Architecture, Engineering, and Construction

Design Guidelines

(United States and Canada)

THE CHURCH OF
JESUS CHRIST
OF LATTER-DAY SAINTS

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All previous versions of this document are obsolete.

This document is available for download on the AEC website at http://aec.ldschurch.org/ .

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Appendix 1

How to Use These Guidelines

These guidelines are intended to be used in an electronic format.

This document may be printed and bound or kept in a folder.

Open the navigation toolbar and use the navigation buttons to navigate the document.

The table of contents can be used to access specific areas of the document by clicking the desired topic.

Clicking on a highlighted link (**01 0000**) leads the reader to the associated document.

Clicking on this symbol leads the reader to additional information about an item.

Icon Legend

Architectural

Interiors

Civil Engineering

Landscape

Structural Engineering

Plumbing

HVAC – Heating, Ventilation, and Air Conditioning

Fire Protection

Electrical

Sound, Satellite, and Acoustics

Introduction

Guidelines Intent

> *"This tremendous building program is phenomenal. I know of nothing equal to it. Our structures are beautiful. They add to the ambience of any community in which they stand. They are well maintained. We have had long experience in constructing houses of worship, and out of that vast experience we are producing better buildings than have ever previously been constructed in the Church. They combine beauty with great utility. If they look much the same, it is because that is intended. By following tried and tested patterns we save millions of dollars while meeting the needs of our people."*
>
> *(President Gordon B. Hinckley, October 2004 General Conference)*

The design guidelines are primarily for use by consulting architects, engineers, and landscape architects who provide professional services to the Church. They are also for use by project managers and facilities managers.

These guidelines:

- focus on requirements unique to the owner's needs and do not attempt to cover technical information already familiar to the design professional
- emphasize areas which present a continual challenge and potential for error in meeting owner's needs
- are intended to be broad in scope and to provide guidance and instruction to the design professional whose responsibility it is to develop specific solutions to design problems
- convey the owner's preference, intent, standards, and methods of doing business
- are meant to be more technical in nature rather than procedural
- have been written to comply with U.S. building codes (adaptation for Canadian building codes will be necessary)

The Architecture, Engineering, and Construction Division (AEC) is a resource for additional information and feedback.

Building Codes and Standards

The latest version of the International Building Code (IBC) is used in producing standard plan documents.

Types of Meetinghouse Projects

Standard Plan Projects

Standard plans have been prepared for full-size and phased meetinghouses, each with its own specific name and development number. As directed by the project manager, the consulting architect, engineers, and landscape architect adapt the standard plan meetinghouse drawings, specifications, and produce new calculations for the specific site, local conditions, and governing codes.

Non-Standard (Custom) Projects

Where a standard plan meetinghouse cannot be constructed at a needed location due to site restraints, the project manager will provide schematic design drawings for a non-standard meetinghouse. Using the schematic design provided, the design consultants will develop a full set of drawings, specifications, and calculations. The Design Guidelines should be adhered to in custom projects. Do not exceed quality and cost standards established in the *Design Guidelines.*

Addition and Replacement and Improvement (R&I) Projects

A meetinghouse addition with project scope based upon a standard plan phased addition design (if available) or a custom design. In either case, the design consultants prepare drawings, specifications, and calculations necessary to integrate the new addition with the existing building.

The design consultant(s) also prepares drawings, specifications, and calculations for R&I projects based on the specified R&I scope of work.

These projects should follow the criteria found in the *Meetinghouse Replacement and Improvement Standards*.

A project may have an addition component, an R&I component, and historic component.

Historic Property Projects

Some existing facilities have significant historical, architectural or aesthetic significance, and have been given Historic Property status bv the Historic Sites Executive Committee, and the Presiding Bishopric. These facilities require special attention and care that often goes beyond typical operations and maintenance (O&M) policies and procedures. Design guidelines including cost and quality standards may not apply as related to maintaining the historic fabric or character of a historic property. These

facilities may or may not be registered as historic on a national, state or local registry. Facilities on national, state or local registries may be subject to additional requirements. Facilities Managers (FMs) should recognize all Church Historic Properties facilities in their care. Renovations, remodels and general care of these facilities should be guided by notations regarding "Historic Properties" in these *Design Guidelines.* Whenever a renovation and improvement project is undertaken at any of these buildings, a Church History Department curator should be included on the project team for all stages of the project from planning through design and construction.

The following principles will be applied when doing a project at a Historic Property:

- Preserve the visual prominence of the building and the historic and cultural elements of the character defining landscape features.
- Preserve the historic character of the building and its distinctive materials, features, finishes and construction techniques
- Develop new additions and alterations that are compatible with historic materials, features, size, scale and proportion, and massing of the original building
- Integrate structural elements necessary to meet modern building codes and amenities essential for comfort and safety in a manner that is visually unobtrusive, compatible with a building's historic character, and preserves original materials to the greatest extent possible.
- Alterations to the historic fabric or character of the building or landscape, requires the approval of the Historic Sites Executive Committee.

Glossary

Architecture, Engineering and Construction Division (AEC)

A division of the Meetinghouse Facilities Department that provides professional architecture, engineering and construction services for the preparation of standard plans, specifications, and calculations. AEC also provides technical support and expertise to the project managers and facilities managers and participates in the development of value managed relationships (VMR) for construction projects.

Area Physical Facilities Manager (APFM)

A management position, under the North America Operations Division, responsible to oversee the design and construction of projects for new and existing Church facilities and the maintenance and operation of existing meetinghouses.

Area Project Manager (APM)

A management position, under the North America Operations Division, responsible to oversee the design and construction of an assigned number of project managers.

Authority Having Jurisdiction (AHJ)

The city, county, state, or other governmental body charged with the responsibility for zoning, planning, life safety, building permits, and so forth.

Bishops' Storehouse

This is a specific entity within Welfare Services. Also, facilities designed and constructed for the purpose of a commodity resource center that is used by the bishops of the Church to provide goods to individuals in need.

Church Headquarters (CHQ)

The owner with head offices located in Salt Lake City, Utah.

Church History Department

Department responsible to assist the Presiding Bishopric and their staff to preserve Church historic properties by reviewing all major renovation, restoration, sale, donation and demolition proposals; and assign Church History staff as needed to serve as project collaborators.

Church Occupying Unit

An ecclesiastical unit of the Church with geographic boundaries, such as a branch, ward, stake, mission, seminary, or institute.

Core Feature Requirements

This is a set of common basic building elements or core features that are deemed necessary to accommodate an occupying unit's needs within any given facility. These core features define the type, quantity, and capacity of spaces needed to accommodate Church programs.

Corporation of the Presiding Bishop (CPB)

The legal entity of the Church in the United States (with the exceptions of Kansas, Virginia, West Virginia, and Washington, D.C.) through which contractual arrangements are made with consultants, manufacturers, vendors, and contractors relative to design, construction, and management of meetinghouses and other Church facilities. (The full name is *The Corporation of The Presiding Bishop of the Church of Jesus Christ of Latter-day Saints, a Utah Corporation Sole*.) In these guidelines,

The Corporation of the Presiding Bishop may be referred to as "The Owner" of Church facilities or an authorized representative.

NOTE: Separate legal entities have been established for Canada and each of the above named states and districts.

Custom Project

Also known as a non-standard project, it may be any building project that does not fit one of the standard plans as a result of site or other conditions or requirements. As a result, a custom-designed plan has to be developed to meet core feature requirements, standard design guidelines, and local zoning and building codes. The AEC Design Guidelines should be adhered to in custom projects. Do not exceed quality and cost standards established in the *AEC Design Guidelines.*

Customer

The customer is the recipient of professional services from the Meetinghouse Facilities Department, also referred to as "Client".

Deseret Industries

This is a specific entity within Welfare Services. Also, facilities designed and constructed for the purpose of providing non-profit, vocational rehabilitation and a thrift store.

Director for Temporal Affairs (DTA)

The DTA is the person who directs the temporal affairs of the Church in a geographic area, working with local ecclesiastical leaders and coordinating the services of the MFD to design, construct and maintain Church facilities.

Director for Temporal Affairs (DTA) for Historic Sites

Consults with Church History Department and Missionary Department on maintenance, R&I and addition projects that impact the historic fabric or character of Historic Properties.

Coordinates with area DTAs on all aspects of Historic Properties and facilitates access to services provided by MFD and SPD.

Facilities Manager (FM)

The FM is the person in charge of a Church facilities management group.

FM Group (Office)

A facilities management group is responsible for the operation and maintenance of assigned Church facilities (such as meetinghouses, Deseret Industries, and Seminaries and Institutes of Religion) in a geographic area.

Historic Properties

A selection of the most important Church-owned facilities with historical, architectural, or aesthetic significance—mostly temples, tabernacles and meetinghouses—that continue to be used for their original or adapted ecclesiastical purpose. Historic Properties are categorized into a three-tiered classification based on historical, architectural, and aesthetic significance, historic integrity, materials and workmanship. The three classifications are Historic Temple Properties, Landmark Properties, and Register Properties. See Landmark Properties and Register Properties.

Historic Sites Executive Committee

Approves and recommends to the Presiding Bishopric the list of Historic Properties. Reviews and makes recommendations to the Presiding Bishopric for all major maintenance, R&I, and other projects which affect the historic fabric or character of Historic Properties.

Landmark Properties

The second tier of classification within the Historic Properties Program, buildings and associated property of Church-wide significance which exhibit the highest historical, architectural, or aesthetic value, as designated by the Historic Sites Executive Committee. These buildings have the highest degree of interior and exterior integrity.

Meetinghouse Facilities Department (MFD)

MFD is the headquarters organization, under the Presiding Bishopric, responsible for developing and maintaining Domestic US and Canada standard plans, developing core processes and tools, and providing training and support to NAO and the International Areas.

Meetinghouse Replacement and Improvement Standards

The purpose of the *Meetinghouse Replacement and Improvement Standards* is to ensure that the desired level of quality established by the Presiding Bishopric is achieved but not exceeded. When items are replaced before they meet the replacement criteria, cost increase and the replacement is no longer defensible. Replacement of items that do not meet the replacement criteria is not authorized.

Meetinghouse Technical Services (MTS)

A staff of technicians in the Operations and Maintenance (O&M) Division at Church Headquarters that provides technical support and information, orders replacement parts, and otherwise provides help to facilities management groups and project managers to solve problems as they occur in electrical, HVAC, sound, and satellite systems.

New Meetinghouse

A facility designed and constructed for the purpose of Church units holding worship services. The objective is to construct an approved standard plan meetinghouse on an existing site.

New Space Projects

This is a project for construction of new space (a new building or addition to an existing one).

North America Operations Division (NAO)

A division of the Meetinghouse Facilities Department that provides design and construction period oversight of new building and renovation and improvement projects through project managers (PM) and manages operations and maintenance of existing facilities through facilities managers (FM).

Owner's Representative

A person designated to be the official representative of the Church for a project. This would be a project manager (PM) on a construction project and a facilities manager (FM) on a maintenance project.

Presiding Bishopric Office (PBO)

The PBO is the ecclesiastical office responsible for overseeing the temporal or physical aspects of the Church.

Physical Facilities Advisory Committee (PFAC)

PFAC is a headquarters advisory committee that reviews DTA requests for exceptions and other funding requests and sends forward recommended requests to the committee responsible for granting final approval.

Project Manager (PM)

The PM is the person responsible for the management of construction and R&I projects in an assigned geographic area or territory.

Quality, Cost, Time (QCT) Targets

Owner established performance goals for quality, cost, and timeliness for each project or type of work.

Register Properties

The third tier of classification within the Historic Properties Program, buildings and associated property of area, regional, state or provincial, or local significance which contain major historical, architectural, or aesthetic value, as designated by the Historic Sites Executive Committee. These buildings have a high degree of either interior or exterior architectural integrity.

Replacement and Improvement (R&I) Project

A project that replaces existing finishes, fixtures, and inventoried equipment with new product that performs the same function and that upgrades and/or expands the utilization of an existing facility, resulting in additional inventory. Project scope may involve any combination of existing space reconfigurations, new space additions, and/or existing building element replacements. The *Meetinghouse Replacement and Improvement Standards* should be followed.

Seminaries and Institutes of Religion (S&I)

S&I is a specific entity within the Church Educational System (CES). Also, facilities designed and constructed for the purpose of providing religious instruction to middle school, high school, and college age students.

Value Managed Relationship (VMR)

VMR is a business relationship between the Church and a manufacturer or supplier of goods and/or services used in the construction or maintenance

of Church facilities (such as meetinghouses, Deseret Industries, and Seminaries and Institutes of Religion). It is a long-term, mutually advantageous relationship between the parties designed to continually improve quality, cost, and timeliness.

Welfare Services

This is a specific entity overseen by the Presiding Bishopric Office. Deseret Industries and Bishops' Storehouse facilities are managed by this entity.

Chapter 1: Architectural

Guiding Principles

"Meetinghouse standard plans are approved by the Church Budget and Appropriations Committee. A meetinghouse is to portray an image of dignity and reverence while providing adequate facilities for Church members to participate in approved programs. Plans, specifications, and operating procedures necessary to support standard plans are produced under the direction of the Presiding Bishopric and Physical Facilities Department. Standard plan buildings are to be constructed without unnecessary alteration. If under exceptional circumstances conditions dictate modification, every effort should be made to adhere as closely as possible to the intent of the original standard plan."

(Budget and Appropriations Committee 16 December 1997)

These guidelines incorporate the following principles:

- Uniform appearance
- Consistent utilization of space
- Facilities that accommodate the programs of the Church
- Establishing an appropriate image
- Contributing to the ambiance of a community
- Combining beauty with utility

Standard Plans Change Boundaries

Standard Plans Change Boundaries

Project Site Adaptation

The key to success of the construction project is proper site design where a building is carefully placed and oriented to maximize site utilization, provide convenient access to parking and building, properly manage storm water drainage, allow appropriate flexibility for planned future phased building additions, and provide appropriate landscape elements.

Refer to the Architectural, Civil, and Landscaping Site Development Checklist the Appendix for additional information.

Meetinghouse Standard Plan Development

Building Codes and Standards

The latest version of the International Building Code (IBC) is used in producing standard plan documents.

Types of Meetinghouse Projects

Standard Plan Projects

Standard plans have been prepared for full-size and phased meetinghouses, each with its own specific name and development number. As directed by the project manager, the consulting architect, engineers, and landscape architect adapt the standard plan meetinghouse drawings, specifications, and produce new calculations for the specific site, local conditions, and governing codes.

Non-Standard (Custom) Projects

Where a standard plan meetinghouse cannot be constructed at a needed location due to site restraints, the project manager will provide schematic design drawings for a non-standard meetinghouse. Using the schematic design provided, the design consultants will develop a full set of drawings, specifications, and calculations. The Design Guidelines should be adhered to in custom projects. Do not exceed quality and cost standards established in the *Design Guidelines.*

Addition and Replacement and Improvement (R&I) Projects

A meetinghouse addition with project scope based upon a standard plan phased addition design (if available) or a custom design. In either case, the design consultants prepare drawings, specifications, and calculations necessary to integrate the new addition with the existing building.

The design consultant(s) also prepares drawings, specifications, and calculations for R&I projects based on the specified R&I scope of work.

These projects should follow the criteria found in the *Meetinghouse Replacement and Improvement Standards*.

A project may have an addition component, an R&I component, and historic component.

Historic Property Projects

Some existing facilities have significant historical, architectural or aesthetic significance, and have been given Historic Property status bv the Historic Sites Executive Committee, and the Presiding Bishopric. These facilities require special attention and care that often goes beyond typical operations and maintenance (O&M) policies and procedures. Design

guidelines including cost and quality standards may not apply as related to maintaining the historic fabric or character of a historic property. These facilities may or may not be registered as historic on a national, state or local registry. Facilities on national, state or local registries may be subject to additional requirements. Facilities Managers (FMs) should recognize all Church Historic Properties facilities in their care. Renovations, remodels and general care of these facilities should be guided by notations regarding "Historic Properties" in these *Design Guidelines.* Whenever a renovation and improvement project is undertaken at any of these buildings, a Church History Department curator should be included on the project team for all stages of the project from planning through design and construction.

The following principles will be applied when doing a project at a Historic Property:

- Preserve the visual prominence of the building and the historic and cultural elements of the character defining landscape features.
- Preserve the historic character of the building and its distinctive materials, features, finishes and construction techniques
- Develop new additions and alterations that are compatible with historic materials, features, size, scale and proportion, and massing of the original building
- Integrate structural elements necessary to meet modern building codes and amenities essential for comfort and safety in a manner that is visually unobtrusive, compatible with a building's historic character, and preserves original materials to the greatest extent possible.
- Alterations to the historic fabric or character of the building or landscape requires the approval of the Historic Sites Executive Committee.

Core Feature Requirements

The owner has— through many years of meetinghouse construction experience and functional evaluations— identified and compiled a set of common basic building elements or core features that are deemed necessary to accommodate a Church occupying unit's needs within any given meetinghouse. These core features define the type, quantity, and capacity of spaces needed to accommodate Church programs and there is no distinction made between the needs of occupying units housed in either new or existing meetinghouses.

In particular, groupings of basic meetinghouse sizes have been formulated with corresponding core features to accommodate the needs of occupying units with sacrament meeting attendances of 130, 170, 230, and 300, which numbers are called the functional capacity of the meetinghouse.

It is intended for the 130 size meetinghouse to accommodate one occupying unit and for the 170 size meetinghouse to accommodate two occupying units. The 130 and 170 size meetinghouses can accommodate additional units, but this will reduce their functional capacity below 130 and 170 respectively. The 230 and 300 size meetinghouses should be able to accommodate up to three occupying units and potentially serve as a stake center at appropriate locations and under qualifying circumstances.

For approved exceptions, smaller 50 and 90 size meetinghouse programs have also been developed.

Refer to the U.S. & Canada Standard Plans Planning Brochure - Selection Chart for a summarization of the afore-mentioned meetinghouse sizes.

Historic Properties may not offer all of the core features of standard plan meetinghouses. When engaging in a renovation, remodel, or addition project on a Historic Property for the purpose of meeting necessary core features, include a CHD curator in the project to consult on the impact to historic fabric or character.

Core Activity Requirements

Historic Properties

Historic Properties may have chapels, rostrums, baptismal fonts, cultural centers, offices, teaching areas, or other historically significant areas or features that may not fully meet current core activity requirements. These areas and features should not be damaged or altered in any way without significant compelling reasons such as code compliance or other unusual requirements. A CHD curator should be engaged in the project to consult and assist with meeting the core activity requirements to the extent possible, reviewing each specific situation, with the goal of preserving the historic fabric and character. Alterations to the historic fabric or character require approval of the Historic Sites Executive Committee.

Chapel

The chapel is the primary assembly area and place of worship. Design elements should create a reverent, peaceful atmosphere that inspires quiet contemplation. The floor area is commensurate with meetinghouse size and is intended to seat the assigned occupying unit attendance plus 10 percent with all related circulation spaces.

Chapels in 170 size and larger meetinghouses are furnished with rows of fixed seating (pews) based upon a linear seating module of 20 inches per person and spaced at 36 inches back-to-back with an aisle width of 48 inches. Clear minimum space from the rostrum front to first pew row should be 60 inches. *Note that building codes allow 42-inch minimum wide aisles and calculate occupancy loading for exiting provisions based upon a linear seating module of 18 inches per person.*

These larger chapel floors should be carpeted and walls finished with vinyl wall covering. (Where moisture control and mildew is a problem, a painted textured wall may be considered in lieu of vinyl wall covering.) Ceiling should be finished with a painted hard surface (no acoustical ceiling tile) at a sloped height between 16 feet (wall spring line) and 23 feet (ridge line) and painted wood trim.

Chapels in 130 size and smaller meetinghouses are multi-purpose to also function as cultural centers and are to be furnished with movable seating to accommodate appropriate cultural or recreational activities as well as usual worship services. Total floor space allowed per chair is 20 by 20 inches square. Rows should be spaced at 36 inches back-to-back with a minimum aisle width of 48 inches. Clear space between the rostrum front and first row of movable seats should be 51 inches.

These smaller chapel floors should be carpeted and walls finished with vinyl wall covering and stained hardwood chair rail. (Where moisture control and mildew is a problem, a painted textured wall may be considered in lieu of vinyl wall covering.) Ceiling height should be at

least 10 feet high and finished with acoustical ceiling tile, if level, or finished with a painted hard surface, if pitched.

A multi-purpose chapel used for cultural or recreational activities should not designate or isolate one part of the room as being more sacred than another part.

Rostrum

Located at the head of the chapel, the rostrum faces the assembly space and includes a seating area for ecclesiastical leaders and program participants behind a prominently placed pulpit with modesty panels. Also includes space for sacrament administration, musical instruments, and choir. Size of rostrum area is commensurate with meetinghouse size. When full sized organ and piano are provided, place organ and piano in center area of rostrum with space in-between for music director. This allows for both the organist and pianist to better balance accompaniment with choir or congregation and music conductor has better eye contact and communication with organist and choir.

Rostrums in 170 size and larger meetinghouses are permanently constructed in place, raised two steps (7-inch risers) above the chapel floor to the level behind the pulpit, and are furnished with fixed pew seating, sacrament table, grand piano, and digital organ (if building is equipped with satellite a motorized roll-down projection screen may be provided). It is preferred (and may be required in some jurisdictions) for the rostrum to be accessible by wheelchair. Up to three 7-inch high stepped tiers with pews may be provided for choir seating.

Floor should be carpeted and walls finished with vinyl wall covering. Where moisture control and mildew are a problem, a painted textured wall may be considered in lieu of vinyl wall covering. Ceiling should be an extension of the chapel ceiling.

Non-raised rostrums for multi-purpose chapels are comprised of movable components placed directly on the chapel floor.

Sacrament Preparation

Utility space of 30 to 35 square feet convenient to the rostrum and used for preparing the emblems of the sacrament to include a small single compartment countertop sink with gooseneck faucet, potable cold water supply, base cabinets, and wall-hung adjustable shelving for storing sacrament trays and supplies.

In 130 size and smaller meetinghouses, sacrament preparation function will be provided within the serving area.

Cultural Center (Cultural Hall)

A multi-use assembly space to accommodate social, recreational, and cultural activities. This space also functions as the chapel/multi-purpose space in smaller meetinghouses. Size of cultural center is commensurate with the planned meetinghouse type.

Assembly functions include movable seating for chapel overflow and conference needs. Spacing between rows of seating should be 36 inches back-to-back with a typical aisle width of 48 inches. In buildings equipped for satellite at or above 170 capacity, a motorized projection screen may be provided.

Floor should be a polished wood flooring system and walls finished with sisal wall covering. Ceiling should be finished with acoustical ceiling tile at a sloped height between 16 (wall spring line) and feet (ridge line) and painted wood trim.

Social functions may include dances and banquets with associated tables and seating to accommodate at least 50 percent of the planned sacrament meeting attendance of an occupying unit. Round banquet table layout is based on abutting 11-foot diameter circles that include seating for 8 persons around each table.

Recreational functions may include approved interior sport events with related equipment and fixtures. Coordinate convenient storage needed for any such equipment.

Cultural events in larger meetinghouses may include coordinated use of an adjoining platform (stage) for basic drama activities and other talent sharing presentations.

Platform (Stage)

Permanent platforms provided in larger meetinghouses that may be used as stages, teaching areas, and assembly seating areas when required. It may be mandated in some jurisdictions for the platform to be accessible by wheelchair.

Floor should be carpeted and walls painted with a stained hardwood chair rail. Ceiling should be finished with a hard surface finish (no acoustical ceiling tile) at a height of 12 feet minimum above platform floor.

The installation of cyclorama tracks and draperies is not authorized.

Standard Teaching Areas

Teaching areas are provided for instruction of Church members participating in Aaronic and Melchizedek Priesthood quorums, Relief Society, Young Women, Primary, Sunday School, stake functions, and other appropriate Church meetings and activities. Total count of needed teaching areas is commensurate with the planned meetinghouse type.

Provide a mixture of small and medium sized teaching areas— the minimum usable room size is about 70 square feet and the preferred typical sized room is between 140 to 150 square feet.

Teaching areas should provide:

- seating for a minimum of six members plus an instructor
- acoustic and visual separation from other teaching areas (provide a view window in typical classroom doors for security reasons)
- acoustical conditions conducive to teaching (noise and reverberation)
- light, ventilation, and thermal conditions (natural or artificial)
- a permanent or portable chalkboard—large teaching areas may have chalkboards on two walls to allow for flexibility in classroom orientation (whiteboards may be installed in bishop and stake president offices and high council rooms only)
- electrical power for needs of audiovisual equipment.

Spacing between rows of seating should be 36 inches back-to-back with a typical aisle width of 36 inches. Clear space between the wall with a writing board and first row of movable seats should be 51 inches. Total floor space allowed per chair is 20 by 20 inches square.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceilings should be finished with acoustical ceiling tile at a height of 8 feet.

All occupiable spaces within a meetinghouse that meet teaching area criteria are counted as teaching areas, including the following:

- serving areas (kitchens)
- one unit leader's office (available as leader office of unit meeting during their Sunday meeting block, allowing other unit leaders access their own offices at any time)
- stake high council rooms
- classrooms associated with a designated Family History Center
- when provided, designated seminary or institute classrooms
- chapels not needed for overlapping Sunday meeting schedules in meetinghouses that accommodate three occupying units

The following spaces are not counted as teaching areas:

- clerk offices
- mechanical, custodial, and storage rooms
- designated meetinghouse library (materials center), except in 130 size and smaller meetinghouses
- stake offices (including interview room)

- designated family history center equipment and computer storage rooms, unless the equipment is contained in secure cabinetry in a room that otherwise meets teaching area criteria
- foyers and corridors
- mothers' rooms
- designated seminary/institute offices
- chapel and overflow needed to accommodate overlapping Sunday schedules in meetinghouses accommodating three occupying units

Non-standard Teaching Areas

Occasionally, a shortage of teaching areas may result when the number or size of occupying units need to temporarily exceed the meetinghouse capacity, such as while awaiting completion of a new meetinghouse or building addition construction project. In order to provide for these transitional needs, a portable partition has been approved for use as a means to temporarily provide non-standard teaching areas. These portable partitions are not to be used for any other purpose and are only available for units who qualify for this temporary need (see *Qualifying For and Ordering Portable Partitions*). These partitions should only be planned for and purchased as part of the annual R&I plan.

Nursery Teaching Areas

Two adjoining teaching areas of 120 to 150 square feet each should be available for nursery needs (teaching area for young children between 18 months and 3 years of age). Provide toy storage cabinets within or near these rooms. A folding partition may be used to divide one large room into two smaller rooms. These rooms should preferably be located near restrooms.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceilings should be finished with acoustical ceiling tile at a height of 8 feet.

Assembly Teaching Areas

Four larger assembly teaching areas (ATA) included in the total teaching area count that will accommodate the following group assembly needs:

- opening exercises for combined men and young men priesthood group/quorums held before these groups separate for individual instruction
- meetings for Relief Society (women's organization)
- opening/closing exercises for Primary (children's organization) held before /after classes separate for individual instruction
- opening exercises for Young Women organization held before classes separate for individual instruction (this space should be sub-dividable into three teaching areas by means of folding partitions)

Area of each assembly teaching area is commensurate with the planned meetinghouse size. Spacing between rows of seating should be 36 inches back-to-back with a typical aisle width of 36 inches. Clear space between writing board wall and first row of movable seats should be 72 inches.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceilings should be finished with acoustical ceiling tile at a height of 8 feet. Ceilings in the Relief Society and Primary rooms should have simple center-stepped ceiling treatment with lowest (perimeter) portion of these ceilings at a height of 8 feet.

Unit Leader Office

Secured sound isolated office of 170 to 180 square feet for leader of each occupying unit to conduct interviews and meetings. Provide seating capacity for at least 10 persons and configure this space to also serve as a teaching area. Locate this office convenient to entrance foyers that can provide seating in a related waiting area function.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceiling should be finished with acoustical ceiling tile at a height of 8 feet.

Unit Clerk Office

Secured sound isolated workspace of 90 to 100 square feet with floor supported countertops and wall-hung cabinets for each occupying unit designated for administrative unit recordkeeping purposes, located convenient to the unit leader office, and without an interconnecting door. Two occupying units within the 130 size meetinghouse may share a clerk office. Windows are not provided in order to protect sensitive records and equipment storage.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceiling should be finished with acoustical ceiling tile at a height of 8 feet.

Serving Area (Kitchen)

Support area of 175 to 200 square feet with adequate countertops on base cabinets and wall-hung storage cabinets that will accommodate warming and serving food prepared elsewhere, located convenient to the cultural center. This room should also function as a teaching area if located adjacent to a large assembly teaching area or cultural center.

Commercial equipment for food preparation and long-term food storage should not be provided. Serving area should provide a double compartment sink and residential grade kitchen appliances that are appropriate for local customs and practices.

When a local authority having jurisdiction would otherwise mandate commercial kitchen provisions— such as, an exhaust hood, fire suppression system, grease traps, *etc.*—, the architect or project manager should meet with the local authority having jurisdiction and follow one of the suggestions referred to in the *Serving Area Appliances* section of this document (see Chapter 2: Interiors, Owner Furnished Products, Serving Area Appliances).

Floor should be paver tile and walls painted. Ceiling should be finished with a hard surface finish (no acoustical ceiling tile) at a height of 8 feet.

When directed by a project manager, a serving area within an existing meetinghouse that becomes remotely located from a new cultural center constructed as part of an addition project may be considered for relocation.

Materials Center (Meetinghouse Library)

Support room of 200 to 250 square feet with countertops on base cabinets, wall-hung cabinets, and full height storage shelving for secured storage of curriculum materials, audiovisual equipment, and a copy machine. This room is used by library workers to prepare and distribute teaching materials and equipment for Sunday and weeknight classes. Windows are not provided in order to protect materials and equipment storage.

Floor should be carpeted and upper walls painted, with sisal wainscoting below a stained hardwood chair rail. Ceiling should be finished with acoustical ceiling tile at a height of 8 feet.

Mothers' Room

A designated private room of 150 to 175 square feet with seating capacity for two in upholstered glider chairs, with a wall hung sink, and diaper changing station provided for convenience of nursing mothers. Provide an overflow sound system tied into the chapel and cultural center sound system and configure room access to provide adequate visual barrier from a main corridor— room can also be accessed through a privacy door within an adjacent women’s restroom.

Floor should be carpeted; upper walls should be painted; lower walls should be finished with sisal wainscoting and stained hardwood chair rail. Provide ceramic tile on wall behind and paver tile on floor below the sink. Ceiling should be finished with acoustical ceiling tile at a height of 8 feet.

Restrooms

Restrooms should accommodate personal hygiene needs of building occupants, comply with governing plumbing code requirements (including adequate fixture count), be fully accessible, and be designed to provide adequate privacy to maintain personal dignity consistent with a house of worship. Where feasible, restrooms in larger meetinghouses requiring

more plumbing fixtures should be split into multiple locations for added convenience.

Restrooms with multiple toilet and urinal stalls should provide visual privacy between stalls and should further be designed so that no stall or fixture (including sinks) can be seen directly or indirectly by means of reflected image from a main corridor.

Toilet compartments and urinal stalls are to be formed from floor mounted overhead braced metal partition systems. Provide a baby changing station in every restroom.

In 170 size and larger meetinghouses, provide at least one additional private accessible unisex (family) restroom convenient to a main corridor and equipped with a toilet and sink for assisting a family member with personal sanitary needs.

Floor should be paver tile and walls should be ceramic wall tile from floor to ceiling, and a subtle ceramic tile accent band is allowed. Ceiling should be a painted hard surface at a height of 8 feet.

When directed by a project manager, restrooms in existing meetinghouses that are inaccessible and/or have insufficient fixture counts may be reasonably upgraded if the need exists as part of a replacement and improvement project.

Drinking Fountains

Provide the number of bi-level drinking fountains required by local building code to be typically located in corridors adjacent to restrooms or other plumbing wall locations within barrier-free recesses finished with ceramic wall tile and paver tile.

Baptismal Font

The baptismal font accommodates the ordinance of baptism by total immersion performed within a typical volume of water 48 inches wide by 78 inches long by 30 inches deep within a 36-inch deep ceramic tiled recess extending below floor level. Provide drainage overflow protection above the maximum intended water level as measured above the water surface displaced by two persons during a baptism—normally about 33 inches above font floor.

Provide adequate number of floor drains in critical areas such as the landing at the top of the font stairs and in the changing area to allow drainage of water dripping off of wet clothing.

The font should be secured against unsupervised entry and directly accessed by steps from both men and women restrooms— each with privacy provisions for changing from wet clothing. Provide a transparent 42-inch high protective railing comprised of a glass railing system across

the viewing edge of the font. For viewing opening widths up to 7’-6”, install 1/2” fully tempered clear glass continuously supported on both sides and bottom edges within 20 gauge stainless steel channel frame securely mounted to sides of opening and floor or font curb. For opening widths between 7’-7” and 10’-0”, install 3/4” fully tempered clear glass in same manner. For openings greater than 10’-0” in width, contact AEC for further instructions.

Provide a 60 inch wide by 42 inch high mirror typically mounted at a 35-degree angle from the vertical just below the ceiling on the upper portion of the rear font wall to enable distant viewing of a baptism.

Floor and font stair treads should be porcelain mosaic tile with non-slip, non-abrasive surface, font walls should be ceramic wall tile with uppermost portion of wall to be painted gypsum board above a level set by top of paver tile base at top landing of font stairs. Ceiling should be a painted hard surface at a typical height of 8 feet above main floor of the adjacent viewing area.

A baptismal font is normally provided within a stake center and other meetinghouses located more than 30 minutes’ drive time distance from any other facility with a baptismal font.

Custodial Spaces

Support space of 70 to 120 square feet with a service sink and storage for cleaning equipment and supplies for member general cleaning activities. Provide an additional secured storage cabinet for specialty custodial cleaning supplies accessible only to the facilities management group.

Provide a floor drain.

Floor should be paver tile and walls should be ceramic wall tile behind the service sink and painted elsewhere. Ceiling should be a painted hard surface at a height of 8 feet.

Interior Storage

Interior storage space distributed throughout the meetinghouse in locations convenient for users should be provided for each unit. Storage should be adequate for short-term storage of Church approved program supplies. Banquet tables and chairs are to be stored so as not to interfere with meetinghouse function.

