Section 4.1

MINNESOTA STATE CAPITOL INTERIOR RESTORATION
ARCHITECTURAL

The architectural tasks have been focused on developing conceptual designs for "found space" within the capitol buildings lower levels and analyzing the requirements stated in the Predesign program. We have also begun the process of identifying and categorizing the existing conditions as a first step toward developing a prioritization strategy for restoration, rehabilitation, repair, or replacement of historic material and finishes. The ongoing discovery process continues as we expand our understanding of the Capitol's original construction and current condition. Important issues about the building are being identified as we go, many of which have significant cost implications in addition to the new work being proposed.

Many prior projects to repair and replace aging and damaged areas have been accomplished over the years. However, there are still some areas that require additional repair/replacement and some that will likely require further in-depth research and exploration. In depth investigation can help validate assumptions about original construction and materials but it also provides important qualitative and quantitative information pertaining to existing conditions. As mentioned in the previous Summary, there has been considerable water infiltration and damage throughout the dome which should be further assessed before any interior cosmetic work is begun.

Conceptual plans have been developed. This includes the development of a south extension to what is now called the Basement level. The plans include developing the existing basement level into usable office space- thus, we have renamed this "Lower Level". A "New Basement" level is also proposed below the new Lower Level.

For purposes of defining the Floor Levels, the following definitions are offered:

- New Basement: Building service areas and media production.
- Lower Level: Area of the existing basement and the new and existing vaults.
- Ground Floor: Opens directly onto grade.
- First Floor: The floor of the Rotunda.
- Second Floor: The House and Senate Chambers and Supreme Court.
- Third Floor: Office space
- Fourth Floor: Partial floor – office and building services.
- Attic
- Roof
- Dome
- Lantern

Recommendations for Renovated Areas are as follows:

Lower Level: There are certain opportunities to develop "found space" within the lower levels of the building as well as additional underground expansion space that begins to meet the program stated in the Predesign document. As presented, this proposal involves a significant revision of what is currently called the basement – to be known as the lower level. Some considerations for cost estimating are:

- Removal of existing wall partitions. Assume that all partitions at the basement level are masonry. Early non-load bearing construction is of either 4" clay tile or brick infill. Load bearing walls are typically limestone block or brick. New construction is typically 4" CMU.
- The historic north wing portion has been recently restored and will remain intact. Some selective demolition of modern finishes will be required in rooms (room B22) or areas that are to be restored back to their original condition. Restoration and repair (rooms B22, B27) includes wall, floor, and ceiling assemblies, plaster and paint finishes, base and trim details, doors and hardware, built-in casework, and lighting.
- Existing stone masonry walls to remain will require paint removal. Painted surfaces are extensive, perhaps eighty percent of current finished basement spaces.
- The clear height to structure varies throughout the basement level. Some areas have 8'-5" clearance to bottom of beam and 9'-1" to bottom of slab. Other areas are more generous with 10'-3 to bottom of beam and 11'-4" to bottom of slab. Finished plaster ceilings currently in place are anywhere from 6'-7" to 8'-0" above finished floor. To provide adequate headroom, a consideration may be lowering the basement slab elevation to more readily accommodate ME, sprinkler, and lighting requirements.
- Lowering the floor elevation would involve removal of the existing concrete floor slab, and in some areas, the stepped stone foundation may need to be underpinned and/or altered. The wings appear to have shallower footings than the central portion of the building. The width and depth of these shallow footings will be a determining factor for the elevation of the new proposed slab. Footings will also impact mechanical strategies for below slab trenching. Invert elevations also need to be considered if the slab is lowered.
- Revising the floor slab, and/or columns, may result in removal or modification of stone walls or stepped foundation elements. Significant alterations need to be coordinated w/ structural to determine feasibility. Any stone removal or recovery should be done with care such that material can be salvaged and stored for possible future reuse.
- There may be a desire to salvage the existing mechanical trench covers
- The floor in the historic north wing of the basement level, including the historic stair (B24H), café (B24) and rest rooms (B24J and B24K) would remain intact. New ramped connections will have to be made to transition between existing and new construction.
- There is significant water infiltration in mechanical area (B25), hall (B25A) and Judges Dining (B27). The source of this water infiltration remains unclear but merits additional investigation. This may be a plumbing issue, possibly a rainwater leader, or may be flashing or roof related. Again, further investigation is required.

- If there is interest in salvaging or reusing any non-historic building materials (doors, hardware, fire extinguishers, remodeled security department equipment/furnishings…), appropriate storage space for salvaged materials must be provided.

Ground Level: There will be significant site work at this level which will potentially impact the terraces and porte cochere.

- Consideration should be given to temporarily bracing the porte cochere Guastavino vaults. The south wall would also likely need to be temporarily shored and underpinned. See structural for further discussion.
- The drive surface and ramped entry at the porte cochere are to be removed. Selective demolition in this area needs to be sensitive to the historic façade materials.
- Historic lighting fixtures should be carefully removed and securely stored for post construction reinstallation.
- Historic doors, associated glazing and hardware should be carefully removed and securely stored for post construction reinstallation.
- Historic louvers and grills associated with exterior terraces should be carefully removed and securely stored for possible post construction reinstallation.
- All site features (stone piers, stone steps, statuary…) are to be carefully taken down and securely stored for future reinstallation. Pieces will be numbered and catalogued to insure that elements are reassembled in a manner that is consistent with the current existing condition.
- At present, the porte cochere serves as an accessible entrance/exit. Additional accessible entrances are located to either side of the north wing at corridor GC05. Provisions will need to be made to insure adequate accessible exiting is provided throughout construction. There is tunnel access but many of these tunnels have slopes that exceed ADA recommendations.

Floors 1 through 4: General construction will have an effect on every floor.

- Provisions will be made to protect and securely store valued artifacts and artwork during the construction phase, in collaboration with MNHS.
- Original exterior double hung wood windows were previously replaced with aluminum window assemblies. This violates Standard # 6 of the Secretary of the Interior Standards for Rehabilitation. When a historic feature requires replacement, “the new feature should match the old in design, color, texture, and where possible, materials.” The second floor Senate offices have a few remaining wood window assemblies in place. These should be restored and the aluminum assemblies replaced with historically sensitive window assemblies to match to original. Perform paint analysis on the historic windows to determine original paint color.

Attic

- Several sky-lites have been "separated" from spaces served below. Their historic function should be restored. Prior to restoration, sky-lites and roof hatches may provide opportunities to move ME equipment into attic spaces.
- Access to lighting positions in the attic spaces is difficult and falls short of OSHA standards. Newer catwalks have been provided at the base of the rotunda. Provide similar catwalks and safe access to attic spaces in north, west and east wings.

Roof

- The capitol roof system consists of multiple roof surfaces, skylights, gutters, drains, flashing, etc. It is a complex system and it is frequently penetrated by vents, conduits, and other mechanical and electrical items. The roof has been replaced recently (so it may not need to be replaced as part of this project), but there are some observed problem areas that must be addressed by the restoration project. In addition, the roof may become disrupted during construction, as it is a potential area to locate new (screened) mechanical equipment. In any case, the design team will thoroughly evaluate the roof "system" and will design interventions that are appropriate to the building aesthetically (the roof is "seen" from above) and functionally.

Dome

- The building has been subjected to long-term water intrusion. Evidence of the extent is still plainly visible from the inside where abraded plaster and peeling paint can easily be seen at window heads and jambs. Masonry and mortar on the inner face of the exterior dome show severe signs of prolonged water infiltration: masonry staining, efflorescence, degraded mortar joints. Although work has been done to correct these issues, active brick spalling and areas of apparent dampness indicate that water problems are persistent. This is not a conditioned space. Dampness and fluctuating winter temperatures will continue to stress damaged masonry.
- Waterproofing measures have been taken to mitigate water penetration to the inner dome. The floor surface appears to have membrane protection that is integral with that of the intermediate dome. The intent of the membrane system seems to be containment of water leaking in through the outer dome. The system was most likely installed to prevent severe leakage into the interior space, the effects of which are still visible at the window heads and plaster walls at the base of the dome. Water, however, continues to pool at various locations along the walking surface indicating that positive drainage to the single floor drain is not occurring.
- The dome windows and vents leak.
- Stone patches at the dome's exterior lantern, some recently installed, appear to be failing. Chips and cracks can be observed at some locations; other patches appear to be separating from the marble. The stone patching material should be reassessed before any additional repairs are undertaken.

Finishes: Finishes in the existing Capitol will be renovated or restored according to Preservation Zone. A description of zones and treatments is described in the Preservation Zone summary found in Section 4.2.

Recommendations for New Construction of the South Extension are as follows:

New Basement: Construction of the new basement under the south extension will include a permanent dewatering system to guard against water intrusion. The below-grade construction shall be fully enveloped with a continuous waterproof membrane with drainage and protection boards.

- Mechanical Vaults: These spaces are to accommodate the largest air handling units which will supply air for the heating and cooling of the south side of the lower level, ground and first floors of the existing Capitol. These vaults will also house air handlers for all areas of the new extension, including the auditorium. The height of the mechanical vaults will be approximately 14' clear to the underside of the beams. These spaces will have sealed concrete floors and raised concrete house-keeping pads for equipment. The finishes will be exposed cast concrete walls and underside of structure with utilitarian service lighting.
- Media Center: These spaces are to accommodate the production and editing of television, radio and internet broadcast signals. The production studio will include 12' ceiling height, acoustic isolation and attenuation to facilitate broadcast quality production. Finishes within the studio will include acoustical surfaces, a lighting grid and resilient flooring to accommodate recording needs. The editing production areas will have basic office finishes with appropriate lighting.
- Circulation Areas: These areas are non-public areas and they will need to balance the utilitarian nature without becoming deadening spaces. Finishes will be basic with painted walls and floors. Sections of the corridors might have accessible suspended ceilings to protect infrastructure or to provide some articulation for the corridor. Stairs will have painted steel stair structure with concrete filled pans at treads and landings. Stairwell walls will be painted exposed masonry with a minimum of exposed conduit.

Lower Level: The lower level of the extension will provide an opportunity to create a true visitor's center and accommodate organized groups as well as the needs of individual visitors. This extension will provide much needed office and meeting space and it also allows the Capitol to develop an appropriate dignified accessible entry which responds to contemporary security concerns.

- The limited exterior portion of the lower level will be carefully detailed in granite. The emphasis will be to create an architectural expression which is informed by the historic Cass Gilbert design, while avoiding direct mimicry. The exterior site work, including steps, paving and balustrades will match similar site components in size, detail and material. The windows and entrance doors to the extension will be wood, scaled to match the monumental scale of the building.
- A significant portion of the extension is to be covered with paving or lawn areas. To facilitate this, a green roof system will be utilized to provide drainage while supporting the growth of lawn areas. To maintain maximum ceiling height and to limit the alteration of the existing site grades, the lower level of the extension will incorporate an under-floor air distribution system.
- Light Wells: Flanking the building's exterior front stair are light wells or sunken courtyards which bring daylight down to the Lower Level. The light wells provide eye-level views from Senate offices and the tunnel onto the narrow lawn of this courtyard and a view up to the façade of the

Capitol. The exterior of the light well courtyards are comprised of a cloistered colonnade, with a soffited perimeter and cornice, capped with a balustrade which provides edge protection.

- On grade, the light wells are surrounded by planting areas, which provide additional edge protection and discourage casual access to the edge. In addition to providing daylight to the lower level, the light wells also provide fresh air for the HVAC air handling equipment located in the basement of the extension. As with all fresh air intakes at the Capitol, these need to be designed to reduce the vulnerability of the air system to intentional or accidental contamination. Examples of accidental contamination would include automotive or truck exhaust entering the intake. Intentional acts would include acts of terrorism or vandalism, such as smoke producing pyrotechnics. Existing air intakes will be evaluated for safety considerations and improved where possible.
- The light well intakes will use a combination of complimentary strategies to protect the quality of intake air. First, the air grilles will be located in the soffit area beneath the cornice of the light well, along the entire perimeter. This allows blanking-off of sections of the soffit so that active and inactive vents are identical; "the shell game". Secondly, the soffit portion of the cornice will be located approximately 9' above the grade at the bottom of the light well; "distance". In addition, the air intakes are "supervised" by 14 Senate offices on each side and hundreds of passer-bys using the enclosed below grade tunnel system; "eyes and ears". And finally, security cameras can be positioned to view these two courtyards. These precautions coupled with the landscape barriers seek to discourage, confound and lastly expose any attempt to tamper with the intake air of the basement vaults.

- Entry Vestibule: The vestibules will provide a welcoming weather break for the building. They will take their design cues from the existing ground floor entry underneath the main exterior south stairs. The finishes will be a continuation of the exterior materials; granite walls and herringbone tile finish on the ceiling. Floor finishes will be a combination of stone and walk-off matting. The entries will be accented with appropriate exterior and interior lighting to aid in way-finding.
- Visitor Center: This space is the primary arrival space for visitors to be greeted and marshaled into groups, readying themselves to tour or depart from the Capitol. The Visitor Center will contain all the visitor services; the reception desk, coat storage, an orientation and classroom area, a gift shop, access to food service and provisions for a security check-point to adapt to varying levels of security needs.
  - The Visitors Center should create a unique architectural expression, expressed as the metaphorical and actual base upon which the Capitol sits. Native Minnesota stones can be used for floor and wall finishes. Walls can be created from various native stones arranged in layers to illustrate the breadth of geologic history in Minnesota.
- Public Corridors: The stone finishes used in the Visitors Center can extend down the public corridors where they could be embellished with the addition of symbols and patterns inspired by the "first Minnesotans", including Native Americans and per-Columbian Europeans. The interiors of this new space should contain an equivalent commitment to permanence and public art, as do the interiors of the existing Capitol building.
  - This extension of the Capitol provides a unique opportunity to expand the narrative content of the architecture to include portions of Minnesota's story which may be under-represented in the original Capitol. The extension is a singular opportunity to update the historical narrative of the Capitol.

- The Multi-Purpose Room: This room will provide the Capitol with a flexible multi-purpose space which can accommodate groups of 500 people for public hearings or special events. This space will provide an area within the Capitol which can be used as temporary legislative chambers, should it be necessary during the sequenced restoration.
    - For security purposes, the design of this space will incorporate necessary structural and HVAC systems to meet "shelter-in-place" requirements.
    - Approximately two-thirds of the Multi-Purpose will have a sloped floor with fixed theatre style seating, as will the sloped upper balcony. The front one-third of the room will not be sloped and will accommodate additional seating or other furniture in flexible arrangements to accommodate a wider variety of uses. A raised platform will straddle the front of the room.
    - Special attention will be given to acoustic performance and sightlines within the multi-purpose room. Finishes might include wood ceiling and wall surfaces combined with acoustically absorptive materials such that they can be acoustically tuned. Lighting will be designed to support the broadcast of events and technology will be incorporated to facilitate tele-conferencing. Support spaces adjacent to the auditorium will be provided for storage of tables, chairs and AV equipment and copiers.
- Legislative Offices: Legislative office suites will accommodate 28 Senators and their staff. The office area will be organized around a legislative corridor with suites opening off of that corridor, similar to the arrangement of existing office suites in the Capitol. The office area will have several shared locations for copy rooms and coffee/break rooms.
    - Like other spaces on this level, the legislative offices will have under-floor air supply with ducted returns located high on side walls. Ceilings will be suspended acoustical assemblies with only a modest drop to accommodate concealed sprinkler lines and electrical systems.
    - Offices will utilize wall assemblies and mechanical detailing to provide adequate STC ratings to provide privacy between office suites. Wall finishes will be painted gypsum wallboard, and office floors will be a high grade carpet tile. The offices will have wood trim with a transparent finish, including base, crown molding and stile & rail doors. Borrowed lights and transom windows will be used to bring daylight from outboard offices to inboard spaces. Lighting will be a combination of indirect general lighting and task lighting.
- Legislative Corridors: These corridors will have stone or terrazzo flooring with a border. The walls will have a stone (probably marble) wainscot with painted plaster veneer on the upper portions. Ceilings will be smooth plaster veneer with a crown mould. Entrance doors to office suites will be wood stile & rail doors with a half-lite, transom above and wood casing and trim. The corridors will have stone base and plinth blocks at door casings. Ducted supply grills will be located low on the wainscot and ducted returns will be located high on the plaster sidewall. Lighting will be a combination of traditional or period ceiling fixtures and wall sconces, as well as special art lighting where needed.
- The Tunnel: Relocating tunnel access to the Capitol is an important part of improving security and utility of the existing Lower Level. By moving the public tunnel to the south side of the existing Lower Level, it keeps pass-through traffic out of the main building.
    - In particular, this new arrangement will allow the entire west wing of the lower level to be secure and accommodate a "back-of-house" entry path between a new secure drop off and parking area for vehicles to a private elevator.

- Realigning the tunnel also allows for easier control of Capitol entries during times of heightened security. Only persons entering the Capitol need pass through the security screen, while those using the tunnel connection to travel beyond will not need to be screened.
- Portions of the tunnel adjacent to the Capitol will be dignified with a slightly higher finish level; terrazzo floors and base with plaster walls and ceilings. The day-lit portion of the tunnel is an ideal location for public art, such as murals, as an integral expression of the building wide arts program. Pilasters and soffits will be used to relate to the rhythmic geometry of the adjacent capitol and to provide transitions to the simpler portions of the tunnel system where glazed tile wainscot and acoustic finished cement plaster is used. The lighting will also transition from dressier ceiling and sconce lighting close to the Capitol to basic tunnel lighting in the more simple portions of the tunnel.

- The Loggia: This new space absorbs the existing porte cochere beneath the upper landing of the main exterior stairs on the south elevation. The proposed plan will turn this into interior space just outside the new Auditorium. What is now the driveway elevation will be lowered 14'and a two-story interior space will be created. This change will require underpinning of the existing footing, down approximately four feet.
  - The existing green tile ceiling finish, currently in the porte cochere will be protected in place, or be replaced in-kind. The existing granite finishes will remain and new granite will be used on new surfaces to form a wainscot or water table. Floor finishes will be stone or terrazzo and will extend into the new stairway connecting the Loggia and the ground floor. New ceiling fixtures will illuminate the vault. Decorative wall sconces will be used to highlight the entrances to the Capitol and Auditorium.
  - The stairway connection between the ground floor and the lower level will be created by excavating the existing lobby down to the bottom of the existing footings and adding two new switchback stairs. A single set of stairs will connect the existing Lower Level to the new Lower Level and the Auditorium
  - The existing elevator shafts will be extended down to serve the new Auditorium level. Each shaft will include two elevators, arranged in a manner similar to the existing elevators on the west side. New elevator cabs will have period detailing and finishes, such as painted steel and bronze trim with cork flooring. The hoist-way doors will be single-speed side opening doors with the two cab doors centered in the existing arched opening. Doors and frames shall be bronze with patterned glass to take advantage of the borrowed light from the existing south-facing windows in the shaft.
  - New monumental stairs from the ground floor to the "formal space" in the basement level that are reminiscent of the existing building stairs in these locations.

Section 4.2

MINNESOTA STATE CAPITOL INTERIOR RESTORATION PRESERVATION ZONES & DESIGN GUIDELINES

To permit an organized approach to preservation and rehabilitation of the building, a preservation plan will be developed to set forth specific design guidance to be used by the team throughout the course of the project. This guidance will be the direct result of the physical and academic research conducted during the current analysis phase. The preservation zones will be created in such a way as to respect both the extant historic fabric of the buildings and the proposed space uses and design concept. The guidelines for each zone should be used in close concert with the space program and the *Secretary of the Interior's Standards for Rehabilitation* to develop final design documents. Strict adherence to the guidelines will ensure that the finished restoration project respects the historic integrity and significance of the Capitol, deals sensitively with the introduction of modern systems into the building, and prepares this important building for its next century of hard use.

This plan is intended to act as a long-term "building" or "zoning" code for the Capitol. Its usefulness does not expire when the currently envisioned project is complete, but rather, the plan should continue to guide future proposals to renovate or remodel the building. Deviations from this plan should only be allowed and granted by the State Architect, MNHS and the CAAPB as the exception rather than the rule.

The preservation zones are hierarchical: the lowest numbered zones are the most conservative and restoration-oriented; higher numbered zones are more flexible. For this reason, it is acceptable to apply the guidelines of the lower zone number to a given zone, but not a higher one. Thus, an area in Zone 3 may be treated as if in Zone 2, but not as if in Zone 4.

Zone 1 – Primary Significance

This zone includes spaces and elements most significant artistically and architecturally; whose use has not changed significantly; which have a high degree of integrity; are of the greatest visual interest; and which are most strongly character-defining. These spaces should be restored to original condition with as little alteration as possible. Examples include the Governor's Office, the Governor's Reception Room, the Legislative Chambers, Supreme Court Rathskeller, the Rotunda and all public corridors.

Zone 2 – Secondary Significance

Zone 2 spaces and elements are those which retain a high level of integrity and have experienced a minimal level of alternation, but which were clearly secondary in character when designed and executed, and employed elements that clearly involved a lesser degree of skill and workmanship. The surviving elements of such spaces should be retained and treated sensitively (missing components do not necessarily have to be replaced.) The original plan configuration should be kept largely intact, however

some modifications are permitted if the overall character is kept intact. Improvements should be as reversible as possible. Examples include areas within the Attorney General's suite, selected conference rooms where technology is required, and historic restrooms and stairs.

Zone 3 – Tertiary Significance

Zone 3 includes spaces and elements originally intended to be flexible in design and subject to change over time as the state's space needs demanded; and which thus were designed with little decoration or special architectural treatment. These spaces may be partitioned in the course of new construction. In spaces where historic elements were employed, however, this zoning category advocates their retention during rehabilitation. Examples include typical office space and new public restrooms.

Zone 4 – Minimal Significance

This zone includes spaces which have undergone alteration and have retained no ornamentation or architectural character; and spaces designed as non-public work spaces which have no historic or architectural significance. These spaces may be removed, altered, or updated in any manner. Examples include mechanical, electrical and other non-public service areas.

Zone 5 – Acceptable Location for New Construction

This zone includes those areas where additions or compatible new construction, sensitive to the scale, materials and historic and architectural significance of the Capitol may occur.

Design guidelines for each zone will be further developed as research continues and input will be requested from the Minnesota Historical Society, the CAAPB, the State Architect and other appropriate organizations. Specific interior finishes will be developed and based on the space program and the preservation zone.

Recommendation for Finishes and Furnishings in Renovated areas are as follows:

General: Many of the aluminum replacement windows should be replaced with wood. New window treatments throughout the building should be anticipated – probably wood horizontal blinds and draperies in selected areas.

Lower Level: Formerly known as the basement, this area will be renovated to provide office and meeting space, as well as a loading dock, a sally port and visitor services.

- A new loading dock/service area is being considered at the east end of this floor. This area may be considered Zone 4 as it is purely service space. Finishes will include sealed or painted concrete. The area will include a new freight elevator whose doors and frame must be detailed to be appropriate to the Zone in which it occurs on each of the upper floors. The cab will be lined with rugged, yet decorative metal panels.

