasible. Reuse and refurbish materials, components, furnishings and equipment when possible.
- 2.1.9 Avoid materials that generate ozone-depleting chemicals (VOC's, HCFC's, etc.) during manufacture and/or use, are made from toxic or hazardous constituents (benzene, arsenic, etc.). Flush the building prior to occupancy when necessary to reduce toxic emissions.
- 2.1.10 Formaldehyde-containing products are not permitted.
- 2.1.11 Maximize reuse and recycling of construction waste and demolition debris. Provide waste collection/sorting/recycling areas that are easily accessible by the occupants.

### 3. Renovations

3.1 When renovating, investigate the remaining service life of all building components and utility infrastructure. Roof condition reports and Capital Needs Assessments will be made available for review. Where age of the component exceeds the following schedule, report on age, condition, and capacity and receive written direction from the owner as to how to proceed.

<u>Building Component or</u>	<u>System Age (In Years)</u>
Compressed air systems, sanitary and interior storm drains .....	50
Exterior walls .....	50
Foundation wall & interior floor waterproofing .....	50
Heating, cooling and sprinkler piping .....	50
Boiler .....	35
Power distribution system .....	35
Exterior doors and windows .....	30
HVAC controls and equipment .....	25
Elevators .....	20
Fire alarm and security system .....	20
Roofs .....	20
Communication and data .....	10

### 4. Sitework

#### 4.1 Lawn Irrigation Systems

4.1.1 Coordinate with the owner the location (if specified) of lawn irrigation systems.

#### 4.2 Site Lighting

4.2.1 Coordinate with the owner the location and appropriate level of site lighting.

### 5. Architectural

#### 5.1 Exterior Design

5.1.1 The exterior design must be the result of the examination of alternatives by the design professional in consultation with the owner. Alternatives shall be generated until the owner is satisfied that the design principles have been achieved.

5.1.2 Refrain from indentations and extensions outward in wall planes. The objective is to have the building be straightforward to construct, without complex footing designs or flashing details.

- 5.1.3 To resolve problems of complexity, constructability, and cost, all design features containing curves and non-right angle planes shall, during the design phase in which the feature is introduced, be fully analyzed at intersections and other complex areas by isometric detail drawings.
- 5.1.4 Provide positive site drainage, with exterior grading sloping a minimum of ¼" per foot away from the building for the required distance.
- 5.1.5 Foundation walls shall be cast-in-place concrete. Refer to Division 3 – Concrete.
- 5.1.6 Foundation walls enclosing occupied space below grade shall be drained by tile sloping no less than ¼" per foot to daylight, to a pumped sump, or to a storm drain.
- 5.1.7 All spaces below grade shall be externally waterproofed to the BYU-Idaho specification. Refer to Appendix 07120.
- 5.1.8 Post-tensioned concrete is not allowed.
- 5.1.9 Cambered decks for cast concrete structures are not allowed.
- 5.1.10 Define, with the owner's approval, the levelness and flatness (deflection) to be achieved for all elevated slabs. Also, levelness and flatness for slabs on grade must be specified.
- 5.1.11 Thin veneer systems, such as EIFS, are not allowed at exterior walls.
- 5.1.12 Masonry or concrete backup is required at all exterior brick walls. Metal studs are not allowed at exterior walls.
- 5.1.13 All structural masonry and exterior masonry shall be laid running bond except for minimal decorative features.
- 5.1.14 Brick selection for testing and approval is required early in the design process. The selected brick must pass color selection and prequalification testing prior to bidding. Brick testing (12 weeks per sample) shall start during schematic design and be completed during the design development phase. Refer to Division 4 – Masonry, 04200 and Appendices 01400 and 01410.

- 5.1.15 Cavity wall construction is required to be continuously flashed above and below all window and curtain wall sills, above adjoining roofs, at ground level conditions and any other observations to the downward flow of water.
- 5.1.16 All glazing shall be vertical.
- 5.1.17 Bottom of exterior window openings shall be a minimum of 12" above roof flashings, grade, slabs on grade or other horizontal surfaces. For high/low roof conditions, the height of the lower thru-wall flashing shall be a minimum of two brick courses above the highest parapet/expansion joint/control joint and no less than 18" (24" preferred) above the deck for re-roofing, and no less than 24" (30" preferred) above the deck for new construction.
- 5.1.18 Exterior wall details shall be configured to prevent condensation caused by cold surfaces in contact with interior air.
- 5.1.19 Vapor barriers are required interior to the warm side of all insulation. Detail so that condensation will not occur at relative humidity levels anticipated by ASHRAE standards or caused by Program.
- 5.1.20 The roof design will be a BYU-Idaho standard roof. Refer to Appendix 07510 for Roofing Standards.
- 5.1.21 Verify rooftop walkway location with the owner.
- 5.2 Interior Design
- 5.2.1 Unless limited by existing conditions, design a minimum of 48" clearance from top of ceiling to the lowest point of the structure above, allowing space for ductwork, piping, wiring, and maintenance access). Maintenance access shall be provided for servicing all equipment including but not limited to filters, strainers, control actuators, damper actuators, control valves, sound attenuators, boilers and chiller tube pull, knock-out panels, and double mechanical room doors.
- 5.2.2 All partition walls enclosing offices, classrooms, and other spaces requiring acoustic separation shall be continuous floor-to-deck and be filled with acoustic insulation unless otherwise directed by the owner.
- 5.2.3 General design requirements shall be for a NC 35 (noise criteria level) for offices and classrooms and NC 20 for ITV and specialized functions at full cooling or full heating conditions. Other spaces shall at a minimum meet the ASHRAE requirements.