Floors should be carpeted and walls painted— except that walls of chair and table storage rooms should be finished with sisal wall covering over plywood sheathing to provide a more durable wall surface. Ceilings should be a painted hard surface at a height of 8 feet.

In cold climates, coat storage space of 70 to 90 square feet may be provided, if corridor coat storage recesses are not allowed or would

otherwise be inadequate. In buildings designed for overlapping schedules, provide sufficient coat storage for two units that may be in the meetinghouse during overlapping Sunday meeting schedules. Coat storage room walls and ceilings should be finished similar to corridors.

Circulation Spaces

Main entrance foyers of 190 to 200 square feet should establish a sense of reverence and dignity so as to promote appropriate behavior upon entering the meetinghouse. All fittings, furnishings, and artwork should be appropriate to enhance the function and appearance for that purpose.

Floor should be carpeted; upper walls should be painted; lower walls should be finished with sisal wainscoting and stained hardwood chair rail. Foyer ceilings should be finished with a hard surface finish (no acoustical ceiling tile) and raised above adjoining corridor ceilings to develop a welcoming building entry function. Foyer spatial treatment should include stained hardwood banding trim as part of the transition from lower corridor ceilings. Corridor ceilings should be finished with acoustical ceiling tile at a typical height of 8 feet.

Circulation spaces should provide convenient and full accessibility to all major functions of the meetinghouse without needing to pass through an intervening room and without encountering accessibility obstacles, such as floor level changes to be navigated only by stairs. Any necessary ramps should fully comply with accessibility requirements, such as slope, clearances, landings, and handrails.

Width of corridors should comply with all governing building and life safety codes and allow out-swinging doors where minimally required. Provide an adequately wide route from building exterior in to at least one (larger) assembly teaching area and the chapel by means of aisles, 42-inch wide doorways, and corridors to facilitate funeral service needs.

Access to Mechanical Rooms

Provide secured vertical maintenance access to mechanical rooms not located on a ground floor that is adequate to allow equipment replacement and comply with all code requirements of local authority having jurisdiction. Typical access should be a 42-inch clear width fixed stairway, except that retractable stairs can be used in 130 size and smaller meetinghouses where fixed stairs cannot be provided. Ladder-only access to a mechanical room is not approved.

Stair treads, risers, walls, and ceiling should be painted.

Exterior Storage Building

Wherever possible, for full-size meetinghouses or stake centers a standard 12 foot by 14 foot freestanding storage building should be provided and located convenient to site parking and having four rooms, each with

separate secured access to the exterior. One 8 foot by 12 foot room is to be used for storing site maintenance equipment and three 4 foot by 6 foot rooms for provided occupying units to store outdoor equipment needed for approved Church programs. Exterior storage buildings for one unit buildings are 6 foot by 12 foot, and for two unit buildings are 10 foot by 12 foot. For the Church's official phased meetinghouse standard plan program, exterior storage building shall be that for the next phase development above the one being constructed.

Exterior Elements

Paved space for vehicle parking should be provided in a quantity and configuration to meet current and projected parking needs.

A visual enclosure should also be provided for trash collection and removal, preferably located adjacent to the exterior storage building. Designated space should be provided for required outdoor system components for building water, drainage, heating, cooling, fire protection, electrical, and telecommunication services.

Other Spaces Provided as Needed

Stake President Office

Sound isolated office of 180 to 190 square feet within each stake center provided for stake president to conduct interviews and hold meetings. Preferred location is adjacent to the high council room with an interconnecting door. Provide seating capacity for at least 10 persons.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceiling should be finished with acoustical ceiling tile at a height of 8 feet.

Stake Clerk Office

Secured sound isolated workspace of 100 to 110 square feet with floor supported countertops, full height storage cabinets, and wall-hung cabinets within each stake center provided for administrative stake recordkeeping purposes and located convenient to the stake president's office and without an interconnecting door.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceiling should be finished with acoustical ceiling tile at a height of 8 feet.

Stake High Council Room

Secured sound isolated room of 470 to 480 square feet within each stake center and furnished with conference tables and chairs to accommodate 25 persons in stake council meetings. Preferred location is adjacent to the

stake president's office with an interconnecting door. A writing board should be provided so this room can also serve as a teaching area.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceiling should be finished with acoustical ceiling tile at a height of 8 feet.

Stake Interview Room

Sound isolated office of 55 to 65 square feet provided for leadership to conduct interviews. Provide seating capacity for at least 6 persons.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceiling should be finished with acoustical ceiling tile at a height of 8 feet.

Stake Waiting Area

Sound isolated area of 190 to 200 square feet convenient to all stake suite rooms with seating for at least 5 persons.

Floor should be carpeted and upper walls painted with sisal wainscoting below a stained hardwood chair rail. Ceiling should be finished with acoustical ceiling tile at a height of 8 feet.

Stake Suite Restroom

Private an accessible unisex restroom of 45 to 50 square feet within the stake suite and equipped with a toilet and sink.

Floor should be paver tile and walls should be full height ceramic wall tile and a subtle ceramic tile accent band is allowed. Ceiling should be a painted hard surface at a height of 8 feet.

Seminaries and Institutes

Meetinghouse space may be shared with seminaries and institutes as needed. In general, locate seminary and institute classrooms within teaching areas near an entrance and easily accessible to restrooms with the intent to keep students in a portion of the meetinghouse that can be easily monitored by seminary and institute personnel for security.

Refer to the Seminaries and Institutes of Religion section elsewhere in these guidelines for further information.

Meetinghouse Addition Projects

> *"Meetinghouse components and furnishings are replaced only at or near the end of their useful lives* (when they meet the standard for replacement). *Improvements or alterations occur only when it is necessary to change or upgrade the function of an existing building…*
>
> *When properly maintained, most older meetinghouses continue to be attractive and comfortable and portray the desired image of dignity and reverence without extensive remodeling. Reasonable wear is acceptable when buildings show evidence of appropriate maintenance, cleanliness, and care.*
>
> *Older buildings are architectural examples of their time and need not be remodeled to look like modern meetinghouses. However, if exceptional circumstances dictate modification, the results should be in harmony with the character of the original buildings."*
>
> *(Facilities Management Guidelines for Meetinghouses, p. 6)*

Addition Design Principles

Current core feature requirements should be used when planning a needed addition project to identify potential correctable deficiencies in harmony with the *Meetinghouse Replacement and Improvement Standards* and *Meetinghouse Adequacy Standards*.

Balanced Meetinghouse Design

A balanced meetinghouse— wherein all needs and functions for an approved meetinghouse program size are adequately accommodated— is the most efficient use of meetinghouse space. Capacity analysis and adequacy evaluation of an existing meetinghouse needing an upgrade may identify an unbalanced configuration. An upgraded or expanded meetinghouse should accommodate balanced target meetinghouse program needs— see also Core Feature Requirements section defining target program needs for approved 90, 130, 170, 230, and 300 size meetinghouses.

Sensitivity to Original Meetinghouse Design

Design of new addition elements should be sensitive to the existing or original meetinghouse style. Continuation of an existing meetinghouse style should first be considered; however, minimal image enhancements may be justified. Upgrading existing meetinghouse elements to match the current new meetinghouse image is not justified or allowed.

Historic Properties

If exceptional circumstances indicate a need for an addition to a Historic Property, a CHD curator should be engaged in the project, and as

necessary a historic architect, in the initial planning and scoping of the project. Additions to Historic Properties require the approval of the Historic Sites Executive Committee.

Existing Conditions Documentation

If existing building record drawings are available, the design architect should fully verify that existing conditions are correctly documented. When as-built conditions are unknown, the design architect should accurately document existing conditions (without relying upon any assumptions) to properly coordinate the merging of new construction with all aspects of existing construction.

Addition Design Strategy

Addition design considerations should first explore reconfiguring existing spaces to increase spatial functionality and reduce the need to add new space in efforts to maximize cost effectiveness. Unnecessary reconfiguring of existing structural, HVAC, plumbing, and electrical systems should be avoided.

Existing deficiencies commonly encountered as corrective opportunities to reconfigure existing spaces for an addition project may include:

- Horizontal circulation problems (dead-end corridors, exiting problems, lack of 'connecting' corridors, non-corridor access to teaching areas)
- Vertical circulation problems (stair-only access, multiple floor levels, inaccessible rostrum)
- Spatial relationship problems (remote kitchen, undersized foyers and font viewing area, non-private office locations)
- Restroom issues (non-accessibility, insufficient fixture counts, open-door sight lines, inadequate font dressing)
- Underutilized areas (abandoned shower or dressing room, redundant baptismal font, inadequate/non-functional stage)

Exterior and Site Design Issues

Addition design considerations should also address issues regarding building exterior, location, and orientation on the site, such as:

- Reinforce and/or maintain an appropriate scale and proportion of new building exterior elements with respect to existing features
- Main facade orientation and presentation
- Steeple placement
- Entry prominence
- Current and future parking needs
- Building accessibility

- Future expandability
- Re-routing of existing utility lines
- Re-grading of the site

Addition Design Overall Objective

Ideally, meetinghouse addition construction should not readily be discernible from existing construction, especially where logical and sensitive transitions from existing to new elements can be carefully executed.

Specifications

AEC has prepared and maintains a master set of specifications for new standard plan meetinghouses and other types of Church facilities. These documents are electronically available in Microsoft Word format and organized in accordance with CSI *MasterFormat*™ 2004 Edition. These master specifications are regularly updated in coordination with standard plan update releases.

"Front end" documents (i.e. Bidding Requirements, General Conditions and Supplementary Conditions) are provided separately by the project manager and are to be edited for each project (except that General Conditions are never to be edited).

Supplementary specification sections are available for some atypical conditions encountered in existing meetinghouses. Use of a supplementary section requires approval by the project manager.

A current set of master specification sections is provided for each project and are to be edited for specific project needs. The latest version of master specifications should be used and coordinated with the corresponding release of standard plan drawings. A Project Manual edited for a past project should not be re-used for a subsequent project.

Edit notes are embedded text boxes within specification sections that provide specific instructions regarding items to be addressed as each section is edited for a specific project. The non-hidden text of these notes should be reviewed and deleted after taking the required action; otherwise it will print. Edit notes are intended for any of the following purposes:

- Procedural Notes: Guidelines at the beginning of most sections to provide coordination and/or design information and background for the entire section
- Edit Required Notes: General instructions for a needed action
- Option Notes: Instructions for selecting from a choice of given options and deleting the other choice(s)

- Information Notes: Explanatory information in some regular sections and in all Supplementary Sections

Historic Properties

When preparing specifications for renovation, remodel or addition work in Historic Properties, select and specify materials, products, equipment, finishes, furnishings, etc., that match the function, appearance, style, color, finish, materials, and quality of the original element. If this is not available, select and specify elements that resemble the appearance, function, style, etc., of the original element to be replaced. A CHD curator should be consulted for guidance in material selection.

Construction Materials and Elements

Exterior Opening Surrounds

Molded urethane, molded fiberglass, molded GFRC, or stone around exterior door and window openings should not be used, except as indicated on standard plans and/or as approved by the project manager.

Interior Door Automatic Closers

Where building codes require doors to be fire rated and provided with automatic closers, doors are not to be hindered in their operation. If hold opens are desired, the only kind of hold open that may be installed is a building code approved unit, usually one that is connected to the fire alarm system or detectors. Use of manual “toe-kick” hold opens at door bottoms that violate applicable life safety codes are not allowed. Specific questions about this item should be directed to the local authority having jurisdiction when directed by a project manager.

Interior Door View Windows

Classroom doors are to have a 6-inch wide by 14-inch high view window for security reasons; however, it is not intended for existing doors to be replaced or retro-fitted to receive view windows unless approved by the area DTA. Chapel, cultural center, offices, high council room, and materials center doors are not to have view windows.

Interior Walls

Typical wall construction is one layer of gypsum board on both sides of wood studs. A double layer of gypsum board should be installed on cultural center stud walls for additional resistance to abuse. See also Sound Attenuation paragraph for sound wall information.

Meetinghouse Access Control

Locking hardware and keying schemes should only be selected as specified in the master specifications for the following reasons:

- Controlled Availability of Keys: Specified key systems are patented with key blanks available only from a designated controlled supplier. To eliminate unauthorized key duplication, keys should only be requested through the facilities manager.
- Reduced Cost of Re-keying: Interior keying system should be different from the exterior keying system to eliminate necessity of re-keying both systems in the event of lost or stolen keys.

Securing Devices

Locks and locksets for doors are provided through national contracts with preferred suppliers established by the owner. Typically, the interior door keying system of one meetinghouse will be independent from other meetinghouses. For most meetinghouses, re-keying of interior door locks is rarely, if ever, necessary and should not be required. If re-keying interior door locks becomes necessary, however, costs can be minimized if the hardware and keying system used conforms to Church standards.

Locks are no longer approved for interior doors to classrooms (including Relief Society and Primary rooms), chapels, and cultural halls (including folding partitions).

Building Code Requirements: In fire sprinklered meetinghouses located in areas under the International Building Code jurisdiction, the following hardware changes can be made for new construction:

- Delete interior rated corridor doors and magnetic door hold opens
- Delete closers from interior doors, except on chapel, overflow, cultural center, restroom, and interior vestibule doors
- Delete panic hardware and install push/pull hardware

Master Key Access for Facilities Managers: One exterior door in all meetinghouses under the responsibility of a facilities manager should be keyed alike in order to provide needed access for the facilities manager. The keying scheme for these locks should be independent from the local keying scheme for each building.

Meetinghouse Identification

Building Mounted Sign

All meetinghouses are to display the name of the Church on the prominent elevation (facade) of the building. The sign is intended to be a dignified signature of the Church (not a billboard) to assist people in finding the building. Only the approved sign design shown below should be used as provided by owner approved fabricators— do not include any street address information to the building sign.

Permanently anchor building sign and inset into new construction so that face is flush with surrounding wall finish. Place top of the sign level with top of typical entry doors. For a non-standard installation onto an existing meetinghouse, consult with sign fabricator for specific mounting details.

Monument (Free Standing) Signs

A free standing monument meetinghouse sign with the Church logo on one side only may be provided in lieu of a building mounted sign in a project with any of the following conditions and when approved by the Director for Temporal Affairs.:

- When building location/orientation does not allow the standard building mounted sign to be seen easily from the street
- When local neighborhood covenants require a free standing sign
- Other exceptional circumstances for identification or visibility
- In order to preserve the original character of Historic Properties and to avoid damaging original materials

Use design and details provided by AEC. Lighting of these signs is not approved.

Address Sign

Street address numbers should not be placed near the meetinghouse sign unless unalterably mandated by local governing jurisdiction. The preferred location of street numbers is on the opposite side of the prominent facade (elevation) away from location of meetinghouse sign.

Polyethylene Film Vapor Retarders 07 2613

A polyethylene vapor retarder should not be installed under drywall for frame construction unless unalterably mandated by the local authority having jurisdiction. Owner's experience indicates that, with normal usage

of meetinghouses, a polyethylene vapor retarder does not provide sufficient benefit to justify cost and complexity of installation.

Current information about indoor air quality shows use of a polyethylene vapor retarder can adversely contribute to a building envelope becoming too airtight and thereby increasing size and complexity of the mechanical system needed to eliminate contaminated air.

Kraft paper and foil vapor retarders included with fiberglass insulation, together with taped, textured, and painted drywall, will meet most code requirements and are adequate to prevent water vapor from condensing in the insulation.

Product Options 01 6200

The owner has negotiated with select manufacturers and suppliers for contractual procurement and/or installation of certain construction products and building systems as follows:

Owner-Furnished and Contractor-Installed Products

Owner will furnish selected products to be installed by contractor. Products in this category include but are not limited to:

- Fixed Chalkboards **10 1113**
- Fixed Markerboards **10 1116**
- Fixed Tackboards **10 1123**
- Display Cases **10 1200**
- Interior Signage **10 1495**
- Baby Changing Station **10 2814**
- Range, Refrigerator, Microwave Oven **11 3114**
- Projection Screens **11 5213**
- Volleyball Equipment (Floor Anchors) **11 6625**
- Wall Padding (Safety Wainscot) **11 6626**
- Scoreboards **11 6643**

Owner-Furnished and Installed Products

Owner will furnish and install selected products— installation may require coordination with project construction scheduling. Products in this category include but are not limited to:

- Soap, Paper Towel, and Toilet Tissue Dispensers **10 2813**
- Basketball Equipment **11 6624**

Owner Established Value Managed Relationships (VMRs)

Specific procurement and scheduling procedures are to be followed to preserve these relationships (see *Current Managed Relationships Matrix*). No product substitution is allowed for the following products:

- Lumber **06 1100** , **06 1636** , **06 1712** , **06 1733** , **06 1753** , **06 1800**
- Rostrum Casework **06 4115**
- Asphalt Shingles **07 3113**
- Hollow Metal Frames **08 1213**
- Hollow Metal Doors **08 1313**
- Flush Wood Doors **08 1429**
- Aluminum-Framed Entrances and Storefronts **08 4113**
- Aluminum Hung Windows **08 5113**
- Vinyl Hung Windows **08 5313**
- Common Finish Hardware **08 7101**
- Ceramic Tiling **09 3013**
- Acoustical Tile Ceilings **09 5116**
- Wood Athletic Flooring **09 6466**
- Tile Carpeting **09 6813**
- Sheet Carpeting **09 6816**
- Accordion Folding Partitions **10 2233**
- Upholstered Audience Seating **12 6113**
- Pews **12 6713**

Roof-Mounted Steeple

Steeples are to be provided in owner approved models of aluminum or fiberglass construction and are typically mounted straddling the ridgeline of the roof in a prominent location— usually over the chapel rostrum area and facing property frontage. For Replacement and Improvement projects with chapels not facing forward, new roof-mounted steeples may otherwise be oriented to another appropriate main building element, such as a projecting building entrance, as approved by project manager.

Sound Attenuation

Sound attenuation assemblies should be provided within interior walls, above ceilings, and around door openings of offices (including stake high council room), restrooms, mothers' room, mechanical equipment rooms, and with folding partitions in chapel and cultural center.

Thermal Protection 07 2613

Maintain the minimum level and type of thermal insulation specified in the owner's standard documents that portray the expected level of building performance in both hot and cold climates.

Consult with project manager if it can be demonstrated that additional insulation or a different type of insulation is needed. If adding insulation, evaluate the load-bearing capacity of the roof structure to assure that any resulting increased snow accumulation can be properly supported by the roof structure.

Blown-in insulation cannot maintain a stable depth and is not allowed.

Windows

Windows in standard plan meetinghouses are currently an owner furnished item. Coordinate with the project manager to select either aluminum or vinyl windows. Do not change window sizes or quantity from that shown on the standard plan. The only approved color is white.

Glazing in all windows (except chapel, cultural center and storefront windows) is to be obscure.

Historic Properties

Historic Properties may have windows that are part of the historic character and fabric of the building. Repairs and replacement should only be done after consulting with a CHD curator.

Seminaries & Institutes of Religion

Historic Properties

If a seminary and institute building is also a Historic Property, all guidelines concerning historic meetinghouses also apply to these buildings.

Facility Definitions

Small Seminary Building

Stand-alone 1 to 4 classroom building of 1,740 to 6,207 square feet (excluding attic level mechanical spaces) for secondary school grades 9, 9 through12, or 10 through12.

Large Seminary Building

Stand-alone 6 to 8 classroom building of 9,406 to 11,727 square feet (excluding attic level mechanical spaces) for secondary school grades 9 through12 or 10 through 12.

Small Domestic Institute Building

Stand-alone 1 to 3 classroom building of 3,910 to 6,735 square feet (excluding attic level mechanical spaces) located convenient to college or university facilities.

Medium Domestic Institute Building

Stand-alone building of 6,736 to 31,900 square feet and typically custom designed with or without full ecclesiastical elements (chapel, cultural hall, bishop's and clerk's offices).

Large Domestic Institute Building

Stand-alone building located convenient to college or university facilities. Buildings range from 31,900 square feet up to about 54,500 square feet and containing ecclesiastical and meetinghouse elements as outlined in the meetinghouse core activity requirements. Typically custom designed although some developed standard plans are available for both one and two level buildings that provide from 6 to 16 classrooms.

Meetinghouse Seminary and Institute Module or Pod

Full-time S&I program "shared-use" pod elements added onto or included with meetinghouse buildings. Typically constructed towards rear of meetinghouse with separate entrance; but, sharing other spaces inside the building, such as, restrooms. Other areas of the building may also be utilized occasionally, such as, serving area, cultural center, and chapel—with close supervision and monitoring by S&I staff members. In similar manner and as part of a "shared-use" concept, S&I classrooms may also

be utilized on Sunday or weeknight meetings by the local occupying units. S&I offices and secretarial workroom remain specific to S&I, unless program need does not require their use. Meetinghouse finishes and color selections should control design for these modules.

Early-Morning Seminary Spaces

Multi-purpose or combination classroom spaces within current meetinghouse plan layouts utilized for early morning seminary applications as part of the "shared-use" concept. Meetinghouse requirements are the focus of the room design with simple modifications to allow for a 12-foot long sliding chalkboard or marker board (preferred), a 6-foot wide pull-down screen, and black-out treatment at the windows. A 30-inch wide journal cabinet together with an audiovisual cart storage cabinet is added to the back of the space. Groupings of 6- or 8-foot long by 18 inch deep folding tables with stacking chairs are utilized for student desks. Note that 6-foot tables are preferred for ease of storage. Storage areas for tables should be provided convenient to the classroom.

Meetinghouse Elements in Large Institute Buildings

These buildings have a dedicated room used only as a chapel or have a multi-purpose room without pews that can be used as a chapel when combined with adjacent classrooms by opening motorized operable partitions. A change to either of these configurations is not authorized without approval of the owner. Follow meetinghouse guidelines for all dedicated chapel areas.

These buildings may include ecclesiastical elements in addition to the chapel such as bishop's offices, clerk offices, and stake offices (including high council rooms, stake president's office, stake clerk office, interview room and a waiting area). Follow meetinghouse guidelines for all ecclesiastical spaces.

These buildings also include a cultural center. Follow meetinghouse guidelines for this space including the required adjacency of the serving area convenient to the cultural center.

A platform may also be included at the end of the multi-purpose room in these buildings consisting of a permanent raised platform up to 500 to 600 square feet to double as a second rostrum to serve the multi-purpose room when used as a second chapel. The platform should be provided with movable modesty railing and pulpit. A permanent proscenium curtain should be provided and a carpeted floor with a 14 to 16 foot ceiling height.

Material centers are included to accommodate Sunday curriculum storage and distribution requirements for occupying student wards and stakes. Follow meetinghouse guidelines for this space.

Core Activity Requirements

Director Office (Institute) or Principal Office (Seminary)

Secured office of about 140 square feet (14 feet by 10 feet or 12 feet by 12 feet) for each seminary or institute director/principal, to be used for interviews and teacher preparation space. Sound masking at doorway is not required unless office is shared by a bishop.

Office is furnished with a 6-foot long desk and a built-in 30-inch deep rear credenza placed at 30 inches above finished floor and full length along the short wall with knee space and storage cabinets and drawers below and open adjustable wall shelving above. Install data/telephone outlet for internet connectivity at two locations. Provide two upholstered guest chairs, swiveling arm chair with casters, telephone, and open adjustable shelving above the credenza. Provide standard meetinghouse finishes.

Provide door with a 6-inch wide by 33-inch high view window positioned at 9 inches below door top and 6 inches from latching side of door.

Instructor Office

Secured office of about 120 square feet (12 feet by 10 feet or 13 feet by 9 feet rooms) for each full-time teacher in a seminary/institute building to be used for interviews and teacher preparation space. One office is generally provided for each classroom in addition to director or principal. (One classroom seminary buildings are provided with just one standard office for the instructor.) A sound masking system is not required unless shared with a bishop. Office is furnished with a 5-foot long desk and built-in 30-inch deep credenza placed at 30 inches above finished floor and full length along the short wall with knee space and storage cabinets and four double tiered file drawers below and open adjustable wall shelving above. Install data/telephone outlet for internet connectivity at two locations. Provide two upholstered guest chairs, swiveling arm chair with casters, and telephone. Provide standard meetinghouse finishes.

Provide door with a 6-inch wide by 33-inch high view window positioned at 9 inches below door top and 6 inches from latching side of door.

Support Specialist (Secretary) Office

Separate office of 150 to 165 square feet in any stand-alone seminary or institute building of six or more classrooms. Room includes 30-inch deep countertops at 28.5 inches above finished floor. Provide base cabinets with file drawer capacity in the lower drawer element. Install data/telephone outlet for internet connectivity. Provide one 3-foot by 4-foot tack board, telephone, secretary chair with casters, and 4 to 6 metal file cabinets. Painted gypsum board walls are standard.

Provide door with a 6-inch wide by 33-inch high view window positioned at 9 inches below door top and 6 inches from latching side of door.

Workroom

Separate workroom of 150 to 220 square feet in a large seminary or any institute building. Provide stand-up height countertop work surfaces (typically 36") with 24-inch clearance to underside of upper 14-inch deep wall cabinets of adjustable shelving. Provide 48-inch wide clear space with a data connection for free-standing printer/copier or cart for smaller copiers. Workroom should include break room elements such as: microwave unit at upper shelf, double sink, and a refrigerator space. Painted gypsum board walls are standard for this room.

Combined Support Specialist (Secretary) Office / Workroom

A combined function support room of 220 to 250 square feet in a small seminary building of four classrooms or less and in a seminary/institute module (pod) connected to a meetinghouse. Data/telephone outlet for internet connectivity should be provided. Provide 36-inch high countertops in the "work" area of the room with Support Specialist's portion meeting cabinet design information noted in item above. The Workroom portion is to meet the cabinet requirements of Workrooms as noted in item above. Painted gypsum board walls are standard.

Quiet Study (Institutes Only)

Quiet study space for students enrolled in the institute and college or university. Provide rectangular tables and chairs together with three 30-inch wide by 7-foot high sections of open adjustable shelving for storing common church books and manuals. Room may be eliminated in some projects or standard plan prototypes when directed by S&I-HQ Physical Facilities Representative.

Serving Areas (Institutes Only)

In general, a support room in a stand-alone institute building with residential grade kitchen equipment to heat and serve previously prepared food for social activities. This room is always located adjacent to the student activities center except when a cultural center is provided in a large institute building as previously noted. Flooring should be paver tile with a 6-inch high tile base (4 inches high at cabinets) over entire floor area.

Small Domestic Institutes: Support space of 130 to 210 square foot room with countertops on base cabinets, with adjustable shelving behind cabinet doors, and open adjustable shelving, 15 to 24-inch wide drawers, and double compartment sink. Also provide upper wall cabinets with doors and adjustable shelving, one 30-inch wide range with oven and four surface burners, and one 36-inch wide refrigerator with freezer.

Large Domestic Institutes: Support space of 260 to 330 square feet with countertops on base cabinets with both adjustable shelving behind cabinet doors and open adjustable shelving, 15 to 24-inch wide drawers, three 24-

inch high vertical storage spaces, one double compartment sink, one triple compartment sink, and 4 to 5-foot long under counter clear space for storing serving carts. Also provide upper wall cabinets with doors and adjustable shelving, two 30-inch wide ranges with oven and four surface burners each, and one 36-inch wide refrigerator with freezer

Classrooms (Teaching Areas): Seminaries & Institutes

Teaching areas are to be provided for formal instruction of students enrolled in seminary and institute classes and other appropriate Church meetings and activities.

A classroom for full-time seminary or institute enrollment is defined as a space with primary function for receiving religious instruction and providing the following features:

- Adequate visual and acoustic separation.
- Acoustical wall covering on walls above the chair rail in seminary classrooms only for displaying changeable teaching materials.
- Adequate light, ventilation, and controllable thermal conditions (either natural or artificial).
- A standard sliding marker board.
- Painted walls (above chair rail) in standard institute classrooms only, with sisal below.
- Pull down projection screen and overhead projector.
- Electrical power for use of audiovisual equipment. Telephone/data outlet at teaching podium with appropriate data cabling internet connectivity capability.
- Light switches located near classroom entrance door and at front of classroom on adjacent sidewall near computer station cabinet. Avoid placing any switches on the ‘teaching wall’.
- Preferably a rectangular room of about 32 feet by 24 feet in size (768 square feet) with space for 30 to 36 individual desk-chairs for seminary classrooms or space for 36 to 48 individual stacking chairs placed at either 6-foot long by 18-inch deep or 8-foot long by 18-inch deep folding tables for institute classrooms.
- Doors with a 6-inch wide by 33-inch high view window positioned at 9 inches below door top and 6 inches from latching side of door.

Student Activity or Multi-Purpose Area (Institutes of Religion)

A room designated for recreational student activities in a location easily monitored by CES staff. Furnishings include round tables with chairs, a television, upholstered chairs (couches and loveseats are not to be used), vending machines, foosball table and/or table tennis. Provide a pool table where deemed appropriate and approved on a case-by-case basis only for domestic stand-alone institute facilities.

Small Domestic Institute Buildings: Locate this room of about 820 square feet adjacent to a serving area and provide a separating serving counter.

Large Domestic Institute Buildings: Provide a room of about 850 square foot in addition to a cultural center or other multi-purpose rooms. The room is not required to be adjacent to a serving area if a cultural center exists in the building.

Restrooms, Electric Water Coolers (EWC), and Fonts

In general:

- Restroom doors should swing out into corridors.
- Provide sensor-activated faucets with battery back-ups at lavatories.
- Provide sensor-activated automatic flush valves with battery back-ups on urinals.
- Provide a wall-hung accessible lavatory within each accessible toilet compartment in each restroom that can be included in the overall fixture count requirement.

The plumbing fixture counts noted below are minimums according to seminary and institute program requirements for the building size stated. All fixture count numbers should be verified with requirements of the local authority having jurisdiction.

Small (1 to 4 Classroom) Seminary Buildings:

- Provide a handicap accessible women's restroom of 180 to 200 square feet with at least one countertop lavatory (with additional wall-hung lavatory in an accessible toilet stall), two to three toilets, and visual screening of plumbing fixtures from the corridor. A baby changing station is not required.
- Provide a handicap accessible men's restroom of 160 to 180 square feet with at least one countertop lavatory (with additional wall-hung lavatory in an accessible toilet stall), one to two urinals, one toilet, and visual screening of plumbing fixtures from the corridor. A baby changing station is not required.
- Provide a bi-level accessible drinking fountain with paver tile floor and ceramic tile walls, as a 5-foot high wainscot.
- Finish entire floor of restrooms with paver tile and finish walls with ceramic wall tile to a minimum height of 86 inches (top of door frame) and painted gypsum wallboard from top course of wall tile up to ceiling.

Large (6 to 8 Classroom) Seminary Buildings:

- Provide a handicap accessible women's restroom of about 275 square feet with three countertop lavatories (with additional wall-hung lavatory in an accessible toilet stall), six toilets (to include one

ambulatory stall), and visual screening of plumbing fixtures from the corridor. A baby changing station is not required.

- Provide a handicap accessible men's restroom of about 275 square feet with three countertop lavatories (with additional wall-hung lavatory in an accessible toilet stall), three to four urinals, two to three toilets (to include one ambulatory stall), and visual screening of plumbing fixtures from the corridor. A baby changing station is not required.
- Provide two bi-level accessible drinking fountains with paver tile floor and ceramic tile walls, as a 5-foot high wainscot.
- Finish entire floor of restrooms with paver tile and finish walls with ceramic wall tile to a minimum height of 86 inches (top of door frame) and painted gypsum wallboard from top course of wall tile up to ceiling.

Small Domestic Institute Buildings:

- Provide a handicap accessible women's restroom with three countertop lavatories (with additional wall-hung lavatory in an accessible toilet stall), four toilets, and visual screening of plumbing fixtures from the corridor. A baby changing station is not required.
- Provide a handicap accessible men's restroom with two countertop lavatories (with additional wall-hung lavatory in an accessible toilet stall), two urinals, two toilets, and visual screening of plumbing fixtures from the corridor. A baby changing station is not required.
- A unisex restroom is not required unless unalterably mandated by a local authority having jurisdiction.
- Finish entire floor of restrooms with paver tile and finish walls with ceramic wall tile to a minimum height of 86 inches (top of door frame) and painted gypsum wallboard from top course of wall tile up to ceiling.
- Provide a bi-level accessible drinking fountain with paver tile floor and ceramic tile walls, as a 5-foot high wainscot. Provide bi-level drinking fountains in two separate locations within a standard three classroom institute building.

Large Domestic Institutes (with Full Meetinghouse Elements):

- Provide a handicap accessible women's restroom of 200 to 220 square feet in two to four locations with a total counts of four to nine countertop lavatories (with additional wall-hung lavatory in each accessible toilet stall), twelve to fifteen toilets, one 4-foot long bench for dressing at restroom adjacent to font (when provided), and visual screening of plumbing fixtures from the corridor. A baby changing station is not required.
- Provide a handicap accessible men's restroom of 200 to 220 square feet in two to four locations with total counts of four to eight in

countertop lavatories, (with additional wall-hung lavatory in each accessible toilet stall), six to eight toilets, six to eight urinals, one 4-foot long bench for dressing at restroom adjacent to font (when provided), and visual screening of plumbing fixtures from the corridor. A baby changing station is not required.

- Provide a handicap accessible unisex restroom with a wall-hung lavatory and toilet.
- A children's restroom is not required unless specifically authorized.
- Finish entire floor of restrooms with paver tile and finish walls with ceramic wall tile to a minimum height of 86 inches (top of door frame) and painted gypsum wallboard from top course of wall tile up to ceiling.
- Provide a bi-level accessible drinking fountain with paver tile floor and ceramic tile walls, as a 5-foot high wainscot, at four to six locations.
- Provide a baptismal font in multi-level institute buildings that house stake offices or when specifically requested and approved in single-level large domestic institutes.

Custodial

Utility room with a service sink and storage space for cleaning equipment and supplies in seminary and institute buildings, as follows:

Small Seminary Buildings: A room of 50 to 60 square feet with a service sink and utility shelf.

Large Seminary Buildings: A room of 50 to 60 square feet with a service sink, one 36-inch by 48-inch tack board, utility shelves, and cabinets.