- A new sally-port is being considered at the west end of this floor and may be considered Zone 4. This includes secure underground parking for vehicles and a passage from the sally-port to the Governor's private elevator. Finishes in the sally-port will be sealed concrete. Upon entering the building, finishes will be similar to the basement level public corridors described below (Zone 3). Carpet might be considered in lieu of the stone flooring.
- Public corridors, visitor and exhibit space may be considered Zone 3. Restored to their original width, corridor walls and ceilings will be exposed stone, requiring patching, re-pointing and paint. New floor finishes will be stone or tile and relate to new materials used in the South Extension. Conduit and ductwork currently exposed will be concealed below the floor or in walls, allowing better ceiling height and decorative lighting to be added.
- The possibility of extending the monumental interior east and west stairs down to this level is being explored. This will expand access to the Lower Level and create a stronger connection with the office floors above. The stair extension will require the same stone materials used in the existing stairs.
- Office and hearing rooms may be considered Zone 4. Walls will be a combination of stone and plaster with paint. Ceilings will be drywall where possible with accessible ceilings only where absolutely necessary (Limit accessible ceilings to workrooms and less public areas). Tufted broadloom carpet with a period feel will be used on the floor. New light fixtures will be sensitive to the building period. Doors, frames, base and other woodwork will be wood with a transparent finish. These rooms will be furnished with a combination of existing and new wood furniture. Pieces will be selected to be compatible with the building period. "Time warp" will be avoided as styles and materials are selected.
- The existing Rathskeller will be protected and preserved in place. The addition of some acoustical treatment will be considered; possibly the addition of tapestries on the wall. Some technology may be added to this area.
- Restrooms may be considered Zone 3 space. They will be designed to meet ADA requirements and to allow efficient maintenance, however the materials will be appropriate to the building period. For example, marble floors and wainscoting will be used with painted plaster above. Marble toilet partitions with clear-finished wood doors will surround porcelain wall-mounted water-closets. Marble vanities will include sinks and fittings with electronic sensors for water conservation. Restroom accessories will be of high quality and built-in where possible.

Ground Floor: This floor will include office space for the Governor's staff and legislative staff, as well as one legislative committee room.

- Public corridors may be considered Zone 1. Ceilings, walls and floors will be maintained or restored to their original condition. Historic light fixtures will be upgrades to provide contemporary light levels using efficient sources. Recessed cans lights will be eliminated and if necessary supplementary cove lighting will be added.

- Legislative Committee Rooms may be considered Zone 2. These spaces will be enlarged by removing masonry vaults at the back of the room, however the character of the original building will be recreated. Finishes will include custom axminster carpet in a pattern appropriate to the period, and painted plaster walls and ceiling. A new raised platform in each room will hold a new wood dais with clear finish, fitted with microphones and other required technology. These rooms will have projection capability and media panels. New reproduction pendant and sconce light fixtures will be included.
- Legislative office space on this floor may be considered Zone 3. Ceilings will be drywall with heights maintained as high as possible and the addition of reproduction pendant light fixtures. Walls will be painted plaster. Doors, frames, base and woodwork will be wood with a transparent finish. Carpet will be axminster. Furnishings will be a combination of new and existing wood pieces suitable to the building and task lighting will be provided.
- New Fire Stairs: These stairways may be considered Zone 4. Materials might include metal stair structure with concrete treads and carpet and bronze handrail. New wall-mounted light fixtures will be appropriate to the period.

First Floor: This floor will include the Governor's suite, the Attorney General's suite, legislative committee rooms and office space.

- Public corridors may be considered Zone 1. Ceilings, walls and floors will be maintained or restored to their original condition. Historic light fixtures will be upgrades to provide contemporary light levels using efficient sources. Recessed cans lights will be eliminated and if necessary supplementary cove lighting will be added.
- The Governor's office and reception rooms may be considered zone 1. Original finishes will be maintained or restored. This will include furnishings that are original to the building, reproductions and/or adaptations and possibly some antiques of the building period. Adaptive furniture would include pieces detailed for the period, but designed to accommodate ergonomic, ADA and technology issues. New period window coverings should be anticipated.
- Legislative Committee Rooms may be considered Zone 3. These spaces will be enlarged by removing masonry vaults at the back of the room, however, the character of the original building will be recreated. Finishes will include custom axminster carpet in a pattern appropriate to the period, and painted plaster walls and ceiling. A new wood dais with clear finish, fitted with microphones and other required technology. These rooms will have projection capability and media panels. New reproduction pendant and sconce light fixtures will be included. New period window coverings should be anticipated.
- Legislative office space on this floor may be considered Zone 3. Ceilings will be drywall with heights maintained as high as possible and the addition of reproduction pendant light fixtures. Walls will be painted plaster. Doors, frames, base and woodwork will be wood with a transparent finish. Carpet will be axminster. Furnishings will be a combination of new and existing wood pieces suitable to the building and task lighting will be provided.

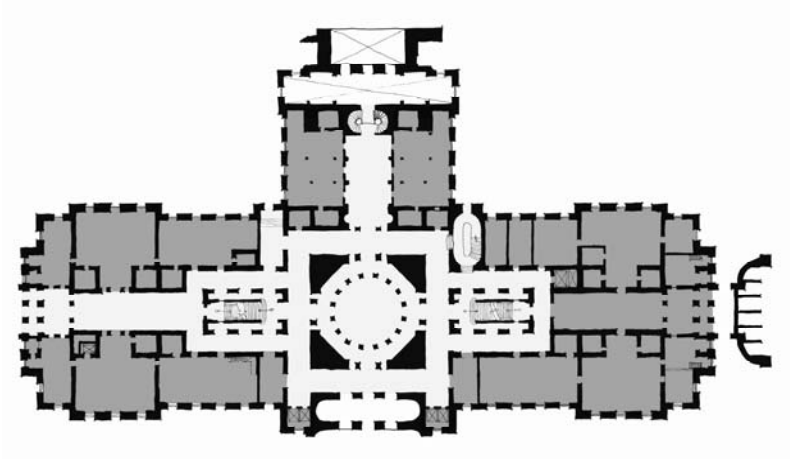
Second Floor: This floor will include the Legislative Chambers, the Supreme Court's courtroom and legislative offices.

- The Chambers, the Courtroom and the Legislative Retiring Rooms may be considered Zone 1. Ceilings, walls and floors will be maintained or restored to their original condition. Custom axminster carpeting will be required. Historic light fixtures will be upgraded to provide appropriate and efficient light levels. The recessed can lights will be eliminated and if necessary indirect cove lighting will be added. Furnishings will include restored pieces and some reproductions in addition to period-sensitive ergonomic seating.
- Legislative office space on this floor may be considered Zone 3. Ceilings will be drywall with heights maintained as high as possible and the addition of reproduction pendant light fixtures. Walls will be painted plaster. Doors, frames, base and woodwork will be wood with a transparent finish. Carpet will be axminster. Furnishings will be a combination of new and existing wood pieces suitable to the building and task lighting will be provided.

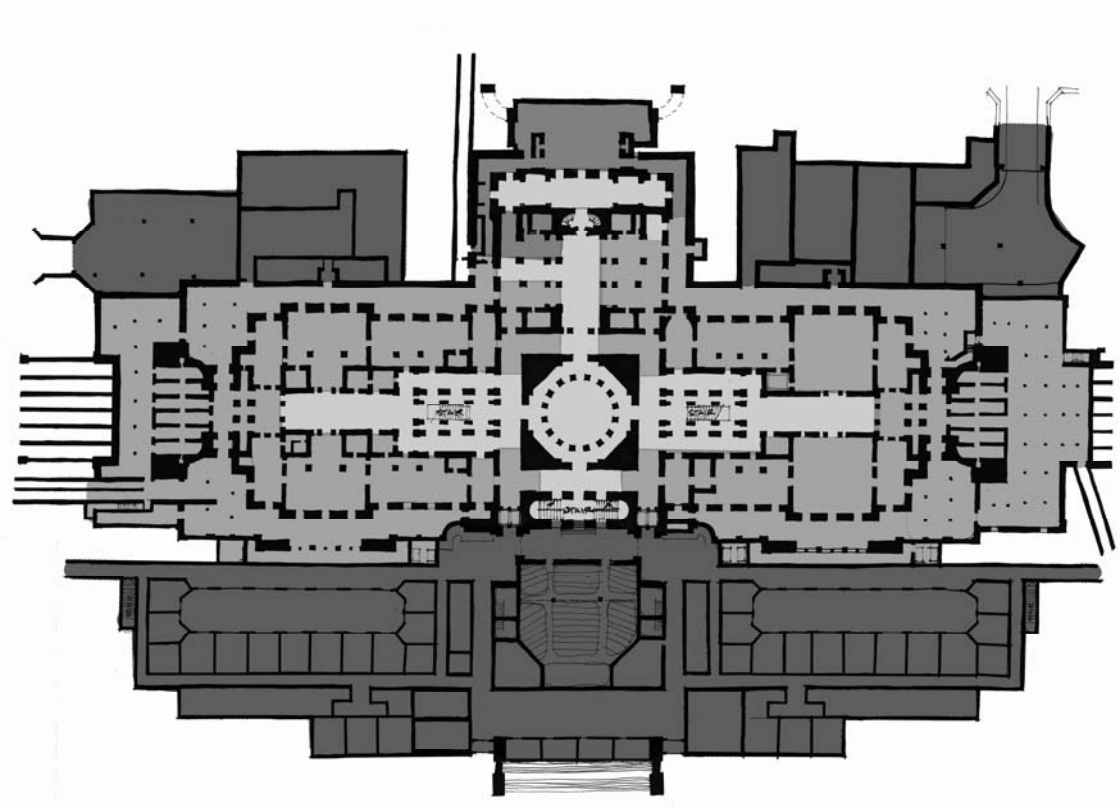
Third & Fourth Floors: The third floor will include the upper portions of the chambers, and the remainder of the floor will house legislative offices and meeting space.

- As a portion of the Chambers, the Gallery space may be considered Zone 2 space and will be treated the same as the floor below.
- Legislative office and meeting space may be considered Zone 3 and will be treated the same as Zone 3 offices on lower floors. In the case of open office areas for staff, low partitions and systems office furniture may be considered, however the aesthetics of these partition systems will be simple with wood trim to blend with the historic period.

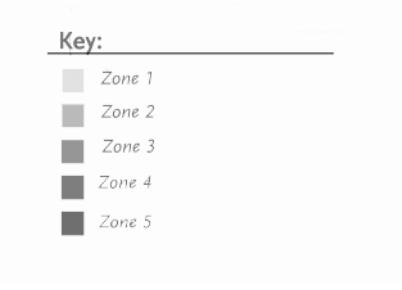
South Extension: This below grade addition will include Legislative office space, space for the legislative media and portions of the visitor center. As new construction, these will all be considered Zone 5.



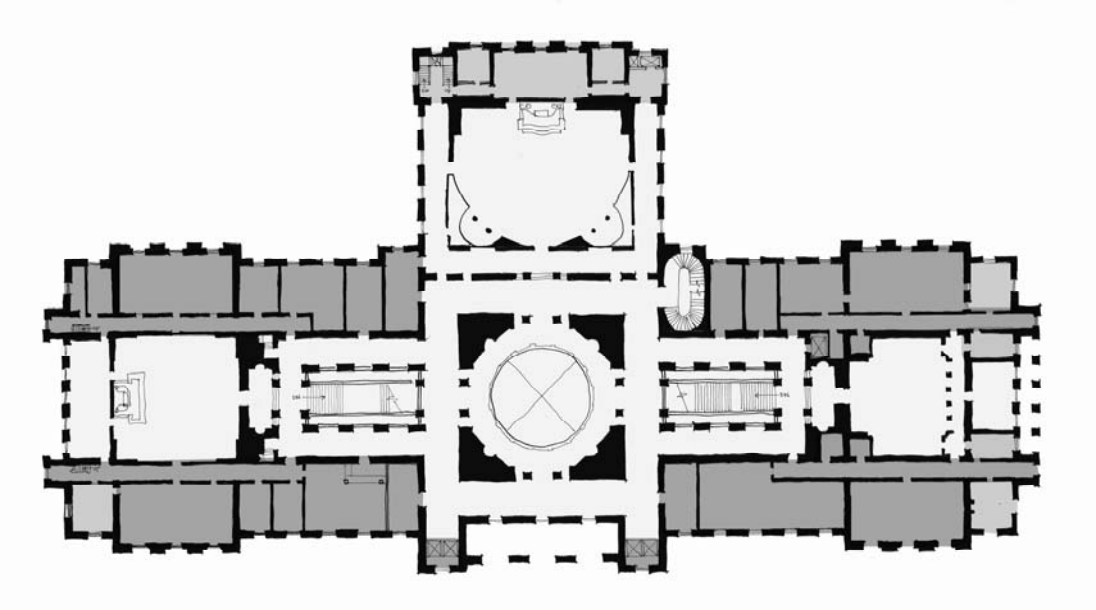
Ground Level Plan



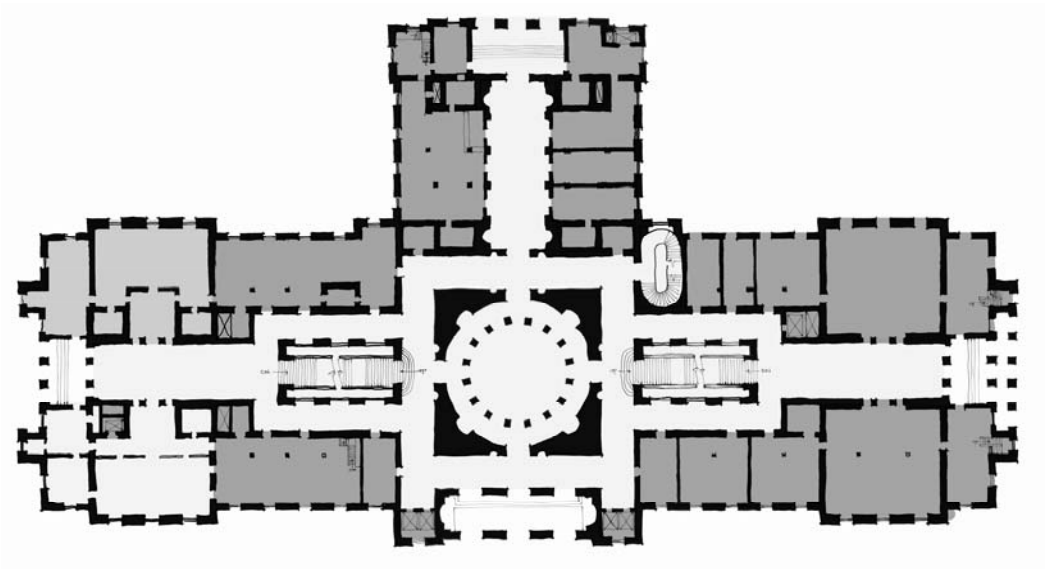
Lower Level Plan



PRESERVATION ZONING PLANS



Second Floor Plan

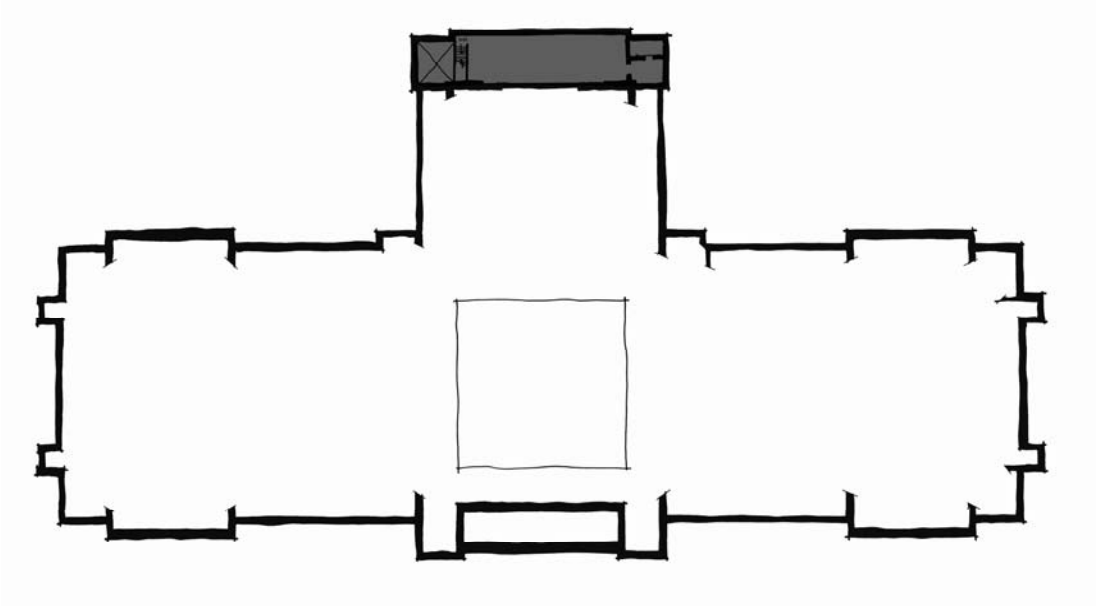


First Floor Plan

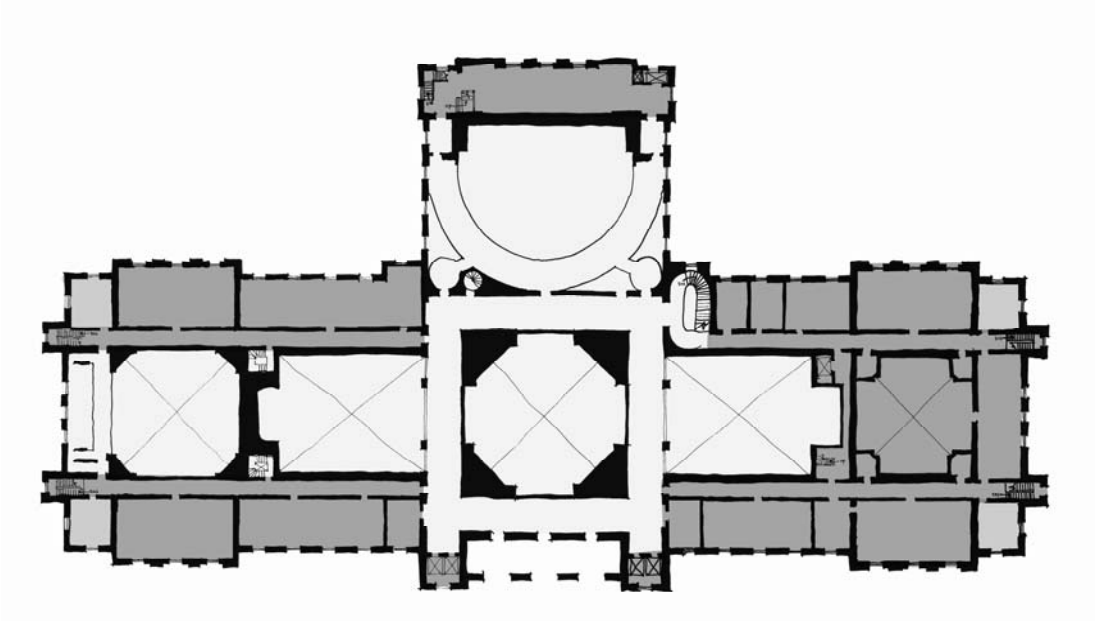
Key:

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5

PRESERVATION ZONING PLANS



Fourth Floor Plan



Third Floor Plan

Key:

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5

PRESERVATION ZONING PLANS

Section 4.3

LANDSCAPE ARCHITECTURE

General

Site improvements associated with the renovation and addition to the Capitol Building will complement existing architecture and grounds, and to the greatest extent practicable will replicate pre-existing conditions that are historically significant. Visual quality and specification of materials are especially important. All improvements will be perceived as being entirely harmonious with the design of the Capitol building and its grounds.

Moreover, all improvements will keep in mind the fundamental objective of *place-making*. Not only functionally, but also symbolically and psychologically, the Capitol is immensely important to the people of Minnesota and our nation. Site improvements should do more than simply accommodate practical needs. For all citizens of Minnesota, and especially our legislators, staff and visitors to the Capitol, the finished result should contribute to the "lifting of one's spirit," our sense of pride, and our ability to enact progressive legislation that will help us better face our future.

It should also be remembered that the Capitol and grounds is an enduring landscape. A long-term vision must be maintained regarding decisions made for all proposed improvements.

Existing Conditions

Site Demolition/Salvage of Materials

Natural Stone Paving, Steps, Planters, Edgers, Benches and Walls: All natural stone materials, regardless of type will be salvaged, cleaned of mortar, caulk and dirt, and then carefully stored for re-use as part of the finished improvements. Some of the natural stone paving may be recycled (transported off site for use elsewhere) depending on its condition and applicability to finished improvements.

Statuary (Monuments): All bronze statuary will be salvaged and carefully stored so it can later be re-installed as part of the entry plaza, including the John Albert Johnson Monument, Knute Nelson Monument and associated statuary.

Concrete Paving and Curbs: All concrete paving, curbing and associated subgrade materials will be demolished and disposed of properly off-site.

Bituminous Paving: All bituminous paving and associated subgrade materials will be demolished and disposed of properly off-site.

Handrailings: All metal handrailings of historic significance will be will be salvaged, cleaned, and then carefully stored for re-use as part of the finished improvements.

Light Fixtures and Electrical Cabinets: All pedestrian pole lights and bollards will be salvaged and carefully stored for possible re-use as part of the finished improvements, especially those that have historic significance. Vehicular pole lights (ornamental globes) along Aurora Avenue will be salvaged and carefully stored for possible re-use after re-alignment of the avenue. Floodlights, including ground-mounted floodlights and associated enclosures, will be salvaged and carefully stored for "possible" re-use. Electrical cabinets, conduit, junction boxes and similar ancillary elements will likely be discarded. Refer to the section entitled Electrical Engineering for more information.

Security Stations: The two security stations will be salvaged for "possible" re-use elsewhere.

Signage and Parking Meters: All signage and parking meters along Aurora Avenue will be salvaged but only for use elsewhere in the City. Proposed conditions will require new signage and parking meters.

Miscellaneous Furnishings and Signage: Furnishings such as litter receptacles, ash urns, flower pots and barricades will likely be discarded or used elsewhere. Proposed conditions will require new litter receptacles and other such elements.

Protection of Existing Trees to Remain: All trees near the construction site identified to remain will be properly protected from damage of any kind, especially to their root zones. Protection shall include fencing (preferably chain-link) at the dripline of the trees, and no construction activity, storage of materials, operation of machinery or parking will occur within the protective fencing, i.e., under the dripline of any trees.

Topsoils: Topsoils shall be stockpiled off-site in an appropriate location for possible re-use as part of the proposed site improvements.

Refer to section entitled Civil Engineering for more information.