- 5.2.4 Mechanical room floors, shower room floors and walls, and other wet spaces above occupied space shall be waterproofed.
- 5.2.5 Allow for adequate space for waste collection, recycling storage, and recycling containers.
- 5.2.6 Size elevators to accommodate an emergency medical gurney and equipment and meet ADA requirements.
- 5.2.7 Table of floor area standards

Description	Area (sq.ft.)	Additional Requirements
Classrooms	See standard classroom layouts	1 classroom per 2.5 faculty
Faculty Workrooms	250 sq.ft.	Include full, base and upper cabinets. Copy machine location
Department Storage	80 sq.ft.	Adjustable shelving on three walls
Reception	250 sq.ft.	See Programming requirements
Dean/Chairman Office	150 sq.ft.	60 lf. adjustable shelving, 3' round table, BYUI Standard office layout.
Office	120 sq.ft.	60 lf. adjustable shelving, BYUI standard office layout
Telecom BDF	10 x 13	See programming requirements

### 5.3 Material Selections

- 5.3.1 Formaldehyde-containing products (i.e particleboard, MDF, hardwood plywood) shall be certified to comply with HUD rule 24 CFR.
- 5.3.2 Fire treated plywood is not allowed.
- 5.3.3 Fibrous spray applied fireproofing is prohibited due to concerns for indoor air quality.

## 6. Structural

### 1.1 Footing and Foundations

- 1.1.1 A detailed and dimensioned concrete foundation plan will be provided in the final construction documents.
- 1.1.2 Note on the drawings that the building perimeter, grid lines, and bolt layout shall be established by a licensed land surveyor.

### 1.2 Floor slabs on grade

- 1.2.1 "Nova/Mesh shall be used in lieu of reinforcing bars for concrete slab reinforcing.
- 1.2.2 Moisture barriers will not be installed under slabs.

### 1.3 Structural steel

1.3.1 Shop welds shall be inspected by the University's special inspector prior to painting and shipping. Materials not inspected accordingly will be returned to the fabricator at his expense. All subsequent costs shall be born by the fabricator.

1.3.2 The fabricator shall not assign the work to others without written permission from the Owner.

#### 1.4 Structural masonry

1.4.1 The design shall use standards that will limit the need for masonry inspections.

#### 1.5 Elevated Floor Slabs

1.5.1 "Nova/Mesh shall be used in lieu of reinforcing bars for concrete slab reinforcing

## 7. Mechanical

### 7.1 Mechanical Design Issues

7.1.1 Air conditioning will be included in all designs.

7.1.2 Study and select available energy sources to provide building heating, cooling, and process needs. Demonstrate through life cycle costs analysis the most appropriate fuel and power sources.

7.1.2.1 Heating shall be by high pressure campus steam.

7.1.3 The HVAC system design shall consider issues related to indoor air quality, including location of air intakes and exhausts, humidity controls, filtration and special circumstances related to the treatment and handling of hazardous substances for buildings.

7.1.4 Air intakes at or below grade are not allowed. Air intakes shall be located so as not to intake building or vehicle exhaust.

7.1.4.1 Include emergency generators in this consideration.

7.1.5 Conduit, piping, and ductwork are not allowed on the roof. Minimize roof penetrations.

7.1.6 Mechanical penetrations in roof drain sump area are not allowed.

7.1.7 Infiltration shall not be accepted for exhaust fan makeup air.

7.1.8 See Appendix \_\_\_\_\_ for steam system requirements and specifications.

- 7.1.9 Interview appropriate personnel to determine ventilation requirements of each space, including material safety data information for special use spaces such as printing, etc.
- 7.1.10 The use of diversity factors in sizing fans and coils is not allowed.
- 7.1.11 Avoid the use of antifreeze to solve freeze protection problems for chilled water, hot water and steam coils.
- 7.1.12 Design quiet, efficient mechanical systems without reliance on internal lining. Interior duct lining is prohibited. Include all necessary sound and vibration eliminators before ducts and pipes leave mechanical room. Provide ample space in mechanical room between air handling equipment and the walls where ducts exit, to allow noise abatements to be installed and serviced.
- 7.1.13 Roof top penthouses are not allowed unless there is access from within the building for maintenance. Integrate the mechanical rooms into the plan of the building. Provide sound isolation between mechanical rooms and other occupied spaces.
- 7.1.14 Mechanical rooms shall provide adequate space and sufficiently large openings to service and replace mechanical equipment without significant demolition. Consider future expansion possibilities with the design of the mechanical room.
- 7.1.15 Provide access panels to service valves, VAV terminal units, sound attenuators, and all other mechanical equipment located inside wall chases or above inaccessible ceilings.
- 7.1.16 Insure that accessibility is provided by design so that systems are readily accessible for proper maintenance.
- 7.1.17 Verify a minimum headroom clearance acceptable to owner in mechanical space walkable areas.
- 7.1.18 Provide reheat coils to avoid sub-cooling spaces.
- 7.1.19 Reheat systems shall be provided for all air conditioning systems.
- 7.1.20 Design shall show capability of cooling coil discharge air temperatures to 50o F at design conditions to provide proper humidity control.
- 7.1.21 Thermostat zones shall avoid combining spaces with different interior/exterior or directional exposures.