Small Domestic Institute Buildings: A room of 50 to 60 square feet with a service sink, one 36-inch by 48-inch tack board, utility shelves, and cabinets.

Large Domestic Institute Buildings: One or two rooms of 150 to 175 square feet total with a service sink, one 36-inch by 48-inch tack board, utility shelves, and cabinets.

Finish entire floor of custodial room with paver tile and provide a 60-inch high ceramic wall tile wainscot on two walls directly behind corner service sink.

Interior Storage

Provide storage rooms, closets, and cabinets to store chairs, classroom tables, supplies, and activity materials. Distribute storage spaces throughout the facility in locations convenient for instructors' use. Seminary buildings should include a journal cabinet at the back of each classroom for storage of individual student scriptures and manuals, with

the number of cabinets based on planned student enrollment. Standard office cabinetry is defined by the S&I Design Standards book and is to be provided in all standard seminary and institute buildings. Rooms used for storage of stacking chairs and tables are to have walls covered with full height sisal wall covering (wall sheathing backing not required).

One-Classroom Seminary: General storage is limited to spaces designed within individual rooms. Instructor's office, secretary, and classroom cabinets (additional to the journal cabinet space) as planned for in the standard plan layout. Maintenance storage is confined to a combined mechanical/custodial room of 60 square feet.

Two-Classroom Seminary: Provide a room of 80 square feet containing space for video cabinet and general storage cabinets with individual doors along one wall. In expandable plan versions the Storage room becomes a connecting corridor to new addition with the wall cabinetry remaining and the video cabinet relocated to another designated space within the addition.

Three- to Four-Classroom Seminary: Provide storage similar to the two-classroom seminary with an additional storage room of 25 square feet adjacent to instructor's office for each additional wing.

Six to Eight-Classroom Seminaries: Provide three rooms of 50 to 60 square feet each for miscellaneous general storage containing adjustable shelving along one wall. Also provide a chair storage room of 70-90 square feet adjacent to one classroom of a set of three combined classroom spaces separated by motorized folding panel partitions.

Small Institute Buildings (One-, Two-, and Three-Classroom): Provide a room of 50 to 60 square feet for storage of chairs and tables adjacent to the multi-purpose room.

Large Institute Buildings: Provide several rooms of 15 to 50 square feet distributed throughout the facility in addition to storage rooms needed to store tables from the large multi-purpose room.

Exterior Storage

Include one standard 10-foot by 12-foot storage building similar to the standard meetinghouse outside storage building, except without individual compartments. Smaller buildings may be provided with a smaller storage building or no building as directed by the S&I Physical Facilities Representative.

Circulation and Exit System

Corridors or exit passageways are required by code and are necessary for convenient access to the seminary or institute rooms. Foyers adjacent to the main entrance and exit are needed in seminary and institute buildings

to accommodate high numbers of students leaving or congregating after leaving classroom areas. Vestibules are to be included at each foyer, exterior entrance, and preferably at each corridor exterior entrance. Foyers are not to be designed for furniture arrangements except for large institute buildings. Specific circulation requirements are as follows:

Small Seminaries: Corridors are to have minimum clear width of 6 feet.

Large Seminaries: Main corridors are to have an average clear width 10 feet. Provide one 15-foot wide foyer of 180 to 225 square feet adjacent to the main entrance.

Small Institutes: Corridors are to have minimum clear width of 6 feet. Provide one central foyer of 180 to 225 square feet.

Large Institutes: Corridors are to have a minimum clear width of 6'-8". Provide two foyers of 350 to 500 square feet each and furnish with a minimum of two pairs of upholstered chairs and, depending on available space, an optional foyer table and lamp. Love seats and sofas are not to be provided.

Windows

Glazing in windows of Seminary and Institute buildings shall be clear, except where a Seminary or Institute pod is attached to a meetinghouse where it should match the obscure glazing of the meetinghouse. Storefronts are to be clear glazing in all cases.

Other Spaces Provided as Needed

Nursery Rooms

This room is not generally provided in seminary and institute buildings unless specifically requested and authorized by S&I Physical Facilities and Real Estate representatives. Nursery needs can typically be accommodated within a designated classroom.

Mothers' Rooms

This room is not generally provided in seminary and institute buildings for use during the Sunday meeting schedule unless specifically requested and authorized by S&I Physical Facilities and Real Estate representatives. Nursing mothers can typically use a designated room.

Sacrament Preparation (large institute buildings only)

Utility space of 30 to 35 square feet convenient to the rostrum area of the chapel and platform area of the multi-purpose space and used to prepare the emblems of the sacrament to include a small single compartment countertop sink with gooseneck faucet, potable water supply, base cabinets, and wall-hung cabinets with adjustable shelving for storing sacrament trays and supplies. Doors are optional at upper cabinets.

Stake Suite (approved large institute building location only)

Comprised of stake president office, stake clerk office, high council room, stake interview room, and stake waiting area. Refer to Stake Suite Elements under Meetinghouse_Stake_President_Office *Core Activity Requirements* section.

Family History Suite

Typically not provided in seminary and institute buildings and included only upon specific approval and in conjunction with "shared-use" projects.

Seminary and Institute Buildings Identification

All seminaries and institutes are to display the name of the Church on a prominent elevation of the building (such as a front-facing facade), using the approved sign design as provided by the owner.

The sign is intended to be a dignified signature of the Church, not a billboard to assist people in finding the building. The sign has been designed with lettering and negative space to specific proportions.

Placement of street numbers on seminary and institute buildings:

- Street number signage should not be placed near the seminary or institute identification sign, if possible.
- The preferred location of street numbers signage is on the opposite side of the prominent elevation (facade) from where the Church identification sign is located.

Chapter 2: Interiors

Guiding Principles

"For behold, ye do love money and your substance, and your fine apparel, and the adorning of your churches, more than ye love the poor and the needy, the sick and the afflicted." (Mormon 8:37)

These guidelines incorporate the following principles:

- Standard designs
- Uniform appearance
- Appropriate image
- Adequate facilities
- Dependable quality
- Low maintenance
- Long-term cost savings

General Concepts

Design

It is important to provide adequate space and select materials and finishes that will help members of the Church and visitors feel comfortable and welcome. Interiors should portray an image of dignity, integrity, respectability, and reverence. Excessive adornment that conveys a feeling of opulence is not the desirable appearance for meetinghouses. Caring for the poor and the needy, both spiritually as well as temporally, is a central theme of the gospel of Jesus Christ. Excessive adornment that portrays an image of wastefulness does not represent this theme and is inappropriate.

Seminary and Institute Projects

Seminary and institute facilities should meet, but not exceed, the design level and construction quality of meetinghouses constructed within the same vicinity.

Historic Properties

Historic Properties may exceed the design level of current standard plans in order to preserve the historical character of the building and its distinctive materials, features, finishes, and construction techniques.

Finishes for Historic Properties should be consistent with the original finishes in consultation with the CHD curator. This includes flooring, walls, ceilings, window treatments, loose furniture, fixed seating, and all

other finishes. Do not destroy any original furniture, pews, fabrics, or other material without consulting a CHD curator.

Vendor Relationships

Various building materials, furnishings, and other commodities are provided with the assistance of the owner's Purchasing Division through various vendor relationships. Refer to Specification Section **01 6200** for details.

See also Product Options in Chapter 1 of these guidelines.

Staging Program

In most cases, items not to be installed during construction are supplied to each project using the owner's staging program. When staged, furniture and equipment is shipped directly to a warehouse, stored, and delivered later in a single delivery to the project site, after the contractor's work is complete.

A smaller sized project may not warrant staging and, in that instance, furniture and equipment are delivered directly to the project site by the manufacturer. These deliveries are intended to be made after the contractor's work is complete; however, some items may arrive early and will need to be securely stored on site for the duration of the project work.

Staged furnishings are received on site by the facilities manager. The FM should confirm that the correct items have been provided in the correct quantities and with the correct finishes.

Pre-set Color Scheme Selection

Furnishings and finishes that meet the owner's expectations have been grouped into standard furnishings packages and pre-selected color schemes. The project architect should not deviate from what has been specified.

Where the specifications leave the selection and application of finishes to the architect's discretion, specify finishes that will tolerate normal wear and tear without excessive maintenance.

Finishes should not create distractions or otherwise call undue attention to any particular feature by virtue of their color, pattern, or texture. For example, strong colors or bold patterns should be avoided so finishes do not 'ugly out' before they wear out, prompting premature replacement.

New construction projects and major renovations require the selection of a pre-set color scheme by the local ecclesiastical leader during the project initiation meeting with the project manager. Small replacement and

improvement (addition) projects are not required to adhere to a pre-set color scheme to allow flexibility in accommodating existing conditions.

Please note: the A&R Selection Record does not allow selection of a pre-set color scheme that automatically filters out unrelated items. Rather, it includes all options for all color schemes in order to allow flexibility in accommodating existing conditions. Consequently, if a pre-set color scheme is selected for a major renovation project and the A&R Selection Record is used to order furnishings, the furnishings for that particular color scheme must be manually selected. Special attention should be given to ensure furnishings from different color schemes are not mixed inappropriately.

Project manager should convey the pre-set color scheme selected for the project, along with a copy of the designated Pre-set Interior Color Scheme Schedule and Vendor Directory to the architect. Architect should edit the specifications in compliance with the selected pre-set color scheme. For components not specified in the owner's approved color schemes, architect should make selections as required by the individual specification sections.

Category 1 components are owner provided, whereas Category 2 and Category 3 components are contractor provided. A 'color standard' is listed for Category 3 items available from multiple approved suppliers and architect should match the color standard as closely as possible. The following components are included in each preset color scheme:

Table 2.1 COMPONENTS BY CATEGORY

Category 1 Components (Owner-Furnished)	Category 2 and 3 Components (Contractor-Furnished)
Carpet	Wood Stain
*Foyer Sofa Fabric	Vinyl Wall Covering
Foyer Chair Fabric	Sisal Wall Covering
Pew, Choir Seat, and Padded Folding Chair Fabric	Acoustical Wall Covering (S&I Designated Classrooms Only)
Executive Chair / Side Chair Fabric	Ceiling Tile
Mothers' Lounge Chair Fabric	Curtain/Drapery Fabric
Steno Chair Fabric	Paint
Safety Wall Pad	Plastic Laminate
Tackboard Vinyl	Metal Toilet Partition
Accordion Partition Vinyl	Wall Tile
	Floor Tile
	Grout Color

* Note: Sofas are not to be provided in seminary and institute facilities

Seminary and Institute Projects

Local S&I personnel should select an approved color scheme with assistance from project manager. A copy of the selected Pre-Set Interior Color Scheme Schedule and Vendor Directory is then conveyed to the architect, who then should edit the specifications to comply with the selected pre-set color scheme. For items not included in owner's approved color schemes, architect should make color selections required by individual specification sections.

Acoustical Wall Covering: Use acoustical wall covering above the wainscot on all seminary classroom walls only. Acoustical wall covering should not be used on institute classrooms, except on operable folding panel partitions where it is applied full height.

Color Board Requirements

Refer to Agreement Between Owner and Architect.

Seminary and Institute Projects

Submitting color boards is not required when interior selections are made from the current Pre-Set Color Scheme Schedules for Seminaries and Institutes of Religion. Electronic samples or 'JPG' files of brick and other exterior selections should be sent directly to the S&I Physical Facilities and Real Estate Representative at Church headquarters for approval.

Vertical Surfaces

Stained/Painted Millwork 09 9324

Use stained red oak with a clear pre-catalyzed lacquer finish on millwork for chair rail, wall trim in chapels, cultural centers, offices, foyers, and corridors. Use only the approved stain colors as listed in the owner's Master Specification. Project managers and architects should request new stain control samples from headquarters when beginning a new project rather than refer to samples used on previous projects. Use painted hardwood or softwood only where shown on standard plans.

Painted Drywall 09 9123

Use painted drywall for interior walls. 'Light orange peel' texture is the only approved wall texture **09 9413**. Up to one accent color may be included on the rear rostrum walls. The accent color should be low contrast and should not draw undue attention to any particular element of the rostrum wall. Do not select highly contrasting colors.

Interior Painted Metal 09 9124

Door frames in new construction projects should be painted the same color as the walls.

Replacement and Improvement Projects

When repainting door frames in existing buildings, match existing paint unless the scope of the project includes all door frames and changing the color to match the walls makes sense.

Vinyl Wall Covering 09 7216

Use vinyl wall covering only in the chapel (including rostrum) and Relief Society room. Specify only the specified patterns and colors. Vinyl wall covering is not approved for use in other areas of the building. Where moisture control and mildew is a problem, a painted textured wall may be considered in lieu of vinyl wall covering.

Replacement and Improvement Projects

When replacing vinyl wall covering in an area of the building where it is no longer approved for use (such as corridors or bishop offices) paint the walls rather than perpetuate the use of vinyl wall covering.

In older buildings where the chapel or Relief Society room is painted CMU, vinyl wall covering should not be added in an effort to conform to current standards.

Sisal Wall Covering 09 7226

Use sisal wall covering below chair rail as a wainscot only, except in cultural center where it is installed to height of wood trim, and in chair and table storage room where it is installed full-height. Specify only the colors designated by the specification section. Sisal is not approved for use in chapels in lieu of vinyl wall covering.

Replacement and Improvement Projects

As an alternative to replacing sisal that is in fairly good condition, but unattractive, a supplemental section was added to the specifications several years ago: *Rehabilitation of Sisal Wall Covering* **09 0171**. This section details Church-approved systems for re-coloring the sisal. Sisal should be in fairly good condition prior to re-coloring. Imperfections such as frayed seams or bubbles where the sisal is not adhering to the wall may be accentuated by the re-coloring process.

Sisal wainscots should not be added to CMU walls in existing buildings.

Acoustical Wall Covering 09 7313

Use acoustical wall covering above the wainscot on seminary classroom walls only. Acoustical wall covering should not be used on institute classrooms, except on operable folding panel partitions where it is applied full height.

Acoustical Wall Panels 09 8413

Use the manufactured acoustical panels specified in owner's Master Specification for sound absorption on cultural center walls. Sisal wall covering should match that used on walls.

Wood Veneer Paneling 06 4217

Wood paneling is authorized only when and as shown on a standard plan. Wood panel wainscots are not authorized in meetinghouses.

Ceramic Tile 09 3013

Include ceramic tile on restroom walls, font walls, and walls around drinking fountains in meetinghouses. Subtle tile patterns in tile walls may be included in compliance with instructions in the Church Master Specifications and construction documents.

Stone Tile

Stone tile is not approved for use in Church buildings.

Floor Coverings

Carpet 09 6816

Color is defined by the selected preset color scheme for the project. Do not include borders or patterns in the field of carpet in any meetinghouse rooms, corridors, or foyers. Carpet is supplied and installed by owner immediately prior to substantial completion through a VMR program.

Wood Flooring 09 6466

Select wood size and grade only from approved options as described in contract documents. Do not install wood flooring in any location except the cultural center. Clear aluminum base is the only approved base above the wood flooring in the cultural center. Ease all corners and vertical edges for safety.

Paver Tile 09 3013

Use only tile sizes as described in contract documents for the font, restrooms, serving area, entrance vestibules, custodial rooms, and under drinking fountains and mothers' room sink. Install tile on a setting bed in a

recessed slab wherever floor drains and sloped floors are necessary, otherwise use epoxy thin set system. Tile patterns in tile floors are not authorized unless otherwise directed by project manager.

Resilient Flooring

Use of sheet vinyl with rubber base is not approved for use in standard meetinghouse plans.

Carpet Tile 09 6813

Use carpet tile in vestibules of standard meetinghouses. Specify only the color designated by the Church Master Specifications.

Stone Flooring

Stone flooring is not approved.

Marble Thresholds

Marble thresholds are not approved for use in meetinghouses.

Owner Furnished Products

See also Product Options in Chapter 1 of these guidelines

Rostrum Casework 06 4115

Rostrum casework includes the rostrum pulpit, rostrum modesty screen, ramp wall, and the sacrament table. These items are furnished under a national contract (unless the project falls under the Utah Initiative, in which case they may be contractor furnished). A freestanding, knockdown rostrum is provided for 90 and 130 capacity buildings. Permanently installed rostrum casework is installed by the contractor in 170 capacity and larger buildings. Modifications to rostrum casework are not allowed.

Replacement and Improvement Projects

Necessary site adaptations should conform to standard plans as closely as possible.

Fixed Seating 12 6713 , 12 6113

Do not change the requirements for pews and rostrum seating as these are furnished and installed through a national contract. Default for rostrum seating is pews. Opera seats may be selected at the request of local leadership. Stain color and fabric for each pre-set color scheme have been pre-selected.

Replacement and Improvement Projects

When there is a need to reupholster just the opera seats or just the pews (but not necessarily both), consider how old the fabric is that is to be matched: whether it is a very old standard or whether the fabric is still the current standard. If the fabric is an old standard, but only the opera seats or only the pews need reupholstering, consider how much longer it may be before the remaining seating needs to be reupholstered and whether the project can be deferred until all the seating in the chapel meets replacement criteria, or if circumstances warrant an early replacement of the other seating in order to ensure the fabrics continue to match. Although it may be possible to obtain the old fabric for this project, by the time the other seating needs reupholstering in just another year or two or three the fabric may no longer be available. Identically upholstered opera seats and pews help to maintain an appropriate image of dignity, integrity, and respectability.

Musical Instruments in Chapel

When full sized organ and piano are provided, place organ and piano in center area of rostrum with space in between for music director. This allows both organist and pianist to better balance accompaniment with choir or congregation, and music conductor has better eye contact and communication with accompanist and choir.

Artwork

Church leaders select and obtain Church-approved artwork for existing meetinghouses through the facilities manager, and for new facilities through the project manager, who provide Church leaders access to the online *Church Facilities Artwork* catalog. Artwork that is appropriate for meetinghouses may also be obtained through Church Distribution Services. (See *Handbook 2: Administering the Church*, 21.2.1.)

Artwork enhances the interiors of meetinghouses by helping to create a spiritual, reverent atmosphere. However, meetinghouses are not intended to be art galleries. Too much artwork can detract from its significance and diminish its overall impact. Appropriate locations for artwork are suggested on the standard plans behind the "View Floor Plan" tab on the Home page of the *Church Facilities Artwork* catalog. Artwork may not be placed in the chapel or the baptismal font. Statues, murals, and mosaics are not authorized. This policy may not apply to works of art that have been on display for many years in the chapels of existing meetinghouses.

Artwork purchases for existing meetinghouses are funded from the meetinghouse improvements budget and are ordered by the facilities manager. Artwork for new facilities is funded from the construction budget and ordered by the project manager. Budgets for new meetinghouse artwork are pre-determined according to building size. Local unit budget allowance (LUBA) funds should not be used to

purchase artwork for meetinghouses. Local leaders select artwork and identify preferred locations for the artwork.

During the project initiation meeting, local priesthood leaders may choose to select the default artwork package prepared for the building, or may make an individual selection of all artwork for the building. Artwork comes only in the sizes and frames shown in the *Church Facilities Artwork* catalog. Custom sizing and framing is not available. Requests for custom framing may be accommodated by purchasing the unframed print and having it framed locally; however, framing costs must remain within budget.

Do not include special lighting for artwork that differs from that shown on current standard plans.

Historic Properties

Standard meetinghouse artwork is generally appropriate. Custom frames may be appropriate to be consistent with the style and character of the building. Existing artwork that is inappropriately scaled, framed, or faded should generally be discarded and replaced in accordance with the meetinghouse art and artifact inventory. Although the stake president may still have input, the selection and placement of artwork should be reviewed and approved by the Church History Department.

Accordion Folding Partitions 10 2233

Use owner-specified accordion folding partitions to divide large rooms. Do not change the specified finishes or colors. The quantity of accordion folding partitions provided in standard plan meetinghouses meets owner's expectations and should not be added to or subtracted from. Use only approved colors specified in the selected preset color scheme.

Projection Screens 11 5213

All 170-size and larger new construction projects are approved to have a motorized projection screen permanently mounted over the rostrum area of the chapel. Motorized projection screens are also approved for the cultural hall of the Independence 230 and 230-SC buildings.

The Legacy stake center is the only standard plan authorized to have two motorized projection screens in the cultural hall.

Replacement and Improvement Projects

Where webcasting of stake conference is authorized a motorized projection screen may be added to the chapel of existing meetinghouses size 170 and above.

Seminary and Institute Projects

Motorized projection screens are not approved for seminary and institute classrooms.

Interior Signage 10 1495

If Braille signs are not required by local authority having jurisdiction, delete the requirement for Braille signs from the specification section.

Serving Area Appliances 11 3114

Do not change the type and size of ranges and refrigerators as specified in owner's Master Specification since the owner furnishes these items. Check dimensions of appliances and verify cabinet measurements on drawings.

Handicap-accessible appliances are available through owner's Purchasing Division (a range with controls at front instead of rear).

Ranges may be changed to built-in wall ovens when the local code official requires commercial hoods or grease traps. When a local code official requires a hood over the range in the meetinghouse serving area, the contract architect or project manager should meet with the local authority having jurisdiction and follow one of the suggestions below:

- Clarify that according to the room signage, the serving area is used as a warming area only, and not for food preparation or cooking as in commercial kitchens
- The serving area receives only minimal use throughout the year
- Determine if the range hood can be eliminated due to the type of usage in the facility
- Discuss the potential of allowing installation of a Type II hood in lieu of a Type I hood with a full fire suppression system due to type of usage. Suggest that the range is a light duty cooking appliance for warming only and will not produce grease.
- Discuss the option of removing the range(s) and installing wall oven(s) instead as this reduces the chance of grease being produced and eliminates the open heat source.
- If none of the above options are acceptable to the local authority, a warming drawer(s) may be installed in place of a wall oven.

Visual Display Boards

A single 4'x4' display case with sliding glass doors and lock is provided for each unit in which to display the names and photographs of missionaries currently serving from the unit (typically a missionary plaque).

Replacement and Improvement Projects

Quantity and location of visual display boards (tack boards, chalkboards, marker boards, and visual display cases) should conform to current standard plans.

Loose Furnishings

Replacement and Improvement Projects

When there is a need to replace or recover an individual piece of furniture from an old standard that is part of a furniture grouping, consider whether the individual piece can be repaired and replacement deferred until the entire grouping meets the criteria for replacement. Rather than perpetuate old standards it is sometimes better to move into the current standard by replacing the furniture grouping all at once.

For example, the fabric on a side chair in the foyer may need to be replaced. It may sit next to another side chair and across from a sofa. The entire grouping is an old standard. Although the second chair and the sofa are not in immediate need of repair, it's likely that within another year or two they will be. In such a case, it may be time to replace the entire grouping and move into the current standard rather than try to extend the life of the old standard.

Contractor Furnished Products

Drapery 12 2200

Project architects and facilities managers should use the owner-specified drapery products for meetinghouse windows in chapels, Relief Society rooms, Primary rooms, mothers' rooms, offices, and high council rooms. Blackout drapery is authorized for use only in chapels where satellite broadcasts will occur and in meetinghouse rooms used for seminary classes. Drapery may also be used in foyers to protect carpet and furniture from sun damage when the orientation of the building allows excessive amounts of solar rays into the foyer. Blinds or shades are not authorized except where otherwise directed by project manager.

Chapter 3: Civil Engineering

Guiding Principles

"Therefore whosoever heareth these sayings of mine, and doeth them, I will liken him unto a wise man, which built his house upon a rock: And the rain descended, and the floods came, and the winds blew, and beat upon that house; and it fell not: for it was founded upon a rock." (Matthew 7:24-25)

These guidelines incorporate the following principles:

- Extending useful life of buildings and site elements
- Long term cost savings
- Enhanced appearance of building sites
- Safety of building sites
- Planning for future additions to phased projects
- Reduced site adapt costs

Civil Engineering Checklists

The civil engineer is to be familiar with and employ the "Abbreviated Civil Analysis, Design and Drawing Checklists" and the "Extended Civil Analysis, Design, Drawing and Construction Checklists" on the AEC Website.

- http://aec.ldschurch.org/aec/
- Select "Design Guidelines"
- Select the civil engineering checklists desired
- Use the password, "nephi" to download the checklists

Soils 31 0501, 31 1100, 31 2213, 31 2216, 31 2316

Geotechnical Evaluation Report

The project manager arranges, using the *Agreement between Client (Trust) and Geotechnical Consultant*, for a registered professional geotechnical engineer to evaluate a project site and perform a geotechnical investigation and prepare a report that is provided to the architect and the civil engineer.

The Geotechnical Evaluation Report Template should be given to the geotechnical engineer to help the geotechnical engineer provide in the report the items the Owner and the other design consultants need to know.

The report will contain requirements regarding how the building, site elements, and paving are to be supported by the soil and how the soils are to be prepared. These requirements are to be incorporated into the contract drawings, contract specifications, and calculations.

The geotechnical engineer, as separately contracted with the Architect per the *Agreement Between Owner(Trust) and Architect (or as arranged otherwise by the Project Manager)*, should review the contract documents to verify that the requirements of the geotechnical evaluation report have been correctly incorporated into the contract documents and provide a letter to the architect stating that verification has been completed.

The geotechnical engineer should refer to the *Geotechnical Evaluation Report Template* for guidelines for load criteria and for the number of borings required for a project. The template also notes the information required in the geotechnical evaluation report (use the Geotechnical Evaluation Report Template).

Engineered Fill (Fill, Structural Fill, Compacted Fill) 31 2323

All fill placed under or within the area of the building or parking area should be engineered in accordance with recommendations of the geotechnical investigation report (existing on-site material may be used as the engineered fill if allowed by the geotechnical investigation report). Project specifications should properly specify the type and required compaction of engineered fill.

Moisture Sensitive Soils

The Owner has experienced significant problems with buildings constructed on moisture sensitive soils. Structural foundation systems and all site elements are to be designed to meet requirements of local codes and the geotechnical investigation report.

Proper site drainage is critical for limiting movement of moisture sensitive soils. Drainage systems are to be designed to prevent runoff from saturating foundation soils and soils supporting sidewalks, gutters, and pavement. Provide the minimum and maximum slopes required by these guidelines.

It is unreasonable to expect the moisture content in the site soils to remain constant for the expected life of the building. When evaluating options for foundation systems do not assume a constant soil moisture content level.

Consideration is to be given to protecting sidewalks and entry slabs from the effects of heaving soils that can be caused by moisture sensitive soils and/or freezing soils. The architect, civil engineer, and structural engineer are to provide solutions compatible with successful local construction practices.

All exterior entries are protected from rain by dormers or gable ends. Therefore, gutters and downspouts are normally not needed. Do not include them in the project unless required by local jurisdiction or where required due to moisture sensitive soils.

Boundary and Topographical Survey Requirements

The existing site should be surveyed and a boundary and topographical survey obtained, based on the *Boundary and Topographical Survey Guidelines*. The project manager arranges for the survey to be performed. A boundary and topographical survey (together with the geotechnical investigation report and environmental site assessment report) is provided to the architect and civil engineer.

Site Plan

Development and Design Considerations

The architect, civil engineer, and landscape architect should identify the authority having jurisdiction early in the site plan development phase and verify requirements for site development.

The civil engineer should visit the site early in the design phase to review existing site conditions and verify the results of the boundary and topographical survey.

The architect prepares the site plan with assistance from the civil engineer and landscape architect. The site plan should identify required engineered fill depths and locations. Site development design should take advantage of existing topography to minimize cut and fill requirements and to provide minimum and maximum grading slopes required by these guidelines. Site development constitutes a significant portion of total project cost and a well prepared proper site design will greatly minimize future maintenance of site and site elements.

Site development should address vehicular and pedestrian access to site, topography, drainage, frontages, vegetation, large trees, setbacks, historic structures, environment (including prevailing winds), and future building expansion locations.

Adequate pedestrian access should be provided to accessible parking areas.

It is acceptable to place catch basins in landscaped areas, such as grassed areas, in order that proper, and recommended, slopes be provided across the entire site.

Following are items of particular importance to the owner that may be unique to local practices and that are to be verified by the architect with the local authority having jurisdiction:

- Any requirement for detectable warning panels in exterior handicapped ramps.

- Any required development of any off-site adjoining streets, water lines, sewer lines, sidewalks, etc.
- Any setbacks at front, rear, and sides and/or any greenbelt (open space) requirements.

Site Plan Drawings

- Drawing scale no smaller than 1 inch = 20 feet (1:240)
- The benchmark location and elevation.
- Existing and proposed contours at 1 foot (30 cm) intervals. For sites with existing and final grades of 2 percent or less, show existing and proposed contours at 0.5 foot (15 cm) intervals. Steep portions of the site may use 2 to 5 foot (60 to 150 cm) contours. Denote existing contours using a lighter weight dashed line.
- Existing and finished spot elevations for existing and new concrete structures including building slabs, building entrances, equipment slabs, catch basins, curb cuts to offsite streets, and beginning and ending of slopes for walkways, curbs, gutters, and waterways.
- Dimensions from walkways, curbs, gutters, drainage swales, structures, equipment slabs, and buildings to the property lines.
- Sections of roads, streets, and site entrances.
- Provide one (minimum) longitudinal and two (minimum) transverse cross sections through the building and the site indicating existing and final site grades and indicating the final building interior slab on grade elevations.
- Location of utility lines and their connections, both on-site and off-site.
- Parking lot layout with ingress and egress.
- A sufficient number of top of mow strip elevations to ensure correct installation.
- The elevation contours of water elevations for both the 10 year and 100 year storms at areas used for detention of water. Site drainage calculations shall be provided. The paving surface should not be used for ponding storm water from the 10 year storm when retention or detention is required. Runoff in excess of the 10 year storm may be ponded on the paving surface.
- Control and expansion joints in concrete sidewalks, curbs, mow strips, and paving. Control joints in concrete sidewalks should ideally align with control joints in concrete curbs. Spacing for control joints and expansion joints are found in the specifications (**03 3053)** Joint sealant requirements at expansion joints are also found in the specifications.
- Right of ways and easements
- Location of light poles

- Location of retaining walls. Retaining walls are to be designed by the civil engineer or the structural engineer. Once concrete walls are over about 6’ tall, it can be more economical to use “rock walls”, “keystone walls”, “segmented walls”, etc.
- Indicate fire access lanes.
- Incorporate any locally required development of any offsite adjoining streets, water lines, sewer lines, sidewalks, etc. into the contract documents.
- Incorporate any locally required setbacks at front, rear, and sides and/or any greenbelt (open space) requirements into the contract documents.
- Provide a storm water pollution prevention plan (SWPPP) or equal as required by the authority having jurisdiction.

Floodplain

The architect should check with local authority having jurisdiction to determine if the site is located within a floodplain and, if so, seek direction from the project manager.

Environmental

The project manager will provide an environmental site assessment report for the site to the architect and this information will be made available to the civil engineer. If unusual environmental conditions exist, the civil engineer should seek direction from the architect.

Site Grading

Design Requirements and Considerations

Establish finish floor elevation to ensure positive grading away from building— this may require engineered fill to raise the building elevation. (On site materials may be used as structural fill if allowed by the geotechnical investigation report.) Do not place the building so that water flows toward it.

Establish site grading to ensure positive drainage away from buildings and preferably into engineered drainage management systems. Grade slopes so that water is not trapped behind walkways, mow strips, or against retaining walls. Where this is not possible, and if runoff cannot flow directly to storm management systems parking areas, provide for culverts, area drains with minimum allowed drainage slopes within landscaped areas, or gutters to carry water away from the building.

For landscaped areas adjacent to the building, the finish elevation at the face of the building should generally be 6 inches (150 mm) minimum

below the finish floor. The elevation should then drop another 6 inches (150 mm) minimum within the first 12 feet (3.5m) horizontally away from building. This is a 4% slope. The civil engineer will need to check the local building code requirements. Some authorities having jurisdiction require steeper slopes than 4%. The requirements for drainage are not found in the International Building Code but are established by the local building codes.

For concrete pads (mechanical equipment areas) adjacent to the building, the finish elevation at the face of the building should generally be 4" (100 mm) minimum below finish floor elevation. The slope of the concrete pad down and away from the building should be 1/4 inch for every 12 inches. This is a 2% slope.

Site grading is to be coordinated to provide handicap accessibility from parking areas into the building, and from the building to the public way.

Slopes on the site should not be steeper than 2 horizontal to 1 vertical. Where slopes would unavoidably need to be steeper, use retaining walls as designed by the structural engineer. Limit use of retaining walls as much as possible.

New finish grades should match existing grades at perimeter of property. Review site design with the geotechnical engineer at steep sites to ensure that a proper foundation system is used.

Site Grade Limitations

Grading slopes/site grades should be within the limits of the following table. The civil engineer may want to indicate steeper slopes on the plans to assure that minimum slopes are obtained.

Table 3.1 SITE GRADING LIMITS

Area	Minimum Slope	Maximum Slope
Asphalt Paving	2% (50H:1V) (1.5% (65H:1V) at handicap parking)	5% (20H:1V) (2% (50H:1V) at handicap parking)
Concrete Paving	1% (100H:1V)	5% (20H:1V) (2% (50H:1V) at handicap parking)
Driveways	Asphalt 2% (50H:1V) Concrete 1% (100H:1V)	5% (20H:1V) for asphalt and concrete Up to 8% (12.5H:1V) is allowed for asphalt and concrete, if approved by the project manager
Gutters	0.5% (200H:1V) 1% preferred	8% (12.5H:1V)
Sidewalks/Handicap Ramps	No minimum	8% (12.5H:1V) (5% (20H:1V) on sidewalks and 8.33% (12H:1V) on ramps used for handicap access)
Sidewalk Cross Slope	1% (100H:1V)	2% (50H:1V)
Means of Egress	1% (100H:1V) or as required by local codes	5% (20H:1V) or as required by local codes 2% (50H:1V) at doors for width of door
Landscape Areas	Within 12’ of building 4% (25H:1V) Shrub areas intended to drain 2% (50H:1V) Elsewhere 2% (50H:1V)	50% (2H:1V) Retaining walls required if slope is greater than 50% (2H:1V) In lawn and swale areas, slope should not exceed 33% (3H:1V)

Site Drainage 33 4116

Site Drainage Considerations

See Site Grading - Design Requirements and Considerations.