Proposed Improvements

Stairs and Associated Materials:

The existing granite stairs and all associate materials including stone monuments, columns, cheekwalls, planters, benches, railings and light fixtures will be salvaged and reinstalled to replicate exactly the current condition. The existing concrete paving surrounding the upper stairs will be demolished and replaced with granite paving.

Precise identification of existing stone materials needs to be confirmed, but it appears that vertical surfaces (i.e., all materials other than paving) is Rockville White granite, and all walking surfaces appear to be Rockville Beige. There is a hierarchy of finishes that must be replicated for all new fabricated granite pieces that may be installed.

Pedestrian Pavements at Stairs (Landings): All pedestrian pavements between the Capitol building façade and the lower set of stairs (adjacent to re-aligned Aurora Avenue) will be granite of various types to match existing or pre-existing materials

Other Pedestrian Pavements: All pedestrian pavements between the bottom set of stairs and Aurora Avenue, and between Aurora Avenue and The Mall will be decorative concrete, i.e., with tinting, blasted finishes or whatever finish is appropriate to remain congruous with existing pavements to remain.

Site Lighting: The existing site lighting in this area will be analyzed, and new fixtures will be proposed to complement the existing style and improvements. Proper lighting involves both practicality (safety) and aesthetics. Appropriate light levels (footcandles) will be achieved while maintaining an attractive nighttime character . Refer to the Electrical Engineering section for more information.

Planting Soils Over Substructure: Planting soils will be installed to a depth of 24" over the building addition, this dimension including the waterproof membrane, protection board and drainage board. The planting soil will be a special rooftop mix comprised largely of sand to facilitate free-drainage.

Note: To achieve a 24" depth of planting soil over the building addition, a 30" high perimeter retaining wall will likely have to be installed parallel with the front face of the existing terrace to avoid placement of soils against the building. This retaining wall will likely be granite (most likely solid monolithic material), and be installed approximately 5 feet from the terrace. The resulting area between the terrace and the retaining wall will be surfaced with decorative granite pavers.

Historic Landscape

Planting:

All planting options to be reviewed by CAAPB. Shade and ornamental (flowering understory) trees will be installed near the east and west corners of the Capitol building but not over the proposed building addition. Caliper size of shade trees will average 4" (range from 3" to 5"). Caliper size of ornamental trees will average 2.5" (range from 2" to 3") unless multi-stem. Multi-stem specimens will average 10' height (range from 8' to 12').

Trees will be high quality specimens, and the species (or cultivars) specified will complement existing types on the Capitol grounds.

Foundation plantings will almost exclusively consist of flowering shrubs due to the limitation of planting soil depth. Where appropriate and feasible, larger shrubs that can be pruned as small flowering multi-stem trees may also be planting along the foundation and/or over the building addition.

Planting over the building addition will consist mainly of lawn with some flowering shrubs, most likely around the light wells. All ornamental trees and shrubs will provide at least two seasons of interest, preferably three or four.

Irrigation: The existing irrigation system will be re-configured to accommodate the proposed newly configured planting areas. Location of controller(s) will be studied to determine best location(s), whether indoors or out-of-doors.

Restoration of Affected Portions of the Mall: Those portions of The Mall that are affected by the re-alignment of Aurora Avenue will be restored to approximate their original condition. Given differences in layout (geometry) between the existing and proposed alignment of Aurora Avenue, the adjacent pedestrian pavements, plantings, light fixtures and the like will be restored as much as possible to replicate the existing condition. Limit of work will extend to a line approximately 100 feet south of the existing location of Aurora Avenue.

Re-Alignment of Aurora Avenue: Aurora Avenue will be re-aligned by moving the centerline southward, while maintaining the existing intersections (with Park Street and Cedar Street), i.e., the radius will be smaller. All sidewalks, parking meters and signage associated with the re-location will be new. The salvaged globe light fixtures will be re-installed.

Section 4.4

CIVIL ENGINEERING

Site Preparation

The State Capitol site is bounded by University Avenue, Cedar Street, Aurora Avenue, and Rev. Dr. Martin Luther King Jr. Boulevard. There is a landscaped mall that extends south from the Capitol Building to the Veteran's Service Building. Existing topographic and utility mapping of the State Capitol site is available, and is suitable for preliminary design. An updated survey is required to verify topography and utilities within the project area for preparation of construction documents.

The site slopes from north to south. The highest elevation of approximately 883.0 feet is at University Avenue on the north edge. . Dr. Martin Luther King Jr. Boulevard at the south end of the mall is approximately at elevation 840.0-feet. Aurora Avenue is at approximately elevation 870.0-feet at the south end of the entry stairs.

Preparation of the site for the planned expansion of the lower level of the Capitol Building will include:

- Relocation of statues
- Removal of the main entry stairs and walks.
- Removal of the drop-off drive
- Reconstruction of Aurora Avenue on new alignment further south.
- Reconstruction of sidewalks and plaza to match new Aurora Avenue
- Relocation of chilled water lines
- Relocation of natural gas line
- Relocation and reconfiguration of storm sewer lines
- Relocation of site and street lights including underground electric lines.
- Relocation and reconfiguration of irrigation lines

A specific plan for each utility must be determined through consultation with the utility owner.

Redesign of Aurora Avenue must include provisions for maintaining required emergency vehicle circulation.

Water Service

Existing water mains are located in University Avenue, Cedar Street and. Dr. Martin Luther King Jr. Boulevard on the north, east, and west edges of the building site. Two separate existing domestic and fire protection water services enter the building on the north from the watermain in University Avenue. Constructing a new watermain along Aurora Avenue that connects to the existing watermains in Cedar Street and .Dr. Martin Luther King Jr. Boulevard, would provide additional fire hydrants in the vicinity of the Capitol Building. All water system improvements must be consistent with the St. Paul Regional Water Services requirements and practice.

Sanitary Sewer Service

Existing sanitary sewer is located in University Avenue and Dr. Martin Luther King Jr. Boulevard. If required, a new sanitary sewer service could be extended to the south edge of the building from Constitution Avenue. All sanitary sewer materials and construction must be consistent with the City of St. Paul requirements and practice.

Storm Drainage

Existing storm sewer is located in Cedar Street, Aurora Avenue, and. Dr. Martin Luther King Jr. Boulevard Avenue. The existing storm sewer in Aurora Avenue must be relocated to the south with the street realignment. In addition to relocating the storm sewer, new inlets are needed along the reconstructed Aurora Avenue. Existing rain water drain connections that exit the south side of the building must be re-routed to new storm sewer within the realigned Aurora Avenue.

The City of St. Paul has storm water management requirements. The applicable requirements for this site must be reviewed with city staff. Generally, limiting the peak discharge from the 100-year design storm event to 1.64 cfs/acre is required. Storage of storm water in surface depressions, building rooftops, or underground pipes is typically required to limit the peak discharge to the required rate.

Gas Main

Existing gas mains are located in University Avenue and Aurora Avenue. The existing gas main in Aurora Avenue must be relocated.

Geotechnical

A geotechnical exploration and report with specific recommendations for the proposed building expansion must be prepared by a licensed geotechnical engineer. Based on a past soil investigation for the Capitol Complex, prepared by Soil Exploration Company in 1975 and 1976, generally the soils in the Capitol area consist of glacial drift overlying bedrock. Glacial drift consists of till (unstratified mixtures of gravel, sand, silt and clay directly deposited from glacial ice) and alluvium (stratified layers of outwash sand with silt and clay). The Capitol area lies on the edge of the intersection of two glacial river valleys, so the thickness of the glacial drift and the formation beneath the drift varies. Site soils are expected to consist of lenses and layers of silt, sandy silt and fine grained sands and silty sands. Variable depths (1' to 14') of fill soils were identified at the surface near the Captitol. The depth to the bedrock surface is presumed to be highly variable.

Support of the proposed building on spread footings is anticipated. Generally fill soils must be excavated, so the footings are supported on dense native soil. If the underlying soils are loose, surface compaction, or excavation and replacement with compacted material may be required.

The actual foundation system, bedrock elevations, and earthwork requirements will not be known until the geotechnical report is complete.

A foundation drainage system is required for all below grade building spaces.

Section 4.5

MECHANICAL ENGINEERING

UTILITIES

Heating Hot Water (HHW):

The heating hot water service delivered from district energy at the Northeast corner of the East wing is large enough to handle the future capacity of the Capitol. The location of this 4"HHW line is such that it will not be disturbed during excavation or new construction work.

The Capitol building has averaged (since 1984) a peak heating load demand of 1600 kW or about 5.5 million Btu/hr. The peak heating demand for the building occurred during the year 2003. This peak heating demand was 1908 kW or about 6.5 million Btu/hr.

The entire potential capacity of the 4"HHW line feeding the Capitol is available. St. Paul District Energy operates the heating hot water at a 90 deg. F. At this temperature differential, the 4"HHW line has a potential capacity of 12.6 million Btu/hr, which is nearly double the building's peak demand over the previous 22 years. Therefore, no additional heating hot water utilities will be needed.

Chilled Water (CHW):

The Capitol building is served by a 20"CHW that enters the building at the Northeast corner of the East wing. This line leaves the building as a 20"CHW line at the Southeast corner of the East wing. This 20"CHW leaving the building will need to be replaced and relocated to avoid conflict with the excavation and new construction to the South side of the building. Additionally, the 14"CHW main running from East to West (under Aurora Avenue) may need to be replaced and relocated to avoid construction below Aurora Avenue. The 20"CHW line at the Northeast corner of the East wing will not be disturbed during excavation or new construction.

The available capacity from this 20"CHW pipe is 17,250 gpm. In 2005, the peak flowrate for the Capitol was around 1900 gpm. St. Paul District Energy and the Capitol power plant both stated the existing 20"CHW line has the available chilled water capacity for the Capitol renovation and addition. This will be validated at a later time.

The Capitol is also connected to the central powerhouse that can provide 100% back-up should district energy fail. The chilled water backup consists of (1) 2,500 ton chiller and (3) 1,000 tons chillers.

Domestic Water (CW):

Two 4"CW lines may need to be replaced and relocated with new 4"CW lines that avoid potential conflict with new mechanical and electrical vaults being added to the North side of the buildings. One 4"CW line is located on the North side of the West wing. The other 4"CW line is located on the North side of the East wing. The location of the new vaults may not overlap with the current pipe locations, but the excavation of these vaults may expose these pipes. No additional domestic water capacity needs to be added.

A 4” CW line has the capacity for 280 GPM which translates to over 1500 w.s.f.u. Currently, we estimate the domestic water consumption to be under 1,000 w.s.f.u. The estimated future domestic water demand should not exceed the existing capacity. Currently, the water pressure entering the building is between 60 and 65 psi.

Sanitary Waste (W):

The sanitary waste currently leaves the building at two locations. The first is a 12”W line at the South end of the West wing. The second is a 6”W line at the West end of the West Wing.

The 6”W line at the West end of the West wing will not be disturbed during excavation or new construction. The 12”W line at the South end of the West wing will need to be replaced and relocated with a 12”W line that runs to the West near the South exterior of the building. This 12”W line will tie into an existing sanitary waste main running North and South under Dr. Martin Luther King Jr. Boulevard. The portion of the new 12”W line running near the exterior of the building will require additional care and coordination during the excavation and new construction to the South of the building. No additional waste capacity should be needed.

The 12”W line has capacity for 4,600 d.f.u. (at 1/8 in./ft. slope). The invert elevation of this waste line roughly 92’-0”. This would allow for a total horizontal run of approximately 750 feet. One design consideration is to lower the floor in the basement. This would limit the usability of this waste line. The 6”line has capacity for 700 d.f.u. (at 1/8 in./ft. slope). The invert elevation of this line needs to be verified.

Storm (ST):

The storm system for the Capitol leaves the building at three locations. The first is a 12”ST line at the South side of the West wing. The second is an 8”ST at the North side of the East wing. The third is an 8”ST at the North side of the West wing.

The 12”ST line has capacity for 33,300 square feet of roof area (at 1/8 in./ft. slope). Each of the 8”ST lines has capacity for 11,500 square feet of roof area (at 1/8 in./ft. slope). The total capacity of the existing storm would allow for drainage of 56,300 square feet. The roof area of the capitol is approximately 69,000 square feet. The invert elevation of the 12”ST is approximately 92’-0”. The invert elevation of the 8”ST needs to be verified.

The (2) 8”ST lines may need to be replaced and relocated with (2) new 8”ST lines to avoid potential conflict with new mechanical and electrical vaults being added to the North side of the buildings. The location of the new vaults may not overlap with the current pipe locations, but the excavation of these vaults may expose these pipes.

The 12”ST line at the South end of the West wing will need to be replaced and relocated with a 12”ST line that runs to the West near the South exterior of the building. This 12”ST line would tie into an existing storm location to the West. The exact tie in location is yet to be determined. The portion of the new 12”ST line running near the exterior of the building would still require additional care and coordination during the excavation and new construction to the South of the building. Additionally, the existing storm main running from East to West under Aurora Avenue may need to be replaced and relocated to avoid potential construction of Aurora Avenue.

Fire Protection (F):

The domestic water entering the building to serve as fire protection does so in two locations. The first is an 8"F at the North side of the West wing. The second is a 3"F at the North side of the East wing.

The 8"F and 3"F should be sufficient for the renovation and the new construction. However, these lines may need to be relocated to avoid potential conflict with new mechanical and electrical vaults being added to the North side of the buildings. The location of the new vaults may not overlap with the current pipe locations, but the excavation of these vaults may expose these pipes.

Natural Gas (NG):

The only remaining natural gas service to the building in located in the recently remodeled cafeteria. This service is sufficient for the current uses and likely to be sufficient for the building's future uses. The 2"NG line may need to be replaced and relocated with a new 2"NG line to avoid potential conflict with new mechanical and electrical vaults being added to the North side of the West wing. The location of the new vaults may not overlap with the current pipe locations, but the excavation of these vaults may expose these pipes.

The natural gas main running under Aurora Avenue may need to be relocated to avoid excavation and construction work with Aurora Avenue.

HVAC

System Description

The Capitol campus Central Plant currently provides heating hot water and chilled water to mechanical rooms throughout the building. New central pumps will distribute heating water and chilled water throughout the complex to all the new equipment including air handlers, VAV boxes and other terminal units. All new air handlers will include an economizer mode and heat recovery and will be operated via a direct digital control system.

The Capitol campus prior to 2005 had its own chilled water plant and distribution piping. This plant consisted of three centrifugal chillers with approximately 3200 tons of nominal capacity, not all of which was usable. There were issues with low delta T and there were pumping problems with the distribution system. The two large projects recently completed by HGA added +/- 3000 tons to this system. While a central plant addition was planned and designed, the State elected to connect to Saint Paul District Energy for its chilled water. The chillers are available for use, but given District Energy's history they will likely never be used again. There is adequate capacity available in the system for this project.

The Capitol campus is connected to Saint Paul District Energy for heating energy. Heating energy is in the form of medium temperature hot water. Water temperature varies from 250 deg F on a design winter day to about 180 deg F during the summer. There is adequate capacity available in the system for this project.

There are Design Guidelines for both chilled water and heating water services. District Energy is fairly strict on how the services are used, how they are connected, how they are metered, and how they charge for their use.

New variable volume central chilled water and heating water pumps will be added during this renovation project. (1) primary pump with (1) stand-by is preferred. Chilled water is used directly. Heating water requires the use of heat exchangers. District Energy has special requirements for heat exchangers used.

Economizer cycles should be used for central air handling systems. Total energy recovery wheels have been used recently (Laboratory project) with great success. District Cooling water will be used directly for cooling of special rooms that are difficult to serve with central air handling units (such as elevator equipment rooms, computer rooms, etc). Chilled water systems are an option for hard to serve rooms. The building automatic control system and the building management system will be Honeywell.

Applicable Codes and Standards

The building will be designed in accordance with the following codes and standards:

2003 International Mechanical Code

2003 International Plumbing Code

2003 International Fuel Code

2003 International Fire Code

ASHRAE Standard 62 - 2004

ASHRAE Standard 90.1 - 2004

NFPA Standards

Energy Conservation – Mechanical

Mechanical systems will be in compliance with ASHRAE 90.1 – 2004 and meet the Minnesota Sustainability Guidelines, including Variable Air Volume air systems, variable speed pumping, a Building Management System with Direct Digital Controls, and air and water temperature reset. Plumbing system with low flow water closets, urinals, and electronic faucets. Building envelope, with new insulated roofing system and low-e windows.

Advanced energy conservation strategies similar to the Orville Freeman Office Building shall be used. Air handling systems operate continuously. During unoccupied cycles the air terminal units switch to a zero minimum airflow and minimum outside air is reset to minimum levels (for exhaust fans that remain on and for building pressurization). With this strategy any room air terminal could respond to cooling during off-hour periods, but typically would remain closed.

Night setback strategies for a building with the combination of building mass and the poor thermal envelope qualities of this building should be considered with caution. There have been problems shutting down air handling systems over long summer holiday weekends creating musty and moldy smells on Monday mornings. It may be preferable to operate the systems continuously with lower airflow rates and lower outside air quantities to minimize energy use, but not compromising indoor air quality by allowing the humidity to rise.

Use a return air bypass system to introduce return air downstream of the cooling coil to allow for supply air heating when the chilled water coils are providing maximum dehumidification.

With the high minimum airflows required for conference rooms, carbon dioxide sensors should be used to automatically reduce the minimum airflows when not needed. Any conference room larger that 10-12 people needs to utilize this strategy.

Design Conditions

1. Summer Conditions

Outdoor Design Temperature	91° F dry bulb / 73° F wet bulb (0.4% ASHRAE)
Indoor Design Temperature	75°F (adjustable) / 50% relative humidity (occupied) 80° F / 60% max. relative humidity (unoccupied)

2. Winter Conditions

Outdoor Design Temperature	-22°F.
Indoor Design Temperature	68 - 72°F (adjustable)
	70° F (adjustable) / 20% relative humidity (occupied) 60° F (night setback)

Note: Maintaining a relative humidity above 20% will be a challenge without humidification. We will humidify only if the building envelope will allow it; presently, it will not.

3. Occupancy Ventilation

The volume of outdoor air brought into the building will be the greater of requirements from ASHRAE Standard 62-2004 and the exhaust air volume. For this building, the quantities will be as follows:

Committee Rooms – 7.5 cubic feet per minute (cfm)/person

Administrative and Office Areas – 5 cfm/person

Dining Area – 7.5 cfm/person

Library – 5 cfm/person

Conference Rooms – 5 cfm/person

Reception – 5 cfm/person

Computer Lab – 10 cfm/person

Gallery -- 7.5 cfm/person

Assembly/Multi-Purpose – 7.5 cfm/person

Legislative Chambers – 7.5 cfm/person

Corridors – 0.10 cfm/ft^2

Occupancy Schedule

The design will be based on year-round occupancy with an occupied/unoccupied timed schedule with overrides. The occupancy schedule will be from 7:00 a.m. to 11:00 p.m. weekdays. An unoccupied mode will used minimum airflow at the air terminals and reset the minimum outside air temperatures. An override sequence will allow the building operator to schedule, in advance, occupancy for lectures or special events during unoccupied times. But we would not recommend shutting down fan systems.

Space Conditioning

Air Conditioning loads for air handlers will be block loads with approximately 20% diversity.

Approximately four air handlers will be located in the vault mechanical room on the ground floor. These units will be VAV (variable air volume) with hot water pre-heat and chilled water coils and will incorporate humidification if possible. These units will serve areas on the ground, first and second floors. There will also be four or five units located on the attic level of the building that feed the third and fourth floor levels as well as the three main chambers (House, Senate and Supreme Court). A combination of VAV and constant volume units will serve these upper areas of the building. These units will also have pre-heat and chilled water coils and incorporate humidification. All units will be custom built aluminum, double-wall insulated units such as manufactured by Air Enterprise, Haakon, Kite, Temtrol, Ventrol and York. All temperature controls on these units will be manufactured by Honeywell Controls (which is the capitol campus standard). Each air handler will be equipped with an energy recovery wheel, and by-pass dampers for air side economizer to take advantage of "free" cooling during moderate weather seasons such as fall and spring. The air distribution for all units will be maifolded together to allow for redundancy and ease in maintenance.

Terminal Units and Air Distribution

Committee rooms, legislative offices and conference rooms will have at least one dedicated variable air volume terminal with hot water reheat. A dedicated thermostat in each room will control its respective terminal. VAV terminal units in assembly/multi-purpose rooms and other large occupancy rooms will be controlled by occupancy/CO2 sensors that will also control lighting. Typical staff offices and areas that have similar loads will share VAV terminals.

All of the air distribution grilles and registers in public spaces will be custom fabricated to integrate with the historical spaces. Air devices in the ground and lower floors will be high quality specification grade units.

The noise criteria (NC) level in most public areas should not exceed a value of NC-30 for all air distribution.

The main air distribution ductwork from the vaults into existing structure will be underground. FRP insulated duct, such as Peabody Spunstrand, will be used. Underground ducts require a statement from the Civil Engineer that there won't be ground water. If this cannot be done, a separate foundation drain must be installed under each run of duct.

Above ground ducts will be 4-inch pressure class duct for supply ducts from the fans to the inlet of the air terminal units, and 2-inch pressure class downstream and on constant volume systems. Return air can be 2-inch pressure class. Above ground ducts will be galvanized double-wall insulated (K-27) out to the air terminals where justified by sound calculations. Ductwork from the air terminals to the air device will be galvanized, with an armaflex type liner where needed. All return air ducts will also be galvanized, with an armaflex type liner liner.

Air distribution via ductwork will need to be coordinated with the shallow floor-to-floor height of the building to allow reasonable ceiling heights in the rooms below. Creative solutions will be required. In some spaces, for instance, "pilasters", "window seats" thickened walls, floor-to-ceiling furniture and sometimes, raised floors are being evaluated as possible means of concealing HVAC distribution.

The open rotunda will be equipped with a smoke evacuation system. Atria smoke evacuation systems must have tempered (heated) replacement air. The entire facility will be operated and monitored by a Honeywell Direct Digital Control (DDC) Building Automation System.

Cooling System

The source of chilled water to cool the Capitol building will be the central plant on the Capitol complex which is severed by St. Paul District Energy, the central district energy company. The plant also has it's own chillers that can provide back-up in the event the central district goes down. A single pump will distribute water to the air handlers for conditioning of spaces, with an Alternate for additional pump (standby).

Chilled water piping will need to be non-fiberglass and non-paper jackets to prevent moisture from condensation and ultimately mold. A polyisocyanurate insulation with Saran 560 vapor barrier jacket will be used. (Trymer-Dow Chemical Co website.)

Heating System

Currently, heating hot water is brought into the building and feeds air handlers and terminal units. St. Paul District Energy Company provides the heating hot water to the Capitol complex. New pumps will be installed to distribute (one standby as alternate) to VAV terminal units, unit heaters and cabinet unit heaters. A steam generator will be required to feed most air handling units for humidification.

Ceiling suspended, hot water, propeller unit heaters will be utilized in the mechanical room and electrical rooms. Unit ventilators with chilled and hot water coils or individual VAV terminal will supply vestibules and main entry.