- 7.1.22 Detail automatic controls diagrammed on construction documents to provide minimum outdoor air quantities for each supply fan on projects with more than one fume hood. Require automatic control such that additional fume hood exhaust will cause the supply air to be increased to meet exhaust needs.
- 7.1.23 Unions or flanges shall be provided on all coil piping connections to allow for ease of future cleaning.
- 7.1.24 Flow measuring devices shall be provided for all coils, radiation elements, pumps, and secondary piping. Add pressure gauges with shut-off cocks for all pumps and chillers. Provide thermometers with wells for heating and cooling coils, hot water boilers, and converters.
- 7.1.25 Detail the distances from elbows and fittings when required for proper airflow.
- 7.1.26 Volume dampers shall also be shown on each branch duct line.
- 7.1.27 Specify the supply fan be adjusted to lowest horse power setting required to achieve full air flow at the most remote terminal unit. The fan shall not be set at high RPM and then throttled to meet corresponding requirements. Fans shall be sized to accommodate increases and decreases in airflow for future considerations. Specify that all outlets shall be adjusted to no less than 90% of required flow.
- 7.1.28 Invite local fire marshal to be present at substantial completion inspection walk-through.
- 7.1.29 A performance specification is required for fire suppression systems.
- 7.1.30 Consult with the owner for sprinkler head type. Concealed-type sprinkler heads are preferred where applicable.
- 7.1.31 Show standpipes, test headers, fire department connection valves, and water flow indicators on the drawings. Engineer is to provide notes on the drawings for any special conditions, Siamese connections, and fire pumps.
- 7.1.32 Engineer to size the mains and the fire pumps.
- 7.1.33 Sprinkler heads may be located on architectural reflected ceiling plan in spaces that are architecturally sensitive.
- 7.1.34 Toilet fixture quantities should generally exceed the minimums required by code. Consult with the owner on each project.
- 7.1.35 All water supply lines shall be copper.

- 7.1.36 Dielectric couplings shall be used at all connections of dissimilar metals.
- 7.1.37 Review with the owner selection of all valves, hose bibbs, gages, traps, meters, fixtures, etc.
- 7.1.38 Identify expansion compensation for steam, chilled water, and domestic water lines.
- 7.1.39 Provide a separate roof drain at each cooling tower location.
- 7.1.40 Humidification steam shall not be the same as, and shall be isolated from, treated heating plant steam.
- 7.1.41 Rooftop heating and cooling units are not allowed.

## **8. Electrical**

### 8.1 Electrical Design Issues

- 8.1.1 Exterior lighting shall be evaluated for energy efficiency, design characteristics, safety, and maintainability.
- 8.1.2 Interior lighting should be reviewed for energy efficiency and control, design characteristics, and maintainability. Incandescent lighting is not allowed.
- 8.1.3 All conduit and cable tray shall be accessible for cable installation and shall provide for cable turn radiuses.
- 8.1.4 Study electrical energy sources for infrastructure, life safety, security, and overall capacity.
- 8.1.5 All high current equipment and conductors shall be copper. All wiring shall be copper.
- 8.1.6 All indoor transformers shall be dry type, copper wound, cast coil, and adequately vented for proper cooling.
- 8.1.7 Specify K-rated step down transformers.
- 8.1.8 Remediate the negative effects of harmonic currents. Oversize neutral conductors to accommodate harmonic currents caused by equipment with power supplies such as elevator digital controls, variable speed drives, computers, lighting system electronic ballasts, etc.

- 8.1.9 Consult with owner as to whether emergency generator or battery packs are to be specified.
- 8.1.10 Specification for emergency generators shall be a design specification – not a performance specification. Contact the owner for information on level of quality of components.
- 8.1.11 Refer to Appendix 17000 for Telecommunications and Information Technology Guidelines.

## **9. Commissioning**

### **9.1 Building Commissioning**

- 9.1.1 The owner may consider contracting independent building commissioning for specific building systems, such as HVAC, fire and life safety, and temperature control systems. Building commissioning agents will probably be brought into the project early in the design process to assist in the development and review of the design intent criteria.
- 9.1.2 Design development documents and construction documents will be reviewed by the building commissioning agent for consistency with the previously approved design intent document.
- 9.1.3 During the construction phase, the building commissioning agent would perform periodic and specific observation to assure that the construction documents are being followed in the field.
- 9.1.4 The building commissioning agent would oversee the testing and acceptance process of the building systems to assure that they perform as designed and that they are appropriately integrated with other systems.