Runoff Considerations

The site drainage system should collect and drain all storm water on the sites. Preferably, runoff will immediately be removed from the site into an acceptable off-site storm water management system. The site should collect and drain all storm water that falls on the site. If water from adjacent properties or existing waterways drains onto site, consult with architect and project manager to seek their direction. If local authority having jurisdiction requires on-site disposal or a controlled runoff system, this may be accomplished by using dry wells, sumps, storage ponds, detention basins, retention basins, pervious systems or storage structures.

The collection, retention, detention and disposal of the storm water should not interfere with the function of the parking or building during high intensity storms.

Design Considerations

Design drain pipes, catch basins, manholes, and retention or detention basins for the 100-year Average Recurrence Interval precipitation event.

Perform site drainage calculations, including runoff calculations for surrounding property that drains onto the project site. Include precipitation intensity data for the 100-year storm for various time events from 5 minutes through 24 hours. The paving surface should not be used for ponding storm water from the 10-year storm when retention or detention is required. However, runoff in excess of the 10-year storm may be temporarily ponded on the paving surface. The contour of the water elevation for both the 10-year and 100-year storms should be shown on the site drawings.

A permanent drainage easement should be obtained and approved by local authorities before designing site drainage that drains onto adjoining properties.

When required by local jurisdictions, provide 1-foot (300mm) freeboard in retention/detention basins above the calculated 100-year storm elevation and provide means to manage overflow of retention/detention basin in the event of an extreme event.

In addition to site contours, use spot elevations on the site drainage plan to establish elevations of waterways, swales, sidewalks, catch basins, mow strips, curbs and gutters, etc.

Erosion and Sediment Control Plan
Storm Water Pollution Prevention Plan (SWPPP)
Post Construction Storm Water Maintenance Plan

The civil engineer should provide an Erosion and Sediment Control Plan, Stormwater Pollution Prevention Plan (SWPPP), Post Construction Stormwater Maintenance Plan or equal as required by the authority having jurisdiction using the templates, guidelines, regulations and requirements of the authority having jurisdiction for the project site.

Determine if the local authority having jurisdiction has a stormwater utility credit, if so, identify utility credit procedures and application. Coordinate with project architect and project manager to identify and carry forward through design "Best Management Practices" (BMPs) to obtain utility credits.

Parking Lots

Considerations

The project manager should evaluate whether asphalt or concrete paving should be used based upon site conditions and a life cycle cost analysis. Choose the type of material to be used for the pavement (asphalt or concrete) after discussion with the project manager. The design life of the paving is to be 40 years minimum.

Paving is to be designed for the following loads unless otherwise determined through the site adapt process:

- Parking areas, drive lanes, driveways and paved areas:
  - Design for a "Light" Traffic Classification, Class I (equivalent single axle load, ESAL, of less than 10^4 year) AND
    - Design paving to support six (6) equivalent single axle loads of 18 kips/sq ft (214 MPa) per week.
    - Design drive lanes and driveway paving system to support five (5) to fifteen (15) equivalent single axle loads of 18 kips per week from buses and garbage trucks.
    - Trash enclosure approach slab: One (1) 40,000 pound axle load per week.
- Design life of concrete and asphalt paving system is to be forty (40) years (minimum).

Design paving sections and prepare underlying soils as recommended in the geotechnical investigation report. Drive lane parking section should be designed to support several passes of buses and garbage trucks during a week.

Use concrete paving around the trash dumpster enclosure area to support the weight of garbage trucks. Thicken the concrete paving to support the weight of the garbage trucks as needed.

Use concrete curbs rather than wheel stops.

Decorative planters and landscape islands in parking areas require more maintenance and are not preferred— install only when unalterably mandated by the local authority having jurisdiction.

The base material beneath the paving and the final grades and elevations must be tested and inspected to ensure success of the paving.

Parking lot stalls should be per the requirements of the authority having jurisdiction. If there are no requirements, use a parking lot stall size of 9'x18' and 9'x20' if the vehicles are parked "nose to nose".

The three most important things to consider when designing a pavement are drainage, drainage and drainage. Parking areas should have a minimum slope of 2% for asphalt and 1% for concrete to facilitate drainage. Pavement cross slopes of less than 2% for asphalt are hard to construct without forming flat spots or depressions that can lead to ponding water (birth baths).

Where water tables are high, provide subsurface drainage systems (i.e. French drains) to remove and prevent build up of water in the aggregate base and in the upper layer of the subgrade.

Asphalt Paving Considerations 32 1216

Design asphalt paved areas with a minimum asphalt thickness of 3 inches (75mm) and a minimum aggregate base thickness of 6 inches (150mm). Prepare underlying soils according to requirements of the geotechnical investigation report. Local experience and/or requirements of the geotechnical investigation report may dictate using thicker asphalt or aggregate base.

A 3 inch (75mm) single lift is preferred or if two lifts are desired, the first lift should be 2 inches (50mm) thick and the second lift should be 1-1/2 inches (40 mm) thick. Use caution when placing multiple lifts since the time between placing and compacting asphalt lifts can be reduced to as little as 10 minutes.

Modify project specifications to match a locally available mix design that most closely matches the mix design of the standard specification.

Do not channel water across asphalt surfaces. Use concrete gutter or waterway structures at these locations.

Confine edges of asphalt paving by concrete curbs, gutters, or paving.

Concrete Paving Considerations 03 3913, 03 3111, 03 3053, 03 3923, 32 1313

Design concrete paved areas with a minimum concrete thickness of 4 inches (100 mm) and a minimum aggregate base thickness of 4 inches (100 mm). Prepare underlying soils according to requirements of the geotechnical evaluation report. Local experience and/or the requirements of the geotechnical evaluation report may dictate using thicker concrete or aggregate base.

Show control joint layout on the site plan drawings. Joint spacing should not exceed 30 to 36 times the thickness of the concrete. Individual sections of concrete should not exceed an aspect ratio of 2:1. Avoid joint layouts that would create a narrow sliver of concrete. For a 4-inch (100 mm) slab, the maximum spacing of control joints should be 10 to 12 feet (3 to 3.6 m). Do not use reinforcing steel in exterior concrete slabs on grade.

All concrete is to be Mix Type C (4,000 psi), except that Mix Type D (4,500 psi) with air entrainment is to be used where the concrete will be exposed to freeze thaw conditions or de-icers.

Quality Assurance

Site Observations and Verification

The civil engineer should be consulted during the project site selection process for input regarding the acceptability, from a civil engineering standpoint, of the project sites being considered. Input from the civil engineer during the site selection process can help prevent many design problems and help reduce site adapt costs. The least expensive project site may be the most expensive site to build on.

The *Agreement between Owner(Trust) and Architect* should define the minimum number of site observations required of the civil engineer. The project manager, architect, and civil engineer should jointly establish the minimum number of site observations to be performed before finalizing the agreement. The agreement also notes the number of pre-installation and post-construction meetings that the civil engineer is contractually obligated to attend. The site observations performed by the civil engineer are to be thorough and accurate.

The minimum number of site observations by the civil engineer during construction is recommended for site complexity as follows:

- Simple Site: 3 to 4 site observations
- Moderately Complex Site: 4 to 5 site observations
- Complex Site: 6 to 7 site observations

Major replacement and improvement projects may require more site visits.

The architect and civil engineer should verify that the required quality of work is being provided. During site observations, the civil engineer should thoroughly review all aspects of the civil engineering work underway. The civil engineer is to verify the work on the project site is as shown on the civil site and grading plans and the related civil work described in the contract documents. Errors are to be immediately reported to the contractor for correction. Written observation reports as well as photographs for the Owner's quality assessment program are required. Reports should be provided within 24 hours of having been performed.

The civil engineer should also review mix designs for exterior concrete site work and reinforcing and should review the mix designs for paving. The civil engineer should review test results for aggregate base, concrete site work and paving and recommend to the architect acceptance or rejection of the tested work.

Refer to the *Agreement between Owner(Trust) and Architect* for additional requirements.

Inspections and Testing

General

The project manager will retain a testing agency to verify the work and test the material quality during construction.

The project manager, architect, and civil engineer should jointly establish the type, amount and frequency of inspections and testing to be performed. The requirements for testing and inspection should be incorporated into the contract documents. Utilize the guidelines for the testing and inspection requirements found in the *Civil and Structural Testing and Inspection Services Guidelines*.

The testing agency should maintain a record of all inspections and tests performed and provide adequate information to verify compliance with the contract documents. The testing agency should provide reports to the project manager, architect, civil engineer, and contractor.

Contract documents give the project manager the right to test any material on the project. The cost of testing will be paid by the project manager; however, the cost of re-testing materials replaced due to failed tests will be paid by the project manager and reimbursed by the contractor. The following inspections and tests should be considered for all projects:

Engineered Fill **31 0000**

Inspection and testing of engineered fill is required for all projects by the code and by the Owner.

The base material beneath the paving and the final grades and elevations must be tested and inspected to ensure success of the paving.

Asphalt Paving **32 1216**

Inspection, performed during asphalt testing, and testing of asphalt is not required by the code but is required for all projects by the Owner.

Concrete

Inspection and testing of concrete is required for Welfare Service projects.

Inspection and testing of concrete is generally not required for meetinghouses and other wood framed projects by the code. However, it is required that some inspections and tests be performed. Specific requirements are found in the *Civil and Structural Testing and Inspection Services Guidelines*. The project manager, at his discretion, and with the input of the project design team, may require that additional inspections and tests be performed for more quality control.

Meetinghouses and other Wood Framed Projects

Inspections and testing for meetinghouses and other wood framed projects are to be minimal.

Welfare Services Projects

Inspection and testing programs for Welfare Services projects are to be fully implemented.

Asphalt Paving Maintenance

Paved areas should be well maintained and have good drainage. The *Meetinghouse Replacement and Improvement Standards* provide good guidance for the reviews and maintenance required for paving. Standard specifications are available for repair methods allowed and required.

Guidance for the type of maintenance methods available and when to use them are included with the asphalt maintenance specifications as an attachment. The specifications are found on the AEC Website. Also included in the asphalt specifications are FM and Contractor checklists for use in defining scope and encouraging adherence to the requirements of the specifications. A “smart adobe” version of the checklists is available on the AEC Website.

- http://aec.ldschurch.org/aec/
- Select “Design Guidelines”

- Select “FM and Contractor Asphalt Maintenance Checklist”
- Use the password, “nephi” to download the checklists

Chapter 4: Landscape

Guiding Principles

"For the Lord shall comfort Zion: he will comfort all her waste places; and he will make her wilderness like Eden, and her desert like the garden of the Lord; joy and gladness shall be found therein, thanksgiving, and the voice of melody." (Isaiah 51:3)

These guidelines incorporate the following principles:

- Conservation of water and natural resources
- Natural enhancement of architectural and building features
- Reduction of maintenance
- Long-term cost savings
- Neighborhood beautification

General Landscape Development Standards

Building and site development should reflect the dignity of the Church and sensitivity to the site and region without inferring opulence. For most sites, future building expansion areas should be simple and clean. In all new sites, excess site areas outside the developed building and parking lot should be left undeveloped, with only minimal necessary grading or landscape improvements.

New Site Development

New meetinghouse projects should follow the recommendations outlined in the Bio-Regional Landscape Development section of these guidelines. Consideration should be given to the following requirements:

- Install decorative planters and landscape islands in parking areas only when unalterably mandated by local authority having jurisdiction
- Use retaining walls for slopes greater than 2:1
- Except for flag poles and bicycle racks, unnecessary site furnishings such as benches, small trash receptacles, and so forth, are not authorized

Replacement and Improvement Projects

Older landscape and irrigation systems and planting beds often differ from current standards. For example, existing irrigation systems may have steel pipe or brass heads and valves or shrubs may be closely planted at the foundation of the building. In these instances the facilities manager, project manager and landscape architect should follow the *Meetinghouse*

Replacement and Improvement Standards provided by the facilities manager for existing meetinghouses in order to provide justification.

When a meetinghouse landscape is being retrofitted, consider correcting inherent deficiencies, such as, poor zoning of the irrigation system. Separation of lawn and shrub areas should be a priority. Where applicable, consider using a drip irrigation system in shrub areas along with as much of the existing system as is cost effective. Shrubs and trees should not be replaced prematurely to follow the style option plans and regional design approach that is provided in these guidelines.

When evaluating the need for replacement and improvement, the consultant should evaluate life cycle costs of existing and proposed work.

Historic Properties

The existing landscape may need to be retained as part of the historic setting. Consult with a CHD curator before making any significant landscape changes.

Seminary and Institute Projects

Landscapes of seminary and institute buildings should be complimentary to or an enhancement of their surrounding neighborhoods.

The safety and security of students and faculty is of major concern. This includes the placement of building and utility service areas as well as the landscape planting design. The design should also consider the impact of frequent and heavy foot traffic around the facility due to large student populations.

Seminary and institute site plan development should consider the following:

- Install sidewalks in areas where students will most likely walk or gather
- Keep sites well lighted— trees and shrubs should not block lights
- Use lawn in areas that may have moderate foot traffic or congregating students
- Use shrub species that will not exceed 3 feet in height
- Design shrub and tree areas with security and safety in mind avoiding hiding places.
- Use low spreading shrubs or groundcovers where local ordinances require large amounts of shrub beds, *etc*.
- Use appropriate bark or rock mulches in areas where turf is restricted or not allowed

- Avoid creating extensive hardscape areas that may be an invitation for skateboarding. Provide skateboard deterrent design where reasonable, effective, and without excessive associated costs

Landscape construction documents for seminary and institute buildings should use meetinghouse standard eco-region plans, details, specifications, and eco-region plant materials, but should use them in light of the considerations listed above.

Welfare Department Projects

Landscapes of welfare department facilities should meet the governing local codes and requirements and they should be complimentary to surrounding neighborhoods. These facilities should use meetinghouse standard eco-region plans, details, specifications, and eco-region plant materials modified to meet the needs of individual sites and conditions.

Additional considerations should include:

- Keep signs visible.
- Do not use boulders.
- Where bishop's storehouses are built, minimal landscaping should be designed in areas of planned future warehouse expansion.

Deseret Industries Projects

Landscapes of Deseret Industries facilities should meet the governing local codes and requirements and they should be complimentary to surrounding neighborhoods. These facilities should use meetinghouse standard eco-region plans, details, specifications, and eco-region plant materials modified to meet the needs of individual sites and conditions.

Additional considerations should include:

- Keep signs visible.
- Simplify landscapes for ease of maintenance.
- Eliminate thorny plants. Limit use of plants that are more prone to collecting trash.
- Add 12" wide concrete strips in planters adjacent to parking aisles to allow ease of passenger entrance and departure.
- Choose mulch appropriate for the neighborhood. First consider organic mulch, then consider in-organic mulch only if site conditions dictate its use.
- Lawn is preferred in high pedestrian traffic areas. However, where possible limit the use of small lawn areas.

- Limit planting next to the building for security purposes and to limit vagrancy. If possible push required planting to perimeter of site.
- Use plantings to break up the mass of the exterior walls.
- Building visibility is paramount.
- Provide mow strips around exterior signage.

Mission President's Office Projects

Landscapes of mission president's office additions should match those of adjacent meetinghouse facilities. If designing for existing facilities use *Meetinghouse Replacement and Improvement Standards* as well as Life-Cycle Analysis and careful cost estimating to consider updating existing landscapes to the current standard plans, details, specifications and eco-region plant lists.

Building Additions

In addition to incorporation of current guidelines, landscaping designed for building addition projects will harmonize existing landscapes with new in a seamless fashion where landscape elements feel unified as a whole. As such, it is possible that not all current landscape guidelines will be implemented for building addition projects.

Bio-Regional Landscape Development

Landscape guidelines have been developed to assist the design team in a bio-regional approach to landscape development that promotes sustainable management processes for all new and existing facilities. Stewardship of our environment is fundamental to our belief that we should leave the earth at least as well off as we found it. Bio-regionalism is "a place defined by its life forms, its topography and its biota, rather than by human dictates." (Roslan, 1998) By better understanding the bio-region and its characteristics, the development team will come closer to accomplishing these guidelines.

Conservation of Water and Natural Resources

This can be accomplished by providing efficient, low-water-use irrigation systems that:

- Optimize the use of bubblers and drip irrigation
- Eliminate over-watering, over-spray, and other water wasting practices

- Apply water at proper rates, using the charts developed for the *Water Conservation Guidelines*, SMART controllers, or the *Meetinghouse Site Management Plan*
- Follow manufacturer's recommendations for head spacing, valve location, and distribution

Natural Enhancement of Architectural and Building Features

Enhance building entries and views of the building from the street by:

- Framing views to the building with appropriate trees and shrubs
- Increasing color and texture to accentuate these areas
- Not overplanting and obscuring architectural features such as windows and signs.

Reduced Maintenance

Reduce maintenance and care of plant materials by:

- Using hardy, native, and proven plant material for the region that requires little or no maintenance as listed in eco-region plant lists.
- Reducing the number of plants and turf that demand water, pest control, and fertilizing frequently or in large quantities.
- Reducing the number of plants near the building foundation.
- Increasing the use of bark and rock mulch as a ground cover element in place of lawns.
- Reducing shrub and tree hedging and pruning by:
  - Locating plants at the proper distances from walks, parking areas, buildings and mow strips to allow for natural maturation and growth of plants.
  - Specifying plants that typically do not require excessive pruning.
- Reducing the lawn areas on site by:
  - Eliminating lawn in areas less than 8 feet wide or areas with small acute angles.
  - Limiting lawn to areas of greatest impact such as higher foot traffic areas and recreation spaces.

Long-term Cost Savings

This can be accomplished by:

- Providing planting design appropriate for climate, grades and soil conditions.
- Installing efficient irrigation systems that are designed to maximize distribution uniformity (DU), utilize smart irrigation controller technology and provide for longevity and ease of maintenance.

Neighborhood Beautification

Landscape improvements to developed portions of the site should meet an appearance standard equal to or slightly above similar properties in the area**.**

Topsoil Testing

Topsoil testing for landscape purposes should be performed during the design development phase on all new sites and on existing sites where more than 5,000 square feet of landscape work is being performed. The form, *Topsoil Testing Report*, should be used by the testing laboratory to tabulate the testing data. The landscape architect should incorporate all soil recommendations into the project specifications prior to bidding. Imported topsoil should be tested and approved prior to being installed.

The topsoil testing report should become a part of the *Meetinghouse Site Management Plan*, which is to be delivered to the project manager during the substantial completion phase.

Landscape Style Options

Landscape style option plans have been developed to provide a more naturally sustainable landscape and to develop a more aesthetically pleasing site that complements the building and the surrounding environment. These style options show the landscape design criteria and specific site elements for both landscape planting and irrigation that should be used for each project site in specific geographic and environmental regions.

The geographic area of each approved standard plan style option is identified and established based on the Level II eco-regions map developed by the commission for environmental cooperation. The eco-regions are shown and identified in the map and table below.

Map 4.1 LANDSCAPE STYLE OPTIONS

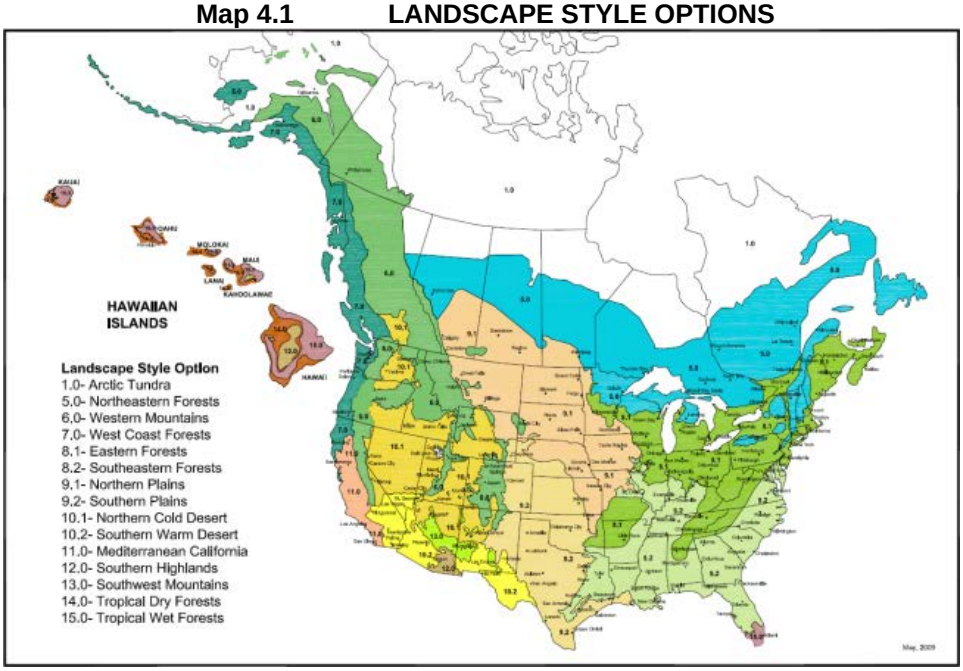


Table 4.1 STYLE OPTION LOCATIONS

Style Option Number	Landscape Style Options	Example City	Level I & II Eco-region Zone Classifications
1.0	Arctic Tundra	Fairbanks, AK	1.0, 2.0, 3.0 and 4.0
5.0	Northeastern Forests	Duluth, MN	5.1, 5.2 and 5.3
6.0	Western Mountains	Jackson, WY	6.1 and 6.2
7.0	West Coast Forests	Portland, OR	7.1
8.1	Eastern Forests	Columbus, OH	8.1, 8.2 and 8.4
8.2	Southeastern Forests	Atlanta, GA	8.3 and 8.5
9.1	Northern Plains	Omaha, NB	9.2, and 9.3
9.2	Southern Plains	Dallas, TX	9.4, 9.5 and 9.6
10.1	Northern Cold Deserts	Salt Lake City, UT	10.1
10.2	Southern Warm Deserts	Phoenix, AZ	10.2
11.0	Mediterranean California	San Diego, CA	11.1
12.0	Southern Highlands	Tucson, AZ	12.1 and 12.2
13.0	Southwest Mountains	Flagstaff, AZ	13.1 thru 13.6
14.0	Tropical Dry Forests	Acapulco, MX	14.1 thru 14.6
15.0	Tropical Wet Forests	Miami, FL	15.1 thru 15.6

Design elements and characteristics unique to each style option are identified as follows:

TABLE 4.2 LANDSCAPE DESIGN ELEMENT OPTIONS (Revised September 2015)

Eco-Region	1.0- Arctic Tundra	5.0- Northeastern Forests	6.0- Western Mountains	7.0- West Coast Forests	8.1- Eastern Forests	8.2- Southeastern Forests	9.1- Northern Plains	9.2- Southern Plains	10.1-Northern Cold Desert	10.2- Southern Warm Desert	11.0- Mediterranean California	12.0- Southern Highlands	13.0- Southwest Mountains	14.0- Tropical Dry Forests	15.0- Tropical Wet Forests
Range of Average Annual Precipitation by region shown in inches per year (Average for eco-region in inches per year)	10 thru 25 (18)	47 thru 63 (40)	10 thru 102 (56)	24 thru 197 (111)	16 thru 63 (40)	39 thru 47 (43)	15 thru 45 (30)	12 thru 35 (24)	8 thru 15 (12)	5 thru 8 (7)	8 thru 39 (24)	12 thru 24 (18)	12 thru 36 (24)	24 thru 63 (43)	59 thru 157 (108)
Lawn Areas:															
Max.% of total landscape- New SC	40	45	35*	40	45	45	45	40	35*	20	25	20	30	40	45
Max.% of total landscape- New MTHS	30	35	35*	35	40	35	40	35	35*	20	25	15	25	35	35
Max.% of total landscape- Existing Facility	40-90	45-90	35-90	40-90	45-90	45-90	45-90	40-90	35-90	20-90	25-90	20-90	30-90	40-90	45-90
Cool weather seed mix	X	X	X	X	X	X	X		X		X			X	
Warm weather seed mix						X		X		X	X	X	X	X	
Tropical seed mix						X		X						X	X
Irrigation Elements:															
Automatic irrigation system			X	X	X	X	X	X	X	X	X	X	X	X	X
SMART Controllers			X	X	X	X	X	X	X	X	X	X	X	X	X
PVC main lines	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Poly lateral lines (optional)			X		X		X		X						
PVC lateral lines			X	X	X	X	X	X	X	X	X	X	X	X	X
Drip irrigation- point source ½" distribution			X	X	X	X	X	X	X	X	X	X	X	X	X
¼" distribution tree indicator			X	X	X	X	X	X	X	X	X	X	X	X	X
In-line Drip Tubing			X	X	X	X	X	X	X	X	X	X	X	X	X
Irrigation in lawn areas			X	X	X	X	X	X	X	X	X	X	X	X	X
Manual/Quick-coupler system (optional)**	X	X			X	X	X								
Landscape Elements:															
Concrete mow strips	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Metal edging (optional)		X	X			X	X	X	X	X	X	X	X	X	X
Pine needle mulch						X		X							
Shredded bark mulch (optional)	X	X	X*	X	X	X	X	X	X*		X		X	X	X
Rock mulch (optional)		X	X*				X	X	X*	X	X	X	X	X	X
Decomposed granite (optional)										X	X	X	X		
Weed fabric in shrub areas		X	X				X	X	X		X	X	X		

*Meetinghouses adjacent to the Wasatch Mountain Range and stretching from Utah County, Utah to Pocatello, Idaho as well as from Idaho Falls, Idaho to Rexburg, Idaho may add 10% lawn coverage if needed to fit within neighborhood context. These same areas should also first consider using organic mulch prior to using rock mulch. Rock mulch should only be used in areas of high wind, potential washout, for erosion control, when directed by the AHJ, or when otherwise prudent.

**Manual/Quick coupler systems are optional in Eco-regions 8.1, 8.2, and 9.1 if local jurisdictions require limited irrigation of the site.

Local landscape architect consultants are to carefully use these guidelines. If conditions necessitate alternate considerations, reasons for guideline deviation should be adequately described on relevant landscape plans. Supporting documentation is to be supplied to persons participating in Quality Assessment reviews.

Use the style option as created for each site considering regional, neighborhood and site context, known future development and microclimatic conditions. Match the location of plant materials and other site elements to the style option as closely as possible given local codes and requirements. Modify landscape design criteria contained in the table on the planting plan for the specific project location. Adapt the landscape design to the site specific boundaries, site layout, slopes, micro-climates, local hardy plant materials, and other natural or existing conditions.

The architect and landscape architect should work with the authority having jurisdiction to encourage use of the style option plans. If local codes or design conditions require landscape elements not shown on the style option plan, the landscape architect should revise the planting and irrigation plans to accommodate these codes and conditions.

Construction Plan Development

Landscape Plan Drawings

Landscape plans should include the following:

- Drawing scale no smaller than 1 inch = 20 feet (1:240)
- Right of ways and easements.
- Location of utilities: light poles, power poles, transformers, sewer manholes, water structures, etc.
- Location of retaining walls.
- All other information required by governing agency.

It is the landscape architect's responsibility to adapt these guidelines and associated standard plans, details and specifications using all reasonable levels of professional understanding and conduct to meet the needs of each site.

Planting Plan Requirements

Locate all plant materials on the planting plan shown graphically at their mature growth diameter in the plan view. The goal is to *plant the right plant in the right place, the first time*. It is important to minimize future maintenance costs and assist the FM staff in knowing the pattern of growth to expect over the life of the plant material.

The landscape architect should be aware of the following requirements while adapting the style option to the local site:

Style Option Planting Plan

Follow the INSTRUCTIONS TO LANDSCAPE ARCHITECT for the eco-region shown on L100 and remove sheet upon completion of design.

Follow the PLANT COVERAGE TABLE shown on L102 to meet the design intent for the project. These percentages should be followed. The table should also remain in the drawings.

Complete the DESIGN CRITERIA and LANDSCAPE DATA TABLES and modify the data (shown in **RED** on L102) for the specific project location. These tables must be included on the drawings for use by the facilities manager to keep accurate information in their data base.

Planting Design (32 9001, 32 9113, 32 9119, 32 9223, 32 9300)

Trees

Avoid specifying trees that are messy (fruit, seed pods, bark, and so forth), have invasive root systems, or create safety hazards (such as thorns). Select trees that are in proper scale with the building. To prevent damage to building, unauthorized roof access, and appearance of overgrowth, large trees should be located away from the building. Avoid tree plantings next to mechanical enclosures. Unless otherwise directed, trees should be grouped in natural arrangements so that future replacements will not require excessive expense to match existing plant materials. Specifying 2-inch caliper trees or equivalent sizes is preferred. Larger trees with a caliper of 2 to 3 inches may be specified at building and driveway entrances. Smaller trees may be used in areas where significant numbers are required such as on a hillside or reforested area.

Shrubs and Ground Covers

Reduce the number of plants 6 to 8 feet to center of plant from the building to avoid excessive amounts of water at the building foundation. Shrubs should be used that fit within the planter area when mature. The scale of the building may necessitate a lesser separation. For instance, in the case of seminary buildings, the overall landscape area may be quite a bit smaller than for a meetinghouse. As such, rather than a 6 to 8 foot separation the designer could generally use a 2 to 4 foot separation.

Avoid planting shrubs close to the building or too close to the edge of the planter or walk where excessive trimming will be required. Ornamental shrubs should be 3- to 5-gallon size. Shrubs and ground covers that mature in a single growing season should be delivered in 1-gallon containers and spaced appropriately depending upon the type of plant. Other ground covers should be provided in 4 to 6-inch pots and spaced appropriately to mass within two to three growing seasons.

Annuals and Perennials

Annual flower beds are not authorized. These beds increase the amount of maintenance required for the site. Some long-life perennial plants may be used in the design to provide seasonal color and texture.

Lawn Areas

Keep lawn areas sized to effectively irrigate without excessive overspray and waste. Except for park strips designated by local ordinances, keep lawn areas at a minimum of 8 feet wide. Do not use lawn on slopes steeper than 3:1 (33 percent). Where turf is restricted at a project, preference should be given to provide turf in potentially high foot traffic areas around the building and areas that may provide a location for outdoor activities.

When calculating lawn areas with regards to a percentage of landscape, allow for additional lawn percentage for large infiltration, detention, retention or other jurisdictionally required grassy areas. It is still the intent to limit the amount of lawn used on sites.

Sod is preferred over seeding in lawn areas. If lawn areas are greater than ½ acre, located away from the building, and on site perimeter, seeding is allowed. Hydro seeding is the preferred application.

Landscape Edging

All lawn and shrub areas should be separated by 6” x 6” concrete mow strips. Concrete mow strips are also required at all lawn areas adjacent to stairs, walls and fences. Machine extruded mow strips are not allowed unless they meet the required dimension of 6” x 6”. Mow strips should not inordinately retain water within planter areas. Slope soil away from planters to minimize collection of surface water.

If required by local soil conditions found within the geo-technical report and as agreed on by the local development team, the designer can utilize a 12” to 24” wide mow strip at the base of buildings. These wide mow strips are otherwise not a requirement.

Metal edging is authorized in shrub areas to separate different sizes and shapes of mulch.

Mulch

Mulch is a natural way to retain moisture, control weeds, protect plants and prevent erosion. There are various approved options depending on eco-region, availability and individual site requirements. Choose the mulch that works best with local conditions, will not wash away in common precipitation events, and that will provide a neat and clean finished appearance. Rock and bark mulch may both be used on the same project.

For areas steeper than 3:1 (33 percent) take special precautions to maintain mulch on hillsides.

Irrigation Design (32 8423)

The landscape architect should be aware of the following requirements while adapting the style option to the local site:

Style Option Irrigation Plan

Follow closely the IRRIGATION COVERAGE notes found at the bottom of the plan.

LEED Items – When required to provide data to obtain LEED certification, the architect and landscape architect should provide information necessary to identify plant water needs at the site. This information is to be provided on the drawings or in other closeout documents for future reference.

Use the irrigation layout method shown on the style option drawings in shrub beds. In most cases, point-to-point coverage for trees and shrubs is required. Drip-line coverage with in-line emitters should only be used when plants are located closer than 24” apart. Where ground covers are used, spray heads are an optional method of irrigation and should be shown on the plan. This provides proper coverage to the plants and greater ease of maintenance for the FM staff.

Irrigation design should incorporate the following guidelines:

- Head to head coverage for spray and rotor heads should be provided.
- A minimum of 70 percent average distribution uniformity (DU) for turf areas should be provided.
- Valves should be located within 12 inches of a sidewalk, curb, or mow strip for easy access.
- The irrigation plan should indicate remote control valve size, gallons per minute (GPM) flow rate, and scheduling sequence for each valve.
- SMART controller technology using central control, evapo-transpiration (ET), and soil moisture sensor systems are now required for all new construction in most eco-regions
- When required by local authorities having jurisdiction for the property or warranted through the regular replacement and improvement process, this technology is also authorized on existing facilities. When a project is not required by local authorities, the facilities manager must show documentation that a pay back of less than 5 years can be met and that budget is approved for the project.
- The project manager, architect, landscape architect and facilities manager make up the irrigation team which should collaborate on which SMART controller should be chosen for the project. Only one manufacturer should be specified before bidding starts.

- Master valve and flow control equipment is also now authorized on all facilities.

- Provide rain sensors on all irrigation systems.

For low-water, secondary or reclaimed water irrigation design, the following guidelines should be used:

- Design:
  - The landscape architect should consider secondary or reclaimed water as the prime source of water for irrigation if it is available. The landscape architect should research the condition of water at the site and design/specify proper equipment and filtering for the irrigation system whenever this type of water is available.
  - Do not use drip equipment on systems designed with reclaimed or secondary water sources that require excessive cleaning of filters. Self-cleaning/flushing filters may be required on sites with extremely poor secondary water quality.
  - Use spray systems in large ground cover areas that require close or tight planting in order to get established.
  - Install low-flow systems using owner provided standard details.
  - Minimize or avoid using 1/4" tubing to distribute water. Portions of Arizona may be exempt from this approach where it is culturally accepted to use flexible laterals with ¼" tubing. However specifications will need to be modified to match this approach.

- Construction:
  - The landscape architect and contractor should work together to ensure use of the specified products and proper installation.

- Maintenance:
  - The landscape architect should provide the appropriate training of the FM staff and contract service provider per the owner-architect agreement and the provisions of the *Site Management Plan*. This is critical for establishment of plant material and development of a long-term maintenance schedule.