Humidification System

The State will not want a steam boiler that requires constant attendance. Instead, gas-fired steam humidifiers may be used. Due to space and servicing issues, this needs to be examined further.

Ventilation and Exhaust

Outdoor air dampers will be opened based upon building occupancy schedule to ventilate the building.

For the four-story building, outdoor air will be brought into the building via new louvers. The location of these louvers still needs to be integrated into the overall architectural design. The return air path will be via a return air plenum above the ceiling.

Each toilet room, janitor's closet, mechanical, electrical and storage rooms will be ventilated per the International Mechanical Code requirements.

Temperature Control

A direct digital control system will be utilized to operate all HVAC equipment in the building. Graphic screens will be available for each air handler, variable air volume boxes, and hydronic pumps. The Capitol campus is served by Honeywell Controls.

PLUMBING AND FIRE PROTECTION

System Description

Services to toilet rooms, janitor closets, mechanical rooms and wall hydrants will be piped in accordance to the 2003 International Plumbing Code. All new above ground water piping will be copper. All new waste and vent piping aboveground will be no-hub cast iron. Below grade piping shall be schedule 80 PVC. A new water heater will provide dual temperature hot water to restrooms, showers, kitchen and janitor closets.

Codes and Standards

The building will be designed in accordance to the 2003 International Plumbing Code, 2003 International Fire Code and NFPA.

Domestic Hot and Cold Water

All new aboveground water piping will be copper. New piping will be brought back to main mechanical room on the vault level and connected to existing 4-inch service, with new backflow preventer. Copper with lead-free solder will be used for piping up to 1-1/2″. Dielectric unions will not be used between dissimilar metals. A copper male adapter and a female of the dissimilar metal will be used. All piping will be insulated and routed through wall chases or ceiling plenums.

A new water heater(s) will provide domestic hot water with hot water return loop. Thermostatic mixing station with return pumps will provide 140 degree water to kitchen, laundry equipment and janitor's sinks and 120 degree water to restrooms classroom sinks, showers and hand washing areas. A 180° F booster heater for kitchen may be required. Public restrooms will utilize hard wired infrared sensors for faucets, toilets and urinals. A new central water chilling machine will serve all the building's drinking fountains with cool domestic drinking water.

Sanitary System

The existing two sanitary lines will be reused from the building. All new above ground waste and vent piping will be cast iron, service weight, no-hub piping with extra-heavy couplings. All new underground sanitary will be schedule 80 PVC with solvent welded fittings. Approval from Plant Management for plastic piping underground is still needed.

All restrooms will incorporate restored or new white vitreous china, countertop lavatories, wall hung water closets and urinals that replicate fixtures of the period.

ADA Compliance

Toilet rooms will be ADA compliant. This will include water closets, lavatories and drinking fountains.

Storm System

The storm lines will be connected into the existing storm lines (three) exiting from the south side of the building.

Fire Protection Sprinkler Coverage

The entire building will include a complete fire suppression system with a Light Hazard classification in the offices and classrooms, and an Ordinary Hazard, Group 1 classification in all service areas, equipment rooms and storage rooms. All new piping will be black steel schedule 40 with either threaded or welded connections. At this time, a fire pump will be part of the project. Later analysis will determine its need.

The open rotunda will be equipped with a smoke evacuation system. The entire facility will be operated and monitored by a Honeywell Direct Digital Control (DDC) Building Automation System.

Section 4.6

ELECTRICAL ENGINEERING

ELECTRICAL DESIGN

Existing Conditions & General Description

The Minnesota Capitol is currently served by two (2) 1000 KVA double ended substations located in vaults on the north side of the building. These substation are new and will be reused in the updated sever if feasible. The substations are fed at 13,800 volts from 2 circuits off of the campus primary grid. The power is the stepped down to 208Y/120 volts which is subsequently distributed throughout the Capitol for power to mechanical equipment, lighting and general power.

New substations will be added that have a secondary voltage of 480Y/277 Volts. If feasible, the existing 208Y/120 volt substations will be sub-fed from the new 480Y/277 volt substations as part of the new electrical distribution scheme for the Capitol.

Electrical service and distribution capacity provided is based on the following loads:

Lighting:	1.2 W/SF Sounds low
General Power:	3.3 W/SF
Mechanical Equipment:	Connected Loads

Applicable Codes and Standards

The following codes and standards apply generally to the design of the electrical systems. Additional Standards may apply to specific equipment or components.

ANSI C2 – National Electrical Safety Code (NESC)

Minnesota State Building Code (MSBC) – (Current Version)

NFPA 70 – National Electrical Code (NEC)

NFPA 101 – Life Safety Code ASHRAE 90.1 – 2004

Minnesota Sustainable Building Guidelines – B3

Energy Conservation - Electrical

Energy conservation will be in compliance with Minnesota Sustainable Building Guidelines.

Electrical system will be designed in complacence to ASHRAE 90.1 – 2004, including full automatic lighting controls; high efficiency lighting will be used throughout as it complies with the programming needs, occupancy sensors, etc.

Power distribution will meet or exceed all of the voltage drop requirements established by the NEC and ASHRAE 90.1 – 2004.

PRIMARY SERVICE

Two (2) feeders from the campus primary circuits will radial feed to each end of the double ended sub stations.

Each primary feeder will terminate into each end of a double ended substation. Each primary switch is a 600 ampere, load interrupting, medium voltage switch (MVS). Primary fuses are current-limiting type

150A. Station class surge arrestors rated 9kV MCOV are installed on the load side of the primary switches. Existing primary switches will be maintained and reused to feed existing or new substations as they are reconfigured.

Primary Switch Specifications:

Maximum Voltage	15,000V
Interrupting Rating:	600 A
Short-time Rating:	25,000 A RMS SYM
Momentary Rating:	40,000 A RMS ASYM
Fault Close Rating:	40,000 A RMS SYM
Basic Impulse Level:	95 kV
Applicable Standard:	IEEE C37.20.3
Manufacturers:	G & W

Primary Fuse Specifications:

Type:	Silver-sand current limiting
Maximum Voltage:	15.5 kV
Interrupting Rating:	50,000 A RMS SYM
Mountings:	Positively Held
	Applicable Standard: ANSI C37.46, NEMA SG2A 4/0 600V insulated ground shall be run with all medium voltage, 15kv, single conductors in conduit.
Manufacturers:	G & W

DOUBLE ENDED SUBSTATION

New double ended substations in each of the north electrical vaults are to provide the 480Y/277 service equipment for the building. The two 13.2 kV-480Y/277 V dry-type transformers serve each half of a 2000 to 3000 ampere double ended substation.

To reduce the size of the transformers and normal losses, they will have a base ambient air kVA rating, and a 150% kVA forced air rating. Each transformer will normally supply 50% of the load of the substation and have the capability to supply the entire substation, with the forced air rating, should there be a loss of one of the primary feeders or one of the medium voltage transformers the tie switch closes. Similarly, either transformer can be out of service for maintenance or due to failure without overloading the other unit.

Network Transformer Specifications:

Primary Voltage:	13,800 V, delta-connected
Secondary Voltage:	480Y/277 V, wye-connected
kVA:	2500/3750
Temperature rise:	80/100 deg C

Primary BIL:	95 kV
Secondary BIL:	Impedance: 5.75%, minimum
Applicable Standard:	NEMA ST 20
Manufacturers:	Square D, Cutler Hammer, GE, or Siemens
	ANSI C57.12.51
	IEEE C57.12 01
	UL 1562

Network Protector Specifications:

Maximum Voltage: 600 V	
Continuous Current:	2500 A
Applicable Standard:	ANSI C57.12.44
Manufacturers:	Square D, Cutler Hammer, GE, or Siemens

Each transformer at each end of the double ended substation is connected to a main switchboard switch. New 480Y/277 Volt switchboards will supply power to those specific loads. The distribution devices will either be fused switches or group mounted circuit breakers depending on need of the project or space constraints.

The existing 208Y/120 volt substations will be reconfigured and reused to supply the loads of this voltage. The exact configuration in each of the substations will be further determined. Feeds to these substations will either be maintained from existing primary switches or will be reconfigured to be sub-fed from a 480 to 208 volt step-down transformer in the new 480 volt switchboards.

208Y/120 volt Switchboard Specifications:

Maximum Voltage:	250 V
Main Bus Current:	2000 A
Phase:	3
Wire:	4
Short Circuit Rating:	100,000 A RMS SYM
Manufacturers:	Square D, Cutler Hammer, GE, or Siemens

The existing 208Y/120 volt service switchboards use fused distribution switches.

480Y/277 volt Switchboard Specifications:

Maximum Voltage:	600 V
Main Bus Current:	~2000 A to 3000 A (depending service to 208v switchboard)
Phase:	3
Wire:	4
Bus	Copper, 100% rated, i.e. tapered bus will not be allowed.

Short Circuit Rating:	100,000 A RMS SYM Minimum
Manufacturers:	Square D, Cutler Hammer, GE, or Siemens

Applicable Standard: Switchboards, NEMA PB2, UL Standard 891, Breakers and/or Fused switches, ANSI C37.13, C37.16, C37.17, C37.20.1, C37.50, C37.51 UL 1066 and NEMA SG-3 standard, UL witnessed and approved as appropriate. Each circuit breaker is provided with a solid-state tripping unit having adjustable overload, short circuit, and ground fault pickup settings and time delay settings. Short circuit protection on feeder circuit breakers is provided by both short time and instantaneous settings, while only short-time settings are used on mains and ties. Ground fault protection uses time band coordination; zone interlocking is not specified. 480 volt fused switches with a 100 ampere frame or greater will have ground fault protection in accordance with the NEC.

Base Primary Conductor (Single Conductor):

Voltage Class	15,000V
Type:	MV-105
Size	350 kcmil or as required.
Insulation Level:	133%
Insulation:	EPR, CPE Jacket
Conductor:	Copper
Shielding:	Shielding is six corrugated copper drain wires embedded longitudinally in a flame-resistant semi-conducting Chlorinated Polyethylene, (CPE), jacket.

NORMAL DISTRIBUTION AND POWER

The existing 208Y120 volt distribution system throughout the building will remain in place and be utilized to maintain or extend the existing distribution system. The existing distribution system has been undergoing renovation and will be utilized wherever possible.

New 480Y/277 volt distribution will be added to the building to support the requirements of the new mechanical equipment and the new lighting and power systems. Distribution panelboards will be fed from the main switchboards as necessary for distribution logistics. New branch circuit panelboards will be installed for general power and lighting. Transient voltage surge suppression (TVSS) will be provided on all main service entrance switchboards or panelboards, including emergency sources.

Branch Circuit Panelboards will be provided as required. 480Y/277V panel will be provided for lighting and 208Y/120V for general power will also be provided. Panelboards will be installed as necessary to enhance the existing systems. Logistics, quantity of load, or concentrations of load will determine if additional branch circuit panelboard are necessary in any area.

All panelboards will be of a door in door, i.e. a hinged door in a hinged panel cover. Panelboards will have copper bus and use bolt-on breakers.

General purpose receptacles will generally consist of specification grade 120-volt duplex-grounded type, 20 ampere minimum. Special outlets styles will be provided as necessary for equipment. Power connections will be made to all fixed in place equipment including mechanical equipment.

Panelboard Specifications:

Type:	Deadfront
Bus	Copper
Applicable Standard:	UL 67; NEMA PB1
Manufacturers:	Square D, Cutler Hammer, GE, or Siemens

Transformer Specifications:

Type:	Ventilated Dry
Insulation Class:	220 deg C
Temperature Rise:	115 (or 80) deg C
Non-linear Rating:	NA
Applicable Standard:	UL 506; NEMA ST20
Windings	Copper
Manufacturers:	Square D, Cutler Hammer, GE, or Siemens

For emergency and standby power distribution, see Section "Emergency Power Systems".

METERING

Electric service will be metered. Meters will be compatible with and monitored by Minnesota's Capitol complex S.C.A.D.A. system.

GROUNDING

Grounding will be in compliance with the NEC. The building grounding system is intended to provide a low-impedance equipotential ground network for electrical safety and communications system grounding.

Step-down transformers will be grounded as a separately derived source. And have the neutral bonded to the ground. The generator will be grounded to the building ground system and not as a separately derived system.

It is anticipated that a common grounding electrode will be run through the building for derived source grounding purposes. Due to the age of the building, adequate grounding electrodes may not be available.

Equipment grounding for electrical circuits is provided by green-colored insulated grounding conductors installed in conduits with the phase conductors.

All teledata grounding shall be per EIA-TIA standards.

Grounding Criteria:

Maximum resistance per rod:	10 Ohms
Maximum grid resistance:	5 Ohms
Applicable Standards:	IEEE 81, UL 467, TIA/EIA 607

The buildings Lightning Protection system will be repaired, replaced, and extended as necessary to provide a complete UL Master Label Lightning protection system.

POWER QUALITY

Steady state electrical supply voltage and frequency regulation are largely determined by the primary voltage supplier.

Per NEC recommendations, secondary voltage feeder conductors and branch circuit conductors are sized to limit total circuit path voltage drop to 5 percent, however, this building is designed to limit this drop to better than 4 percent where economically feasible..

To provide protection from externally generated voltage transients, Transient Voltage Surge Suppression (TVSS) is applied at each service entrance switchboard and at the emergency panelboard. TVSS installation is intended to maintain low surge impedance through short, direct-bussed connections to phase and ground buses in the switchgear.

Where new panelboards serving teledata rooms or closets are installed, TVSS will be installed on these.

TVSS Specifications:

UL 1449 Clamping Voltage:	700 V
IEEE C62.41 Let-through:	Per UL1449, UL 1283
Category:	C3 – High Exposure
Maximum Surge Current:	200,000 A Service Entrance, 80,000 A Panelboards
Applicable Standards:	UL 1449, IEEE C62.41

EMERGENCY POWER SYSTEMS

General

Emergency power is supplied to the building from an existing campus generator.

The generator feeds a main emergency panelboard and then to transfer switches. There will be 2 emergency distribution systems in the building, one for Life Safety Emergency Distribution and one for Standby Emergency Distribution. Each type of emergency power system will have its own distribution system and have it own transfer switches as required by the NEC.

Generator and ATS's will be monitored by the building automation and control system, (Honeywell Controls).

Applicable Codes and Standards

The following codes and standards apply generally to the design of the emergency and standby power system. Additional standards may apply to specific equipment or components.

ANSI C2 – National Electrical Safety Code (NESC)

Minnesota State Building Code (MSBC) – (2003)

NFPA 70 – National Electrical Code (NEC)

NFPA 101 – Life Safety Code ASHRAE 90.1 - 2004

Life Safety Emergency Distribution

The emergency power system supplies life safety loads. These are those electrical loads that are that are required for the Life Safety protection of personnel. Life safety loads are exit lighting, egress lighting, fire alarm system, smoke control equipment (if required), elevators (if required), etc.

Emergency power distribution for lighting is provided by optimally located 100-ampere panelboards or directly from the main standby distribution panelboard. 480-208/120 Volt step-down transformers and branch circuit panels are provided for miscellaneous loads.

Panels and transformers will be similar to "Normal Distribution and Power.

Standby Emergency Distribution

The standby distribution system is for critical loads that are of a standby nature and consist of equipment considered essential and requiring restoration within 60 seconds that may be necessary for property or equipment protections. Typical critical loads are heating water pumps, UPS's, sump pumps, fans, and some general exhaust fans, building automation and control system, and will be determined as design continues.

Standby power distribution will be provided either by optimally located 100-ampere panelboards or directly from the main standby distribution panelboard. 480-208/120 V step-down transformers and branch circuit panels are provided for miscellaneous loads.

Panels and transformers will be similar to "Normal Distribution and Power"

LIGHTING AND LIGHTING CONTROL SYSTEMS

Lighting/Interior

Where reasonable and without sacrificing an appropriate sense of historic lighting treatments, lighting will be energy efficient in an effort to meet the intent of ASHRAE 90.1–2004 and lighting criteria targets will be based on Illuminating Engineering Society guidelines.

Automated lighting controls and presets will be used for efficiency, sustainability, convenience and to meet the intent of ASHRAE 90.1–2004. Lighting throughout the building will be based on original historic or period reproduction luminaire housings/styles while using modern lamps for best efficiency and longest service life. Except where very low–level dimming is necessary or luminaire limitations prohibit auxiliary components such as ballasts and transformers, most interior lighting will be achieved with compact fluorescent, linear fluorescent, and LED lamps as the application warrants.

Fluorescent lamps are of high color rendering (CRI greater than 80) and warm color temperature (2700K to 3000K) to provide best color contrast and rendering while maintaining a warm tone reminiscent of gas and early incandescent light. Fluorescent ballasts are electronic with high power factors (0.95 or greater) and high ballast factors (0.88 or greater), and with low harmonic distortion (typically less than 10 percent).

In some historic areas, lighting is achieved with halogen, tungsten, or xenon incandescent lamps for full-range dimming and a minimum of auxiliary components (ballasts and/or transformers may not be accommodated in existing historic housings). The halogen, tungsten, or xenon incandescent lamps also provide the perception of a more authentic appearance of the period luminaires in this highly-visible historic public landmark.

Proposed light intensity targets for many functions/space types are reported in the table below and are generally based on current IESNA guidelines. For the office and administrative support spaces, the

ambient targets are somewhat lower than IESNA guidelines for a more historic appearance and a less institutional/commercial appearance. Here, task lighting at the work zone is required.

Table 1-1 identifies by interior space function the light level criteria targets.

Applicable Codes and Standards

The following codes and standards apply generally to the design of the lighting and lighting control. Additional standards may apply to specific equipment or components.

ANSI C2 – National Electrical Safety Code (NESC)

Minnesota State Building Code (MSBC) – (2003)

NFPA 70 – National Electrical Code (NEC)

NFPA 101 – Life Safety Code ASHRAE 90.1 - 2004

Table 1-1. Lighting Targets by Interior Space Functions

Space	Ambient Illuminance Target[1]	Task Lighting Required
Circulation, Lobby, Waiting, Rotunda	3 fc to 5 fc	NA
Chambers	25 to 35 fc	NA
Office	15 to 20fc	Yes, add'l 30 to 35fc
Admin Support	15 to 20 fc	Yes, add'l 30 to 35fc
Library	30 fc	30 fc (active stacks)
Gallery	5 to 10 fc	As necessary for accent
Conference	15 to 20 fc	NA
Restrooms	5 fc to10 fc	NA
Equipment Rooms w/windows	5 fc	NA
Equipment Rooms w/o windows	10 fc or greater	NA

[1] Values are average illuminance targeted for horizontal task plane (e.g., floor, table, desk). Actual field measurements may be higher or lower depending on a variety of field conditions, including paint color schemes and actual voltage. Average-to-minimum uniformity at 3-to-1 or less in workspaces.

Lighting/Exterior

Site and perimeter lighting will be provided as the design develops.

Exterior lighting is based on a combination of period reproduction luminaire housings/styles with modern lamps and modern relatively-hidden luminaire housings/styles with modern lamps and optics. All exterior lighting is achieved with low wattage ceramic metal halide lamps and compact fluorescent lamps. These lamps are of high color rendering (CRI greater than 80) and warm color temperature (3000K) to provide

best color contrast and rendering for improved security while maintaining a warm tone reminiscent of gas and early incandescent light. Ceramic metal halide ballasts are electronic or electromagnetic depending on application (where long-distance, remote mounting is necessary, and/or for potting/waterproofing purposes, electromagnetic ballasts are used). Proposed light intensity targets are reported in the table below and are generally based on previous experience on historic landmarks. Light levels at building entries and stairs are entirely dependent on the opportunities for light locations. For example, if limited locations are available for historic postlights and/or handrail styling and placement precludes handrail–integrated lighting on stairs, the light levels of these stairs may be less than typically considered normal.

Table 2-2 identifies by exterior area the light level criteria targets.

Table 2-2. Lighting Levels by Exterior Area

Area	Illuminance Target[1]
Building Entries	0.25 fc or greater
Stairs	0.25 fc or greater
Main site paths	0.25 fc or greater
Secondary site paths	0.25 fc or greater

[1] Values are illuminance targeted for horizontal task plane (e.g., porch, treads, ground). Actual field measurements may be higher or lower depending on a variety of field conditions, including paint color schemes and actual voltage. Average-to-minimum uniformity at 5-to-1 or less.

Lighting Controls

The lighting controls shall be in compliance with ASHRAE 90.1 – 2004. Multifunctional and/or historic spaces such as chambers, committee rooms, conference rooms, and presentation areas shall have multilevel control, zoning or dimming control related to the application or use.

Egress and Emergency Lighting

Exist and egress lighting will be provided as required by code. They will be powered from the emergency power distribution system.

FIRE/SMOKE ALARM SYSTEMS

General

A manual and automatic fire alarm system will be installed throughout the building. It interfaces with fire doors and fire shutters (where installed), smoke control systems, (rotunda), and elevator recall as necessary.

The existing Honeywell Fire Alarm system shall be expanded and used.

“Area of Refuge” communications systems will be provided in stair towers or other areas if and where required by code.

Applicable Codes and Standards

Minnesota State Building Code (MSBC) – (2003)

NFPA 70 – National Electrical Code (NEC)

NFPA 72

NFPA 101 – Life Safety Code

ASHRAE 90.1 - 2004

Manual Alarm System

Manual pull stations are installed at exits to floors and to the building as required by NFPA 72.

Automatic Detection System

A limited automatic detection system will be made up of a signal from the fire suppression system, HVAC system smoke detectors, elevator lobby detectors, and from detectors used to activate the smoke control system.

SECURITY

General

Security system door strikes, card swipes etc will be provided in the building as required and shall be an extension of the existing Honeywell security system. This equipment will be developed as design continues. See Security Update in Section 5.11 (with code)

Section 4.7

TELECOM

General Description and Existing Conditions

Capital campus Centrex phone service is supplied to the majority of the Capital building by O.E.T. with some offices choosing to use their own phone systems. It is anticipated that the campus system will be migrating to a Voice over IP (VoIP) system soon.

The telecommunications infrastructure systems will be designed and installed per TIA/EIA standards, applicable codes, and standards for state buildings. The finished infrastructure will support voice, data, and video distribution.

It is quite possible that the existing infrastructure cabling feeds to the Capitol building (both from the local carrier and from the Capitol complex OET network) will need to be re-routed to the new equipment room/server room locations on the basement level as part of this renovation. Also, the phone equipment within the Governor's secure phone room may need to be relocated to one of the new equipment room/server rooms and enclosed in a security cage within the room as part of this renovation. Existing telecommunications systems are likely to be moved or replaced. Wireless LAN Access Points will be installed to provide 100% wireless network access coverage in the building. New infrastructure cabling will be installed based on the technology needs and programming of the particular space or area.

Telecommunication Spaces

To properly address the information technology requirements of the 425,000-plus square foot capitol building and maintain TIA/EIA standards based cable lengths to workstation outlets, we recommend the following spaces for telecommunications. The specific location of these spaces will develop as design continues:

- Two 30' X 50' main equipment/server rooms (primary & secondary). One in the east wing and one in the west wing of the sub-basement level addition.
- One 10' X 15' entrance facility room (MPOP) on an outside wall in the existing basement level nearest to the carriers existing manhole location.
- Two 10' x 12' telecom rooms in the existing basement level (one in the east wing and one in the west wing).
- Two 10' x 12' telecom rooms in the addition to the basement level (one in the east wing and one in the west wing).
- Three 10' X 12' telecom rooms in the ground level (one in the north wing, one in the east wing and one in the west wing).

- Three 10' X 12' telecom rooms in the first floor level (one in the north wing, one in the east wing and one in the west wing).
- Two 10' x 12' telecom rooms in the second floor level (one in the east wing and one in the west wing).
- Two 10' x 12' telecom rooms in the third floor level (one in the east wing and one in the west wing).

The two main equipment room/server rooms on the sub-basement level addition would be utilized for the termination of Intra-building and Inter-building backbone infrastructure cabling, core network hardware, main phone equipment, and each Agencies file/application servers. The telecom rooms located through-out the building would be utilized for the termination of infrastructure cabling and network hardware required to meet the technology needs of the particular space served by the telecom room.

Refer to S.A.O. website for:

- Designer procedures manual.
- Building Infrastructure Standards of State Owned Building (2003)

Section 4.8

STRUCTURAL

The structural effort fall into three distinct categories: investigation of existing structure, modification of existing structure, and concept design of new underground structure.

Investigation of the Existing Structure

1. Middle Dome column tops. Future investigation is required to confirm that previous deterioration was corrected during the Lantern repair project.
2. The horizontal ring-truss at the intersection between the Middle and Outer Domes. Previously stated concerns about this steel structure remain. Further investigation is required.
3. Tension rings in the Outer Dome. A 1901 correspondence between Cass Gilbert and his consulting engineer discussed the presence of 5 steel tension rings embedded between the marble skin of the outer dome and the masonry backup wall. A 1988 condition report confirmed the presence of the rings, and reported slight to moderate deterioration of these tension rings. Given that the original design does not prevent water penetration through the outer Dome, the probability is high that the tension rings will continue to deteriorate. Our preliminary calculations indicate that the Dome may not be structurally stable if the tension rings are broken. Five future actions are required:
    a. Non-destructive testing of the rings to determine their condition.
    b. Testing of the marble to determine the extent of deterioration to the exterior face, and the permeability of the stone.
    c. Test the back-up masonry to determine how conducive the environment is to further deterioration. This testing includes chemical composition, pH testing, and moisture content.
    d. Determine the mortar joint size variation due to temperature changes. Two options to accomplish this:
        i. Subject samples of the Georgian marble in a lab environment to temperature variations to determine the thermal expansion and contraction of the stone.
        ii. Place expansion monitors over a sampling of the Dome joints. These monitors should remain in place through a 1 year temperature cycle.
    e. The selection of a mortar that has the required elasticity to maintain a water-tight joint over the relatively large joint size variations. Recent advances in mortars that increase their elasticity should be fully investigated. The entire dome outer marble Dome should be repointed with the new mortar.

Several areas within the main building roof structure were viewed. These areas include the House of Representatives Dome, the north half of the Senate Wing, the Senate Dome, and the south half of the Supreme Court Wing. There was no evidence of deterioration to the structural system due to water infiltration. There appears to be relatively large open spaces within the Supreme Court and Senate Wings for new mechanical ducting. The ability of the existing roof structure to support new mechanical units requires additional investigation. Another site visit is required to view the balance of the roof structure.

Continued pooling water in the basement after heavy rain events, and past water damage to the vaulted ceiling surrounding the Rotunda, are evidence that water continues to infiltrate through the roof structure that surrounds the Rotunda Dome. The source of this water and its impact on the existing structure requires further investigation.

Modifications to the Existing Structure

A. Preliminary programming studies include modifications to the existing Meeting Rooms in the Supreme Court Wing to create larger areas for modern Hearings. The restoration may also include similar modifications in the Senate Wing. This expansion requires the removal of two existing columns and stone bearing walls that surround 2 vaults between the 2nd level and Ground level. This will require the following modifications:

Column removal and replacement

1. Shore the 2nd level slab around the existing 2 columns (67,000# shoring load at each column). Remove the 2 existing columns between the 2nd floor and 1st floor.
2. Install a transfer beam tight against the underside of the 2nd level slab to carry the column loads to the east and west walls. Beam ends to bear on pockets cut into the existing stone walls. To ease constructability, the beam may be cut into 2 or 3 pieces and rebuilt with full-penetration site welds.

Wall removal and replacement

3. Just above the 2nd level slab, shore the walls separating the existing meeting room from the Supreme Court chamber (approximately 8,000#/ft x 50' long).
4. Remove the existing stone walls between 2nd and 1st floor (approximately 175,000#)
5. Install steel truss tight to the underside of the 2nd level slab beneath the shored wall. Truss construction to consist of double-angle chords and diagonals; approximate weight is 140#/ft. Trusses to bear on pockets in existing stone walls. Some field assembly will be included in the truss design to ease installation. Another option that may be more economical is a plate girder. The calculations for this option have not been performed.

Floor slabs removal and replacement

6. Remove the existing floors on 1st and 2nd level (approximately 20,000#/floor).

7. Remove 2 columns between 1st and Ground level, and walls surrounding the vaults (approximately 250,000#).
8. Replace 1st and 2nd floors with a 3 1/2 ” lightweight concrete slab on 3” composite deck. Three composite steel purlins to support the floor, each spanning approximately 50’. Preliminary calculations indicate W27x84 beams. Floor area is approximately 2,500 sq. ft. per floor.

Note: The modifications described above are preliminary, meant for pricing purposes only.

The steps listed above include large shoring loads. Because the walls above the shoring are surfaced with historic plaster, the allowable deflections during the transfer of loads to the shoring will be small. The published allowable deflections are L/400 (1” over a 33’ span). These limits will be confirmed through field testing on a sacrificial wall to determine the appropriate criterion. All permanent transfer beams will be designed for the stringent deflection requirements.

B. There have been informal discussions about the removal and replacement of the existing basement concrete slab-on-grade. This does not appear to be difficult structurally. A new 5” unreinforced cast-in-place concrete slab-on-grade is envisioned to replace the existing slab. The removal of this slab offers the opportunity for mechanical ducting and electrical conduits to be run beneath the new slab-on-grade. Any new trenching will be accomplished with trench inserts; under-slab ducts will likely be spanned with transverse reinforcing bars placed within the slab. Given that the existing columns are supported by footings that stair-step outward from the column, it would be prudent to have the specific footing locations at sub-floor elevations surveyed with ground-penetrating radar before under-slab ducting concepts are developed.

New Underground Structure

Cast-in-place concrete is the chosen material at this stage in the project to build the underground additions: the north-side vaults and south-side office/auditorium/Visitor Center space. This system was chosen for four reasons:

1. The foundations and basement walls are typically cast-in-place concrete. Maintaining the same material for the interior columns and the floor and cap slabs maintains continuity within the structure, and reduces coordination issues during construction.
2. The large lateral soil forces on the top of the basement walls require stiff horizontal plates within which forces can be transferred to adjoining shear walls. The stiff and strong nature of concrete in compression, as well as the ease of wall-to-floor connections, make it suitable for this application.

3. Concrete is a highly redundant system that maintains the overall structural integrity during a localized failure. This is an important advantage when considering security issues. Specific security requirements are yet to be determined.
4. Concrete tends to resist corrosion due to water intrusion better than steel. Thus, it is well-suited for underground structures, especially structures that will be covered by soils.

The following is our assumed loading for the underground additions:

- Dead Loads:

- Self weight (floor and cap slabs):	125 psf
- Waterproofing, ceilings, Mech/elec/plumbing	20
- 2 feet of soil	220
	365 psf

- Live Loads: 200 psf
  - higher than code-required due to the potential for outdoor crowds, high vehicle wheel loads, and security considerations.

- Blast resistance. These requirements may be added to the structural design, as the security requirements are determined.

The following is our preliminary cast-in-place design, and is provided for pricing purposes only.

- Materials:
  - 4 ksi concrete; epoxy-coated reinforcing bars in cap slab; reinforcing within walls and floor slabs to be uncoated.
  - Assumed soil capacity: 2.5 ksf (based on previous soils reports)

- Grid spacing:
  - approximately 20’x26’ over office areas;
  - approximately 20’x40’ over auditorium and Visitors’ Center
  - mechanical vaults to be determined.

- Structural slabs: Pan and Joist system with 6” thick slabs.
  - 53” wide x 20” deep standard pans (approximately 9” wide joists) over office areas;

- 30” wide x 20” deep standard pans (approximately 12” wide joists) over auditorium and Visitors’ Center
- mechanical vaults to be determined.

- Basement walls
  - Walls to 15’ below grade: 15” thick with 1.5% total vertical reinforcement; 0.5% total horizontal reinforcement;
  - Walls 15’ to 30’ below grade: 24” thick; same reinforcement percentages as the walls above

- Columns: 24” round columns with 1.5% vertical reinforcement.
- Footings: - beneath 20’x40’ grid: 20’ square x 36” deep, 10 #11 bars each way
  - beneath 20’x26’ grid: 16’ square x 28” deep, 10 #8 bars each way.
- Slab-on-grade: - 8” unreinforced slab-on-grade beneath vaults and mechanical rooms
  - 5” unreinforced slab-on-grade beneath all other areas.

Demolition

It is envisioned that the existing main entry steps will be dismantled, stored during construction, and reused as possible. The existing foundation beneath these stairs will be demolished. The existing wall that supports the south edge of the porte cochere must remain in place if the porte-cochere decorative arched ceiling is to be retained. This will require temporary shoring and a new footing and foundation wall installed beneath. The north-side support of the porte cochere will also require demolition and reframing. Details to be determined at a later date. The existing porte-cochere slab-on-grade and exit ramping will be demolished.

Section 4.9

SUSTAINABLE DESIGN

The following are excerpts from the State of Minnesota Requirements for B3 Guidelines for sustainability. These are to be considered and discussed as this project moves through the design and construction phases.

The Minnesota Legislature required the Departments of Administration and Commerce, with the assistance of other agencies, to develop sustainable building design guidelines for all new state buildings by January 15, 2003. According to the legislation, the guidelines must:

• Exceed existing energy code by at least 30 percent

• Achieve lowest possible lifetime costs for new buildings

• Encourage continual energy conservation improvements in new buildings

• Ensure good indoor air quality

• Create and maintain a healthy environment

• Facilitate productivity improvements

• Specify ways to reduce material costs

• Consider the long-term operating costs of the building including the use of renewable energy sources and distributed electric energy generation that uses a renewable source of natural gas or a fuel that is as clean or cleaner than natural gas.

GENERAL CRITERIA

- Construction and operation of buildings result in high levels of energy and resource usage. Great care must be taken therefore when creating "sustainable" projects.
- Consultants shall design buildings to use resources in a way and at a rate that does not jeopardize the needs of future generations.
- Design decisions must balance economic, environmental and community needs.
- Sustainability may increase <u>or</u> reduce costs. Time and effort is required to make informed sustainable design decisions.
- Design decisions must consider the full life of materials including life-cycle assessment (LCA) and life-cycle cost (LCC) factors, and must consider must also consider operating costs.
- Design decisions must be well documented since issues, suppliers, resources and product choices change frequently.
- Consultants shall use building components that are produced using reliable sustainable technology, avoiding untested systems, materials, and processes.

- The consultant shall develop and document the project using the 'Minnesota Sustainable Design Guide' as a resource, available at: www.sustainabledesignguide.umn.edu
- Note: Sustainability Guidelines will be updated periodically since issues, suppliers, resources and product choices change frequently.

DEFINITIONS

Commissioning	A systematic process for ensuring that building systems perform as efficiently as possible.
Deconstruction	The process of taking buildings / structures apart so that components can be reused or recycled.
Life-cycle Assessment (LCA)	Reviewing the full life of a product and its impact on the environment including: mining of the raw material; refining and creating a finished product; transportation to the site; installation in the project; resources used during its life; and its final disposal.
Life-cycle Cost (LCC)	Reviewing the full life cycle of a product and the cost to use it in the project including: the first cost of the product; the cost to operate and maintain it; and the cost of disposal.
Mandatory	A process or choice that must be included in the project.
Recommended	A process or choice that is not required but should be included in the project.
Sustainability	Using resources in a way and at a rate that allows people to meet their needs, while allowing future generations to meet their needs.
Volatile Organic Compounds (VOC)	Chemicals whose presence in the air may frequently cause poor air quality.

A. Site Issues

A.1 - Mandatory

1.1 Review site features with care. Avoid building on sites or portions of sites that tend to flood; are subject to erosion; have delicate plant or animal life; or include wetlands.

1.2 Audit the site for hazardous materials.

1.3 Prevent erosion to reduce effects on air and water quality, both on and off-site.

1.4 Reduce thermal effects generated by the building and parking design.

1.5 View and design the building and site as a whole "system".

1.6 Where existing site damage is present, reduce the need to develop additional "raw" land by repairing damage and reusing the existing site.

1.7 Remove topsoil and store for re-use.

1.8 Ensure that adequate time and space is allotted for deconstruction including removal and storage of salvaged materials.

A.2 - Recommended

2.1 Avoid building on inappropriate sites. Reduce environmental impact generated by placing the building on the site.

2.2 When appropriate, locate buildings where roads, utilities, and other services exist.

2.3 Reduce the amount of paving required for automobile use.

2.4 When appropriate, conserve natural areas and restore damaged areas to provide space for native plants and animals.

2.5 Reduce storm water runoff and increase on-site infiltration.

2.6 Reduce the amount of light leaving the site (light pollution).

B. Water Use

B.1 - Mandatory

1.1 Limit potable water use for landscape irrigation.

1.2 Design projects so that water is used efficiently thereby reducing local water and wastewater needs.

B.2 - Recommended

2.1 Design landscaping such that plants require minimal irrigation.

2.2 Design to accommodate collection and treatment of water used during the project.

C. Energy Use

C.1 - Mandatory

1.1 Design to decrease energy use and lower operating costs.

1.2 Design systems for easy operation and maintenance.

1.3 Verify that HVAC systems are designed, installed and adjusted to operate as planned (Commissioning).

1.4 Select materials that do not contribute to ozone layer damage. Support early phase-out of chemicals causing ozone layer damage.

1.5 Whenever possible, use renewable technologies to reduce dependence on fossil fuels.

C.2 - Recommended

2.1 Projects should exceed the minimum State of Minnesota Energy Code requirements by 40%.

2.2 Provide a plan for ongoing review and adjustment of building energy and water use

D. Materials & Resources

D.1 - Mandatory

1.1 Design projects to accommodate recycling activities when occupied including providing appropriate storage spaces.

1.2 Review all material selections. Seek practical options to virgin or non-renewable materials.

1.3 Specify durable products or materials requiring little maintenance.

1.4 Make construction waste recycling part of the project. Minimum requirements include recycling of wood, metals, cardboard/paper and concrete.

1.5 Specify low VOC emitting materials.

1.6 Whenever possible, specify building products that have recycled content. Used salvaged materials and products when practical.

1.7 Whenever possible, use products produced locally in order to reduce material transport distances.

1.8 Specify reprocessed or re-blended paint products whenever practical.

1.9 Specify carpeting with recycled content and/or carpeting that is recyclable whenever possible.

D.2 - Recommended

2.1 Purchase wood products from organizations that follow sustainable forest management practices.

E. Indoor Environment & Air Quality

E.1 - Mandatory

1.1 Observe requirements listed in the DOA 'Building Air Quality Guide' available at: www.sao.admin.state.mn.us .

1.2 Include indoor air quality monitoring in the design.

1.3 Specify that the construction process does not cause indoor air quality problems in occupied spaces or adjacent properties.

1.4 Design to maximize day-lighting opportunities whenever possible.

1.5 Design so that daylight and outside views are provided to occupied spaces whenever possible.

E.2 - Recommended

2.1 Provide a reasonable level of occupant control of heat, ventilation, and lighting.

capitol restoration collaborative

Minnesota State Capitol – Interior Restoration and Asset Preservation Work

Form P-2: Performance Management Documentation

B3 Minnesota Sustainable Building Guidelines—VERSION 2.0

Submittal for phase: *Predesign-Programming*

Phases:
AP Agency Planning
PP Predesign-Programming
PS Predesign-Site Selection
SD Schematic Design
DD Design Development
CD Construction Documents
CA Construction Administration
CN Construction
CP Correction Period
OO Ongoing Occupancy
NU Next Use

KEY:
- Yellow hightlighted areas show required inputs
- Blue hightlighted areas show outputs calculated by the spreadsheet
- Green highlighted areas show fixed constants—DO NOT CHANGE

Required Guidelines

P.1 Guideline Management

NARRATIVE (optional) - notes about methods used, key resources, or other information

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

NA

P.2 Planning for Conservation

DATA AND OUTCOMES

Strategies 1: Reduce Program Needs	Square Footage Avoided	First Cost Avoided	Annual Energy Cost Avoided	Primary Energy Avoided	GWP Avoided	Waste Avoided
Expansion of existing	157,730	##########	##########	157730	157730	157730
	0	$ -	$ -	0	0	0
	0	$ -	$ -	0	0	0
	0	$ -	$ -	0	0	0
	0	$ -	$ -	0	0	0
Costs and Impacts Used in Table Above (per sq ft)		$ 150	$3.00	1	1	1

Strategies 2: Reuse Existing Building	Square Footage Avoided	First Cost Avoided	Annual Energy Cost Avoided	Primary Energy Avoided	GWP Avoided	Waste Avoided
Reuse existing	285,000	##########	$ 855,000	285000	285000	285000
	0	$ -	$ -	0	0	0
	0	$ -	$ -	0	0	0
	0	$ -	$ -	0	0	0
	0	$ -	$ -	0	0	0
Costs and Impacts Used in Table Above (per sq ft)		$150	$3.00	1	1	1

Strategies 3: Create Flexible & Adaptable Space	Square Footage Affected	Description
Found space	107,000	Modify structral frame in LL to accommodate new use
	0	
	0	
	0	
	0	

NARRATIVE (optional) - notes about methods used, key resources, or other information

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

NA

P.3 Integrated Design Process

ATTACH TEAM ROSTER

[X] Done

NARRATIVE (optional) - notes about methods used, key resources, or other information

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

NA

P.4 Design and Construction Commissioning

ATTACH COMMISSIONING REPORTS

[ ] Done (Check here and list attachments)

NA

NARRATIVE (optional) - notes about methods used, key resources, or other information

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

NA

P.5 Operations Commissioning

ATTACH COMMISSIONING REPORTS

NA

[ ] Done (Check here and list attachments)

NA

NARRATIVE (optional) - notes about methods used, key resources, or other information

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

NA

P.6 Lowest Life Cycle Cost

DOCUMENTATION FOR THIS GUIDELINE APPEARS IN FORM P-4 ENERGY AND ATMOSPHERE DOCUMENTATION

DESCRIPTION OF ANY ADDITIONAL LCC ANALYSIS (optional) - notes about methods used, key resources, or other information

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

NA

Form P-3 Site and Water Documentation

Phases:

AP Agency Planning
PP Predesign-Programming
PS Predesign-Site Selection
SD Schematic Design
DD Design Development
CD Construction Documents
CA Construction Administration
CN Construction
CP Correction Period
OO Ongoing Occupancy
NU Next Use

Submittal for phase: *Predesign-Programming*

KEY:
- GREEN - Fixed Variables - Do Not Change
- BLUE - Calculated by model
- YELLOW - User input required

Required Guidelines

General Site Data for Reference in Documentation Below

	Units	Existing Conditions	Proposed Conditions
Site Area	acres to 2 decimal places	*SD User Input*	*CD User Input*
Building Footprint (without green roof)		*SD User Input*	*CD User Input*
Non-Building Impervious		*SD User Input*	*CD User Input*
Green roof area		*SD User Input*	*CD User Input*
Surface Waters		*SD User Input*	*CD User Input*
Total Existing Site Vegetated Area (including Surface Waters and green roof)		*Optional Input*	*CD User Input*

S.1 Avoidance of Critical Sites

DATA AND OUTCOMES

	Sensitive Site Areas and Associated Buffer Areas Where Applicable (See Guideline Text for full description of sensitive sites)	**Units**	**Existing Conditions (acres)**	**Proposed Conditions (acres)**	**Sensitive Site Areas Impacted (acres) (Negative = restored)**
S.1A	Land within 150 ft of Biologically/Ecologically Significant Land	acres (to two decimal places)	*SD User Input*	*CD User Input*	*#VALUE!*
S.1B	Prime Farmland	acres (to two decimal places)	*SD User Input*	*CD User Input*	*#VALUE!*
S.1C	Land within 50 ft of Potential Floodland (<5ft over 100 yr flood level)	acres (to two decimal places)	*SD User Input*	*CD User Input*	*#VALUE!*
S.1D	Land within 300 ft of Habitat for Threatened, Endangered, or Rare Species	acres (to two decimal places)	*SD User Input*	*CD User Input*	*#VALUE!*
S.1E	Prior Parkland (not exchanged for other parkland)	acres (to two decimal places)	*SD User Input*	*CD User Input*	*#VALUE!*
S.1F	Conservation Easement Land	acres (to two decimal places)	*SD User Input*	*CD User Input*	*#VALUE!*

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.2 Stormwater Management

DATA AND OUTCOMES

S.2A Option 1

Run-Off Rate (Q.R.O)	Units	Existing Conditions, Q.R.O. Exg.	Proposed Conditions, Q.R.O., Pro.	% Decrease= 100 - 100 (Q.R.O., Pro./Q.R.O., Exg.)	
Stormwater Run-off Rate*	cubic feet per second (cfs)	*SD User Input*	*CD User Input*	*#VALUE!*	(Meet more stringent of the two options)

S.2A Option 2

Run-Off Quantity (V.R.O)	Units	V.R.O., 85% Pervious	Proposed Conditions, V.R.O., Pro.	% Decrease= 100 - 100 (V.R.O., Pro./V.R.O., Exg.)	
Stormwater Run-off Quantity*	cubic feet per second (cfs)	*SD User Input*	*CD User Input*	*#VALUE!*	

S.2A Applies to selected, most stringent option.