Standard Details and Specifications (31 0501, 31 1100, 31 1413 , 31 2213, 31 2216)

Use the most current standard planting and irrigation details for clarity and consistency in bidding. Additional details may be added as needed if not found therein. Edits of standard details may need to be made depending on site conditions, but should not materially change.

Use the most current set of specifications for bidding purposes. Specifications should be edited to reflect materials chosen and represented on the plans as well as to address specific site conditions. Coordinate earthwork and underground sprinkler specifications with civil and electrical engineers.

Landscape Architect Checklist

The *Landscape Architect Checklist* identifies critical areas in which the landscape architect should be involved throughout the project. It should be used as a guide to determine the quantity and quality of services provided by the landscape architect.

Construction Management

Site Observation and Verification

The *Agreement between Owner and Architect* should define the minimum number of site observations required by the landscape architect. The project manager, architect, and landscape architect should jointly establish the minimum number of site observations to be performed before finalizing the agreement. A minimum of six (6) visits should be provided by the landscape architect. Visits should coincide with the *Landscape Architect Checklist*.

The agreement should also establish the specific type of visits the landscape architect is contractually obligated to attend. Those critical to the success of the project identified in the agreement are as follows:

- Examine existing conditions of the project site as part of the preliminary design phase and assist in development of a proposed site plan.
- Meet with the project manager, facilities manager, architect, contractor, excavation subcontractor, and landscape subcontractor for a landscape pre-installation conference to examine project site conditions and review scope of work before installation begins. Determine if appropriate sub-grades have been established.

- Evaluate pressure test compliance and verify proper installation of mainlines and irrigation valves. Evaluate finish grading in preparation for planting.
- Inspect and approve plant quality, plant quantity, plant pits, plant pit backfill, planting depths, removal of packaging/distribution materials, wire, and ties. Inspect irrigation system installation. Inspect weed barrier fabric.
- Conduct a comprehensive substantial completion inspection prior to beginning the thirty (30) day contractor maintenance period described in the contract documents to verify contract requirements have been followed. Amongst other considerations verify planting compliance, irrigation system coverage and irrigation system operation.
- At the end of the thirty (30) day contractor maintenance period verify deficient items have been corrected and verify no others exist. Prepare Meetinghouse Site Management Plan using Owner's template. Review with Owner's Facility Manager and service contractor and provide landscape maintenance training.

During site visits, the architect and landscape architect should verify that the required quality of work is being provided.

Site Management Plan

A *Site Management Plan* should be developed to assist in managing grounds maintenance. This document is currently **approved for new and existing construction** projects. For existing construction, if more than one third of landscape is being modified the Landscape Architect should create one. It provides direction for the FM staff, consultants, and service contractors in standards of landscape performance, appearance, and care. Note that AEC is evaluating the feasibility for using site management plans on all sites.

The landscape architect is responsible to provide the following services in developing a site management plan:

- The *Site Management Plan* should be edited to correspond with specific criteria for the project site. The site management plan format should not be changed or added to. Only the information shown in **RED** should be updated or modified.
- The site management plan should become part of the project Operations and Maintenance closeout documents turned over to the facilities manager during the substantial completion phase and before the end of the landscape contractors initial maintenance period is completed. The landscape architect is to provide two hard copies and one CD copy.

- The landscape architect provides training to FM staff so that a smooth transition is made between the contractor and owner.
- The site management plan should include the following:
  - Plant material standards and maintenance guidelines: provide special care instructions and other critical information
  - Irrigation system standards and maintenance guidelines: provide information for the watering schedule specific to the site conditions
  - Annual service calendar: modify to site conditions and proper local practices
  - Topsoil testing report - incorporate all soil recommendations from the report

Chapter 5: Structural Engineering

Guiding Principles

"Be not deceived; God is not mocked; for whatsoever a man soweth, that shall he also reap." (Galatians 6:7)

These guidelines incorporate the following principles:

- Code complying design
- Safety of building occupants
- Protecting the investment of the Owner
- Uniformity and consistency of design
- Life cycle costs
- Planning for future additions to phased projects

Structural Engineering Checklists

The structural engineer is to be familiar with and employ the "Abbreviated Structural Analysis, Design and Drawing Checklists" and the "Extended Structural Analysis, Design and Drawing Checklists" available on the AEC Website.

- http://aec.ldschurch.org/aec/
- Select "Design Guidelines"
- Select the structural engineering checklists desired
- Use the password, "nephi" to download the checklists

General Design Considerations

Codes and References

The following codes and references have been used in preparing the standard plan documents:

- *2012 International Building Code (IBC 2009)*
- *ASCE 7-10 Minimum Design Loads for Buildings and Other Structures (ASCE 7)*
- *American Institute of Steel Construction (AISC 360) with Commentary*
- *ACI 318-08 Building Code Requirements for Reinforced Concrete*
- *American Iron and Steel Institute (AISI) "Code of Standard Practice for Cold Formed Steel Structural Framing (2005)"*
- *American Welding Society "AWS D1.1/D1.1M: 2008 Structural Welding Code – Steel"*

- *Steel Joist Institute (SJI) for Joists and Girders "42nd Edition Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders"*
- *Steel Deck Institute (SDI) for Steel Deck "Design Manual for Composite Decks, Form Decks and Roof Decks - No. 31"*
- *American Wood Council 2005 Edition ANSI/AF&PA SDPWS-2005*
- *2005 National Design Specification (NDS) for Wood*
- *Truss Plate Institute (TPI) "ANSI/TPI 1 - 2007: National Design Standard for Metal Plate Connected Wood Truss Construction"*
- *ASTM American Society of Testing Materials (2008)*

Revisions to Standard Calculations, Plans and Specifications

Always use concrete foundation walls. Do not change the concrete foundation walls in the standard plans to masonry.

Standard plan structural calculations, plans, and specifications are intended to be used 'as-is' for many project locations.

The structural engineer is expected to update the structural calculations, drawings and specifications to take financial advantage of using lower design loads or higher allowable soil bearing pressures whenever possible.

If local codes or design conditions require higher design loads than were used for the structural calculations, drawings and specifications, the structural engineer should revise the contract documents accordingly in full coordination with the drawings of the other disciplines.

For example:

- If snow loads are less than 30 pounds per square foot, roof structure should be revised to support the lower uniform snow, snow drift, and unbalanced snow loads; or live loads where snow does not occur. As a minimum, for wood framed structures, this adjustment would apply to the prefabricated wood trusses and I-joists. The calculations would need to be adjusted accordingly.
- All values in the DESIGN CRITERIA schedule in the drawings are to be reviewed and be updated as needed.
- The SCHEDULE OF CONSTRUCTION MATERIALS in the drawings is to be modified as dictated by the site location.
- The 3-inch by 3-inch by 1/4-inch square sill plate washers required by code for buildings with a Seismic Design Category of D, E, or F are to be deleted for buildings with a Seismic Design Category of A, B, or C.
- Requirements of the geotechnical investigation report are to be incorporated into structural calculations and drawings. If possible, reduce the size of footings and adjust the footing depths.

- The structural engineer is to take full responsibility for structural calculations, drawings, and specifications by stamping and sealing all structural documents.
- Revise shear wall requirements when possible due to lower seismic or wind loads.

Importance Factors

Meetinghouse Projects and Missionary Training Centers

For projects (with or without considering potential future phases) having a potential occupant load of over 300 people, design the project with the importance factor required for an IBC 2012 Risk Category III, or local code equivalent. For projects with a potential occupant load of less than 300 people, design the project with the importance factor required for an IBC 2012 Risk Category II for wind and snow loads but use the importance factor required for an IBC Risk Category III for seismic loads ($I_e = 1.25$).

Seminary and Institute Projects

For projects (with or without considering potential future phases) having a potential occupant load of over 300 people, design the project with the importance factor required for an IBC 2012 Risk Category III, or local code equivalent. For projects with a potential occupant load of less than 300 people, design the project with the importance factor required for an IBC 2012 Risk Category II for wind and snow loads but use the importance factor required for an IBC Risk Category III for seismic loads ($I_e = 1.25$).

Bishop's Storehouse Projects

Apply the importance factors required for an IBC 2012 Risk Category IV, or local code equivalent, to the snow, wind and seismic loads ($Is = 1.10$, $I_w = 1.15$ and $I_e = 1.50$).

Deseret Industries Projects

Apply the importance factors required for an IBC 2012 Risk Category II but increase the design seismic loads on roof diaphragms and roof diaphragm to wall connections by 25%,

Replacement and Improvement Projects

Apply the importance factors consistent with the above guidelines, the code provisions and the Structural Evaluation and Upgrade design guidelines.

Soils 31 0501, 31 1100, 31 2213, 31 2216, 31 2316

Geotechnical Evaluation Report

The project manager arranges, using the *Agreement between Client(Trust) and Geotechnical Consultant*, for a registered professional geotechnical engineer to evaluate a project site and perform a geotechnical investigation and prepare a report that is provided through the architect to the structural engineer. The Geotechnical Evaluation Report Template should be given to the geotechnical engineer to help the geotechnical engineer provide in the report the items the Owner and the other design consultants need to know. The report will contain requirements regarding how the building, site elements, and paving are to be supported by the soil and how the soils are to be prepared. These requirements are to be incorporated into the contract drawings, contract specifications, and calculations.

The geotechnical engineer, as separately contracted with the Architect per the *Agreement Between Owner(Trust) and Architect* (or as arranged otherwise by the Project Manager), should review the contract documents to verify that requirements of the geotechnical evaluation report have been correctly incorporated into the contract documents and provide a letter to the architect stating that verification has been completed.

The geotechnical engineer should refer to the *Geotechnical Evaluation Report Template* for guidelines for load criteria and for the number of borings required for a project. The template also notes the information required for the geotechnical evaluation report (use the Geotechnical Investigation Report Template).

Engineered Fill (Fill, Structural Fill, Compacted Fill) 31 2323

All fill placed under or within the area of the building or parking area should be engineered in accordance with recommendations of the geotechnical investigation report (existing on-site material may be used as the engineered fill if allowed by the geotechnical investigation report). Project specifications should properly specify the type and required compaction of engineered fill.

Moisture Sensitive Soils

The Owner has experienced significant problems with buildings constructed on moisture sensitive soils. Structural foundation systems and all site elements are to be designed to meet requirements of local codes and the geotechnical investigation report.

Proper site drainage is a critical for limiting movement of moisture sensitive soils. Drainage systems are to be designed to prevent runoff from saturating foundation soils and soils supporting sidewalks, gutters and

pavement. Provide the minimum and maximum slopes required by these guidelines.

It is unreasonable to expect moisture content in the site soils to remain constant for the expected life of the building. When evaluating options for foundation systems do not assume a constant soil moisture content level.

Consideration is to be given to protecting sidewalks and entry slabs from the effects of heaving soils that can be caused by moisture-sensitive soils and/or freezing soils. The architect, civil engineer and structural engineer are to provide solutions compatible with successful local construction practices.

All exterior entries are protected from rain by dormers or gable ends. Therefore, gutters and downspouts are normally not needed. Do not include them in the project unless required by local jurisdiction or where required due to moisture sensitive soils.

Materials – General Information

Concrete 03 3111

The standard contract documents provide five types of concrete identified as Mix Type A, Mix Type B, Mix Type C, Mix Type D or Mix Type E.

- Generally, higher strength concrete (Mix Type D) is intended either for structural strength or for exposed concrete in frost areas or areas where deicers will be applied to exposed concrete. This mix design would be used for exterior concrete in those areas. Frost areas are defined as those geographical areas where frost penetration exceeds 10 inches. Mix Type D is intended to be a 4,500 pounds per square inch mix. Adjust the mix in the specifications as needed.
- If project is located in a non-frost area and there is no structural requirement for the higher strength concrete, then Mix Type A is to be used. This is intended to be a 3,000 pounds per square inch mix. Adjust the mix in the specifications as needed.
- Mix Type B and Mix Type C are mixes that may be needed for a specific site. Mix Type B is 3,500 pounds per square inch concrete and Mix Type C is 4,000 pounds per square inch concrete. Adjust the mix in the specifications as needed.
- Mix Type E is for interior slabs on grade in meetinghouse, CES, and R&I Projects: Use Mix Type E concrete with 7.1/2 lbs. of High Volume Synthetic Fiber Reinforcement (HVSF) per cubic yard of concrete. If the soils report recommends that the interior slab on grade should be reinforced or if the soils beneath the interior slab on grade are unstable due to either expansion or shrinkage potential or where (HVSF) cannot be provided or is not more economical than

reinforcing steel, then reinforce the interior slab on grade with #3 bars at 18” o.c. each way. Locate the bars with 1” clear cover to the top of the slab. The concrete slab is placed without control joints.

- When exposed to freeze thaw conditions, the concrete is to be entrained with 6 percent plus or minus 1-1/2 percent of air entrainment.

Meetinghouses and Other Wood Framed Projects

Standard plan structural calculations use a concrete design strength (f'_c) of 2,500 pounds per square inch for concrete in foundations in order to avoid it being required to be inspected and tested by code. Actual minimum strength required by contract documents for cast-in-place concrete is 3,000 pounds per square inch or concrete Mix Type A.

Welfare Services Projects

Standard plan structural calculations use a concrete design strength (f'_c) of 3,000 pounds per square inch for concrete in the foundations or concrete Mix Type A.

Replacement and Improvement Projects

Provide concrete strengths that are consistent with the above guidelines.

The vapor retarder beneath interior slabs on grade is to be placed directly under the slab on grade. Whenever possible, use membrane curing instead of water curing for the interior slabs on grade to reduce costs and decrease the construction schedule.

Reinforcement in Interior Slabs on Grade 03 2100, 03 3111

The Owner has chosen to reinforce the interior concrete slabs on grade with steel reinforcing bars or high volume synthetic fiber rather than to use control joints for the following reasons:

- Doing so provides control of curling. Curling often occurs at control joints.
- Many small cracks are better than a few large cracks when covered by carpet.
- Control joints sometimes telegraph through carpet.
- The reinforcing keeps the cracks together and prevents them from becoming offset if differential settling of the sub-grades occurs.
- Use Mix Type A for meetinghouse, S&I, and R&I projects when the slab is reinforced with steel reinforcing bars or use Mix Type E when the slab is reinforced with high volume synthetic fiber
- Interior concrete slabs on grade may be water-cured or membrane-cured as determined by the structural engineer. The selected curing method should be coordinated between the different sections of the contract documents by the architect. It is recommended that slabs be

membrane cured whenever possible to reduce costs and condense construction schedules.

Masonry Veneer 04 0523

Carefully select the appropriate masonry veneer brick ties for the project's seismic design category (see project's Seismic Design Category (IBC) or local code requirements). Seismic Design Categories A, B and C require a type of tie significantly differing from ties required by Seismic Design Categories D, E, and F. Weep holes for brick veneer should be installed at 33 inches on center maximum (usually placed at 32" on center to match brick spacing).

Masonry Reinforcement 04 0520

Preferred spacing between vertical and horizontal reinforcement bars should be 4 feet on center maximum (each way) with additional reinforcement used if design stresses require an increase. If walls are reinforced at 4 feet on center maximum, joint reinforcing is unnecessary unless used to anchor masonry veneer.

As a minimum, reinforced bond beams should be provided at top of walls, at floor levels, at roof levels, and at top of parapet walls. Horizontal bars are to continue uninterrupted around corners, through wall intersections and control joints.

Rough Carpentry 06 1100

Standard structural calculations and drawings have been prepared using medium-range wood stresses in order to provide a simple method for selecting the most economical lumber to meet project requirements. Do not use SPF lumber except in trusses.

When exposed to wind loads, deflection of exterior walls is limited to L/360 where the wall provides the backup to brick veneer. Whenever possible, use laminated strand lumber (LSL) studs rather than laminated veneer lumber (LVL) studs where wall heights dictate other than 2x wood studs.

Wood Roof Trusses 06 1753

Shop drawings will be submitted, reviewed, and approved before fabrication of the trusses. Items to verify when reviewing shop drawings include the following:

- Bracing: Check size and location of horizontal web bracing and give direction for its anchorage by using diagonals, by using attachments to the structure, or by using T-'T' or 'L'-braces on the webs.
- Piggyback Trusses: Make sure top compression chord of the lower truss is braced.

- Metal Plates: Size plates for 110 percent of forces in members. Stress increases are not allowed for duration of loading. Metal plates are to have a minimum plate dimension of 3 inches and a minimum bite of 2.5 inches into each truss member.
- The species and grades of the lumber used should match the contract documents.
- The bottom chords of trusses should be braced if ceiling gypsum board is not present to brace the bottom chords or is removed when fire protection is installed.

Wood Roof Joists

Shop drawings are required to be submitted but they are not required to be stamped and sealed.

Design Criteria and Material Strengths

The following large meetinghouse standard plan design criteria and material strengths are to be adjusted as required by site location and type of project. For instance, in some areas of the country, snow loads could be replaced with a lighter 20 pounds per square foot live load.

Roof Snow Loads

(Adjust for site location and project type)

Snow Ground Load	P_g = 44 psf
Snow Importance Factor	I = 1.1 for Heritage 98, Heritage 09T and Independence Meetinghouses, 1.2 for Bishops Storehouses, 1.0 for all other projects
Exposure Factor	C_e = 1.0
Thermal Factor	C_t = 1.0
Flat Roof Snow Loads	$P_f = 0.7 * P_g * I * C_e * C_t$

Seismic Loads

(Adjust for site location and project type)

Short Period Mapped Acceleration	S_s = 1.50
Long Period Mapped Acceleration	S_l = 0.60
Soil Site Class	D
Short Period Site Coefficient	F_a = 1.50
Long Period Site Coefficient	F_v = 1.00

Design Spectral Response Acceleration	$S_{DS} = 2/3 * F_a * S_s$
Design Spectral Response Acceleration	$S_{D1} = 2/3 * F_v * S_1$
Seismic Importance Factor	I_e = 1.25, except use 1.50 for Bishops Storehouses
Response Modification Coefficient	R = 6.5, except use 5.0 for buildings with masonry walls
Seismic Response Coefficient	C_s = Varies
W	Dead Loads of Structure
Building Seismic Design Category	D
Base Shear	$V = C_s * W$ = (Strength Design)
Diaphragm Shear	V = Per ASCI 07-05 Equation 12.10-1

Wind Loads

(Adjust for site location and project type)

Basic Wind Velocity (3 Second Gust)	90 mph
Exposure Type	C
Importance Factor	1.15
Internal Pressure Coefficient	0.18

Working Stresses for Materials

Concrete - 28 day strength

(Adjust for site location, project type and geotechnical requirements. Note that for wood framed buildings, the design strength used in the analysis is 2,500 psi.)

Footings	3,000 psi
Foundation Walls	3,000 psi (Except use 4,500 psi with air entrainment where exposed to freeze thaw conditions)
Interior Slabs on Grade	3,000 psi
Concrete over Steel Deck	3,500 psi
Reinforcing Steel	60 ksi (ASTM 615)
Deformed Bar Anchors	ASTM A496
Headed Stud Anchors	ASTM A108
Anchor Rods	ASTM 1556, Grade 36 with ASTM A563 Heavy hex nuts and hardened washers
Exterior Flatwork	4,000 psi (use 4,500 psi with air entrainment where exposed to freeze

	thaw conditions and de-icers)
Suspended Concrete	4,000 psi
Water/Cement (w/c) ratio	Adjust for project
Slump	Adjust for project

Structural Steel

(Adjust for site location and project type)

Wide Flange Shapes	50 ksi (ASTM A992)
Steel Tubes	46 ksi (ASTM A500)
Other Shapes and Plates	36 ksi (ASTM A36)
Steel Joists	Comply with Steel Joist Institute requirements
Steel Roof and Floor Deck	Comply with Steel Deck Institute requirements

Masonry

(Adjust for site location and project type)

Hollow Concrete Masonry Units	2,000 psi (lightweight units normally have at least this strength)
Hollow Brick Masonry Units	2,500 psi (hollow brick masonry units normally have at least this strength)
Grout	2,500 psi in HCMU
Grout	3,300 psi in HBMU
Mortar	Type S(1,800 psi)

Wood

Blocking, Top Plates, Struts, Roof Joists, Floor Joists, Headers, Beams, Misc. Framing

- Douglas Fir-Larch - No. 2 or Better or MSR 1650F – 1.5E
- Hem Fir – No. 1 or Better or MSS 1650F – 1.5E
- Southern Pine – No. 2 or Better

Sill Plates

- Douglas Fir-Larch - Standard or Better
- Hem Fir - Standard or Better
- Southern Pine - Standard or Better
- LSL – 1.3E or Better

Trussed Rafters

- Douglas Fir-Larch – No. 2 or Better
- Hem Fir – No. 1 or Better
- Southern Pine – No. 2 or Better

- MSR 1650F – 1.5E or Better

Exterior Walls and Interior Structural Walls

- Douglas Fir-Larch – No. 2 or Better
- Hem Fir – No. 1 or Better
- Southern Pine – No. 2 or Better
- SCL (LVL and LSL)
  - 1 1/2" x 3 1/2" – Fb = 1,730 psi, 1.35E or better
  - 1 1/2" x 5 1/2" – Fb = 1,730 psi, 1.35E or better
  - 1 1/2" x 7 1/4" – Fb = 2,250 psi, 1.50E or better
  - 1 1/2" x 9 1/4" – Fb = 2,250 psi, 1.50E or better
  - 1 1/2" x 11 1/4" – Fb = 2,250 psi, 1.50E or better
  - 1 1/2" x 11 7/8" – Fb = 2,250 psi, 1.50E or better
  - 1 3/4" x Fb = 2,600 psi, 1.90E or better
  - 3 1/2" x Fb = 2,600 psi, 1.30E or better

Interior Non-Structural Walls

- Douglas Fir-Larch – Standard, Utility, Construction or Better
- Hem Fir - Standard, Utility, Construction or Better
- Southern Pine - Standard, Utility, Construction or Better

Glued Laminated Beams (design per non cantilevered stresses to reduce costs) are to be Stress Class 24F-1.8E

- DF/DF – 24F-V4 (Fb in compression zone stressed in tension is 1,850 psi)
- SP/SP – S4F-V3 (Fb in compression zone stressed in tension is 1,950 psi)

Roof Sheathing – 19/32" with a span/index of 40/20

Floor Sheathing – 23/32" with a span/index of 40/20

Quality Assurance

Site Observations and Verification

The *Agreement between Owner(Trust) and Architect* notes the minimum number of site observations required of the structural engineer. The project manager, architect, and structural engineer should determine and agree upon the minimum number of site observations to be performed before finalizing the agreement. The agreement also notes the number of pre-installation and post-construction meetings that the structural engineer is contractually obligated to attend. The site observations performed by the structural engineer are to be thorough and accurate.

The minimum number of site observations by the structural engineer during construction is recommended for building sizes as follows:

- Projects up to 8,000 square feet: 4 site observations
- Projects from 8,000 to 15,000 square feet: 5 site observations

- Projects over 15,000 square feet: 6 site observations

Replacement and improvement projects or seismic upgrade projects may require more site observations.

Architect and structural engineer should verify that the required quality of work is being provided. During site observations, structural engineer should thoroughly review all aspects of the structural engineering work under construction. The structural engineer is to check that the foundations have been correctly placed and reinforced, check that anchor bolts/rods are as specified and installed correctly, check that hold downs are as specified and installed correctly to foundations and studs, check that wall framing is as specified and installed correctly, check that floor systems are as specified and installed correctly, check that roof framing is as specified and installed correctly, check that prefabricated metal plate wood trusses are as specified and installed correctly, check that deficiencies are corrected. Written observation reports as well as photographs for the Owner's quality assessment program are required.

Refer to the *Agreement between Owner (Trust) and Architect* for additional requirements.

Wood Truss Observation

Unless arranged in the *Agreement between Owner and Architect*, the structural engineer is not required to review the wood trusses at the truss fabrication plant. The specifications now require the truss fabrication plant to be certified. The structural engineer should observe trusses delivered to the project site to determine:

- If any trusses are damaged
- If any of the metal plates have become separated from the wood members
- If plate sizing and truss configurations are correct
- If the wood used for construction of the trusses is acceptable

Inspections and Testing

General

The project manager will retain a testing agency to verify the work and test the material quality during construction.

The project manager, architect, and structural engineer should jointly establish the type, amount and frequency of inspections and testing to be performed. The structural engineer is to incorporate the testing and inspection requirements into the contract documents. Utilize the guidelines for testing and inspection requirements found in the *Civil and Structural Testing and Inspection Services Guidelines*.

The testing agency should maintain a record of all inspections and tests performed and provide adequate information to verify compliance with the contract documents. The testing agency should provide reports to the project manager, architect, structural engineer, and contractor.

Contract documents give the project manager the right to test any material on the project. The cost of testing will be paid by the project manager; however, the cost of re-testing materials replaced due to failed tests will be paid by the project manager and reimbursed by the contractor.

The following inspections and tests should be considered for all projects:

Engineered Fill **31 0000**

Inspection and testing of engineered fill is required for all projects by the code and by the owner.

Concrete

Inspection and testing of concrete is required for Welfare Service projects.

Inspection and testing of concrete is generally not required for meetinghouses and other wood framed projects by the code. However, it is required that some inspections and tests be performed for larger projects. Specific requirements are found in the *Civil and Structural Testing and Inspection Services Guidelines*. The project manager, at his discretion, and with the input of the architect's design team, may require that additional inspections and tests be performed for more quality control.

Structural Welding Including Attachment of Steel Deck

Inspection of structural welding, including attachment of steel deck, is required for all projects. Where fabrication of structural load-bearing members and assemblies is being performed on the premises of a fabricator's shop, inspection of the fabricated items is required unless the fabricator is approved per IBC Section 1704.2.2.

Masonry

Inspection and testing of masonry is required for all projects (except at mechanical enclosures). Masonry is principally used on welfare services projects.

Wood

Inspection of prefabricated metal plate wood trusses is not required as allowed by IBC Section 1704.2. The prefabricated metal plate wood truss manufacturer is required to be certified. If the manufacturer is not certified, then inspection of the trusses is required by the same section.

Inspection of wood shear walls and diaphragms, including nailing, bolting, anchoring and other fastening to other components of the seismic force resisting system is not required, unless the fastener spacing is less than 4

inches on center.

Wood is used principally on meetinghouses, seminaries and institutes and do not typically require any inspection. However, site observations performed by the structural engineer are expected to be very complete and very thorough.

Meetinghouses and other Wood Framed Projects

Inspections and testing for meetinghouses and other wood framed projects are to be minimal.

Welfare Services Projects

Inspection and testing programs for welfare services projects are to be fully implemented.

Installation of Post-Installed Anchors in Concrete or Masonry

Inspection and testing of post-installed anchors is required for all projects by code.

Structural (Seismic) Evaluation and Upgrade

General

Seismic evaluation and upgrade is usually performed in conjunction with regularly scheduled and related R&I work on existing "at risk" facilities.

Seismic "at risk" facilities have been identified. The facilities manager and project manager are aware of these facilities.

A structural evaluation report, using the *Structural Evaluation Report Template*, is completed for a seismic "at risk" facility as the need arises.

The evaluation should be performed by a structural engineer who has experience using ASCE/SEI 31-03 Seismic Evaluation of Existing Buildings and ASCE/SEI 41-06 Seismic Rehabilitation of Existing Buildings. This structural engineer is selected by the project manager.

The structural evaluation and report scope of work includes the following tasks, among others, that are described in the report template as follows:

1. As-built drawings review and verification
2. Facility inspection, verification, investigation, and testing
3. Tier 1 (screening phase) and Tier 2 (evaluation phase), along with engineering judgment, to identify whether critical structural and nonstructural elements are identified as acceptable or potentially deficient
4. Vertical loads check

5. Conceptual upgrade options plans and details
6. Upgrades cost estimate
7. Report preparation

The structural evaluation and report fees for most meetinghouses, including reasonable travel costs, are included in the maximum fee range as follows:

Utah:	$7,000 to $7,500
California/Oregon/Washington:	$7,500 to $8,000
Alaska/Hawaii:	$8,000 to $8,500

You should contact AEC for guidance for fee ranges in states other than those noted.

The project manager should develop local consultant structural engineers to perform these evaluations. The assumption is that the consultant structural engineers are based in the states noted and the fee range differences primarily address the fee rates for those states and the travel costs to get to the facilities in those states.

Some project managers in other states choose to use Utah based firms. In this case, the Utah fee range should be used plus additional travel costs (i.e. airfare to and from the other state, hotel, if required, meals, and rental car) for one structural engineer.

Four paper copies and a PDF electronic copy of the report are provided to the facilities manager or project manager and a PDF electronic copy provided to the AEC division (Steve Markham: markhamsj@ldschurch.org) for archiving.

The facilities manager maintains a copy of the structural evaluation report in the permanent file for the facility. The facilities manager also keeps a record of seismic upgrade work performed in the facility.

Seismic evaluation and upgrade is usually not required for non- “at risk” facilities. However, as a part of re-roof projects on these facilities, the roof sheathing nailing, the connection of the roof diaphragm to the exterior walls, and the connection of the roof trusses to the walls should be inspected and evaluated by a structural engineer, with all deficiencies, as deemed necessary by the structural engineer, corrected as a part of the re-roof project.

Gravity, wind, and snow evaluation and upgrade should be addressed by the facilities manager as the need arises or in conjunction with seismic evaluation and upgrade projects. The evaluation and upgrade procedures are found in the *Structural Evaluation Report Template*.

Seismic Evaluation

Use ASCE/SEI 31-03 Seismic Evaluation of Existing Buildings.

The seismic evaluation is accomplished utilizing the Tier 1 (screening phase) and Tier 2 (evaluation phase), along with engineering judgment, to identify whether critical structural and nonstructural elements are identified as acceptable or potentially deficient.

For the remaining potential deficiencies, a Tier 3 (detailed evaluation phase) should be performed only when there is a high probability that the deficiency can be eliminated to avoid upgrading.

The evaluation demand and acceptance criteria are as follows:

- Meetinghouse: **Life Safety** for the larger of: 2/3 MCE (ASCE/SEI 31-03) and 0.75 x 2/3 MCE (ASCE/SEI 41-06) and **Collapse Prevention** for 0.75 x MCE (ASCE/SEI 41-06)
- Seminaries and Institutes: **Life Safety** for the larger of: MCE (ASCE/SEI 31-03) and 0.75 x MCE (ASCE/SEI 41-06)
- Deseret Industries: **Life Safety** for the larger of: MCE (ASCE/SEI 31-03) and 0.75 x MCE (ASCE/SEI 41-06)
- Bishops' Storehouse: **Immediate Occupancy** for the larger of: MCE (ASCE/SEI 31-03) and 0.75 x MCE (ASCE/SEI 41-06)

Historic Properties

General Preservation Principles

- Historic materials should be preserved and retained to the greatest extent possible and not replaced wholesale in the process of seismic retrofit.
- New seismic retrofit elements and systems, whether hidden or exposed, should be visually design compatible with and respect the historic character and integrity of the building.

- Seismic retrofit work should be “reversible” to the greatest extent possible to allow future removal and replacement with improved seismic retrofit elements and systems and traditional repair of remaining historic materials.
- Features that exhibit design integrity or historic significance should be identified and preserved.

General Information

The interaction of architectural and structural elements in historic facilities often plays a more important role in the overall seismic performance of the structural system.

Historic facilities often include archaic materials, systems, and details. It may be necessary to look at handbooks and building codes from the year of construction to determine details and material properties.

The seismic retrofit design scope of work for historic properties should be reviewed by the Church History Department curator.

Building component replacements should balance cost, historic integrity, current building use, and aesthetic and architectural compatibility with other building components not directly affected by the seismic retrofit.

Disturbance of historic architectural elements and finishes to allow testing during evaluation and to implement the resulting retrofit measures may be unacceptable. Destructive testing and inspection of historic features of the building should be approved by the Church History Department curator.

The center core system should be considered when the historic interior and exterior finishes of the building cannot be disturbed.

Building components not affected by the seismic upgrade should not be replaced unless they meet replacement standards. (Example: pews and carpet unaffected by the seismic upgrade.)

Chapter 6: Plumbing

Guiding Principles

"And Isaac digged again the wells of water, which they had digged in the days of Abraham his father…" (Genesis 26:18)

These guidelines incorporate the following principles:

- Standardization of plumbing systems for all new facilities
- Conservation of water resources
- Sanitary environments
- Reduced maintenance
- Long-term cost savings

Replacement and Improvement Projects

Piping

If copper pipe has developed leaks along the pipe wall and not at joints, have the water chemistry analyzed by a water treatment company. Copper pipe has been known to fail from reacting to some municipal water supplies.

If reaction to municipal water supply is the cause of failure, there are two alternatives (contact AEC Division for information about these alternatives): 1) cross-linked polyethylene piping (PEX) or 2) epoxy barrier coating on the inside of the existing piping.

Look for evidence of close coupling with dissimilar metals. This causes electrolysis, and the piping will fail.

Use a pressure-reducing valve at the water main into the meetinghouse where there is concern about water hammer. Set the pressure to meet the pressure requirements of the furthest fixture at the highest elevation, typically 50 psi. Avoid the use of water hammer arrestors.

Historic Properties

Modifications to existing plumbing should be as required by governing codes and to accommodate approved facility improvements. Perform work to minimize impact on existing landscaping, building interior and exterior finishes and views (including the locations of utility metering equipment). Generally work shall be concealed.

Water Supply

Municipal Water Supply 33 1116

Water main connected to city water is preferred, whenever possible.

Utilize a 2-inch copper line unless local jurisdiction or soil conditions require otherwise.

Where possible and allowed by the local jurisdiction, consider a separate meter for the lawn sprinkler system. In some locations, lower water fees are assessed for a second irrigation water meter. Perform a simple payback analysis on the extra initial cost for separate meters to ensure the payback is four years or less. If the payback is more than four years, do not use separate meters. Instead, provide a stop and waste valve from the cold water main at a point 24 inches outside the building for connection to the lawn sprinkler system. This does not apply if a secondary water system for irrigation exists. Do not locate the valve under a walkway.