Stormwater Run-off Quantity*	cubic feet (cf)	*SD User Input*	*CD User Input*	*#VALUE!*	

	Run-off Quality	Proposed Contaminant Load (after treatment) (mg/L)	Target Removal(-) or Addition(+) Rate* for Compliance (%)	Proposed Contaminant Load (after treatment) (mg/L)	Contaminant Load removed (mg/L)	Site levels as Designed after Project Work* (mg/L)	
S.2C	Total Suspended Solids (TSS)	*SD User Input*	-80%	*CD User Input*	*#VALUE!*	*#VALUE!*	**MPCA threshold levels for the site** (For MSBG compliance)**
S.2D	Total Phosphorous (TP)	*SD User Input*	-60%	*CD User Input*	*#VALUE!*	*#VALUE!*	
S.2E	Hydrology**	*SD User Input*	*CD User Input*	*CD User Input*	*#VALUE!*	*#VALUE!*	*SD User Input*
S.2F	Nutrients**	*SD User Input*	*CD User Input*	*CD User Input*	*#VALUE!*	*#VALUE!*	*SD User Input*
S.2G	Solids and Floatables**	*SD User Input*	*CD User Input*	*CD User Input*	*#VALUE!*	*#VALUE!*	*SD User Input*

	Recharge Rate (Q RCHG) and Quantity (V RCHG)	inches/hr	Existing Conditions (Q RCHG Exg and V RCHG Exg)	Proposed Conditions (Q RCHG Pro and V RCHG Pro)	% Increase = 100-100 (Q RCHG Pro/Q RCHG Exg) OR Increase = 100-100 (V RCHG Pro/V RCHG Exg)	
S.2L	Stormwater Recharge Rate*	Inches per 24 hours	*SD User Input*	*CD User Input*	*#VALUE!*	Meet > or = 0%
	Stormwater Recharge Quantity*	cubic feet per second (cf)	*SD User Input*	*CD User Input*	*#VALUE!*	

Guideline S.2 Notes:
* Use worst case for all events less than or equal to 2 1/2"/24 hour storm event.
** For storm event for these calculations, use worst case / design case as determined by current MPCA Guidelines

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.3 Soil Management

DATA AND OUTCOMES

		Units	Chosen Site Before Project Work	Site with Project as Designed	Performance Result	
S.3B	Site Area	acres to 2 decimal places	*SD User Input*			
	Disturbed Site Area	acres to 2 decimal places	*SD User Input*	*CD User Input*	*#VALUE!*	Total % of site disturbed

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.4 Sustainable Vegetation Design

DATA AND OUTCOMES

		Units	Chosen Site Before Project Work	Site with Project as Designed	Performance Result		
General	Site Area	acres to 2 decimal places	*SD User Input*	*CD User Input*			
	Building Footprint			*CD User Input*			
	Non-Bldg Site Area (Total site area - Building Footprint)			*#VALUE!*			
	Total Site Vegetated Area		*Optional Input*	*CD User Input*			
S.4A	Non Bldg Site Area with Natural Site Functions and Biodiversity	acres to 2 decimal places	*SD User Input*	*CD User Input*	*#VALUE!*	% of Non Bldg Site Area with Natural Site Functions and Biodiversity	
	% site area consisting of existing shrubs and herbaceous cover > 24" in height	acres to 2 decimal places	*SD User Input*	*CD User Input*			
S.4B	% of Total Site Vegetated Area that is Native	acres to 2 decimal places	*Optional Input*	*CD User Input*	*#VALUE!*	% improvement in Total Site Vegetated Area that is Native	
S.4C	Tree Trunk Area (site before project work only need include trees that are > 6" DBH)	square inches at dbh	*SD User Input*	*CD User Input*	*#VALUE!*	% Increase in tree trunk area	
	% site area concisting of existing trees > 6" Diameter at Breast Height (DBH)	acres to 2 decimal places	*Optional Input*				
	Reduced Global Warming Potential (negative value = GWP sink) associated with Tree Trunk Area	(Tons CO2 or weighted equivalent value of CO2)	*Calculated*	*Calculated*	*#VALUE!*	Associated % Decrease in GWP	
S.4D-F	See S.1 For Documentation of Areas associated with these criteria.						
S.4G	% of Total Site Vegetated Area that is Invasive (Trees, Shrubs, Herbaceous)	acres to 2 decimal places	*SD User Input*	*CD User Input*	*#VALUE!*	% Decrease in acres of invasive species	

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.5 Light Pollution Reduction

DATA AND OUTCOMES

S.5A List the Enviromental Lighting Zone of the Site:

	Units	Required Level to comply (For Type of Lighting Zone)	Site with Project as Designed	Result	
Maximum Vertical Illuminance at Property Line	foot candles	*SD User Input*	*CD User Input*	*#VALUE!*	% Decrease (> or = 0% to comply)

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.6 Erosion and Sedimentation Control During Construction

DATA AND OUTCOMES

	Sediment Discharge:	Units	Threshold for Scenario	Site with Project as Designed	Result	
S.6F	Sediment Discharge - Scenario A RUSSLE Method	tons per acre per year	5 tons per acre per year	*CD User Input*	*#VALUE!*	% Decrease (to comply need to be > or = 0% decrease compared to most stringent scenario threshold)
	Sediment Discharge - Scenario B Minnesota Storm Water Manual	tons per acre per year	*CD User Input*	*CD User Input*	*#VALUE!*	
	Sediment Discharge - Scenario C - other organization (See S.6F) Standard Runoff Calculation	tons per acre per year	*CD User Input*	*CD User Input*	*#VALUE!*	

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

e

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.7 Landscape Water Efficiency

DATA AND OUTCOMES

		Units	Base Case Landscape Design	Site with Project as Designed	Result		
S.7A-B	Annual landscape* irrigation total water consumption (after 1-2 year establishement period)	gallons/year	*CD User Input*	*CD User Input*	*#VALUE!*	Gallons per year reduction (due to water demand decrease)	
	% of alternative irrigation water source (water that is NOT municipal potable water or harvested ground water)	%	0%	*CD User Input*	*#VALUE!*	Gallons per year reduction (due to alternative water sourcing)	
	Resulting Annual landscape* irrigation water consumption (after 1-2 year establishment period) that is from municipal potable water or harvested ground water	gallons/year	*CD User Input*	*#VALUE!*	*#VALUE!*	Total Gallons per year reduction in municipal potable water or harvested ground water	
					#VALUE!	Associated % reduction	50% or more for compliance

Notes for S.7F

*Irrigation for Landscape does not include irrigation for annual beds.

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.8 Building Water Efficiency

DATA AND OUTCOMES

		Units	Code Base Regulated Building Water Design	Design Case Regulated Building Water Design	Result		
S.8A-B	Annual building ~~total~~ water consumption for regulated fixtures	gallons/year	*CD User Input*	*CD User Input*	*#VALUE!*	Gallons per year reduction (due to water demand decrease)	
	% of alternative regulated building water source (water that is NOT municipal potable water or harvested ground water)	%	0%	*CD User Input*	*#VALUE!*	Gallons per year reduction (due to alternative water sourcing)	
	Resulting Annual regulated buildign water consumption that is from municipal potable water or harvested ground water	gallons/year	*CD User Input*	*#VALUE!*	*#VALUE!*	Total Gallons per year reduction in municipal potable water or harvested ground water	
					#VALUE!	Associated % reduction	30% or more for compliance

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.7&S.8 Summary: Project Water Savings

DATA AND OUTCOMES

Reduction in Gallons per year of municipal potable water or harvested ground water

	Units	Base Case	Design Case	Result		Year 1 Water Consumption (provide any sub totals as possible if submetered)	Year 1 Water Consumption (provide any sub totals as possible if submetered)	(Copy Columns to right and complete every year there after)
Landscape	gallons/year	*CD User Input*	*#VALUE!*	*#VALUE!*	% reduction (due to decreased demand and alternative sourcing)	*Optional User Input*	*Optional User Input*	
Regulated Building Water	gallons/year	*CD User Input*	*#VALUE!*	*#VALUE!*		*Optional User Input*	*Optional User Input*	
Sub Total	gallons/year	*#VALUE!*	*#VALUE!*	*#VALUE!*				

OPTIONAL: List Other Water uses not incorporated in items above (eg. Cooling Tower water, other)

Optional User Input- Other Water Use #1	gallons/year	*Optional User Input*	*Optional User Input*	*#VALUE!*	% reduction (due to decreased demand and alternative sourcing)	*Optional User Input*	*Optional User Input*	
Optional User Input- Other Water Use #2	gallons/year	*Optional User Input*	*Optional User Input*	*#VALUE!*		*Optional User Input*	*Optional User Input*	
TOTAL Project Water Use (Municipal and Harvested Ground Water) (landscape, regulated building, and other)	gallons/year	*#VALUE!*	*#VALUE!*	*#VALUE!*		*OO YR1 User Input*	*OO YR2 User Input*	

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE (For added items not in S.7 or S.8)

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information) (For added items not in S.7 or S.8)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

Recommended Guidelines

S.9 Appropriate Location and Density

DATA AND OUTCOMES

S.9A-B Land Use Profile

Ecologically Preferable Land Use?	MLCCS Reference	Land Use Type	Units (acres to two decimal places)	Site Selection Alternate 1	Site Selection Alternate 2	Site Selection Alternate 3	Chosen Site Before Project Work (acres)	Site with Project as Designed (acres)	Land Use Change, Acres (+ = added, - = lost)
N	-	Building Footprint	acres	*PS User input*	*PS User input*	*PS User input*	*SD User input*	*CD User input*	*#VALUE!*
N	10	Paved Surfaces	acres	*PS User input*	*PS User input*	*PS User input*	*SD User input*	*CD User input*	*#VALUE!*
N	20	Planted or Cultivated Vegetation	acres	*PS User input*	*PS User input*	*PS User input*	*SD User input*	*CD User input*	*#VALUE!*
Y	30-40	Forests & Woodlands	acres	*PS User input*	*PS User input*	*PS User input*	*SD User input*	*CD User input*	*#VALUE!*
Y	50-80	Other Natural Vegetation	acres	*PS User input*	*PS User input*	*PS User input*	*SD User input*	*CD User input*	*#VALUE!*
Y	~ 90	Open Water (not part of Wetlands)	acres	*PS User input*	*PS User input*	*PS User input*	*SD User input*	*CD User input*	*#VALUE!*
Y	-	Wetland	acres	*PS User input*	*PS User input*	*PS User input*	*SD User input*	*CD User input*	*#VALUE!*
		SubTotals:							
Sum of Y		Ecologically Preferable Land Use	acres	*0*	*0*	*0*	*0*	*0*	*#VALUE!*
Sum of N		Non-Ecologically Preferable Land Use	acres	*0*	*0*	*0*	*0*	*0*	*#VALUE!*
		Summed Total Site Area from Land Use Areas Above:	acres	*0*	*0*	*0*	*0*	*0*	
		Entered Total Site Area (to confirm summed amount)	acres	*PS User input*	*PS User input*	*PS User input*	*SD User Input*	*CD User Input*	

Context and Planning Compatible Development Pattern

		Units	Baseline Contextual Pattern or Goals	Site as Designed	Comparison % (+ = Increase compared to baseline)
S.9C	Density	Enter Units per Baseline Reference	*User input*	*User input*	*#VALUE!*
S.9D	Open Space	Enter Units per Baseline Reference	*User input*	*User input*	*#VALUE!*
S.9E	Green Corridors	Enter Units per Baseline Reference	*User input*	*User input*	*#VALUE!*

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.10 Brownfield Redevelopment

DATA AND OUTCOMES

		Units	Site with Project as Designed (acres)
S.10A	Brownfield Remediated	acres (to two decimal places)	*User input*

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.11 Heat Island Reduction

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.12 Transportation Impacts Reduction

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

S.13 Wastewater Reduction and Management

DATA AND OUTCOMES

		Units	Waste water from Code Base Regulated Building Water Design	Waste water from Design Case Regulated Building Water Design	Result		
S.13A	Waste water from Annual building total water consumption for regulated fixtures	gallons/year	*CD User Input*	*#VALUE!*	*#VALUE!*	Gallons per year reduction (due to waste water quantity decrease)	
	% of waste water that goes to an alternative treatment system (waste water that is does NOT go to municipal waste water or conventional on-site septic system)	%	0%	*CD User Input*	*#VALUE!*	Gallons per year reduction (due to alternative water treatment)	
	Resulting Annual Waste water from regulated building water consumption that goes to municipal waste water or conventional on-site septic system	gallons/year	*CD User Input*	*#VALUE!*	*#VALUE!*	Total Gallons per year reduction in conventionally treated waste water	
					#VALUE!	Associated % reduction	50% or more for compliance

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

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Minnesota State Capitol – Interior Restoration and Asset Preservation Work

B3 Minnesota Sustainable Building Guidelines—VERSION 2.0

Form P-4: Energy and Atmosphere Documentation

Submittal for phase: *PP Predesign-Programming*

Phases:
AP Agency Planning
PP Predesign-Programming
PS Predesign-Site Selection
SD Schematic Design
DD Design Development
CD Construction Documents
CA Construction Administration
CN Construction
CP Correction Period
OO Ongoing Occupancy
NU Next Use

KEY:
- Yellow hightlighted areas show required inputs
- Blue hightlighted areas show outputs calculated by the spreadsheet
- Green highlighted areas show fixed constants—DO NOT CHANGE

Required Guidelines

E.1 Energy Reduction by at Least 30%

DATA AND OUTCOMES (Not applicable to Small Building Methodology)

Economic Performance Indicators	Units	Code Baseline from simulation	Design Solution from simulation	Savings (*1)	% Savings	Actual Energy Use YEAR 1	Actual Energy Use YEAR 2
Annual Energy Cost	Dollars	$ 200	$ 100	$ 100	50%	$ -	$ -
Incremental Construction Costs	Dollars		$ 500				
Simple payback	Years		5.0			#DIV/0!	#DIV/0!

Life Cycle Cost		Net Present Value	Years	Discount rate	Annual energy cost increase
CASE A: Constant energy cost		$ 1,037	30	0.05	
CASE B: Increasing energy cost		$ 3,573	30	0.05	1.07

Energy Performance Indicators	Units	Code Baseline from simulation	Design Solution from simulation	Savings (*1)	% Savings	Actual Energy Use YEAR 1	Actual Energy Use YEAR 2
Electric consumption (purchased)	kWh	2000	1000	1000	50%	0	0
Electric demand	kW	200	100	100	50%	0	0
Natural gas consumption	Therms	2000	1000	1000	50%	0	0
Purchased chiller water	Ton-hrs	0	0	0	#DIV/0!	0	0
Purchased steam	Mlbs	0	0	0	#DIV/0!	0	0
On-site renewables	kWh	0	0	0	#DIV/0!	0	0
Off-site renewables (Green Power)	kWh	0	0	0	#DIV/0!	0	0

Life Cycle Assessment Outcomes	Units	Code Baseline	Design Solution	Savings (*1)	% Savings	Actual Energy Use YEAR 1	Actual Energy Use YEAR 2
Primary Energy	MJ/year	279004	139502	139502	50%	0	0
Global Warming Potential	Tons/year	16.2	8.1	8.1	50%	0	0
Solid Waste	Tons/year	0.9	0.5	0.5	50%	0	0

LCA Indicator	Electricity (per KWH)	Natural Gas (per therm)
Primary Energy (MJ)	1.37E+01	1.26E+02
Global Warming Potential (tons)	9.68E-04	7.13E-03
Solid Waste (tons)	1.77E-04	2.91E-04

Metro MN Emissions at Plant	Units	Code Baseline	Design Solution	Savings (*1)	% Savings	Actual Energy Use YEAR 1	Actual Energy Use YEAR 2
CO2 Emissions	Tons/year	13.02	6.51	6.51	50%	-	-
SOx Emissions	Tons/year	0.0	0.0	0.0	50%	-	-
NOx Emissions	Tons/year	0.0	0.0	0.0	50%	-	-
Particulate Emissions	Tons/year	0.0	0.0	0.0	50%	-	-

Emission Type	Electricity (Ton/KWH)	Natural Gas (Ton/therm)
CO2	6.40E-04	5.87E-03
SO2	1.65E-06	2.91E-08
NOx	1.85E-06	6.79E-06
Particulates	1.60E-07	2.42E-07

* NOTES:
1. Savings column indicates savings from regulated energy components as per guideline E.1. (It does not include plug loads savings).
2. Life Cycle Assessment (LCA) Outcomes and MN Average Emissions from Plan reflect impacts from electricity and p

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

E.2 Renewable and Distributed Energy Evaluation

DATA AND OUTCOMES

Economic Performance Indicators	Units	Code Baseline	Design Solution	Renewable Scenario 1	Savings: Scenario 1 vs. Code Base	Renewable Scenario 2	Savings: Scenario 2 vs. Code Base
Annual Energy Cost	Dollars	$ 200	$ 100	$ 50	$ 150	$ 25	$ 175
Incremental Construction Costs	Dollars		$ 500	$ 700		$ 1,000	
Simple payback	Years		5.0	4.7		5.7	

Life Cycle Cost	Years	Discount rate	Design: Net Present Value	Scenario 1: Net Present Value		Scenario 2: Net Present Value	Annual energy cost increase
CASE A: Constant energy cost	30	0.05	$ 1,037	$ 1,606		$ 1,690	
CASE B: Increasing energy cost	30	0.05	$ 3,573	$ 5,409		$ 6,128	1.07

Energy Performance Indicators	Units	Code Baseline	Design Solution	Renewable Scenario 1	Savings: Scenario 1 vs. Code Base	Renewable Scenario 2	Savings: Scenario 2 vs. Code Base
Electric Consumption	kWh	2000	1000	500	1500	250	1750
Electric Demand	kW	200	100	50	150	25	175
Natural Gas consumption	Therms	2000	1000	500	1500	250	1750
Purchased chiller water	Ton-hrs	0	0	0	0	0	0
Purchased Steam	Mlbs	0	0	0	0	0	0
On-site Renewables	kWh	0	0	0	0	0	0
Off-site Renewables (Green Power)	kWh	0	0	0	0	0	0

Life Cycle Assessment Outcomes	Units	Code Baseline	Design Solution	Renewable Scenario 1	Savings: Scenario 1 vs. Code Base	Renewable Scenario 2	Savings: Scenario 2 vs. Code Base
Primary Energy	MJ/year	279004	139502	69751	209253	34876	244129
Global Warming Potential	Tons/year	16	8	4	12	2	14
Solid Waste	Tons/year	1	0	0	1	0	1

LCA Indicator	Electricity (per KWH)	Natural Gas (per therm)
Primary Energy (MJ)	1.37E+01	1.26E+02
Global Warming Potential (kg)	9.68E-04	7.13E-03
Solid Waste (kg)	1.77E-04	2.91E-04

Metro MN Emissions at Plant	Units	Code Baseline	Design Solution	Renewable Scenario 1	Savings: Scenario 1 vs. Code Base	Renewable Scenario 2	Savings: Scenario 2 vs. Code Base
CO2 Emissions	Tons/year	13.02	6.51	3	10	2	11
SOx Emissions	Tons/year	0.00	0.00	0	0	0	0
NOx Emissions	Tons/year	0.02	0.01	0	0	0	0
Particulate Emissions	Tons/year	0.00	0.00	0	0	0	0

Emission Type	Electricity (Ton/KWH)	Natural Gas (Ton/therm)
CO2	6.40E-04	5.87E-03
SO2	1.65E-06	2.91E-08
NOx	1.85E-06	6.79E-06
Particulates	1.60E-07	2.42E-07

* NOTES:
1. Savings column indicates savings from regulated energy components as per guideline E.1. (It does not include plug loads savings).
2. Life Cycle Assessment (LCA) Outcomes and MN Average Emissions from Plan reflect impacts from electricity and p

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

E.3 Efficient Equipment and Appliances

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

Recommended Guidelines

E.4 Atmospheric Protection

DATA AND OUTCOMES

Refirgerant Type	User input
Atmospheric Lifetime	User input
Ozone Depletion	User input
Global Warming Potential	User input

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE (IF GUIDELINE WAS PURSUED)

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

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Pollution Generation Constants

	Electric	Gas	Gas		
	Ton/KWH	Ton/KBTU	Ton/BTU		
CO2	6.40E-04	5.87E-05	5.87E-08		
SO2	1.65E-06	2.91E-10	2.91E-13		
NOx	1.85E-06	6.79E-08	6.79E-11		
Particulate	1.60E-07	2.42E-09	2.42E-12		

Primary Energy Constants

Energy or Fuel Type	Primary Energy Consumption MJ	Solid Waste kg	Air Pollution Index	Water Pollution Index	Global Warming Potential kg	Weighted Resource Use kg
Electricity (per kWh)1	1.37E+01	1.60E-01	1.99E-01	1.50E-05	8.78E-01	2.06E+00
Natural Gas (per c.f.)	1.26E+00	2.63E-03	3.10E-02	2.00E-06	6.46E-02	2.33E-02
Natural Gas (per Therm)	1.26E+02	2.64E-01	3.10E+00	2.00E-04	6.47E+00	2.33E+00

1	Kwh	0.001	Mwh	
1	Kwh	0.000123	tonne of coal equivalent	
8,141	Kwh		tonne of coal equivalent	
1	Kwh	8.6E-05	tonne of oil equivalent	
11,630	Kwh	1	tonne of oil equivalent	
1	Therm	100.2	Cu Ft. at 14.7 PSI	
1	Therm	4.15	lbs of NG	
1	Therm	29.29	Kw	
1	Therm	100,000	BTU	
1	Therm	100	KBTU	3E+05
1	Cu Ft. at 14.7 PSI	0.00998	Therms	

ENERGY SOURCES: Environmental Impact per unit of energy or fuel type

Energy or Fuel Type	Primary Energ	Solid Waste kg	Air Pollution Ind	Water Pollutic	Global Warmi	Weighted Resource Use I
Electricity (per kWh)1	1.37E+01	1.60E-01	1.99E-01	1.50E-05	8.78E-01	2.06E+00
Heavy Fuel Oil (per US gal.)	1.73E+02	8.03E-02	4.04E+00	4.10E-05	1.32E+01	3.65E+00
Diesel (per U.S. gal.)	1.61E+02	6.02E-02	8.29E-01	3.70E-05	1.14E+01	3.61E+00
Liquid Propane Gas (per U.S. gal)	1.10E+02	3.77E-02	1.21E-02	2.30E-05	6.95E+00	2.12E+00
Natural Gas (per c.f.)	1.26E+00	2.63E-03	3.10E-02	2.00E-06	6.46E-02	2.33E-02

0.064596
0.00064467

capitol restoration collaborative

Minnesota State Capitol – Interior Restoration and Asset Preservation Work

Form P-5 Indoor Environmental Quality Documentation
Indoor Air quality Guidelines I.1 - I.5

Phases:

AP Agency Planning
PP Predesign-Programming
PS Predesign-Site Selection
SD Schematic Design
DD Design Development
CD Construction Documents
CA Construction Administration
CN Construction
CP Correction Period
OO Ongoing Occupancy
NU Next Use

Submittal for phase: *Predesign*

KEY:
- GREEN - Fixed Variables - Do Not Change
- BLUE - Calculated by model
- YELLOW - User input required (Replace the sample data shown with actual for project)

Required Guidelines

I.1 Restrict Environmental Tobacco Smoke

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

I.2 Specify Low Emmitting Materials

DATA AND OUTCOMES

I.2A **(Add rows as needed)**

Compliant Interior Product Type	Company and Product Name installed in project	Verification that it complies (list approved data base in which the specific product
CA User input	*CA User input*	*CA User input*
CA User input	*CA User input*	*CA User input*
CA User input	*CA User input*	*CA User input*
CA User input	*CA User input*	*CA User input*
CA User input	*CA User input*	*CA User input*
CA User input	*CA User input*	*CA User input*

DATA AND OUTCOMES

I.2B ☐ As part of Construction Administration (CA) MSBG submittal, Check box indicating that required copies of letters from manufacturers or their testing labs are attached that indicate the systems furniture product(s) installed comply with the referenced stan

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

I.4 Ventilation Design

DATA AND OUTCOMES

I.4A Ventilation Rate

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	Current ASHRAE Ventilation Standard 62.1 Ventilation Rate (cfm/sf) (=B3 MSBG Compliant Level)	Designed Ventilation Rate (cfm/sf)	Meets Requirements for MSBG Compliance? (Y/N)	Commissioned Ventilation Rate (cfm/sf)	Year 1 estimated Ventilation Rate (cfm/sf) based on monitoring CO2 Concentration	Year 2 estimated Ventilation Rate (cfm/sf) based on monitoring CO2 Concentration
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*

I.4B CO2 Concentration

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	B3 MSBG Compliant Maximum CO2 Concentration (ppm) (based on 450 ppm above outdoor concentration)	Designed Maximum CO2 Concentration (ppm)	Meets Requirements for MSBG Compliance? (Y/N)	Commissioned CO2 Concentration (ppm)	Year 1 [max, avg?] Monitored CO2 Concentration (ppm)	Year 2 [max, avg?] Monitored CO2 Concentration (ppm)
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*

I.4C **Outside Air %**

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	% Outside Air (%) Based on B3 Compliant Design	Designed % Outside Air (%)	Meets Requirements for MSBG Compliance? (Y/N)	Commissioned % Outside Air (%)	Year 1 [max, avg] Monitored/Estimated Outside Air %	Year 2 [max, avg] Monitored/EstimatedOutside Air %
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

I.5 Thermal Comfort

DATA AND OUTCOMES

I.5A **Temperature Range - Max**

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	Designed Max Temperature (Deg. F) (Required 80 or less)	Meets Requirements for MSBG Compliance? (Y/N)	Monitored Year 1 Max Temperature (Deg. F)	Monitored Year 2 Max Temperature (Deg. F)
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*

I.5A **Temperature Range - Min**

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	**Designed Min Temperature (Deg. F) (required 64 or more)**	**Meets Requirements for MSBG Compliance? (Y/N)**	**Monitored Year 1 Min Temperature (Deg. F)**	**Monitored Year 2 Min Temperature (Deg. F)**
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*

I.5B **Relative Humidity Range - Max**

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	**Designed Max Relative Humidity (%) (Required 50% or less)**	**Meets Requirements for MSBG Compliance? (Y/N)**	**Monitored Year 1 Max Relative Humidity (%)**	**Monitored Year 2 Max Relative Humidity (%)**
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*

I.5B **Relative Humidity Range - Min**

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	**Designed Min Relative Humidity (%) (Required 20% or more)**	**Meets Requirements for MSBG Compliance? (Y/N)**	**Monitored Year 1 Min Relative Humidity (%)**	**Monitored Year 2 Min Relative Humidity (%)**
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*
User input	*CD User input*	-	*OO User input*	*OO User input*

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

Form P-5 Indoor Environmental Quality Documentation
Remaining Indoor Environmental Quality Guidelines I.6 - I.12

Phases:

AP Agency Planning
PP Predesign-Programming
PS Predesign-Site Selection
SD Schematic Design
DD Design Development
CD Construction Documents
CA Construction Administration
CN Construction
CP Correction Period
OO Ongoing Occupancy
NU Next Use

Submittal for phase: *Predesign*

KEY:
- GREEN - Fixed Variables - Do Not Change
- BLUE - Calculated by model
- YELLOW - User input required

Required Guidelines

I.6 Quality Lighting

DATA AND OUTCOMES

I.6B Illumination Level

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	**IES Recommended Illumination Level**	**Designed Illumination Level**	**Meets Requirements for MSBG Compliance ? (Y/N)**	**Commissioned Illumination Level**	**Year 1 estimated Illumination Levels based on monitoring**	**Year 2 estimated Illumination Levels based on monitoring**
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*
User input	*CD User input*	*CD User input*	-	*CP User input*	*OO User input*	*OO User input*

I.6E Color Rendering Index (CRI)

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	**Recommended CRI for Space Type (0-100)**	**Designed CRI (0-100)**	**Meets Requirements for MSBG Compliance ? (Y/N)**
User input	*CD User input*	*CD User input*	-
User input	*CD User input*	*CD User input*	-
User input	*CD User input*	*CD User input*	-
User input	*CD User input*	*CD User input*	-
User input	*CD User input*	*CD User input*	-
User input	*CD User input*	*CD User input*	-
User input	*CD User input*	*CD User input*	-

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

I.7 Effective Acoustics and Positive Soundscapes

DATA AND OUTCOMES

Name of Type of Area (eg. Regular Classrooms, Science Classrooms…)	**Designed Max Recurrent background noise dBA**	**Designed Max Noise Curve (NC)**	**Designed Reverberation Time at 500 Hz**	**Designed Max Articulation Index for Office Spaces**	**Designed Min Articulation Index for Office Spaces**
User input	*CD User input*	*CD User input*	*CD User input*	*Optional User input*	*Optional User input*
User input	*CD User input*	*CD User input*	*CD User input*	*Optional User input*	*Optional User input*
User input	*CD User input*	*CD User input*	*CD User input*	*Optional User input*	*Optional User input*
User input	*CD User input*	*CD User input*	*CD User input*	*Optional User input*	*Optional User input*
User input	*CD User input*	*CD User input*	*CD User input*	*Optional User input*	*Optional User input*
User input	*CD User input*	*CD User input*	*CD User input*	*Optional User input*	*Optional User input*
User input	*CD User input*	*CD User input*	*CD User input*	*Optional User input*	*Optional User input*
User input	*CD User input*	*CD User input*	*CD User input*	*Optional User input*	*Optional User input*
User input	*CD User input*	*CD User input*	*CD User input*	*Optional User input*	*Optional User input*

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

I.8 Reduce Vibration in Buildings

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

I.9 Daylight

DATA AND OUTCOMES

Attach Daylighting Worksheet Pages, or alternate daylight documentaion if this guideline was pursued

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE (If guideline was pursued)

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

Recommended Guidelines

I.10 View Space and Window Access

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE (If guideline was pursued)

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

I.11 Personal Control of IEQ Conditions and Impacts

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE (If guideline was pursued)

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

I.12 Encourage Healthful Physical Activity

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE (If guideline was pursued)

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

Form P-6 : Materials and Waste Documentation

B3 Minnesota Sustainable Building Guidelines—VERSION 2.0

Submittal for phase: *PP Predesign-Programming*

Phases:
AP Agency Planning
PP Predesign-Programming
PS Predesign-Site Selection
SD Schematic Design
DD Design Development
CD Construction Documents
CA Construction Administration
CN Construction
CP Correction Period
OO Ongoing Occupancy
NU Next Use

KEY: Yellow hightlighted areas show required inputs
Blue hightlighted areas show outputs calculated by the spreadsheet

Required Guidelines

M.1 Lifecycle Assessment of Building Assemblies

DATA AND OUTCOMES

Notes: * Enter results data from Worksheet M-1 or from custom Athena Study.
Attach Worksheet or Custom Study, whichever was used.

	DESIGN1				DESIGN 2				FINAL DESIGN			
Assembly Type	Area (s.f.)	Primary Energy Consumption (MJ)	Global Warming Potential (kg)	Solid Waste (kg)	Area (s.f.)	Primary Energy Consumption (MJ)	Global Warming Potential (kg)	Solid Waste (kg)	Area (s.f.)	Primary Energy Consumption (MJ)	Global Warming Potential (kg)	Solid Waste (kg)
A. INTERMEDIATE FLOORS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. INTERIOR WALLS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C. WINDOWS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. EXTERIOR WALLS	0	0	0	0	0	0	0	0	0	0	0	0
E. ROOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% DIFFERENCE FROM DESIGN 1						tbd	tbd	tbd		tbd	tbd	tbd

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

M.2 Evaluation of Material Properties for Improved Performance

DATA AND OUTCOMES

Notes: * Add rows as needed for each material or product described.

Environmentally Preferable Material	Quantity (indicate units—cost, area, or weight)	Description of Material	Extent of Application	Comments on Performance Over Time
SALVAGED AND REUSED MATERIALS				
Item 1				
Item 2				
RECYCLED CONTENT MATERIALS (indicate % recycled content and post consumer or post industrial content)				
Item 1				
Item 2				
LOCALLY/REGIONALLY PRODUCED MATERIALS (indicate distance)				
Item 1				
Item 2				
RENEWABLE BIO-BASED MATERIALS				
Item 1				
Item 2				
DURABILITY APPROPRIATE FOR SERVICE LIFE				
Item 1				
Item 2				
REUSABLE, RECYCLEABLE OR BIODEGRADABLE AFTER SERVICE LIFE				
Item 1				
Item 2				
DESIGNED FOR DISASSEMBLY				
Item 1				
Item 2				

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

M.3 Waste Reduction and Management

DATA AND OUTCOMES

Performance Indicators	Units	Actual	% Savings	Cost ($)	Recycling Income ($)	Actual Energy Use YEAR 1	Actual Energy Use YEAR 2
Construction waste to landfill	Tons	20		0			
Construction waste recycled	Tons	25	56%	0	0		
Packaging waste to landfill	Tons	10		0			
Packaging waste returned	Tons	5	33%	0	0		
Operations waste to landfill	Tons					0	0
Operations waste recycled	Tons					0	0

LIST STRATEGIES EMPLOYED TO ACHIEVE COMPLIANCE

User input

NARRATIVE (optional) - notes about methods used, key resources, or other information)

Optional User input

LIST SIGNIFICANT CHANGES FROM PREVIOUS SUBMITTAL

User input

Form P-1 Compliance Summary Form - Part 1 Assignments and Status

Project Name: Minnesota State Capitol Addition and Restoration
Project Address: Saint Paul, MN

Phases:
AP Agency Planning
PP Predesign-Programming
PS Predesign-Site Selection
SD Schematic Design
DD Design Development
CD Construction Documents
CA Construction Administration
CN Construction
CP Correction Period
OO Ongoing Occupancy
NU Next Use

CHECK LIST

Enter name of phase being completed and submitted for compliance: **(See list e.g. "Schematic Design")**

Project Phase: PP Predesign-Programming

Attach Documentation Forms (Forms P-2 through P-6 including any other documentation these forms require.)

Enter Date of Submittal: **10/24/06**

Complete the following table for the phase being completed.
Note: if there are inconsistencies in requirements between this form and other parts of the guidelines, the most stringent requirements shall be used.

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Mark "X" in White Cells of Column when required action is achieved

KEY:

	Required Action Due*
P2	Required Action+Data
	Consider Action***
	Not Applicable

* See the Guideline For Details
** See Documentation Form (P-2 for example)
*** See Appendices for Suggested Implementation

	Guideline # and Name	Confirm or edit responsible role name appropriate for phase submitted. (Example role names listed below for design phase.)	REQUIRED	VARIANCE ("X" for pursued, "Y" once approved)	AGENCY PLANNING	PREDESIGN-PROGRAMMING	PREDESIGN-SITE SELECTION	SCHEMATIC DESIGN	DESIGN DEVELOPMENT	CONSTRUCTION DOCUMENTS	CONSTRUCTION / CONSTR. ADMIN.	CORRECTION PERIOD	ON-GOING OCCUPANCY	NEXT USE	COMMENTS (optional)
	PERFORMANCE MANAGEMENT														
P.1	**Guideline Management**	Guideline Leader													
A	Complete Forms P-1 through P-6 at end of each phase	Guideline Leader	Yes		P1-6	x	P1-6	P1-6	P1-6	P1-6	P1-6	P1-6	P1-6		
B	Use Variance Process when appropriate	Guideline Leader	Yes					Var							
C	Share the project story		No												
D	Maintain Project Archive		No												
P.2	**Planning for Conservation**	Architect													
A	Evaluate assumptions to build, expand or remodel	Architect	Yes			x		P2							
P.3	**Integrated Design Process**	Architect													
A	Conduct kick-off meeting	Architect	Yes												
B	Create a plan of meeting and team updates at each phase	Architect	Yes					P2							

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C	Assemble appropriate stakeholder team		No												
D	Establish a Team Roster and Communications Plan		No												
E	Conduct planning/review workshops at key phases		No												
P.4	**Design and Construction Commissioning**	Design/Const Commiss. Leader													
A	Provide 0.75-1.5% of the construction cost for commissioning	Appropriated Agency	Yes			x									
B	Verify compatibility with Operations Commissioning Plan	Design/Const Commiss. Leader	Yes												
C	Use Agency Commissioning Process or Appendix P-4	Design/Const Commiss. Leader	Yes			x			P2						
D	Scope of items to be commissioned	Design/Const Commiss. Leader	Yes			x									
E	Scope: plumbing, interior materials, envelope, acoustics		No												
P.5	**Operations Commissioning**	Operations Commissioning Leader													
A	Use Agency Operations Management Process or Appendix P-6	Operations Commissioning Leader	Yes		x	x			P2	P2	P2	P2	P2		
B	Follow Measurement and Verification Plan for required scope	Operations Commissioning Leader	Yes												
C	Implement Operations and Maintenance Practices	Operations Commissioning Leader	Yes												
D	Follow Measurement and Verification Plan for additional scope		No												
E	Perform Systems Recommissioning		No												
P.6	**Lowest Life Cycle Cost**	Architect													
A	Perform life cycle cost analysis on energy scenarios	Architect	Yes					P2, 4		P2, 4					
B	Perform additional life cycle cost analysis		No												
	SITE AND WATER														
S.1	**Avoidance of Critical Sites**	Landscape Architect													
A	Avoid land with natural resources and areas of significance	Landscape Architect	Yes					P3		P3					
B	Avoid prime farm land	Landscape Architect	Yes					P3		P3					
C	Avoid land in flood plains	Landscape Architect	Yes					P3		P3					
D	Avoid land with endangered species habitat	Landscape Architect	Yes					P3		P3					
E	Avoid using former public parkland	Landscape Architect	Yes					P3		P3					
F	Avoid land under conservation easement	Landscape Architect	Yes					P3		P3					
S.2	**Stormwater Management**	Civil Engineer													
A	Meet runoff rate (2-options)	Civil Engineer	Yes					P3		P3					

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B	Create Micro catchments	Civil Engineer	Yes												
C	Design to remove 80% of total suspended solids (TSS)	Civil Engineer	Yes					P3		P3					
D	Design to remove 60% of total phosphorous (TP)	Civil Engineer	Yes					P3		P3					
E	Maintain MPCA Performance Thresholds levels for hydrology	Civil Engineer	Yes					P3		P3					
F	Maintain MPCA Performance Thresholds levels for nutrients	Civil Engineer	Yes					P3		P3					
G	Maintain MPCA Performance Thresholds levels for solids and	Civil Engineer	Yes					P3		P3					
H	Pre-treat all stormwater for the 2 year TYPE II event	Civil Engineer	Yes												
I	Maintain or increase pre-project recharge rates	Civil Engineer	Yes												
J	Design to remove solids & pollutants for on-site water recharge	Civil Engineer	Yes												
K	All stormwater BMPs to have O & M manuals	Civil Engineer	Yes												
L	Maintain or increase recharge rates from pre-project site	Civil Engineer	Yes					P3		P3					
M	Provide treatment systems to remove solids and pollutants	Civil Engineer	Yes												
N	Implement a stormwater management plan	Civil Engineer	Yes												
S.3	**Soil Management**	Landscape Architect													
A	Create a Soil Management Plan	Landscape Architect	Yes												
B	Limit site disturbance	Landscape Architect	Yes					P3		P3					
C	Maintain 350 ft. buffer for delineated wetland boundaries	Landscape Architect	Yes												
D	Protect all trees as individuals or in groups	Landscape Architect	Yes												
E	Mitigate all compaction impacts during construction	Landscape Architect	Yes												
F	Do not sell or export any topsoil from project site	Landscape Architect	Yes												
G	Maintain mycorrhyzeae populations in topsoil stockpiles	Landscape Architect	Yes												
H	Inoculate all future planting areas with mycorrhyzeae	Landscape Architect	Yes												
I	For trees in hardsurface maintain 500 cubic feet of soil	Landscape Architect	Yes												
J	Maintain soil porosity	Landscape Architect	Yes												
S.4	**Sustainable Vegetation Design**	Landscape Architect													
A	Maintain site functions and biodiversity for 50% of site area	Landscape Architect	Yes					P3		P3					
B	Make 75% of all trees and vegetated area from native material	Landscape Architect	Yes					P3		P3					
C	Ensure no net loss of tree trunk area	Landscape Architect	Yes					P3		P3					

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	Consider Action***
	Not Applicable

* See the Guideline For Details
** See Documentation Form (P-2 for example)
*** See Appendices for Suggested Implementation

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D	If guideline S.1A is not met, implement a protection plan	Landscape Architect	Yes					P3		P3					
E	If guideline S.1C is not met, implement a protection plan	Landscape Architect	Yes					P3		P3					
F	If guideline S.1D is not met, implement a protection plan	Landscape Architect	Yes					P3		P3					
G	Identify and mitigate invasive species	Landscape Architect	Yes					P3		P3					
H	Maintain site functions and biodiversity for 90% of site area		No												
S.5	**Light Pollution Reduction**	Electrical Engineer													
A	Light trespass: Do not exceed specified illuminance values	Electrical Engineer	Yes					P3		P3					
B	Reduce upward emissions of light with cutoff fixtures		No												
C	Minimize Non-Target Light		No												
D	Create outdoor lighting control zones and devices		No												
E	Use lamps with color spectrum closer to daylight for safety		No												
S.6	**Erosion and Sedimentation Control During Construction**	Civil Engineer													
A	Leave no soil open for greater than 48 hours	Civil Engineer	Yes												
B	Repair and cover erosion-damaged areas within 6 hours of storm	Civil Engineer	Yes												
C	Create a Storm Water Pollution Prevention Plan and submit	Civil Engineer	Yes												
D	Enact a fine structure for all erosion control infractions	Civil Engineer	Yes												
E	Identify and protect all downstream (TMDL) impaired waters	Civil Engineer	Yes					P3		P3					
F	Limit sediment discharge	Civil Engineer	Yes												
G	Maintain Temporary Erosion Control	Civil Engineer	Yes												
S.7	**Landscape Water Efficiency**	Landscape Architect													
A	Reduce potable water use for irrigation by 50%	Landscape Architect	Yes							P3					
B	Reduce potable water use for irrigation by 100%		No												
S.8	**Building Water Efficiency**	Mechanical Engineer													
A	Reduce potable water use in building by 30%	Mechanical Engineer	Yes							P3					
B	Reduce potable water use in building by 50%		No												
S.9	**Appropriate Location and Development Pattern**	Appropriated Agency													
A	Select a site with the most comprehensively positive impact		No												
B	Maintain or improve upon site land use type and condition		No												

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	Consider Action***
	Not Applicable

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	Guideline # and Name	Confirm or edit responsible role name appropriate for phase submitted. (Example role names listed below for design phase.)	REQUIRED	VARIANCE ("X" for pursued, "Y" once approved)	AGENCY PLANNING	PREDESIGN-PROGRAMMING	PREDESIGN-SITE SELECTION	SCHEMATIC DESIGN	DESIGN DEVELOPMENT	CONSTRUCTION DOCUMENTS	CONSTRUCTION / CONSTR. ADMIN.	CORRECTION PERIOD	ON-GOING OCCUPANCY	NEXT USE	COMMENTS (optional)
C	Maintain or increase density in urban/suburban locations		No												
D	Maintain or increase open space		No												
E	Maintain or increase Green Corridors		No												
S.10	**Brownfield Redevelopment**	Appropriated Agency													
A	Redevelop Brownfield sites		No												
B	Provide remediation as required		No												
C	Develop a site classified as a Brownfield into a Green space		No												
S.11	**Heat Island Reduction**	Architect													
A	Provide high reflectance paving or shading on 50% of the site		No												
B	Use high-reflectance roofing OR a green roof		No												
S.12	**Transportation Impacts Reduction**	Architect													
A	Locate near mass transit, retail and public services		No												
B	Locate project near restaurants and service facilities		No												
C	Provide-securing bicycle storage and changing/shower facilities		No												
D	Install alternative-fuel refueling station(s)		No												
E	Limit parking area and encourage shared parking with other uses		No												
F	Provide preferred parking for hybrid vehicles, carpools or van pools		No												
G	Locate preferred parking, bicycle parking, near building entrances		No												
H	Offer work pattern alternatives such as telecommuting		No												
I	Set a company policy to buy carbon emission offsets for air travel		No												
J	Offer free or discounted bus or train passes		No												
K	Track travel pollution impacts in annual environmental report		No												
S.13	**Wastewater Management**	Mechanical Engineer													
A	Reduce black water entering municipal system by 50%		No												
	ENERGY AND ATMOSPHERE														
E.1	**Reduce Energy Use by at least 30%**	Energy Consultant													
A	30% reduction from Energy Analysis (over 30,000 sf)	Energy Consultant	*Y/							P4					** For E.1, Either A or B applies,*
B	30% reduction from Small Building Method (under 30,000 sf)	Energy Consultant	*Y/							P4					*Choose one based on project size.*

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	Consider Action***
	Not Applicable

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	Guideline # and Name	Confirm or edit responsible role name appropriate for phase submitted. (Example role names listed below for design phase.)	REQUIRED	VARIANCE ("X" for pursued, "Y" once approved)	AGENCY PLANNING	PREDESIGN-PROGRAMMING	PREDESIGN-SITE SELECTION	SCHEMATIC DESIGN	DESIGN DEVELOPMENT	CONSTRUCTION DOCUMENTS	CONSTRUCTION / CONSTR. ADMIN.	CORRECTION PERIOD	ON-GOING OCCUPANCY	NEXT USE	COMMENTS (optional)
C	60% reduction from Energy Analysis (over 30,000 sf)		No												
E.2	**Evaluate Renewable and Distributed Energy Generation**	Architect/Mechanical Engineer													
A	Analyze two renewable energy scenarios in SD	Architect/Mechanical Engineer	Yes					P4							
B	Update and complete renewable energy scenarios in DD	Architect/Mechanical Engineer	Yes						P4						
E.3	**Efficient Equipment and Appliances**	Architect/Mechanical Engineer													
A	Select Energy Star equipment and appliances	Architect/Mechanical Engineer	Yes							P4					
E.4	**Atmospheric Protection**	Mechanical Engineer													
A	Achieve an atmospheric Lifetime (AtL) < 33		No												
B	Achieve an Ozone Depletion Potential (ODP) < 0.034		No												
C	Achieve a Global Warming Potential (GWP) < 3500		No												
D	Design, maintain and operate to reduce refrigerant leakage		No												
	INDOOR ENVIRONMENTAL QUALITY														
I.1	**Restrict Environmental Tobacco Smoke**	Appropr. Agency/Mech. Engineer													
A	Establish a no smoking policy	Appropriated Agency	Yes		P5										
B	Designate outdoor smoking areas in smoking policy	Appropriated Agency	Yes		1										
C	Indicate no smoking assumption in design documentation	Mechanical Engineer	Yes												
D	Design smoking and non-smoking areas outside the building	Mechanical Engineer/Land. Arch	Yes												
I.2	**Specify Low-emitting Materials**	Architect/Interior Designer													
A	Comply with limits for indoor air pollutants	Architect/Interior Designer	Yes							P5	P5				
B	Comply with Calf. Office Furniture Systems IAQ-VOC requirements	Architect/Interior Designer	Yes							P5	P5				
I.3	**Moisture Control**	Mechanical Engineer													
A	Design the building envelope to resist moisture penetration	Architect	Yes							P5					
B	Keep the indoor dew point below 35ºF(2ºC)	Mechanical Engineer	Yes							P5					
C	Specify moisture content of materials used in construction	Architect	Yes							P5					
I.4	**Ventilation Design**	Mechanical Engineer													
A	Control Radon using source prevention techniques	Mechanical Engineer	Yes							P5			P5		
B	Meet ASHRAE ventilation standard 62.1	Mechanical Engineer	Yes							P5			P5		
C	Monitor CO2 concentrations continuously		No												