Well Water Supply

Use water supply wells when municipal water is not available. Design the supply system as follows:

- Use well flow test results as the basis for the supply design
- Design a pressurized system using one main storage pressure tank
- Do not use filters except where sediment or heavy mineral concentration is in the water or the water tastes bad
- Necessary features to accommodate the weather conditions at the Project location such as a control system that will operate at high ambient temperature or pipe buried below the frost line to adequately protect the system from freezing
- Verify fire sprinkler flow requirements

Domestic Water

Design

Connect to municipal water supply where possible.

Water-softening equipment may be used if local water treatment company determines it is necessary to prevent premature failure of water heater and other devices.

In-line filters may be considered for treating water where they are proven effective in other facilities in the area, or for water that is discolored, has an objectionable odor or may stain building fixtures and features.

Maximum velocity inside water supply pipes is not to exceed 7 feet per second to prevent objectionable noise.

Install a pressure-reducing valve in the main riser if utility water pressure is greater than 60 psig

Where feasible, locate the main riser in a custodial room, fire riser room, or other designated room where it is easily accessible. Locate on side nearest the main entry line.

Provide accessible location for extension of water supply to future building additions for phased standard plans. Size should accommodate future building additions.

Installation 33 1116

Route interior distribution piping above the slab on grade within the building insulation envelope and within areas not susceptible to freezing over time, such insulation may be displaced, exposing the piping to freezing.

Limit below-grade piping to a short length of main service line from the exterior building line to the interior main riser.

Do not route supply drops in exterior walls or interior shear walls.

Provide capped "T" sized for future expansion where required.

Water Heating

Fuel-fired, sealed combustion, instantaneous, tank-less water heaters are standard. In the standard plans, sealed combustion is required because there is no dedicated water heater room into which combustion air can be drawn in from outdoors. Refer to the owner's Master Specifications for information identifying approved manufacturers and model numbers.

For meetinghouses with a font, a 199,000 BTU/Hr input burner is used. Set the discharge temperature for instantaneous tank-less water heater at 110ºF (43ºC).

For meetinghouses without a font, a 199,000 BTU/Hr input burner is used. Water heaters are sized to service all fixtures in the building and are not sized for future expansion. For tank-type storage water heaters the water temperature is to be set to 140º F (60º C).

The maximum developed length of hot water piping from the water heater to the furthest fixture allowed by code is an acceptable distance. Do not use a re-circulating pump and re-circulating piping for hot water. Consider using a small, point-of-use, electric water heater for single restrooms that are beyond the maximum distance from the water heater allowed by code.

If electric storage-type water heaters of 18 kilowatt and larger are used, specify step control to reduce electrical demand.

If tank type water heater is used, thermostatic mixing valves are required so that "tempered" water is delivered to all hand washing stations. Lavatories are the only fixtures that require tempered water. Tempered water temperature is to be 110º F.

Replacement and Improvement Projects

Gas-fired instantaneous, tankless water heaters should be considered. These are mid efficient and require the B vent. If a tankless water heater replaces a tank type, the vent through the roof will need to be changed. The larger capacity model is required for meetinghouses with a font. The instantaneous water heaters listed in the current master specification have proven to operate well in recent years. **22 3413**

Storage-type water heaters of either mid efficiency (80 percent) or high efficiency (90 percent plus) may be used. If a high-efficiency water heater replaces a mid-efficiency model, then the vent through the roof will need to be changed.

Baptismal Font 22 4240

Locate the mixing box near the font to facilitate a simple mixing process with manual valves, temperature gauge, and check valves.

In locations where the HVAC is all electric such as heat pumps, consider a natural gas line dedicated to the water heater or propane if there is no natural gas supply to the site.

Seminary and Institute Projects

Baptismal font in large institute buildings: Same as described in meetinghouse section above.

Replacement and Improvement Projects

When adding a font or refurbishing a font, follow new construction guidelines as outlined above. **22 4240**

Exterior Hydrant 22 1119

Hydrant may be deleted if outside winter design temperature is below 0ºF (-18ºC). If used provide accessible shut-off valve in line to hydrant in a warm attic or ceiling space to facilitate shut-off and draining of supply pipe section to hydrant for winterizing.

Sanitary Waste

Design

Thermoplastic piping is the preferred material. **22 1313**

Penetration of thermoplastic pipe through fire-rated assembly: **33 3313**

- Detail a code-approved fire-stopping assembly. Include the assembly designation in the documents.
- Where the penetration of waste line is not at a right angle to the construction, such as the vent through the roof, cast iron may be used.

Minimum slope of any sewage pipe is 1/4 inch per foot in the direction of flow.

No sewage ejectors are to be installed inside the building without written approval from the project manager.

Provide minimum 4-inch pipe for the main building sewer line.

Burial depth of main building sewer line should be determined based on future building additions for standard plans with planned phased additions.

Replacement and Improvement Projects

Thermoplastic pipe is the preferred material. Cast iron no-hub with steel couplings is acceptable. Cast iron no-hub couplings underground should be of high quality stainless type. See current standard meetinghouse specifications.

Baptismal Font

Depth of font water level is defined by the overflow fitting height of 33 inches.

Locate drain in a corner of the font either near the front of the font or near the stairs.

Fonts in buildings having septic tanks may be drained to holding tanks. Water may then be pumped onto the lawn or to another acceptable location for disposal. Other drainage options may be French drain, seepage pit, lawn drain, or other options that are allowed by local code.

Where draining a font by pumping is necessary, use a centrifugal pump. Locate the pump in a room large enough to provide 3-foot minimum clearance around all sides of the pump. Install pump no higher than the bottom of font. Do not use submersible pumps. Locate font drain in an accessible location remote from the font.

Septic Systems 33 3601

- Design a septic system when a public sewer is not economically available at the project location.
- Follow all requirements of the local authority having jurisdiction based on test results for soil percolation. The soil percolation test results are required in the geotechnical investigation report provided by owner.
- Use a concrete septic tank with two compartments.
- Consider disposing effluent from the septic tank to soil absorption system such as an absorption field, absorption bed, or seepage pits.
- Do not use holding tanks unless unalterably mandated by local authority having jurisdiction.
- Do not route drainage from the baptismal font into the septic system.
- Locate soil absorption system in an appropriate area:
  - Do not locate under parking lots or driveways or other permanent site features.
  - Do not locate in areas designated for future building additions, future parking lots or driveways, or other future permanent site features.
- The minimum distances should be observed (*American Society of Plumbing Engineers Data* book, Table 25-2):
  - Buildings: 15 feet
  - Water well, water main, or cistern: 50 feet
  - Spring: 100 feet
  - Avoid possible drainage back to building, such as a location uphill from the building.

Submit calculations for the septic system design to architect and to project manager for review. Size the system at 2.5 gallons per person per day unless required otherwise by soil conditions and/or the local authority having jurisdiction. Backup data can be provided, if necessary, where approval for a variance may be required from local code authorities. Minimum tank sizes are as follows:

Table 6.1 MINIMUM SEPTIC TANK SIZE

Standard Plan Meetinghouse Name	Plan Series	Tank Size (Gallons)
Modular	1A-50-1[06]	1,500
Independence 50	IPAMH-10-02	1,500
Independence 90	IPB-MH-10-02	2,500
Independence 130	IPC-MH-10-02	2,500
Independence 170	IPD-MH-10-02	3,000
Heritage Classical	HER-CLA-98-19	3,750

Independence 230 Meetinghouse	IPE-MH-10-02	3,750
Independence 230 Stake Center	IPE-SC-10-02	3,750
Heritage 09T Meetinghouse	HER-09T-MH-CS-01	3,750
Heritage 09T Stake Center	HER-09T-SC-CS	3,750

Future Additions

- Estimate the needed capacity of future additions and provide a septic tank sufficiently large for the present and future building.
- Build soil absorption field to meet present needs only and expand as needed for future additions.

Alternative to Septic Systems

If the site is limited by any of the following conditions consider a self-contained waste water treatment system:

- Inadequate area for a leach field
- High ground water
- High quality of effluent required by authority having jurisdiction

Seminary and Institute Projects

Septic System Capacity: Owner has no actual flow test results available for seminary and institute buildings. The occupancy pattern and rate is also different, so that meetinghouse data described above cannot be applied. Occupancy rate for flow determination can be estimated using data for schools.

Seminary buildings without chapel or cultural hall: Full occupancy for five to six days per week, seven to eight hours per day.

Large institute buildings with chapel and cultural hall: Same as for seminary buildings described in previous paragraph except for chapel and cultural hall. For chapel and cultural hall, full occupancy should be considered at two days per week for six hours per day.

Natural Gas

Design

Piping inside building should be designed to 4-ounce pressure.

Rigid steel Schedule 40 pipe should be used.

Manufactured flexible gas pipe connectors may be used at connections to furnaces and water heaters.

Provide accessible location for extension of gas piping into future building additions. Size should accommodate future building additions.

Replacement and Improvement Projects

Higher pressure (up to 2 pounds per square inch gage) piping may be run inside a boiler room if required by the boiler manufacturer.

Provide cathodic protection on steel pipe buried in the ground or replace with polyethylene pipe.

Seismic Gas Shut-Off Valve

Provide on all buildings located in Zones 3 or 4 per the UBC or design categories D, E, or F per the IBC.

Site Visits During Construction

Recommended Minimum

See Chapter 7 page 7-21 for this.

Chapter 7: HVAC— Heating, Ventilating, and Air Conditioning

Guiding Principles

"And there shall be a tabernacle for a shadow in the daytime from the heat…" (Isaiah 4:6)

These guidelines incorporate the following principles:

- Standardization of HVAC systems for all new facilities
- Adequate comfort for occupants
- Adequate indoor air quality
- Conservation of energy resources
- Reduced maintenance
- Long-term cost savings

General

Codes and Standards

Standard plans comply with the latest versions of the International Mechanical, Plumbing, Fuel Gas, and Energy Conservation Codes. If standard plan requirements differ from a governing code, use the more stringent in design. If the Uniform codes are used then change the standard plans as required.

Standard plans may also comply with Official Supplements to the International Codes. Request and confirm acceptance from local authority having jurisdiction.

Standard plans follow industry standards such as ASHRAE (American Society of Heating Refrigerating Air Conditioning Engineers) and SMACNA (Sheet Metal and Air Conditioning Contractors' National Association.) If standard plan requirements differ from these standards use the more stringent in design.

Use ASHRAE standards dated no later than the most current International Code. For example, if the 2009 International Mechanical Code (IMC) is used, then the ASHRAE standard 62.1-2007 is followed.

Industry standards may be followed in lieu of code when approved by local authority having jurisdiction provided standard plan requirements are satisfied.

The Basic HVAC System

The standard plan HVAC system is comprised of several small capacity (residential type 5 ton and under) pieces of unitary packaged type equipment. This facilitates service and support by nearly all qualified HVAC installation and service companies.

Each unitary system represents a zone with a dedicated thermostat.

Large assembly type zones such as the chapel and cultural center may have two or four sets of small capacity unitary HVAC equipment, controlled by a single thermostat.

Localization of Standard Plan HVAC Systems

The appropriate standard plan option is to be selected according to four broad climate conditions. See the M000 sheet in each standard plan set for a detailed narrative. See also *Figure 7.1 Climate Zones – 2009 International energy Conservation Code* on page 7-13.

1. Standard Plan: Zones 4B, 5B, 6B, and 7B.
2. Hot/Dry: Zones 2B, 3B, 4B, and 5B
3. Mixed Humid: Upper 3A, 4A, 5A, 6A and 7A
4. Hot/Humid: Zones 1A, 2A, Lower 3A

Extreme Cold Climates

For sites where the ASHRAE winter design temperature is -20°F or below, a separate outdoor air preheat system will have to be designed by the consulting engineer. It will be site specific. It could include a boiler and hot water system or electric duct heaters.

HVAC Load Calculations

Standard plan HVAC load calculations are prepared using the Carrier E-20-II computer program. The calculations show the basis of design only for that specific standard plan. Copies of inputs and results/outputs are provided on standard plan CD's and are only to be used as a guide.

The mechanical engineer is to prepare project/site-specific HVAC calculations using the computer software of his choice. If the engineer's choice of software is also Carrier E-20-II then original HVAC calculations must still be produced.

Standard plan design summer/winter outdoor and indoor temperatures are listed on the first Mechanical (M) sheet of each standard plan.

Use project/site-specific summer/winter design temperatures when preparing HVAC load calculations. Adjust standard plan heating and cooling equipment capacities as required.

Do not add a safety factor to cooling and heating load results.

Outdoor Ventilation Air

Outdoor ventilation air rate and occupant density calculations for HVAC purposes:

- The 2009 International Mechanical Code - Table 403.3 - Minimum Ventilation Rates is the basis for people outdoor airflow rate, area outdoor airflow rate, and occupant density. The standard plans meet or exceed the code default minimum.
- Ventilation requirements are satisfied with mechanical ventilation.
- The standard plan people outdoor airflow rate is 7-1/2 cubic feet per minute (CFM) per person in all spaces except for the chapel. Use 5-1/2 CFM per person in the chapel.
- The standard plan area outdoor air flow rate is 0.06 cubic feet per minute per square foot.
- Do not use the values on the Occupancy and Exiting Plan on the standard plan General (G) Sheets. These values are higher than for HVAC purposes and lead to oversized equipment.
- See the standard plan HVAC load calculations for the number of occupants in each space.
- In the chapel where there is fixed seating, calculate occupancy using 20 inches per lineal foot of pew for each person.
- See Table below for IMC classification of standard plan spaces:

Table 7.1 IMC CLASSIFICATIONS

Standard Plan Space Name	IMC Occupancy Classification *
Chapel	Public Spaces - Places of religious worship
Cultural Center	Education - Multi-use Assembly
Relief Society	Education - Multi-use Assembly
Children's Meeting Room	Education - Multi-use Assembly
Triple Divided Classroom	Education - Multi-use Assembly
Classrooms	Education - Lecture Classroom
Serving Area	Education - Lecture Classroom
Bishop and Stake President	Education - Lecture Classroom
Clerk	Office - Office spaces
Foyers	Offices - Main entry lobbies
Material Center	Offices – Office spaces
Mother's Room	Not classified

* 2009 International Mechanical Code - Table 403.3- Minimum Ventilation Rates

Seminary and Institute Projects

See the standard plan HVAC load calculations for the number of occupants in each space.

The chapel and cultural center in large institutes are classified same as in meetinghouses.

Energy Issues

The standard plans are designed around natural gas for heating and electricity for cooling. If natural gas is not available, then an economic analysis should be done to determine the most economical fuel sources.

Alternative HVAC systems such as geothermal heat pumps, or systems using renewable energy sources may be considered, provided the total cost of ownership is considered and it makes economic sense.

Do not use an air-side economizer unless unalterably mandated by authority having jurisdiction after exhausting all appeals for an exception citing the limited number of occupied hours (less than 20 hours per week). If an economizer must be used, contact AEC for the standard plan economizer control drawings; however, AEC does not maintain standard plan economizer drawings for mechanical, electrical, architectural, structural sheets. These must be developed by the architect and his engineering team. Drawings have been developed by consulting teams in the Northwest for past specific projects and are available from AEC for use only as a guide.

Energy recovery ventilators (ERV's – **23 7223**) are used on selected zones in standard plan meetinghouses as a means to pre-condition incoming outdoor ventilation air. The purpose of the ERV is to mitigate the impact of large outdoor ventilation air rates on the unitary HVAC equipment, enabling this equipment to function within manufacturer's required tolerances. The criteria for their use are detailed in the heating and cooling sections.

Demand control ventilation based on carbon dioxide (CO_2) is used on selected standard plans. Do not add this control where it is not shown.

Gas fired equipment on standard plan meetinghouses use sealed combustion air or direct vent technology.

Heating

General

The gas fired packaged residential type furnace is the heating plant for each zone. **23 5417**

Furnace Selection for Heating

Select the furnace for high cooling and low heat capacity. A consulting engineer is to help with this, working with the manufacturer's representative.

Avoid over-sizing the furnace – this results in wide temperature swings in the space and occupant discomfort.

Select furnace to prevent high discharge air temperatures (greater than 120 degrees Fahrenheit). A minimum heating discharge air temperature should be the range from 96 to105 degrees Fahrenheit at the outdoor winter design temperature.

When mixed air (combination of return air and outdoor ventilation air) entering the furnace is below 50 degrees Fahrenheit, pre-heat the outdoor ventilation air. Do this with energy recovery ventilators (ERV's). The standard plans show ERV's where required. If site specific winter outdoor air conditions are lower than the standard plan value, add additional ERV's as required.

Ventilating

General

Standard plan ductwork is sized such that it should not need to be redrawn if HVAC capacities are adjusted. Sizes on plans may be adjusted a size one way or the other.

Air Distribution 23 3001, 23 3114, 23 3300, 23 3346

Standard plans require sheet metal ducts with limited flexible ductwork as described later in this section. Nonmetal or fiber board duct is not to be considered.

Air pressure drop through straight lengths of supply air and return air ductwork should be 0.06 inch of water column per 100 feet maximum. This is to account for the extra loss caused by duct liner and to accommodate the fixed-drive, small horsepower motors typically found in the furnaces.
Duct systems are considered as one inch water gauge (1" W.G.) duct pressure class as defined by SMACNA, Table 2-2, in *HVAC Duct Construction Standards 2008 Edition*.

Duct system supply air and return air between air-handling equipment and heated or cooled spaces. Do not utilize ceiling return air plenums. Exceptions may be considered for multiple story meetinghouses— contact AEC. Do not utilize corridor return air plenums.

Changes in direction for rectangular duct are to be effected by a 90-degree mitered elbow with single, thickness turning vanes.

Locate return air inlets at the floor level. An exception to this would be a small classroom where wall construction or code requirements prohibit a return air duct drop inside the wall stud space.

Do not locate return air duct drops in exterior walls.

For large spaces such as a chapel, cultural hall, or Relief Society room, provide a chase for a lined return air duct drop to floor level.

Locate ceiling supply air diffusers and side wall registers to prevent drafts on occupants and to ensure adequate mixing of supply air throughout the space. Refer to ASHRAE fundamentals chapter on space air diffusion.

Ensure that windows and exterior walls are washed with heating supply air.

Ensure that there is no short circuit of airflow between supply air outlets and return air inlets. Establish airflow patterns that avoid drafts on occupants.

In chapel or cultural center spaces in current standard plan meetinghouses, supply air is introduced high on the sidewall. The airflow pattern from these side wall supply air registers is specified to be set to direct the air upward and spread the air horizontally.

If project circumstances require changes in the standard plan construction details, changes should meet requirements of SMACNA standards for Duct Pressure Class 1, except where standard plan standards are more stringent.

Do not locate ductwork underneath the floor slab in slab-on-grade construction.

Use high efficiency take-off (HET) fittings with dampers for round supply air branch ducts. Do not use spin-in fittings with extractors.

Limit flexible duct to the final 6 feet servicing the supply air outlet, usually for ceiling supply air diffusers.

Seal all joints regardless of pressure class.

Line rectangular sheet metal ductwork with acoustical duct liner, except narrow return air drops inside 2 x 6 and 2 x 8 stud wall cavities, outside air ventilation ducts, and diffuser drops 12 inches in length or less.

Insulate ductwork that does not have acoustical duct liner, except for narrow return air drops inside 2 x 6 and 2 x 8 stud wall cavities.

Outdoor Ventilation Air

Indoor air quality requirements are met by dilution with outdoor ventilation air. See HVAC Load Calculations Section.

A motorized damper in the outside air duct is interlocked with the zone thermostat. By design it is fully open whenever the zone thermostat is in occupied mode (or when the remote room sensor override button is pushed) and it is closed whenever the zone thermostat is in the unoccupied mode.

A manual damper is in series with the motorized damper in the outside air duct. It is permanently set to allow the ventilation rate as prescribed by the mechanical code. The code-mandated ventilation rate is set up by the air balance contractor on new projects as directed in the construction documents by the consulting engineer for the project.

Outdoor ventilation air ducts are not lined on the inside; however, they are insulated on the outside.

2 or 4 Furnaces Serving a Common Space – Chapel or Cultural Center

Each furnace supply air and return air ductwork should be independent of the other the furnace(s). Do not combine the supply air or return air of two or more furnaces into a common plenum.

See the controls section for an explanation of how one thermostat controls multiple furnaces.

Exhaust

Usually, a single ceiling-mount exhaust fan is provided in each individual space. Two or more exhaust fans may be ducted into a common duct for a single larger roof or sidewall outlet. Provide a back draft damper on each exhaust fan whether it is ducted into a common duct or not.

Provide exhaust according to the chart below:

Table 7.2 EXHAUST REQUIREMENTS

Standard Plan Space Name	CFM Exhaust	Type of Control
Restrooms (Men's and Women's)	Code – Minimum	Motion Sensor
Font	200	Dial up timer
Mothers Room	50 – 100	Motion Sensor
Serving Area	200	Dial up timer
Custodial Room	70 – 100	Interval Timer

Air Conditioning

General

Residential type packaged electric add-on cooling is the cooling plant for each zone. **23 5417, 23 6213**

Split system direct expansion (DX) systems comprised of an air cooled condensing unit outside and a DX evaporator coil inside with interconnecting refrigerant piping is the basic cooling system. The furnace blower serves as the evaporator fan.

The 5-ton and under residential split system is the basic “building block” of the standard plans HVAC system. Small standard plans may have as few as two split systems and the largest will have eighteen split systems.

Cooling Equipment Selection

It is preferred to have a slightly undersized cooling plant capacity than a severely oversized. For example, if the calculate load is 4.2 tons then select a 4-ton unit instead of a 5-ton unit. Oversized equipment leads to poor comfort, lower efficiency, and poor humidity control in moist climates. The compressor may also be undersized relative to the indoor blower. Always consult manufacturer’s performance data.

Design cooling CFM is based on 400 cubic feet per minute per ton of cooling capacity. Unitary, direct expansion-type cooling equipment is inherently limited in latent heat removal capacity. Because of this, the sensible to total heat ratio requirement will not be achieved in all zones at standard plan conditions. This is particularly true in the high occupancy zones with a high percentage of outdoor ventilation air compared to total system supply air. Consider the following strategies for moist climates:

- Reduce the CFM/ton of supply air from the normal 400 to 350 or the lowest possible CFM/ton value. Work with local cooling equipment factory representative to ensure safe operating conditions for the DX cooling system.
- Select the next larger evaporator coil size.
- Avoid over sizing the compressor capacity in an effort to obtain more latent capacity. This results in poor humidity control in the occupied space.

Refrigeration Piping 23 2300

Most problems associated with cooling systems can be traced to faulty or improper refrigerant piping installation.

The isometric drawings show all valves and accessories such as filter drier and sight glass, elbows, and fittings.

Show refrigerant suction pipes sloped down in the direction of flow to the outdoor condensing unit.

Check installation for field traps— sags in piping that improperly permit liquid refrigerant and oil to settle in the off cycle.

Maintain the shortest possible distance between the indoor evaporator and the outdoor condensing unit to limit the length of piping. The maximum length of pipe between the outdoor condensing unit and indoor evaporator coil is to be 70 feet.

Cooling and De-Humidification in Moist Climates

The Church's design philosophy is to augment the conventional standard plan packaged unitary heating/cooling equipment with dehumidification equipment in the hot and humid climates of the United States as defined by *Figure 7.1 Climate Zones – 2009 International Energy Conservation Code.* Please see figure on page 7-13. See also Localization of Standard Plan HVAC Systems section on page 7-2 for an explanation of the four broad climate conditions.

The intent is to limit the maximum indoor relative humidity to 60 percent or less. The design utilizes the Honeywell TrueDry system. This includes a separate dehumidifier that is installed in parallel with the conventional HVAC system. The TrueDry utilizes a heat exchanger core to remove even more moisture from the airstream than conventional dehumidifiers.

During weekdays and nights when there is no load in the building and the conventional A/C system is in unoccupied mode, the dehumidistat feature in the T7350 activates the TrueDry unit as needed to maintain 60% RH or less in the occupied space. A separate remote humidity sensor must be added to the space along side of the remote temperature sensor.

Energy Recovery Ventilators (ERV) are also used to remove some of the moisture from the outdoor ventilation air stream.

CO2 control of outdoor ventilation air is also used. The damper is controlled either open or closed and not modulated because CFM quantities are relatively small.

Climate Zones – 2009 International Energy Conservation Code

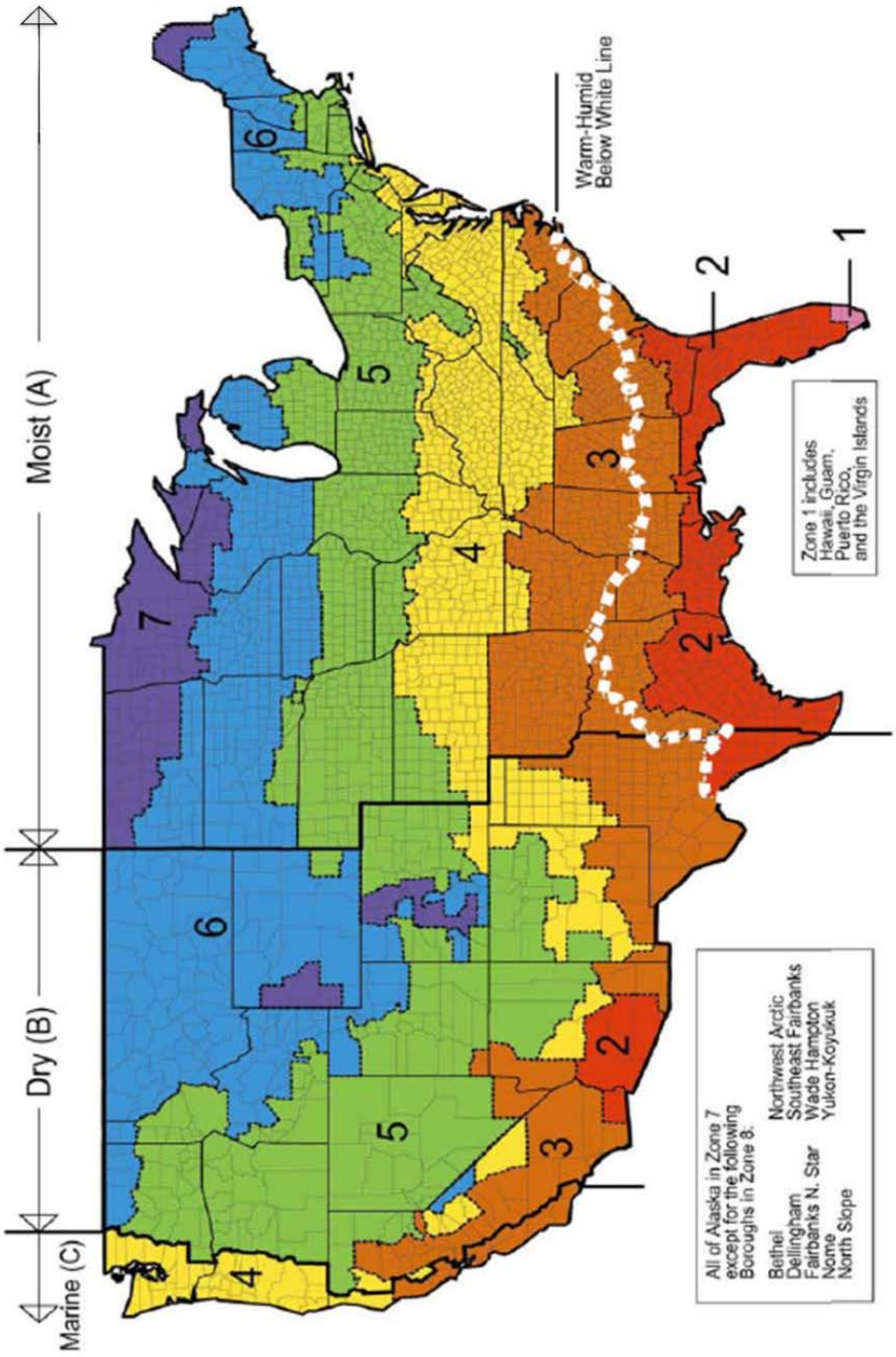


Figure 7.1

Noise control measures in standard plans often exceed that of typical commercial or educational buildings. This is detailed in subsequent sections. Mechanical systems should be designed to provide a maximum NC level in the chapel and cultural center of NC-30 and in the office and classroom areas, NC-35. They should be designed 5 NC points lower to achieve this result (NC-25 and NC-30 respectively).

It is intended that all ductwork be hung from structure overhead. Do not show ductwork mounted rigidly to upper access floor or floor of an upstairs mechanical room. Use flexible duct connections at equipment with fans or other moving parts.

Use acoustic duct liner in supply and return air ducts. **23 3300**

Use branch duct volume dampers. Do not use diffuser face dampers for volume control.

Use un-housed spring and neoprene vibration isolators and flexible connections to gas, electrical and plumbing connections which are installed on all major mechanical equipment.

Select diffusers and grilles for a NC of 25 or less. Do not utilize transfer grilles in doors.

Controls 23 0933

General

Owner has standardized on the Honeywell control components and accessories.

Honeywell has designated minimum contractor qualifications. Contractors may become certified by Honeywell. Do not hire contractors who do not meet these minimum requirements or who do not make the effort to become certified with Honeywell.

Components

The only approved thermostat is the 365-day programmable Honeywell T7350H (modulating version of this thermostat can also be used for hot water and steam applications.) This “H” model is capable of all different applications such as communicating, dehumidify, multiple stages of heat/cool.

The thermostat is located within a controlled yet easily accessible space—usually in the mechanical room near the HVAC equipment that it is controlling or in a locked space near the mechanical room such as at the base of the vertical return air shaft leading up to an overhead fan room in older style meetinghouses.

A remote room temperature sensor is located in the space where occupants can push an override button to activate the HVAC system if it is not already programmed on.

The Honeywell Webstat is an internet enabled appliance that connects to the meetinghouse internet system to facilitate remote management of the thermostats.

All other components such as damper actuators should be Honeywell and compatible with the T7350 thermostat.

Owner has designed a series of special Relay Panels, called RP panels, composed of off-the-shelf relays that are pre-mounted and pre-wired for specific control duty described in detail later in this section.

Authorized Distributors

In coordination with the owner, Honeywell has established a network of qualified distributors through the US and Canada who are familiar with the owner's specifications and expectations.

The installing contractor is to purchase all control equipment (Honeywell components and other non-Honeywell parts such as relays, relay panels) from a distributor located in the vicinity of the project site. For example, the installing contractor should not purchase equipment from a distributor in Salt Lake City if the project is in Florida, even if the contractor traveled from Salt Lake City. There are Florida based distributors listed in the standard plan specifications. The result is that there is local support for the installation in the future because the local distributor sold equipment for the project.

Control of Multiple Furnace Zones such as Chapel and Cultural Hall

The RP panel enables one thermostat to control and stage on and off two or four furnaces.

It is pre-built by an owner-authorized panel builder and should not be built by the installing contractor.

Wiring Diagrams

Installing contractor should follow standard plan wiring diagrams exactly to provide uniform installations to help facilities managers in future maintenance and basic troubleshooting.

Communicating Feature of the T7350 Thermostat

The T7350 thermostats in new construction are networked together.

The Honeywell WebStat is connected to the network of T7350 thermostats and provides internet access for remote management of the thermostats.

Outdoor Ventilation Air (OVA) Control

The T7350 thermostat controls the OVA damper open whenever it is in Occupied Mode. Otherwise the OVA damper is closed.

Replacement and Improvement Projects

The Basic HVAC System

Meetinghouse Replacement and Improvement Standards should always be applied before any components are replaced.

Refer to *Meetinghouse Replacement and Improvement Standards* when:

- Replacing all pieces of HVAC equipment
- Upgrading existing HVAC systems

Existing HVAC systems in older meetinghouses may be different than current standard plan HVAC systems. Existing systems should not automatically be replaced, changed out, or upgraded to resemble current standard plan systems. The existing HVAC system is likely the best solution for that particular building. Follow *Meetinghouse Replacement and Improvement Standards* and upgrade or replace components that are worn or obsolete rather than replace entire systems.

Do not perform straight-line replacement of HVAC equipment. Have a mechanical engineer make an evaluation of the system and recommend replacement equipment. The reason for this is new forced air furnaces may not have the same heating and blower capacity to match the old furnace, and the zone is then short on air flow and heating capacity overall.

Correct and improve poor HVAC zoning where the opportunity presents itself, but do not force architectural or structural changes with sole purpose of improving zoning. Where there is an extremely poor existing zoning problem and members' comfort is severely compromised, bring this to the attention of the architect and the project manager with recommendations.

All boiler systems should have a one-time asbestos survey done in accordance with Risk Management guidelines, due to the likely presence of asbestos-containing materials on insulated system components (boiler jackets, piping, and pipe fittings). Contact the project manager if presence of asbestos is suspected.

Outdoor ventilation air (OVA) requirements:

Follow the latest *International Existing Building Code* when changing or modifying HVAC systems. This code essentially allows existing design OVA rates to remain in place in most situations that occur in meetinghouse and seminary and institute projects.

Keep original or existing design OVA rates when:

- Replacing HVAC equipment only
- Changing or extending HVAC systems to accommodate space changes

Upgrade OVA rates to current code requirements when:

- The work area of the project exceeds 50 percent of the aggregate area of the building.
- The use or classification of the spaces served by the HVAC systems changes. For example, when several classrooms are combined to form a new small assembly area such as a Relief Society room.
- The entire HVAC system is replaced with new equipment and air distribution ductwork.

HVAC systems are not to be upgraded with the sole intent of adding OVA or increasing OVA from original design to current code requirements.

Older existing radiant heat systems may not have OVA provided to some of the classroom zones. Natural ventilation with operable windows may be considered. Follow code-prescribed minimum free openable window areas.

Heating

Involve a mechanical engineer so that design issues can be addressed and corrected.

Gas-Fired Packaged Residential Type Furnace **23 5417**

- These units have been installed for classroom zones in meetinghouses built during the 1960s through the 1980s. These units have been used exclusively for all zones in the ward-size and phased meetinghouses since the 1980s. Since 1999, all meetinghouses use this furnace throughout for serving all zones.
- Often, existing older furnaces have more fan/blower capacity than current models available from the manufacturer. They often had a belt-driven blower and larger horsepower motor. New furnaces are all direct drive blower motors and most have 3/4 horsepower blower motors. If an old furnace is replaced with a new furnace, the new furnace may not deliver as much air and as much pressure as the existing unit. Review airflow requirements and blower capacity of the replacement unit. Recently, Lennox and York have offered 1-horsepower models available that approach or match the airflow performance of older furnaces.
- Former standard plans often use a pair of “twinned” furnaces with common supply air and return air plenums. This is acceptable provided furnace manufacturers’ twinning kit is used for controls.

- See the controls section for an explanation of how one thermostat controls multiple furnaces.

Gas-Fired Duct Furnace **23 5513**

- This is a furnace section only installed in the discharge air duct of an air-handling unit. It is found most often in chapel and cultural hall systems and sometimes in classroom systems in meetinghouses built during the 1960s through the 1980s.
- Do not replace a duct furnace with two or more small packaged residential type furnaces.
- Current models of the gas fired duct furnace type are an acceptable replacement for old or failed units. Verify capacity because efficiencies have improved. Verify flue vent size and upgrade as necessary.
- Inspect the heat exchanger (HEX) for cracks. The HEX may develop a crack prematurely due to poor airflow across it. Have a consultant inspect the ductwork installation to see if it contributes to poor airflow across the heat exchanger.
- Verify code clearance between B vent exhaust pipe and roof or wall construction.
- Verify proper operation of field-installed high temperature limit safety switch.
- Upgrade control system with an air flow proving switch in the return air duct and timed fan control.

Copper-Finned Tube Boiler **23 5234**

- This type boiler is found in the Heritage and Legacy standard plans built in the late 1980s through the 1990s. Two of these constitute the central boiler plant. They are considered an instantaneous type boiler because there is no storage of hot water in the unit. The water passes straight through in a copper-finned tube HEX section. A burner similar to a gas-fired furnace heats the HEX section.
- These boilers are usually smaller than the storage type boilers. They can often be moved through a doorway. They are usually less expensive.
- Parts can be replaced or refurbished, but the point at which replacement is more economical occurs at a lower cost than for the larger boilers referred to above.

Boilers **23 5223**, **23 5234**, **23 5239**

- Many older boilers have been converted to burn natural gas or have been replaced with a natural gas-fired boiler. It is acceptable to replace an existing boiler with one of the same type. If existing boiler is coal fired, consult with project manager about the possibility of converting to another fuel type. With proper water treatment, these boilers can operate for 30 to 40 years.

- Obtain the services of a mechanical engineer and explain it is our policy to keep old boilers in operation until they fail or there are indications the boiler system is near failure. The engineer should evaluate the complete boiler system and provide a written report of his findings and recommendations on system repairs, replacement, or upgrades to the project manager.
- Accomplish inspection and evaluation work in the spring, shortly after the heating season is over.
- Install a 150-gallon condensate/boiler feed-water tank whenever replacing steam boilers as the new high-efficiency boilers do not have the required water volume.
- The mechanical engineer should hire a boiler service firm to evaluate the internal condition of the boiler, boiler tubes, cast iron shell, mud legs, breechings, stacks, boiler controls, and gas trains.
- Investigate boiler system components, such as system supply and return piping. Take a sample of both supply and return piping from approximately the midway point of the piping system and include a 90-degree elbow.
- Split this sample piping and fitting in half and observe the pitting and corrosion in the pipe, fitting, and fitting's threads. Measure depth of pits with a micrometer and make an estimate of system piping life based on the depth of the pitting corrosion and the thickness of the remaining pipe wall. If more than 50 percent piping needs to be replaced or the remaining pipe wall thickness is less than 50 percent of the original thickness (or the pit depth is greater than 50 percent of the pipe wall thickness), piping system is considered failed.
- Include photographs of the pipe samples in the report.
- Evaluate the existing radiation coils or convectors by having a sample cut out and measuring the tube wall thickness. Replace the tubing portion with a similar sized tube. Most coils and fin tube materials wear from the inside out. This evaluation should allow owner to predict the life of the existing system radiation coils.
- Pitting and other forms of corrosion should be looked for as this type of corrosion rapidly reduces radiation life.
- Include photographs of the samples in the report.

See *Boiler Decision Chart* for additional information.

Air Handling Units

It is acceptable to replace a failed AHU unit with a similar new AHU. These AHUs usually serve a chapel, cultural hall, or some other large zone.

Do not automatically replace a single large AHU with duct furnace combination with multiple smaller residential furnaces in an effort to replicate the current standard plan. This may be a case where the AHU duct furnace combination is the best fit for that particular meetinghouse.

Because AHUs have no moving parts except for the fan, they rarely fail.

Several parts of the unit can be refurbished and replaced piecemeal. Partial replacement and refurbishing prevents pulling the AHU out of a space that may require opening the roof or a wall. AHUs are often in spaces where it is not possible to move them out through a door.

Heating and cooling coils may also be repaired, cleaned in place, or replaced.

Fan Coil Unit (FCU) with Hot Water Coil

This is typical of some Heritage and Legacy standard plans built in the late 1980s through the 1990s. Two central copper fin tube boilers generate the hot water that is pumped to each of the coils inside the several fan coil units serving the various zones.

In meetinghouses, a FCU is usually smaller and less expensive than an AHU. An FCU may be refurbished; however, because it is smaller, it can usually be removed through a doorway.

Central Chilled Water Plant

Packaged air cooled: Compared to the water-cooled chiller these have a lower first cost, less maintenance effort/cost, but higher operating cost. They are typically skid mounted on a concrete slab outside of the meetinghouse. The refrigeration technology is the same as for split DX systems. In addition, expertise in chilled water pumping systems operation and maintenance is required.

Water-cooled with outdoor cooling tower: This type of chiller plant requires water treatment for the open-water cooling system in the outdoor cooling tower.

A central chiller plant may not always be a best fit for an existing building. There may be advantages to changing to the multiple, decentralized DX cooling units.

When a meetinghouse is partially occupied, such as the Relief Society only, or just the bishop's wing, a small DX condensing unit for that specific zone will cool the space. With a central chiller, a major piece of equipment is started up for a small cooling load, and this represents a larger electrical draw than if a single small independent condensing unit is activated.

Evaporative CoolingDX cooling is preferred over evaporative coolers. Replace evaporative cooling with a DX cooling system. Do not design new evaporative cooling systems.

Refrigeration Piping

Premature failures of condensing units can often be traced to faulty or improper refrigerant piping installation. Before simply replacing a failed compressor, have a refrigeration service technician review the refrigerant piping system for:

- Appropriate pipe size for correct gas velocity in suction piping for oil return
- Correct slope of suction pipe for oil return
- Plugged in line filter dryer
- Refrigerant leaks

Controls

Purchase thermostats from MTS or an authorized independent distributor as mentioned for new construction.

Installing contractors are to purchase the equipment through the same authorized independent distributors mentioned for new construction standard plans.

Installing contractors are to exhibit the same qualifications noted for new construction.

The thermostat approved for new construction is also the standard for replacement thermostats. However, thermostats should not be networked together.

If existing temperature control system is pneumatic, it should be replaced using the electronic thermostat described in the preceding paragraph.

Damper motors and other temperature control equipment should be replaced with what is currently specified in new construction.

All meetinghouses are to have, as a minimum, a seven-day programmable electronic thermostat with night setback capability for each HVAC zone. The energy codes require this.

So long as an existing electronic programmable thermostat is adequately controlling the temperature in the occupied space and parts are available, it should remain in service. When such a thermostat fails, it should be replaced with one as described for new construction standard plans.

When a new thermostat is installed, damper motors, relays, transformers, and other miscellaneous equipment should be reviewed for compatibility

with the new thermostat and operating condition. They should be replaced, if necessary, to ensure functional compatibility.

Wiring diagrams used for new construction are applicable to replacement projects where the existing systems are similar to those used in new construction, such as, a residential furnace with electric split system DX cooling. These new construction wiring diagrams should be used. Where older, existing HVAC systems are different, contact AEC for replacement and improvement wiring diagrams.

If a Webstat is desired in an existing meetinghouse the FM should first use the *Webstat Defensibility Assessment Tool* in order to justify the expense. Early replacement of functioning non-communicating thermostats may be justified when the Webstat is justified per the assessment tool referenced above.

Humidity Control in Moist Climates

Meetinghouses located in Climate Zones 1A, 2A, 3A, and parts of 4A may have mold and mildew due to high indoor relative humidity. See *Figure 7.1 Climate Zones – 2009 International Energy Conservation Code.*

Where indoor relative humidity levels persist above 60 percent there is cause to consider steps to limit the relative humidity to 60 percent or below.

Evidence of persistent relative humidity above 60 percent may include mold/mildew on books and building finish surfaces, swelling doors that do not shut or continual discomfort by occupants, *etc*.

Follow the *Mold Remediation Fact Sheet* prepared by the Church's Risk Management Department to remove the mold.

Identify the cause of high indoor relative humidity and identify the sources of perpetual moisture into the building such as ground water, excessive irrigation around the foundation, rainwater through compromised building envelope elements such as a leaking roof or large gaps in walls and windows. Correct these issues first before focusing on the HVAC systems.

Continuous monitoring is recommended to verify high relative humidity levels when these and other conditions indicate there may be a problem. Monitoring can be done by setting inexpensive battery powered temperature and humidity data loggers in the space for two to three weeks and then analyzing the data with help of related computer software. The cost is less than $80 per data logger and $100 for the computer software. Follow the *Humidity Monitoring to Control Mold Growth* document prepared by the Church's Risk management Department.

Ensure that all toilet exhaust fans are controlled by a motion sensor or at least a dial up timer.

Where high relative humidity (RH) is indicated, a stepwise approach is recommended beginning with the least expensive measures. Evaluate the results after the completion of each step. These steps are detailed below:

- Work with only one HVAC zone at a time. For example, identify the space(s) with high humidity and start with the HVAC system that serves those space(s).
- Ensure the outdoor ventilation air (OVA) system (auto and manual dampers) is functioning as designed and delivers minimum OVA.
- Replace the existing thermostat with a Honeywell T7350H model and enable/configure the dehumidify option for the existing HVAC equipment.
- Provide carbon dioxide (CO_2) based control of the outdoor ventilation air.
- Install the Honeywell TrueDry dehumidifier per the *Meetinghouse Dehumidification Technical Support Document*.

Site Visits during Construction

Recommended Minimum: Visit the Project Site at least seven (7) times to assist Architect with the services described in Section 6.E.10 of the Agreement between Owner and Architect.

Inspect and verify the work on the Project Site shown on the plumbing and mechanical drawings; related plumbing and mechanical work shown on the Site drawings; and plumbing and mechanical work described in the Contract Documents.

Minimum visits:

- Pre-installation meeting
- Underground plumbing rough-in before cover-up
- Above ground plumbing rough-in before sheetrock and start of duct work
- Plumbing rough-in @ 70-80% and HVAC @ 25-30%
- HVAC @ 70-80% and miscellaneous plumbing

- Substantial completion–equipment placement and operation/automatic temperature control function

- Final inspection - punch list verification

Inspect and verify exterior and interior utility lines, duct work, mechanical systems and plumbing systems before cover-up.

Verify that equipment, systems, and fixtures are properly balanced, adjusted and fully operational for Owner's intended use prior to Substantial Completion.

Recommend to Architect a qualified and licensed or certified air and water balance Testing Agency.

Verify the results of the air and water balance Test and Evaluation Report prior to Final Inspection.

Historic Properties

General

- This is a special case of a Replacement and Improvement (R&I) project.
- The guidelines for R&I projects are to be applied to historic properties with some additional considerations outlined below.

Heating

- Where possible, consider refurbishing and reusing original steam or hot water room radiators if they contribute to a room's historic appearance.

Ventilating

- If the appearance of standard plan interior grilles, ceiling supply diffusers, registers, and louvers conflict with historical nature of a space, then alternative devices may be considered or a decorative grille installed over the top of an air device may be considered provided air flow performance (air pressure drop, air throw pattern, and noise NC) is not compromised.
- Exterior wall louvers may be painted to match the color and décor of the exterior finish. Decorative grilles over the standard plan louvers may be considered but ensure air flow performance is not compromised. Do not substitute standard plan wall louvers with other types or models of louvers.
- Where new ceiling or sidewall supply air diffusers are required, coordinate location with architect. These may also be painted if necessary.

Air Conditioning

- Avoid ductless mini split heat pumps or air conditioning units where the indoor unit is exposed on the wall or ceiling.

- Refrigeration piping is to be hidden inside architectural features. Do not use a panted sheet metal cover attached to the side of the exterior wall.
- Consider sight screens around all outdoor air cooled condensing units.

Controls

- Non-white colors for thermostats may be considered.
- Wiring is to be out of sight. Do not use surface mounted conduit.

Chapter 8: Fire Protection

Guiding Principles

"…therefore let it be a good house, worthy of all acceptation, that the weary traveler may find health and safety while he shall contemplate the word of the Lord…" (D&C 124:23)

These guidelines incorporate the following principles:

- Standardization of sprinkler systems for all new facilities
- Life safety
- Conservation of natural resources
- Reduced maintenance
- Long-term cost savings

Fire Sprinkler and Extinguishing Systems

Design

ANSI/NFPA 13, 24, 101 and 1142 govern the design.

Fire Protection System

Owner requires a fire alarm system be installed in all meetinghouses and the local authority having jurisdiction should be consulted to determine scope of work.

Owner also requires an automatic fire sprinkler system be installed in all new meetinghouses, even when not required by local authority having jurisdiction with the exception of the Modular plan and Independence Series 50 standard plan meetinghouses, unless a local authority having jurisdiction unalterably mandates these smaller meetinghouse to have a fire sprinkler system.

For projects with fire sprinkler installations, always retain a fire protection consultant with main responsibilities to:

- Adapt owner's fire protection drawings to meet local conditions and codes. Confirm with local jurisdiction if a back flow preventer is required. This is not shown on the standard plans.
- Verify that piping is installed and sloped according to contract documents.
- Ensure that sprinkler heads are installed according to manufacturer's installation instructions.
- Verify that all pressure tests have been completed according to contract documents.

- Verify that fire protection system is fully operational prior to Substantial Completion.

A wet-pipe sprinkler system is to be installed in areas of the building where there is no chance of freezing temperatures.

All current meetinghouse standard plans that require fire sprinklers have a warm air attic and the fire sprinkler system is entirely wet. Glycol or dry systems should be required.

An antifreeze system is to be installed in areas of the building where freezing temperatures may occur, typically outside of the building insulation envelope. Provide allowance for the thermal expansion of the antifreeze.

The antifreeze solution must be premixed to provide protection against freezing due to temperatures at least 10 degrees Fahrenheit below winter design.

Verify the thermal envelope will keep the wet-pipe system from freezing. Do not change the location of the insulation envelope.

Provide accessible sample points at the high points of the antifreeze system. An accessible sample point does not require a ladder or crawling under or through trusses or other construction. In rural and suburban areas, when an adequate and reliable water supply system for firefighting does not exist, follow NFPA 1142.

Replacement and Improvement Projects

Unless unalterably mandated by the local authority having jurisdiction, a fire sprinkler system is not required in an existing building or in the addition.

Seminary and Institute Projects

Owner requires a fire sprinkler system in all buildings regardless of local codes. System design is to be the same as the meetinghouse.

Where a pod is attached to a meetinghouse, follow the sprinkling criteria for the meetinghouse.

Historic Properties

Installation of fire sprinkler systems in Historic Properties should be reviewed with the CHD curator before work takes place.

Fire Detection and Alarm 28 3101

For new meetinghouse construction, a monitored fire alarm and detection system is required for meetinghouses that have a fire sprinkling system. Owner will arrange for monitoring services. If a building does not have a

fire sprinkling system, a fire detection and alarm system should be included as necessary to meet local regulations. Typical/generic fire alarm and detection system documents are included with each standard plan, and they must be adapted to meet the local regulations for each project.

Replacement and Improvement Projects

Existing meetinghouses with existing passive (non-monitored or non-auto dial-out) alarm systems are not required to be upgraded to monitored systems.

Add a new fire alarm and detection system or expand an existing system only as required to meet local regulations. If a fire sprinkler system is added to the building, a monitored fire alarm and detection system should also be added.

The Church Security Department can now monitor fire, security, and environmental alarm systems for FM Groups in North America from Church headquarters. There is no charge to the FM group for this service. (See *Building Alarm Monitoring from Church Headquarters* for more information.)

Historic Properties

An automatic fire alarm and detection system is required in all Historic Properties and the system must report to the Church Security Department monitoring service. Perform associated installation work to minimize impact on existing décor and finishes. Generally, exposed raceway or cabling is not permitted.

Site Visits during Construction

Recommended Minimum

Visit the Project Site at least four (4) times to assist Architect with the services described in the Section 6.E.10 of the Agreement between Owner and Architect.

Inspect and verify the work at the Project Site shown on the fire protection drawings, the related fire protection work shown on the site plans and the fire protection work described in the Contract Documents.

Minimum visits to include:

1. Pre-installation meeting
2. Attic rough-in before sheet rock
3. 100% rough-in and pressure test
4. Substantial completion and alarm check

Certify the water pressure test for the fire protection system and verify that the fire protection system is complete and fully operational prior to Substantial Completion.

Chapter 9: Electrical

Guiding Principles

"…therefore touch these stones, O Lord, with thy finger, and prepare them that they may shine forth in darkness; and they shall shine forth unto us in the vessels which we have prepared, that we may have light…" (Ether 3:4)

These guidelines incorporate the following principles:

- Safe electrical systems for end users
- Simplicity of electrical design and system operation
- Minimization of electrical energy usage
- Minimization of required maintenance
- Long-term cost savings

Electrical Service and Rates 26 0503

Utilize the most economical electrical service option available at the project location. Clearly identify the respective responsibilities of the power company and the contractor in the contract documents. For non-phased meetinghouses, a 120/208 volt, 3 phase underground service is commonly utilized. If power company charges for 3 phase service are more than costs to use single phase, consider the necessary changes to the standard plan electrical drawings on the *Single Phase Instruction Sheet*. Locate pad-mounted transformer a minimum of 40 feet from building entrances. Minimize secondary feeder lengths and associated costs; however, also consider visual impact of transformer location. Size the main electrical service in accordance with applicable codes. Peak demand is typically 30 to 40 percent of total connected load for meetinghouses. Generally, demand-limiting/control equipment cannot be economically justified in meetinghouses due to low hours of use and the amount of equipment available for diversified operation. For non-phased meetinghouses, there is no need to provide electrical service capacity for possible future additions.

Replacement and Improvement Projects

Re-use existing electrical service and distribution equipment that is in good condition and of sufficient capacity. Utilize code provisions when adding loads to existing installations to minimize increases of existing services.

Seminary and Institute Projects

Peak demand is typically 40 to 50 percent of total connected load. For non-phased seminary and institute facilities, there is no need to provide electrical service capacity for possible future additions. Locate pad-mounted transformer a minimum of 40 feet from building entrance if the site is large enough to accommodate it. On projects with smaller sites, transformer may be located closer but care should still be taken to minimize visual impact.

Historic Properties

Modifications to existing electrical service should be done as required by governing codes and to accommodate approved facility improvements. Perform work to minimize impact on existing landscaping, building interior and exterior finishes and views (including the locations of utility transformers and metering equipment). Generally work shall be concealed.

Cables, Conductors, Raceway, and Conduit 26 0519 , 26 0523 , 26 0533

Install interior line voltage conductors in conduit where required by code. Interior low voltage cables (70 volts or less) of telephone, sound, data, fire alarm, and temperature control systems need not be run in conduit unless required by code. Exposed conduit or cables are permitted only in mechanical rooms and other utility spaces. Direct burial cable is not permitted.

Replacement and Improvement Projects

Exposed conduit may be used in existing finished areas only with owner's approval.

Historic Properties

Additions to or modifications of raceway and cable systems should be done only as required by governing codes or to accommodate approved facility improvements to such items as lighting, power, audio visual, data, fire alarm, security, and temperature control systems. Perform work so as not to compromise or destroy existing finishes especially in historically significant areas. Generally, exposed raceways and cables are not allowed.

Heating Cables (26 0520)

Rain Gutter and Roof Heating Cables

Installation of rain gutter and associated roof heating cable should usually be considered only on the north side of facilities in cold climates.

Snow Melting Cable in Exterior Concrete

Installation of snow melting cable in concrete is discouraged because of cost and longevity concerns. Installation of such is an exception requiring prior approval.

Wiring Devices 26 2726

Receptacle Design

Quantity and location criteria for duplex receptacles are tabulated in the *Receptacle Design Tables*.

Replacement and Improvement Projects

Because of the audiovisual and other equipment provided in meetinghouses, it is important to have outlets available as shown in the *Receptacle Design Tables*. Additional receptacles may be added in accordance with the tables as long as costs to do so are reasonable. Replacement of existing non-grounding duplex receptacles with grounding type should be considered when economical.

Historic Properties

Follow Replacement and Improvement Projects direction above. Perform associated work so as not to compromise or destroy existing finishes especially in historically significant areas.

Dimmer Switches

Refer to *Interior Lighting* section for approved uses and locations.

Replacement and Improvement Projects

Refer to chapel and cultural center portions of Interior Lighting section for uses and locations.

Occupancy Sensors

Refer to *Interior Lighting* section for approved uses and locations.

Replacement and Improvement Projects

Control of restroom lights and associated exhaust fans by manual switches should remain if installation of ceiling-mounted occupancy sensors entails significant expense.

Receptacle Design Tables

Table 9.1 MEETINGHOUSE

Area	Duplex	Note
Room (classroom)	One per room or partitioned area, located near chalkboard	
Rooms used for CES classes in meetinghouses	Three	
Primary room	Five	
Corridor	40' apart maximum	a
Relief Society room	Six on two circuits	
Bishop's office and Stake President's office	One per wall	
Clerks' office	Three	b
High council room	One per wall	
Material Center (Library)	Five or six on two circuits	
Serving area (Kitchen)	Five each on a separate circuit and one for refrigerator	c, h
Platform (Stage)	Four on two circuits	
Restroom	One GFCI type near mirror	
Foyer	One per wall	d
Cultural center	Ten to twelve on multiple circuits	
Chapel	One for organ (separate circuit), one inside pulpit, one on side of pulpit, one in front of pulpit, others for cleaning	e f
Building exterior	One GFCI type inside at each entrance, one weatherproof GFCI type for mechanical equipment per code	
Mechanical room	One in room or adjacent accessible room	
Mothers' room	One	
Font	One nearby GFCI type	g

Area	Duplex	Note
Custodian	One GFCI type	
Family history	As directed by owner	

NOTES for Table 9.1:

a) Provide additional receptacles as required for electric water cooler (fountain).
b) No special provisions for computers are required. Surge suppression equipment is supplied by owner for computers.
c) GFCI protection required for receptacles mounted to provide counter service.
d) Split wire so top receptacle is controlled by wall light switch.
e) Install empty 1-1/2-inch conduit from electronic organ console to tone chamber when a single tone chamber is used or a 1-inch conduit to each tone chamber when more than one is indicated.
f) Receptacle in pulpit is for motorized adjustable pulpit mechanism.
g) GFCI protection required for lighting over font. Provide bonding for font in accordance with National Electric Code (NEC).
h) If a garbage disposer is to be installed, provide circuiting as required and locate switch above counter at same height as duplex receptacles.

Table 9.2 SEMINARIES AND INSTITUTES OF RELIGION

Area	Duplex	Notes
Classroom	Five or six with three on the front wall	a
Office	Four	b
Support Specialist	Six	b
Workroom	Seven or eight	a,b,c

NOTES for Table 9.2:

a) Provide receptacle for audiovisual system; refer to standard plans for specifics.
b) Coordinate locations and mounting with cabinet work per standard plan details.
c) Provide for refrigerator, microwave, and GFCI type receptacles for counter service.

Interior Lighting 26 5100

Lighting Design

Lighting Design Tables identify lighting levels and general fixture types. The Fixture Schedules on the standard plans contain specific lighting fixture catalog numbers and lamp types. Additional lighting beyond what is shown on the standard plans, such as increased accent or artwork lighting, should not be included. In the interest of maintenance, the number of different lamp sizes and types has been minimized. Fluorescent lamps with electronic ballasts are the primary lighting source. Warm-color temperature (3000K) fluorescent lamps provide a less institutionalized feeling and provide better appearance for flesh tones. Low hours of building use and design lighting levels typically preclude the use of energy-saver and long-life lamps in meetinghouses. High-intensity discharge (HID) lighting is not used for interior applications due to warm-up and re-strike times, and ballast noise potential. When a governing energy code requires changes to the lighting design or control schemes, make adjustments that minimize impact on cost and complexity. Consult with owner for preferred method of complying with code required automatic lighting control for chapel and cultural center areas. Assist the architect in obtaining any available rebates for lamps, ballasts, occupancy sensors, or other lighting equipment.

Chapel Lighting

A combination of lighting fixture types is used to obtain desired lighting levels and provide switching flexibility. In the interest of maintenance and energy use, fluorescent and compact fluorescent sources are used primarily, including use in decorative pendant and wall fixtures. A switch is located at each door to allow a sufficient light level to be turned on for access to the light switch bank at the front of the chapel. This switch bank controls all lighting in the chapel and each switch is to be labeled as to use. Switching arrangement should provide that all rostrum lighting can be separately switched off for meeting broadcasts to other locations. Circuiting and switching should be arranged so a low lighting level is available for viewing of broadcasts.

New Custom Meetinghouse

Lighting of chapels in new custom meetinghouses usually requires individualized solutions to satisfy aesthetic, light level, operational, and maintenance requirements. Pendant fixtures shown on the standard plans may not be appropriate for use in new custom meetinghouses. Consult with owner for options for decorative pendant fixture types. Faux alabaster lenses or enclosure are not authorized. Adjust switching arrangements to be similar to what is shown on the standard plans, when economically feasible. Arrange circuiting and switching so a low lighting

level can be provided if chapel will be utilized for satellite broadcasts. A slide dimmer switch may be used on an incandescent lighting circuit to provide the low lighting level. Do not add additional dimming switches or equipment.

Replacement and Improvement Projects

Replace lighting in accordance with *Meetinghouse Replacement and Improvement Standards*.

Relighting of chapels in existing meetinghouses usually requires individualized solutions to satisfy aesthetic, light level, operational, and maintenance requirements. Pendant fixtures shown on the standard plans may not be appropriate for use in existing meetinghouses. Consult with owner for options for decorative pendant fixture types. Faux alabaster lenses or enclosures are not authorized. Adjust switching arrangements to be similar to what is shown on the standard plans, when economically feasible. Arrange circuiting and switching so a low lighting level can be provided if chapel will be utilized for satellite broadcasts. A slide dimmer switch may be used on an incandescent lighting circuit to provide the low lighting level. Do not add additional dimming switches or equipment.

Historic Properties

Relighting of chapels requires individualized solutions to satisfy sometimes conflicting requirements. New lighting needs to coordinate with the existing design and aesthetics. It must provide recommended light levels in an energy efficient manner. Architects and engineers should be retained that have lighting expertise with historic preservation work and should consult with the Church History Department on relighting decisions. Consider repairing original lighting when appropriate or feasible.

Cultural Center Lighting

Primary lighting is provided by fluorescent fixtures that are circuited and switched to allow a uniform half-level of lighting. Slide dimmer-controlled incandescent fixtures provide low-level accent lighting. When a cultural center has a platform, the associated ante-proscenium and platform light tracks are also controlled with slide dimmer switches.

Replacement and Improvement Projects

When upgrading cultural center lighting, provide switching control to allow a uniform half-level of lighting, if costs to do so are not excessive. Slide dimmer switches may be specified to control incandescent accent, ante-proscenium, and platform lighting. Do not add additional dimming switches or equipment.

Occupancy Sensors

Tamper-resistant passive infrared wall sensor switches with manual “on” and automatic “off” capability control lights in rooms (class rooms), offices, material center, serving area and large storage rooms. Lighting in small storage and mechanical or electrical rooms should be by digital time/timer switch. Ceiling mounted infrared occupancy sensors control lights in Relief Society and primary rooms with conventional wall switches providing manual “off” capability. Ceiling mounted ultrasonic occupancy sensors control restroom lights and associated exhaust fans and font lights. Occupancy sensors in other locations may be added if required by governing energy regulations.

Replacement and Improvement Projects

Occupancy sensors may be added in existing buildings if required payback can be demonstrated.

Exit Signs

Exit signs are included to indicate lanes of egress from assembly areas and to identify exits as required by governing codes. The Fixture Schedules on the standard plans contain specific catalog numbers for exit signs. Also refer to Lighting Design Table 9.3.

Replacement and Improvement Projects

Generally replace existing illuminated exit signs with new signs identified on the standard plans.

Historic Properties

Exit signs should be added or updated as required by governing codes. Perform associated installation work to minimize impact on existing design and finishes.

Emergency Lighting

Emergency lighting is included in classrooms, corridors, restrooms, meetinghouse chapels, meetinghouse cultural centers, and other assembly areas as required by governing codes. Battery packs concealed in the regular fluorescent fixtures or additional low-profile lighting fixtures with integral batteries are preferred. Central battery units may be used where economical.

Historic Properties

Emergency lighting should be added or updated as required by governing codes. New emergency lighting and associated installation work must be done to minimize impact on existing design and finishes.

Night Lights

Low wattage, continuously “on” night lights are included in standard plan restrooms. Do not include night lights in corridors or other areas unless required by local codes or conditions.

Existing Lighting Levels

Replacement and Improvement Projects

Compare existing lighting levels with those listed in the Lighting Design Tables. A good quality lighting meter and its proper application are necessary for evaluating existing lighting levels. Where levels are low, verify that proper lamps are being used. When fixture changes or additional fixtures are necessary, use recommended types.

Historic Properties

Whenever possible, lighting levels should meet those listed in the Lighting Design Tables. Special conditions in historically significant areas should be discussed with the CHD curator prior to making changes.

Existing Lighting Fixtures

Replacement and Improvement Projects

Replace lighting fixtures in accordance with the *Meetinghouse Replacement and Improvement Standards*. Replacement of lighting fixtures primarily to obtain energy savings must meet Church required payback criteria. Consider condition of existing fixtures to determine whether total or incremental costs need to be used in the payback calculation. Do not include requirements in project documents for cleaning and re-lamping of existing fixtures that will be reused. Owner will take care of this when the project is completed.

Historic Properties

Replacement of lighting in historically significant areas of these facilities should be discussed with the CHD curator prior to making changes. Perform associated installation work to minimize impact on existing design and finishes.

Fluorescent Lamps and Ballasts

Replacement and Improvement Projects

Update fluorescent lamps and ballasts to match those shown on current standard plans where Church required payback criteria can be met. Do not mix the use of old and new fluorescent lamp technologies in the same room or corridor. Low-wattage or long life fluorescent lamps should generally not be used unless they are presently being used and are providing satisfactory performance.

Existing Incandescent Lighting Fixtures

Replacement and Improvement Projects

Inspect existing incandescent fixtures for heat damage or brittle or cracked wiring. Replace fixtures whenever these conditions are observed. Replace recessed incandescent fixtures which are rated 200 watts or higher, as usually found only in older chapels and cultural halls. Other than in low use areas, such as closets or storage areas, replacement of existing incandescent fixtures with fluorescent can nearly always be justified.

Historic Properties

Existing lighting fixtures which exhibit signs of heat damage should be repaired or replaced. Replacement of lighting in historically significant areas of these facilities should be discussed with the CHD curator prior to making changes. Perform associated installation work to minimize impact on existing design and finishes.

Switching

Replacement and Improvement Projects

When necessary, make changes so switching control is in the same space where the lighting fixtures are located. Add local switches where feasible, so circuit breakers in panel boards are not the primary switching devices.

Historic Properties

Follow Replacement and Improvement Projects direction above. Proposed switching changes or additions in historical areas of these facilities should be discussed with the CHD curator prior to the performance of any work. Perform associated installation work to minimize impact on existing design and finishes.

Lighting Design Tables

Table 9.3 MEETINGHOUSE LIGHTING DESIGN

Area	fc [a]	Lighting Fixture Type [b]
Room [c] (classroom), Primary room, corridor, overflow, family history [d], mothers' room, font, dressing	20–30	Fluorescent, recessed or surface mounted
Office, workroom, high council room	40–50	Fluorescent, surface mounted wraparound for solid ceilings
Relief Society room, material center, serving area	30–40	Same as above except fluorescent, cove, pendant, surface mounted, recessed in Relief Society room
Rooms used as CES classrooms	50–60	Same as above

Platform (stage)	20–30	Fluorescent, surface mounted wraparound or chain suspended
Restroom	20–30	Fluorescent, surface and wall mounted above mirrors; include low wattage night light in restrooms without windows
Foyer	15–20	Fluorescent, surface mounted, cove; compact fluorescent recessed, pendant, or wall
Cultural center (general)	30–40	Fluorescent, metal-sided, surface mounted with high-impact-resistant plastic lens, 2'x4' size (do not use 4' x4' fixtures)
Cultural center (low-level accent lighting)	-	Recessed incandescent
Platform (with proscenium arch) Ante-proscenium lights	-	2 surface mounted fixtures with 4 incandescent spot lamps in each
Border light (for old stages)	-	Suspended 20-foot aluminum channel with 20 incandescent swivel sockets and 6 receptacles; lamps: 5 white, 5 red, 5 blue, 5 amber
Area	**fc [a]**	**Lighting Fixture Type [b]**
Platform (without proscenium arch) Ante-proscenium lights	-	2 two-circuit light tracks, surface mounted with 8 incandescent spot track fixtures
Borderlight	-	2 two-circuit light tracks, surface mounted with 16 incandescent track fixtures; lamps: 4 white, 4 red, 4 blue, 4 amber
Chapel (rostrum and congregation)	20-30	Fluorescent, cove, pendant, or surface mounted. Compact fluorescent recessed (not over rostrum), pendant, or wall mounted
Chapel (pulpit accent)	-	Incandescent floodlight, surface mounted or recessed. Light angle 60 degrees with horizontal and 90 degrees apart in plan
Mechanical room, storage	10–20	Fluorescent in large rooms; incandescent in small, low-use rooms
Exterior at entries	-	HID controlled by photocell/time switch, surface mounted, recessed or wall fixtures

Parking area	- [e]	High pressure sodium cut-off fixture, 150 watt, on 18' hinged-base aluminum pole
Exit signs	-	LED type with integral battery for new construction. In existing applications replace self-luminous (tritium) type as they expire with new self-luminous signs.
Exit signs (low level if required)	-	Phosphorescent if permitted; otherwise use self-luminous type
Emergency lighting (interior)	- [f]	Battery packs in fluorescent fixtures
Emergency egress lighting (exterior)	- [f]	Lamp heads and battery units

NOTES for Table 9.3:

a) fc (foot-candle) as used in the Table is the calculated average maintained level.

b) Refer to owner's current standard plan for specific fixture manufacturers and catalog numbers that identify desired quality, cost, and efficiency criteria. While architect and consultant have the option to approve "equals" (before bid), other manufacturers and styles must meet this same criteria. Consult with the owner concerning questions. In all cases when preparing lighting schedules, list two or more fixture manufacturers for each fixture type to ensure competitive bidding.

c) Areas referred to as rooms are primarily discussion areas that do not require the higher light levels normally associated with school classrooms.

d) When family history rooms are included in a meetinghouse, the light level must be adequate for difficult visual tasks such as reading small or poor quality print for extended periods.

e) Refer to Exterior Lighting section.

f) To meet code requirements

Table 9.4 SEMINARIES AND INSTITUTES OF RELIGION

Area	fc [a]	Lighting Fixture Type [b]
Classroom	70–80	Fluorescent, surface mounted, wraparound or recessed [c]
Office/secretary/workroom	70–80	Same as above
Hallway/Corridor	30–40	Same as above
Foyer	30–40	Decorative incandescent or fluorescent, surface or recessed

NOTES for Table 9.4:

a) fc (foot-candle) as used in the table, is the calculated average maintained level.

b) Refer to the owner's current standard plan for specific fixture manufacturers and catalog numbers that identify desired quality, cost, and efficiency criteria. While architect and consultant have the option to approve "equals" (before bid), other manufacturers and styles must meet this same criteria. Consult with owner concerning questions. In all cases, when preparing lighting schedules, list two or more fixture manufacturers for each fixture type to ensure competitive bidding.

c) Refer to standard plans for preferred layout.

Exterior Lighting 26 5600

Parking Area Lighting

Pole mounted single head cut-off fixtures are recommended for parking area lighting because of their efficiency in providing lighting coverage and control. Generally, the parking area closet to the building should receive the main lighting emphasis because it is the area that is used the most. Locating fixtures close to the building utilizes the spill light from the fixtures to provide walkway and building security lighting. Power company rental lights are generally not economical except in areas of high vandalism.

In laying out parking area lighting, consider impacts such as glare and light trespass on adjacent neighbors. Coordinate locations of fixtures with landscaping elements to avoid conflicts.

Fixtures should not be located on the perimeter of the lot unless required by the local jurisdiction. Illuminance levels at the site perimeter should not exceed 0.2 fc.

For design purposes, divide the parking area into 2 lighting design zones:

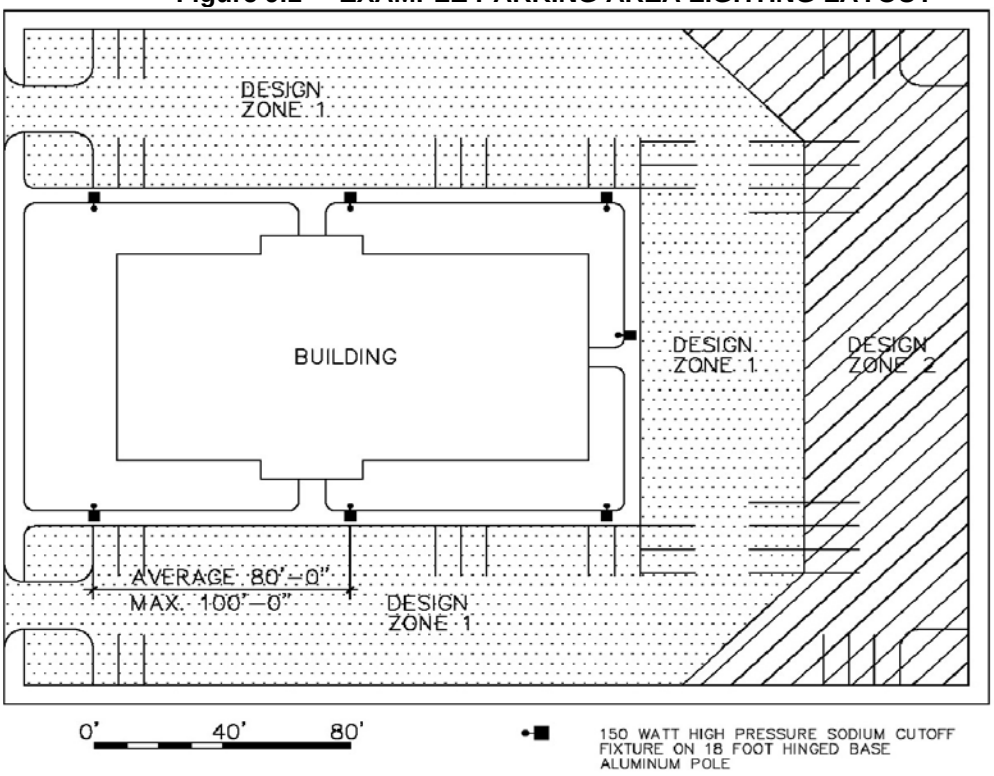
ZONE ONE - the first 65' out from the inside edge of the sidewalk around the building, driveways, and any site stairs. Design this zone for a minimum illuminance level of 0.2 fc (horizontal).

ZONE TWO - the rest of the paved parking area. The lighting in this zone may be allowed to fall off to a minimum of 0.01 - 0.02 fc. Provide ZONE ONE lighting in this zone if there are site safety concerns or it is required by the local jurisdiction.

See Lighting Design Table and Figure 9.1 – Example Parking Area Lighting Layout for additional information.

Control lighting with "photo cell on", "time switch off" combination so the option exists to turn lighting off in the early morning hours for energy conservation.

Figure 9.1 EXAMPLE PARKING AREA LIGHTING LAYOUT



Replacement and Improvement Projects

Older parking area lighting layouts and systems will likely not meet the design direction outlined above. Where minor improvements or additions to existing parking areas are to be done, replacement of the whole lighting system is likely not justifiable so additional lighting should be provided similar to what currently exists. Where major parking area work is to be done, the whole system should be evaluated to determine the feasibility of changing it to meet current design direction.

Historic Properties

Unless required by local ordinances, it is generally not necessary to modify or change existing parking area lighting in an attempt to make it better harmonize with the historic facility.

Other Exterior Lighting

Exterior building lighting is included at building entries and controlled with a “photo cell on”, “time switch off” combination separate from the parking area lighting control.

If a flag pole is installed on the site, unobtrusive pole or building mounted energy efficient lighting should be provided with photo cell control and a disconnect means for when a flag is not posted.

Do not include the following on meetinghouse projects (unless otherwise noted):

- Building accent lighting or floodlighting
- Tower, steeple, or spire lighting (may be included on new meetinghouse projects only if DTA approved. A standard plan option sheet is available with layout and control details. Comply with applicable exterior lighting ordinances and energy codes. For Replacement and Improvement Projects, PFAC approval must be obtained.)
- Walkway lighting, other than as provided by parking area lighting
- Landscape lighting
- Lighting fixtures mounted on or in the ground

Exterior Emergency Egress Lighting 26 5200

Include as required by code. System should generally consist of small, directional exterior lamp heads at the exits with the associated battery units located inside the building in mechanical equipment or other accessible utility spaces.

Replacement and Improvement Projects

In addition to the above information, it may be necessary to include building mounted security lighting where existing site conditions dictate.

Seminary and Institute Projects

Provide lighting for small parking areas in accordance with the seminary and institute standard plan conceptual site plans. For large parking areas provide meetinghouse “zone one” design or match the design levels of the educational institution where the project is located.

Lightning Protection System 26 4100

Lightning protection is required for all meetinghouse steeples or towers and is shown on the standard plans. Generally, surge suppression and additional lightning protection for the building should not be included, unless the building is in an area of high lightning activity or is an isolated structure on an elevated site and local common practice is to provide a full building system. A surge arrestor should be provided for the landscape sprinkler controller. Typical building lightning protection system designs are available for each standard meetinghouse plan.

Design and specify required building lightning protection systems in accordance with the Standard for the Installation of Lightning Protection Systems (NFPA 780); a UL master label is not needed.

Replacement and Improvement Projects

If a new lightning protection system is required on an existing building, conceal down conductors when possible. If down conductors must be run exposed, then route them as unobtrusively as possible. Do not compromise the integrity of the roofing system with the lightning protection system.

Seminary and Institute Projects

Generally, seminary and institute projects do not require a lightning protection system unless the building is in an area of high lightning activity or is an isolated structure on a hilltop and common local practice is to provide a full lightning protection system

Historic Properties

Follow Replacement and Improvement Projects direction above. Perform work for exposed installations to minimize impact on facility exterior appearance.

Telephone and Network Connectivity Systems

Telephone System – Electrical 26 0523 26 2726 26 0533

Coordinate with telephone service provider and meet requirements for service including conduit and trenching as necessary. Clearly identify responsibilities of provider and Division 26 in contract documents. Furnish and install boxes at telephone outlet locations (box may be common with connectivity outlet), associated raceway, and grounding provisions. Provide and install telephone system cable and terminations only when Division 27 Cabling is not included in the project documents. Do not run cables exposed in finished areas. Telephone sets will be furnished and installed by owner.

Replacement and Improvement Projects

Identify cabling responsibilities which may be by Division 26 or 27 depending on project circumstances as directed by owner.

Network Connectivity System – Electrical 26 0523 26 2726 26 0533

Coordinate with internet service provider and meet requirements for service including conduit and trenching as necessary. Clearly identify responsibilities of provider and Division 26 in contract documents. Furnish and install boxes at connectivity (data) outlet locations (box may be common with telephone outlet), associated raceway, and grounding provisions. Provide and install connectivity system cable and terminations only when Division 27 Cabling is not included in the project documents. Do not run cables exposed in finished areas. Furnishing and installing of connectivity system components is by owner.

Seminary and Institute Projects

Internet service is required in all Seminary and Institute projects at the telephone terminal location. Division 26 is responsible for cabling from patch panel on terminal board to all class rooms (at front adjacent to A/V and computer station cabinet), offices (2 locations per office), workrooms (at printer/copier location), and at Support Specialist (Secretary) office. System components will be furnished and installed by separate contract arranged by owner.

Project Site Visits

The project manager, Architect, and consulting electrical engineer jointly determine the number and purpose of site visits to be performed by the engineer. This information is then incorporated into the *Agreement between Owner and Architect*. It is recommended that the engineer attend pre-installation meeting(s) and that a minimum of three (3) site visits be made by the engineer to verify that the work is in full compliance with the contract documents and that the:

1. Electrical rough-in is correct prior to cover-up;
2. Main electrical service, main electrical panel, and electrical sub-panels are correctly installed before the electrical system is energized; and,
3. Entire electrical system is complete and fully operational prior to Substantial Completion.

Engineer shall prepare and submit site visit reports in accordance with *Agreement between Owner and Architect*.

Sound System - Electrical 26 0523 26 0533

Design of the sound system is by an AEC approved consultant. Division 26 is responsible for sound system cabling and associated raceway as indicated in the standard plan documents. Cables and raceway should not be run exposed in finished areas. Power needs to be provided for the main sound equipment cabinet as well as grounding provisions. Sound system components are furnished and installed by Division 27.

Seminary and Institute Projects

A raceway system for sound and A/V cabling and components is detailed on the standard plans. Furnishing and installing of sound and A/V system components, including ceiling speakers, is by separate contract arranged by the owner.

Meetinghouse Satellite Dish Receiving and TV Distribution System - Electrical

Replacement and Improvement Projects

Replace systems in accordance with the *Meetinghouse Replacement and Improvement Standards*.

Design of the system is by the AEC approved acoustical consultant who will provide drawing to electrical engineer. These drawings are to be included in project documents. Furnishing and installing of the system components is included under Division 27 of the master specifications.

A raceway system is required for the cabling between the satellite dish and the building TV distribution system. Metal equipment cabinet, cables, and device boxes are included. Cables inside the building need not be run in conduit. They should not be run exposed in finished areas. Power is provided for the system. Furnishing and installation of the system components is included under specifications Division 27.

Signal System

A class dismissal bell signal system is not authorized in new meetinghouses.

Replacement and Improvement Projects

Where a bell signal system exists and is operational, it may be updated and extended to new addition areas as directed by owner.

Seminary and Institute Projects

The class dismissal system consists of chimes in classrooms and corridors, and a time clock/programmer. Bells are not to be used.

Chapter 10: Sound, Satellite, Acoustics, and Network Connectivity.

Guiding Principles

"For it shall come to pass in that day, that every man shall hear the fullness of the gospel in his own tongue, and in his own language…"
(Doctrine &Covenants 90:11)

These guidelines incorporate the following principles:

- Quality of sound, satellite, and acoustic systems
- Simplicity of system operation for end users
- Provide assistive listening system
- Provide network connectivity and webcasting capability
- Minimization of required maintenance
- Provide office sound privacy

Telephone and Network Connectivity Systems

Telephone System 27-1501

Run separate, uninterrupted cables (Home Run) from each outlet location to a patch panel located at the telephone terminal board. Outlet locations include satellite equipment location, one foyer, and all offices. Cables should be run in conduit in inaccessible areas where they may need to be replaced as technology advances. They may be paired with data cables. Do not run cables exposed in finished areas. Telephone sets will be furnished and installed by owner. Telephone cables are the same as data cables so are installed accordingly.

Replacement and Improvement Projects

Provide telephone system cables to new addition locations as directed by owner.

Network Connectivity System 27-1501

Wired network access consists of network cables running from the firewall to wall jacks. Wired connections should be used primarily where computers are permanently located and where multimedia content will be uploaded or viewed.

Run separate, uninterrupted cables (Home Run) from each outlet location to a patch panel located in close proximity to the firewall location. Cables should be run in conduit in inaccessible areas to allow for future technology requirements. They may be run in same conduit as telephone cables. (Telephone cables are the same as data cables so are installed

accordingly.) Furnishing and installing of system components is by owner. Coordinate with Internet service provider and meet their requirements for service. Clearly identify responsibilities of internet provider and contractor in contract documents. Do not run cables exposed in finished areas. These runs would generally include technology equipment area, clerks offices, chapel pulpit, rear side chapel, sides and rear of cultural center, larger classrooms, relief society room, library, family history center, and utility equipment control locations (as required). For additional information, see: https://tech.lds.org/wiki/Meetinghouse_wired_networking.

Support equipment would include network switch, patch panel, and power injectors for the wireless access points. If webcasting from meetinghouse, provisions need to be provided to connect sound system audio and camera video to webcasting device or computer. See: https://tech.lds.org/wiki/Meetinghouse_technology

Wireless Connections requires the placement of wireless access points in key areas of meetinghouse. Wireless is a convenient way for people to connect to meetinghouse network and is often a practical way of providing Internet access to most parts of a building. Note that the Church-approved firewall may have wireless built-in. See: https://tech.lds.org/wiki/Meetinghouse_wireless_networking

Seminary and Institute Projects

Cabling for network connectivity is required in all Seminary and Institute classrooms at the A/V cabinet location. Network connectivity is also required in all offices (2 locations per office), workrooms (at printer/copier location), and in Support Specialist (Secretary) office.

Sound Reinforcement

The function and objective of the system is to provide clear, audible sound reinforcement to persons with normal and slightly impaired hearing. The children's meeting room sound system is used primarily as a teaching tool for children to learn how to use a microphone.

Chapel

The chapel sound system is designed to reinforce speech of inexperienced users at the pulpit, sacrament table, rostrum, and in the congregation. It should provide reinforcement of vocal soloists at moderate volume levels and include a sound system output connector that can be used for recording appropriate material such as funerals, missionary talks, and meetings for use by members of the Church who are confined to their homes. It should provide playback of satellite audio in buildings equipped with a satellite reception system.

Cultural Center

The cultural center sound system should provide playback of sound originating in the chapel when the rooms are combined. When combined with chapel, the cultural center level should be 3 decibels (dB) higher than level of chapel. It should provide reinforcement of simple music and dramatic events and playback of recorded material for dances, exercise, and so on at moderate volume levels. When the cultural center sound system is used, the overall volume of the cultural hall sound system should be reduced 6 decibels when there is one folding partition separating the cultural hall from the chapel when the chapel system is on.

Relief Society & Children's Meeting Rooms

The Relief Society and children's meeting room sound systems should include mixer amplifiers, and two microphone inputs in each of the two rooms wired in parallel. The system should include switching for audio overflow from the chapel system or from the cultural center system when the chapel system is off.

Foyers, Mothers' Room, High Council Room, Combinable Classrooms

Foyers, mothers' room, high council room, and larger combinable classrooms should be able to have overflow sound from the chapel system when it is on or from the cultural center system when the chapel system is off.

Replacement and Improvement Projects

An AEC approved acoustical consultant should evaluate existing sound systems and, if necessary, design an updated system. Existing components should be evaluated by consultant and reused in new design where possible. System should not be replaced solely to update technology.

Seminary and Institute Projects

Classroom sound system components to be provided and installed under separate owner contract. Conduit raceway, speaker enclosure openings, blocking for projector and screen mounting and electrical boxes are to be included as part of the contractor's responsibilities.

General Design Considerations

Standard plan drawings include a complete sound system design that should be used as shown unless architectural changes approved by project manager require modifications.

Prepare separate sheets showing the respective responsibilities of the electrical installers and the sound installers.

Show items to be provided by installers other than the electrical and sound installers on the architectural sheets.

Design Parameters

Ease of Operation

The sound reinforcement system is designed to perform its function unobtrusively, without interruption, and automatically without attention by the users. Users need only to turn the power on and off and adjust volume as needed. Users can also select the satellite playback mode in buildings equipped with satellite systems. In meetinghouses with permanent rostrums, controls are located convenient to the leadership seating on the rostrum.

A volume control will be available in small meetinghouses or will be automatically set with limited volume control in large meetinghouses. Manual control will be provided for overriding the preset and automatic levels in the cultural center for large meetinghouses.

In large meetinghouses with operable partitions, the system configuration is set automatically by reading the open or closed status of the partitions.

The sound and satellite/video systems are designed to a standard that allows for easy operation and maintenance using common appearing controls for leader operation and interface regardless of the specific components in the system. The layout and location of system controls should follow the standard recommendations and be at the recommended locations. Generally, modifications or additions (more inputs, extra speakers, and additional systems) should not be considered for the project. The sound masking system around ecclesiastical offices is a standard part of these systems and should not be considered as optional.

Responsibilities of Acoustical Consultant

The AEC approved acoustical consultant makes one field visit to project at conclusion of construction and after all furnishings and finishes are in place. Since the Church also uses pre-approved contractors (see Sound Contractor Qualification Guidelines) for this work, it is not unusual for this visit to take place after substantial completion.

During this visit the acoustical consultant will check out and tune/balance the sound and video systems, verify the sound isolation properties of ecclesiastical offices and doors and folding partitions, measure the background noise levels of the HVAC systems in the chapel and cultural center and train the local leaders in the maintenance and operation of the sound and video systems and any network integrated systems.

Replacement and Improvement Projects

The consultant will visit the site to do an evaluation to determine scope and related costs. An Audio and Video Evaluation Checklist form will be completed and reviewed with the facilities or project manager to

determine project scope and cost requirements. After completion of the project, a second visit is required to inspect and finalize the system.

Equipment Characteristics

Pulpit microphone should be easily adjusted to the proper height by inexperienced users. It should be clear, natural sounding, without pops or exaggerated bass. The microphone should have directional pickup to maximize pickup of person speaking while rejecting noise and feedback.

General-purpose microphones for hand or floor stand use should have a dynamic element with the same characteristics as pulpit microphone.

Lapel microphone for hands-free operation should have an output level matching that of handheld microphones so microphones may be used interchangeably. It should be a condenser microphone requiring phantom power.

For stake centers, the wireless microphone system package should include a receiver, a lavaliere (with body pack) or handheld microphone, a carrying case, and a 10-foot microphone cable for connecting the receiver to the sound system. The receiver should have an adjustable output level, a balanced microphone output, and have a minimum of ten channels. The handheld microphone or body pack transmitter should use standard AA batteries.

Sacrament table microphones, for permanently mounted tables, should have an operable cover with printed sacrament prayers. It should have automatic turn-on and turn-off when cover is opened with no observable turn-on/turn-off pops in the system. The microphone uses system phantom power.

Loudspeakers with 70-volt transformers should have a minimum frequency response of 40 hertz to 12 kilohertz, plus or minus 2 decibels on axis with no more than 6 decibels down at 4 kilohertz, 30 degrees off axis. The speakers have a power rating of 16 watts or greater with sensitivity close to 89 decibels at one watt per meter; power taps selectable between 1 to 8 watts in 3-decibel steps.

Speaker layout should be such so that each listener, including those on the rostrum, is within 30 degrees of a loudspeaker's center axis. Power taps and power amplifier capacity are selected to provide at least 85 decibels (A-weighted) sound pressure level (dBA SPL) of normal program material with no audible distortion (typically 4 to 8 watts). Taps are selected to compensate for varying loudspeaker distances (ceiling heights) to achieve seat-to-seat variation of less than plus or minus 3 decibels at the 4 kilohertz octave band.

System Characteristics

General:

- Meets industry standards for frequency response, noise, distortion, and so forth.
- Sufficient power capacity for total loudspeaker load plus 10 percent reserve.
- Distributed speakers are currently being used due to ceiling height and to provide uniform coverage.
- Masking speaker provided outside of offices for branch president, bishops, clerks, stake president, high council room, and interview rooms.

Rental properties:

- Small rental properties should include a portable system which can be obtained through owner's Meetinghouse Technical Services (MTS).

Small (130 size and smaller) meetinghouses:

- Integrated mixer-amplifier with inputs for at least four balanced microphones and two balanced line level inputs: pulpit microphone, sacrament table microphone, two hand-held microphone inputs, satellite input, and master volume control. Organ or keyboard input, if needed.
- A wireless assistive listening system is provided to pick up the feed from the chapel or the cultural center when the chapel system is turned off.
- There should be a manually controlled line level input at the pulpit for media playback.
- Equipment for sound and satellite systems should be combined and installed in secured cabinet with master power switch.
- Provide overflow provisions for chapel sound in the Relief Society room and foyers.

Large (170 size and larger) meetinghouse system characteristics:

- Inputs: Pulpit microphone, sacrament table, two hand microphones in the chapel, satellite input. A line-level input for organ feed in stake meetinghouse standard plan. Three separate microphone inputs in the cultural center. Phantom power enabled on all microphone inputs. A manually controlled line level input should be at the pulpit for media playback.
- Outputs: Chapel, cultural center zones, perimeter speakers, assistive listening transmitter, sound system for recording options and webcasting. May be combined as needed.
- Chapel mixer: The chapel mixer listed on the current standard plan has been carefully researched and chosen to provide the necessary

functionality. Do not use a different mixer. The mixer will operate with preset volume controls with a range-limited master volume control at the rostrum, will automatically adjust the input gains for maximum gain according to the number of microphones in use, and will have an automatic leveling circuit that adjusts the gain so soft and loud talkers have similar volume levels. Variations of short duration will be allowed to provide dynamic range for emphasis and dramatic effect. It may be used to control video matrix switcher if one is used.

- The cultural center system will function automatically at pre-set levels or may be switched by the users for manual operation and adjusted with individual manual volume controls.
- The chapel and cultural center systems will automatically configure and combine based on what operable partitions are opened. No user operated switches are required to turn speakers on or off in a particular zone. The system is easily configured for a satellite broadcast. . The system automatically restores itself from satellite or manual operation to the automatic mode after cycling the power switch. The system has narrow and broadband equalization to compensate for loudspeaker response anomalies, reverberation, and certain adverse acoustical conditions. The equalization maximizes intelligibility and gain before feedback. The acoustical consultant is responsible for tuning of equalizers.
- Settings and parameters of the mixing and signal processing equipment are set by computer and protected from tampering by password. Provisions are made for cloning a replacement in the event of catastrophic failure. A copy of the setup file should be left in the sound rack and given to the facilities manager. A second copy must be sent to SoundEng@ldschurch.org.
- The children's meeting room and Relief Society room have speakers and two paralleled microphone inputs each. A switch is provided to receive overflow sound. The overflow sound is set to be from cultural center system by default. The overflow sound automatically switches to the chapel system when the chapel system is turned on. Volume controls are provided.
- The mothers' room speaker will receive an overflow signal from the chapel or the cultural center as described above. A volume control is provided.
- A wireless assistive listening system is provided to use the feed from the chapel or the cultural center as described above. Two portable receivers are provided for each meetinghouse.
- Perimeter speakers are provided in both entranceways and will receive an overflow signal from the chapel or the cultural center as described above. Volume controls are provided.

Stake center pavilion:

- Current guidelines do not authorize sound systems to be installed in pavilions. Contact Meetinghouse Technical Services (MTS) information on approved portable systems.

Satellite and Video Distribution System 27 4117

General Design Concepts

Qualification: Each stake or district is authorized to have at least one satellite downlink site deployment. Additional downlink sites may be approved where excessive travel is required or expected attendance exceeds the capacity of the existing downlink sites.

Satellite Dish Receiving System:

- Equipment consists of a parabolic dish antenna (Ku or C-band), low noise block down converter (LNB), digital satellite receiver, system television/video monitor, and necessary distribution and display equipment.
- Indoor equipment is mounted in a metal cabinet in a room with a locked door. A power switch is to be provided to allow user to turn off the equipment when not in use or to allow digital satellite receiver to be rebooted if there is a problem.
- Installer should use a spectrum analyzer to properly aim the dish

Video Distribution System:

- Equipment may consist of modulator(s), distribution amplifiers, routers/matrix switches, splitters, combiners, and tap-offs.
- Provide distribution for each satellite language needed and video overflow for meetings held in the chapel.
- Video outputs should provide normal video level of 1.0 volt peak to peak (P-P). Nominal radio frequency (RF) distribution signal levels at tap-offs are set from 0 to plus 10 decibel millivolt (dBmV). Video jacks and Television Radio Frequency (TV RF) tap-offs are normally located in chapel on rostrum and in cultural center of stake buildings near camera jack.
- Video distribution system output jacks are located in cultural center at each side wall adjacent to chapel and in Relief Society room, children's meeting room, high council room, and large sub-dividable classrooms. A camera jack located near the rear of the stake center chapel feeds signal for overflow in the locations listed above. A permanently mounted camera is authorized in stake centers. Support cabling should be provided. Cameras should be mounted where they are easy to access by facility manager but not easy for members. They should be mounted in such a way that they are not a distraction. Permanently mounted projectors are not authorized.

- An audio signal from the satellite receiver is connected to the meetinghouse sound system. This is normally for the main language used by the stake. Add option for multiple languages into DSP.
- The meetinghouse sound system output should also be distributed though the building for overflow. Multiple Language Reception: The standard system is designed to receive up to two languages, with English as the primary language and Spanish as the secondary language. . Languages other than English and Spanish may require additional digital satellite receivers and distribution components. Contact the facilities manager for direction if additional languages and/or additional hearing impaired accommodations are needed.

Site Evaluation and Detailing

Determine the preferred satellite dish type (Ku-band or C-band) and location based on the information provided by the architect (see *Satellite Dish Antenna Recommendation Guide*.) The architect should coordinate with the acoustical consultant during the design to properly locate the satellite. Recommend an alternate location if the preferred location is not acceptable. If possible, locate Ku-band dish in an HVAC condenser area with minimal visibility. The dish must have an unobstructed line of sight of the satellites the Church uses. There should be no trees or shrubbery (including future growth), buildings, walls, fences or other physical obstructions in the line of sight. For both the Ku and C-band dish, the obstruction-free zone is basically a cylinder equal to the dish diameter projecting straight out from the dish on the same azimuth and elevation as the dish towards the satellite

The satellite dish is to be mounted at ground level, not on the roof and not in front of the meetinghouse. Indicate the satellite dish location on site plan.

Total cable length connecting dish to satellite receiver must not exceed 300 feet.

If terrestrial interference in C-band is suspected, then Ku-band should be used, if possible. Otherwise, antenna placement should be selected for maximum shielding from potential sources of interference.

Coordination

The following are included in the project design, but are not part of the sound/acoustic/satellite systems:

- Dish Enclosure: Enclosures are not included in the meetinghouse standard plan and are discouraged. If a C-band dish enclosure is required by local municipalities, it should be at least 6-feet high and wide and long enough to prevent obstruction of the line of sight to the satellite. Do not occlude any part of the dish surface. If possible, have the satellite mounted offset in the enclosure about two-thirds

the inside enclosure distance in from the direction to which the satellite is pointed. Coordinate with acoustical consultant. Centering the satellite dish within an enclosure makes it more easily obstructed by enclosure walls. Ku-band dish should utilize HVAC enclosure where possible.

- Dish Foundation: Detail is available in standard meetinghouse plan or from the project manager or facilities manager.
- Telephone: The telephone outlet inside or immediately adjacent to the equipment rack is provided under Division 27 of the master specifications.
- Landscaping: The plants and trees shown on the landscape planting plan and provided under Division 32 of the master specifications should not obstruct the satellite line of sight when they reach maturity.

Replacement and Improvement Projects

AEC approved acoustical consultant should evaluate existing satellite and video system and, if necessary, design an updated system. Existing components should be evaluated by consultant and reused in new design where possible.

Acoustical Treatment

Architectural Acoustics

The acoustics should help achieve high intelligibility for amplified speech, good music and singing quality, and a reverent atmosphere throughout the building.

Chapel

Reverberation time should be from 1.0 to 1.3 seconds with the room empty. Do not use acoustic tile. Glue-down carpet is used on the floor. It provides little low-frequency absorption but reduces impact noise. Padded pew seats are standard. Sloped or splayed walls and ceilings should be used when practical. Avoid circular or concave surfaces.

Cultural Center

Acoustic tile is required for a minimum 90 percent of ceiling to achieve a required 1.0 to 1.5 second reverberation time. Use the specified ceiling tile. Use specified acoustic wall panels mounted with top of panel at door height to provide echo control on walls where required. **09 5116**

Folding Partitions

The folding partitions in the chapel and cultural center should meet a minimum NIC-30 and is verified by the acoustical consultant during his visit.

Offices, High Council, Interview Rooms, and Classrooms

Acoustic tile and glue-down carpet are required in these spaces to reduce noise and increase privacy.

Stake President, Bishop, Clerk Offices, and High Council Room

Door seals, sweeps, and thresholds on solid core wood doors for privacy. No light should be showing through thresholds and seals. No flanking paths around or over walls. The office walls should be constructed to provide an approximate Sound Transmission Coefficient (STC) rating of 55.

Replacement and Improvement Projects

AEC approved acoustical consultant should evaluate current acoustics and building construction and make recommendations for improvement if needed.

Seminary and Institute Projects

Instructor, Principal, Director Offices, and Classrooms

Office walls are to be constructed with sound blanket insulation between studs to an approximate STC rating of 38. Acoustic tile and glue-down carpet are required to reduce noise and increase privacy. Door sweeps and thresholds are not required. Seminary and institute classroom solid walls are to be constructed to provide an approximate STC rating of 55. Where operable folding panel partitions are provided, an STC rating of 50 with a Noise Isolation Class (NIC) measurement of 33 minimum in the field is required.

Mechanical Noise Control

Review the mechanical system drawings to ensure the design is consistent with good noise control practices as stated below. Check to confirm that there will not be interference with speech intelligibility, particularly in the chapel and cultural center.

- Design for Noise Criterion (NC) rating of 25 in the chapel, cultural center and offices. Use NC 30 to 35 in classrooms.
- Ensure that the full length of supply and return rectangular air ducts are lined with acoustical duct liner.
- Ensure that un-housed spring and neoprene vibration isolators and flexible connections to gas, electrical and plumbing connections are installed on all major mechanical equipment whether mounted on the floor or hung from ceiling structure.
- Ensure that air diffusers with NC rating of 25 or less at design air velocities are used.
- Do not use air transfer grilles in doors to offices, restrooms, or mechanical rooms.

- Manual balance dampers are to be used in the branch duct near the main trunk duct, not as diffusers.
- Similar design and noise criteria apply to both supply and return air systems.
- Ducts between adjacent rooms should have at least two lined elbows to reduce crosstalk.

Historic Properties

- As much as possible, follow the current standard plans.
- Work closely with architects and CHD curator to determine which technology items may distract from historical character and modify design as needed within budget constraints and feasibility for proper operation..
- Working with architect and CHD curator, follow the architectural acoustics guidelines which include mechanical noise isolation, sound isolation, and proper acoustic design to achieve high intelligibility for amplified speech, good music and singing quality, and a reverent atmosphere throughout the building.

Appendix

- *Agreement Between Owner and Architect - U.S.*
- *Audio and Visual Evaluation Checklist*
- *Boiler Decision System Chart*
- *Boundary and Topographic Survey Guidelines*
- *Building Alarm Monitoring from Church Headquarters*
- *Civil and Structural Testing and Inspection Services Guidelines*
- *Consultant Services Agreement – Boundary and Topographical Survey*
- *Consultant Services Agreement – Geotechnical Investigation Report*
- *Current Managed Relationships Matrix*
- *Determining Meetinghouse Adequacy*
- *Humidity Monitoring to Control Mold Growth*
- *Landscape Architect Checklist*
- *Meetinghouse Artwork Guidelines for Facilities Managers and Project Managers*
- *Meetinghouse Building Adequacy Standards*
- *Meetinghouse Dehumidification Technical Support*
- *Meetinghouse Replacement and Improvement Standards*
- *Meetinghouse Site Management Plan*
- *Mold Remediation Fact Sheet*
- *Property Feasibility Study – Cost Worksheet*
- *Qualifying For and Ordering Portable Partitions*
- *Satellite Dish Antenna Recommendation Guide*
- *Single Phase Instruction Sheet*
- *Architectural, Civil, and Landscaping Site Development Checklist*
- *Sound Contractor Qualification Guidelines*
- *Standard Plans Change Boundaries*
- *Structural Evaluation Report Template*
- *Topsoil Testing Report*
- *United States and Canada Standard Plan Selection Chart*
- *Water Conservation Guidelines*
- *Webstat Defensibility Assessment Tool*