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P2	Required Action+Data
	Consider Action***
	Not Applicable

* See the Guideline For Details
** See Documentation Form (P-2 for example)
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D	Keep CO2 levels below 450 ppm above outdoor concentrations		No												
I.5	**Thermal Comfort**	Mechanical Engineer													
A	Maintain temperature less than 80°F and greater than 64°F	Mechanical Engineer	Yes							P5			P5		
B	Maintain the wall, floor, and ceiling temperatures within 20 °F	Mechanical Engineer	Yes							P5			P5		
C	Maintain air velocity greater than or equal to 10 fpm	Mechanical Engineer	Yes												
D	Maintain relative humidity (RH) between 20% and 50%	Mechanical Engineer	Yes												
E	Keep thermal variables within ASHRAE 55-2004 comfort zones		No												
F	Vary dry bulb temperature (DBT) via building control system		No												
I.6	**Quality Lighting**	Electrical Engineer													
A	Design lighting system with multiple modes	Electrical Engineer	Yes												
B	Provide work plane illumination of 35 to 50 foot-candles.		No												
C	Consult the IESNA handbook for other recommended light levels		No												
D	Keep contrast ratios to no greater than 10:1		No												
E	Achieve a Color Rendering Index (CRI) based on IESNA handbook		No												
F	Conduct a point-by-point analysis of horizontal illumination levels		No												
G	Determine lighting system performance characteristics		No												
I.7	**Effective Acoustics**	Acoustical Consultant													
A	Background noise shall not exceed 70 dBA	Acoustical Consultant	Yes							P5					
B	Office space shall meet a NC of no greater than NC-50	Acoustical Consultant	Yes							P5					
C	Classroom space shall meet an NC of no greater than NC-45	Acoustical Consultant	Yes							P5					
D	Reverberation time shall be between 0.2 sec and 0.8 sec.	Acoustical Consultant	Yes							P5					
E	Articulation Index below 0.20 (open offices) above 0.70 (closed offices)		No												
F	No greater than NC 45 for offices		No												
G	No greater than NC 40 for conference rooms and classrooms		No												
H	Reverberation times based on professional acoustic judgment		No												
I.8	**Reduce Vibration in Buildings**	Structural Engineer													
A	For steel structures, follow AISC Design Guide 11	Structural Engineer	Yes												
B	For Steel Joists, follow SJI Technical Digest #5	Structural Engineer	Yes												

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Mark "X" in White Cells of Column when required action is achieved

KEY:

	Required Action Due*
P2	Required Action+Data
	Consider Action***
	Not Applicable

* See the Guideline For Details
** See Documentation Form (P-2 for example)
*** See Appendices for Suggested Implementation

	Guideline # and Name	Confirm or edit responsible role name appropriate for phase submitted. (Example role names listed below for design phase.)	REQUIRED	VARIANCE ("X" for pursued, "Y" once approved)	AGENCY PLANNING	PREDESIGN-PROGRAMMING	PREDESIGN-SITE SELECTION	SCHEMATIC DESIGN	DESIGN DEVELOPMENT	CONSTRUCTION DOCUMENTS	CONSTRUCTION / CONSTR. ADMIN.	CORRECTION PERIOD	ON-GOING OCCUPANCY	NEXT USE	COMMENTS (optional)
C	For Wood/Concrete: Live Load Deflect: L/480, Total Deflect: L/360	Structural Engineer	Yes												
D	Do not construct floors using bar joists		No												
E	Return period in top third of high rise not less than 6 years		No												
F	Floor vibration above Splittgerber Minimum Complaint Level		No												
G	Extend Item F to all intermittently occupied spaces		No												
I.9	**Daylight**	Architect													
A	Provide minimum daylight factor of 1% in 75% of floor area	Architect/Electrical Engineer	Yes							P5/ A12					
B	Do not exceed uniformity ratio of 10:1 in over 15% of floor area	Architect/Electrical Engineer	Yes												
C	Control direct solar penetration with shading devices	Architect/Electrical Engineer	Yes												
D	Use daylight controls to turn off or dim the electric lights	Electrical Engineer	Yes												
I.10	**View Space and Window Access**	Architect													
A	Provide visual access to exterior window		No												
B	Provide view space as specified from seated position		No												
C	Provide high performance view content		No												
I.11	**Personal Control of IEQ Conditions & Impacts**	Architect/ Mech./ Elect. Engineer													
A	Provide adjustable task lighting		No												
B	Provide means of alleviating direct solar gain		No												
C	Provide means of mitigating noise, drafts or low air circulation		No												
D	Provide means of alleviating building control malfunctions		No												
E	Provide access to operable windows		No												
F	Limit neck extension and head rotation for viewing monitors		No												
G	Provide ergonomically comfortable keyboard		No												
H	Provide ergonomically adjustable and movable furniture elements		No												
I	Use tools to improve flexibility and habitability of workspace		No												
I.12	**Encourage Healthful Physical Activity**	Architect													
A	Provide an 'open' or 'enhanced' stair design		No												
B	Encourage staff to walk to building service centers		No												
C	Design circulation paths to encourage staff interaction		No												

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D	Design stairways with amenities that encourage use		No												
	MATERIALS AND WASTE														
M.1	**Life Cycle Assessment of Building Assemblies**	Architect													
A	Do LCA for building assemblies using Worksheet M-1	Architect	Yes					P6/M1	P6						
B	Do LCA on additional materials using BEES		No												
M.2	**Evaluation of Environmentally Preferable Materials**	Architect													
A	Evaluate materials with environmentally preferable properties	Architect	Yes					P6	P6						
B	Use salvaged or reused materials		No												
C	Use material with recycled content beyond normal practice		No												
D	Use materials manufactured regionally		No												
E	Use renewable, bio-based raw materials		No												
F	Use materials with appropriate durability for service life		No												
G	Use materials that are reusable, recyclable, or biodegradable		No												
H	Indicate detailed volume and cost information		No												
M.3	**Waste Reduction and Management**	Architect													
A	Minimize waste through detailing and specs	Architect	Yes							P6/M3					
B	Divert 75% construction and demolition waste from landfill	Architect	Yes							P6/M3	P6				
C	Reuse or return 50% of all packaging material	Architect	Yes							P6/M3	P6				
D	Reduce and recycle waste generated during building operation	Architect	Yes									P6/M3	P6		
E	Divert an additional 15% (90% total) construction waste		No												
F	Return an additional 25% (75% total) of all packaging material		No												

Tally For Each Phase:

	Total										
Record Number of Required Guideline Criteria Completed (# of White Cells marked with X)	6	0	6	0	0	0	0	0	0	0	0
Number of Guideline Criteria Requiring Completion (White Cells)	243	6	6	9	35	9	85	75	18	16	2

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Mark "X" in White Cells of Column when required action is achieved

Guideline # and Name	Confirm or edit responsible role name appropriate for phase submitted. (Example role names listed below for design phase.)	REQUIRED	VARIANCE ("X" for pursued, "Y" once approved)	AGENCY PLANNING	PREDESIGN-PROGRAMMING	PREDESIGN-SITE SELECTION	SCHEMATIC DESIGN	DESIGN DEVELOPMENT	CONSTRUCTION DOCUMENTS	CONSTRUCTION / CONSTR. ADMIN.	CORRECTION PERIOD	ON-GOING OCCUPANCY	NEXT USE	COMMENTS (optional)
Summary Count:														
	Percentage Completed for Phase		2	0	100	0	0	0	0	0	0	0	0	

KEY:

	Required Action Due*
P2	Required Action+Data
	Consider Action***
	Not Applicable

* See the Guideline For Details
** See Documentation Form (P-2 for example)
*** See Appendices for Suggested Implementation

29 Total Required Guidelines
9 Total Recommended Guidelines
38 Total Guidelines

97 Required Guideline Criteria
87 Recommended Guideline Criteria
184 Total Guideline Criteria Possible

KEY to Required Data

P1	Form P-1 Compliance Summary Form
P2	Form P-2 Performance Management Documentation
P3	Form P-3 Site and Water Documentation
P4	Form P-4 Energy and Atmosphere Documentation
P5	Form P-5 Indoor Environmental Quality Documentation
P6	Form P-6 Material and Waste Documentation
Var	Variance Request (if applicable)
S1	Worksheet S-1 Site Surface Base Data (Rational Method)
S2	Worksheet S-2 Building Water Calculator
AI3	Appendix I-3 Day Light Factor Calculator
M1	Worksheet M-1 Life Cycle Assessment Calculator
M2	Worksheet M-2 Construction Waste Recycling Economics
M3	Worksheet M-3 Packaging Waste Recycling Economics

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Form P-A: Compliance Summary Form - PAGE 2 OF 2

Complete the Signatures for each responsible party in the table below:

By signing this you indicate the project is on track towards compliance with the guidelines for which you are responsible as listed above, and that related documentation to these guidelines is accurate to the best of your knowledge.

Role Name responsible for selected guidelines as indicated above	Signature and Printed Name of Responsible Party and Firm	Date
Guideline Leader (Coordinator of Work Team Compliance)	Leigh Rolfshus	10/15/06
Agency Contact	Linda Kane	10.24.06
Architect	Michael Bjornberg	10.15.06
Civil Engineer	Kenny Horns	10.17.06
Landscape Architect	Ted Lee	10.15.06
Structural Engineer	Chris Hartnett	10-17-06
Mechanical Engineer	Kermit Olson	10 25 06
Electrical Engineer	Leigh Harrison	10/25/06
Interior Designer	Jayne Vandenburgh	
Energy Consultant	Certification to follow in schematics Weidt Group	
Acoustic Consultant	Certification to follow in schematics Shen Milsom & Wilke	
Construction Contractor	TBD	
Facilities Operations Manager	Gordy Specht	10-24-06
Design and Construction Commissioning Leader	TBD	
Operations Commissioning Leader	TBD	
Other: List		

	Agency Approval		

Section 4.10

SECURITY

The Minnesota State Capitol Building is a treasured state asset. Designed by Minnesota's own nationally acclaimed Cass Gilbert just over 100 years ago, it is considered to be among the best of the nation's capitols. Today, on the surface, it is a beautiful and majestic building, but under the surface are antiquated mechanical and electrical systems leading to poor air quality and widely varying temperatures, "dead end" corridors and other life safety code problems, inadequate office and public hearing room spaces, a lack of modern technology and security protection, places that are inaccessible to people with disabilities, and virtually no accommodation for the thousands of visitors who come to see it each year. Current tenants have long outgrown a building designed a century ago, leading to compelling need for additional space. For the past many years, the majority of funding provided for the building has been required for quick emergency fixes. The time has come to provide the Capitol with much needed systems updates, enhanced security, code required rest rooms and exiting, building support spaces and overall building repairs, to prepare it for its second hundred years of useful life. The State of Minnesota is at a moment of great opportunity.

There is a recently issued Security Report, prepared by the Minnesota National Guard for Homeland Defense. The Mission Statement of the Report is: "*conduct vulnerability assessments on identified critical infrastructure to prevent, mitigate, and respond to all threats and hazards to protect key assets and key resources against degradation or destruction that may affect the mission and capabilities of that facility or organization and the Minnesota National Guard.*" The Report identifies numerous areas for improvement in the Security Systems at the State Capitol. The planned restoration of the Capitol building provides an opportunity to address the items mentioned in a comprehensive manner. Among the items mentioned are some items that can and will be addresses by the restoration of the Capitol building are:

- "*The locations of the buildings, roads, parking lots, and ramps, co-located in a restrictive urban setting have all but eliminated correct DoD stand-off distances.*" The restoration and expansion of the Capitol will provide the opportunity to construct a small underground, private and secure parking structure. The opportunity to construct an underground secure loading dock area will permit these activities to be performed in a controlled and monitored fashion. The relocation of Aurora Avenue will provide additional stand-off distance of vehicles from the Building proper. The reuse of the Porte-cochere as a vertical circulation node will eliminate the vehicles driving under this area. The Report notes the recommended stand-off distance to be a clear zone of 33' in order to prevent structural collapse.

- "*The infrastructure systems of the Capitol Complex have redundancy and good physical security measures, except for a few key areas. Those key areas are of incorrect height placement of HVAC intakes, public access to some of the fuel systems and public access to vital communication supply lines.*" The restoration provides the opportunity to address these items by placing the new Mechanical, Electrical and Communication systems in secured vaults. These vaults will be underground and invisible to the public. The air intakes will be relocated in such a manner to greatly reduce the risk of intentional contamination.

- "*The Capitol Complex uses an average ¼ inch double glazed window pane throughout its facilities. The windows provide very little protection and represent a high glass fragmentation hazard.*" The restoration provides an opportunity to replace and upgrade the windows of the Capitol building to meet the requirements for enhancing the protection of employees and visitors in the building.

- "*The Capitol Complex has insufficient Internal Access Control Procedures." The restoration provides an opportunity to rethink the building entry/access sequences.* We will look at development of secure V.I.P. access, the provision for a more controlled visitor access sequence that will allow greatly improved monitoring of building visitors and a regulated procedure for screening. The current first line of exterior

visual monitoring is the remote security cameras, while the first line of internal monitoring is provided by volunteer tour guides of the Minnesota Historical Society in the Rotunda.

- *"Capitol Security has a High Risk Personnel protection program. Identify Safe Room for High Risk Personnel."* The restoration will provide an opportunity to identify key rooms that can be used for Safe room use.
- *"There is adequate but incomplete Redundancy of Electric Utility Systems. Install electrical back-up generator a t all Capitol Complex facilities for redundancy."* The restoration will provide the opportunity to redesign the electrical system to reduce vulnerability and to provide redundancy as recommended.
- *The Capitol Complex does not have redundancy in its water supply. Create plans to identify outside drinking water sources for use if the primary source is tampered with or negatively impacted."* The restoration will provide an opportunity to plan for secure delivery and storage of materials to the building and provide a planned internal delivery sequencing process.
- *The Capitol Complex has inadequate physical security for gas supply. Protect outside supply lines with bollards and a fence."* The restoration provides the opportunity to rethink the current delivery of gas and the placement of critical supply lines to eliminate the potential high risk situation that currently exists.
- *The Capitol Complex has inadequate and inconsistent physical security of communication cable lines. Secure outside communication cable access panels. Protect exposed communication cables."* The restoration will provide the opportunity to separate the communication lines from the public circulation and place them in a secure environment that will reduce the risk of tampering or destroying them.
- *The Capitol Complex's' Shelter-in-Place considerations are not adequate. Address temporary shelter-in-place considerations for current facilities and for new construction."* The restoration will provide the opportunity to develop and construct a large 500 seat multi-purpose space that will be able to act as a shelter-in-place for the building and Capitol Complex occupants.
- *The Capitol complex has insufficient mass notification procedures to alert, direct, and inform the Capitol Complex population of imminent threats in real time. Install a Complex-wide Public Address/Mass Notification system."* The restoration will provide the opportunity to address this requirement and install a system that can be modified and upgraded and will act as the notification system that will reduce and minimize occupant risk.
- *"The Capitol Complex has limited medical asset and no medical contingency plans."* The restoration will provide the opportunity to consider and put-in- place areas that can be used for medical equipment storage, and occupant provisions.

FIRE LIFE SAFETY

FOR

MINNESOTA STATE CAPITOL; RESTORATION PROJECT
SAINT PAUL, MINNESOTA
CONCEPTUAL DESIGN

Prepared by:

The MountainStar Group.
216 East 135th Street
Burnsville, Minnesota

September 12, 2006

MountainStar Project Number: 26006

INTRODUCTION

A comprehensive $100 million rehabilitation and renovation of The Minnesota State Capitol will enhance and preserve this historic and social icon[1]. Planned Renovation and rehabilitation efforts involve significant improvements of the overall safety of the structure safety, additional space, improved efficiency, and preserved aesthetics. The cultural, environmental and economic benefits are incorporated into this design effort. The likelihood of damage to the State Capitol is similar to that of other buildings. However there is an important distinction given the high visibility and the activities that occur within the building.

Emergencies other than fire include panic, medical, weather and various security breaches. Any threats to life safety of the building occupants can be mitigated (but not eliminated) to a certain extent by the fire and life safety features designed into the structure. Recommendations outlined in this report significantly improve the fire and life safety level in this building.

The fundamental aspects of improved fire and life safety include involve fire prevention, early warning detection and notification, effective communications, fire suppression, fire smoke management, compartmentalization and tenable egress.

The city of Saint Paul is a jurisdictional code authority and enforces the 2003 Minnesota State Building Code (MSBC), which is an amended version of the 2000 edition of the International Building Code promulgated by the International Code Council. An important document adopted by the State includes the Minnesota State Building Conservation Code (MCC), under Minnesota rule 1311.0010. The Conservation Code adopts chapters 1 through six of the 2000 Guidelines For The Rehabilitation Of Existing Buildings ('GREB' - with State amendments) as promulgated by the International Conference Of Building Officials. These codes represent the minimum level of safety

All new construction, repairs, remodeling and alterations will comply with the current State building code. Other building features are evaluated in accordance with best fire and life safety practices and the Minnesota Conservation Code, which is specifically designed to address existing buildings and those that historical and social significance.

Therefore, the basis for the code analysis begins with the Minnesota State Building Code. Where the code is silent, best practices that achieve acceptable performance based levels of safety are recommended. From a code perspective, where there is no change in use or occupancy reclassification, building features are evaluated to the MCC.

MCC and SBC recognize that existing buildings, especially a structure as unique as the State Capitol, pose unique life safety challenges. However, MCC does address key fundamental life safety features and as long as a distinct hazard is not created, will allow specific conditions to

[1] This conceptual design code review is based upon conceptual design plans prepared by Schooley Caldwell Associates and HGA.

remain under certain conditions. This report will identify the main code issues given concept design status.

KEY LIFE SAFETY OBJECTIVES

There are three (3) primary goals.

1. Minimize Fire-related Injuries and Prevent Undue Loss of Life
    a. The first goal is to minimize fire-related injuries and prevent undue loss of life. This includes building occupants and emergency responders. It pertains to both life safety and structural stability of the building.
2. Minimize Downtime
    a. A second goal of this project is to minimize downtime. Continued functionality is essential for the State Capitol.
3. Minimize Property Damage and Structural Collapse
    a. The third goal is to minimize property damage and structural collapse. This goal is directly related to the first goal because structural collapse affects life safety.

These goals applied to fire, panic, security breach or weather scenarios. Achieving these goals relies upon proactive fire and life safety systems. The earlier a fire or other emergency is detected and appropriately responded to, the less the risk to building occupants.

Thwarting a fire that could jeopardize life safety relies upon both passive and active fire protection systems. Detecting a fire in its incipient stage, establishing appropriate occupant and emergency responder notification and providing fire control through automatic sprinkler protection increases the probability of tenable egress.

SIGNIFICANT ISSUES

The proposed subbasement and gutted basement levels provide distinctly separate fire life safety and code challenges in comparison to the ground-level through the fourth level. Given the extent of construction at the basement level and the new construction of the subbasement, fire life safety and code compliance are more directly achievable relative to the levels above. So for the purpose of this analysis, the ground-level through the fourth floor is viewed distinctly different from a fire life safety perspective in comparison to the basement and subbasement.

With respect to the ground-level through fourth level, the primary challenge involves safe and tenable egress since existing exiting is insufficient and the vertical communicating spaces through these floor levels, namely the rotunda and stairs within the common area of the rotunda, present a potential for smoke and fire movement. Having said this, the sheer volume of the may also work to our advantage by dissipating smoke that could have the potential of creating untenable conditions.

Exits from spaces on the ground-level through the fourth level lack exit capacity and number to handle the projected occupant load which will vary significantly depending upon when the legislature is in session or special events are held. Establishing identifiable exit routes that allow occupants to discharge to the exterior of the building or a safe dispersal area is a high priority. The lack of sufficient exits as the building currently is situated creates evacuation challenges. A timed evacuation study should be considered which addresses partial and full evacuation. At peak occupant loads, evacuation of the entire facility under a fire or other emergency will be prolonged given the current layout.

The influx of visitors and staff varies with time of year, especially when the legislature is in session. While the number of legislators and support staff are readily defined, experience indicates that there are issues faced by the legislature that may cause a significant spike in the occupant load. The structure is accessible to the public in many areas. Other areas are restricted. Visitors will use the most familiar path for entering and exiting the building. The ground-level through the fourth level current exiting currently is insufficient. Additional exit capacity that is clear and distinct noticeable is necessary. The NE, SE, NW and SW stairs in the east and west wings respectively are primarily used for circulation between floors, and due to their condition are not considered acceptable as part of the means of egress. Spaces within proximity of the stairs are considered suites and occupants of these areas are directed to the exits within the rotunda common areas.

Therefore, additional new exits stairs serving the ground-level through the fourth level are required along the south end of the rotunda on opposing sides from the elevators. While many occupants may use the grand stairs or other open circulation stairs within the rotunda given their familiarity with them, they are exposed to the communicating adjacent spaces and provide essentially no passive protection through fire rated construction. This report establishes that these open stairs remain open however become secondary routes of escape. In reality, and an evacuation emergency we expect a significant portion of occupants to use these open stairs. Egress from Chambers and support spaces around the periphery of the rotunda rely upon the additional new exits and the existing open stairways. Therefore, it is important to ensure that these areas remain tenable during an evacuation situation.

The basement and subbasement pose different challenges with respect to egress. A multipurpose assembly space at the basement level increases the occupant load upwards of 500 persons. It is recommended that a horizontal exit constructed as a two hour assembly wrap around the space. The area may serve as an area of refuge if warranted. Exiting from this multipurpose area is achieved through the pre-function and circulation spaces to exterior exit discharge as well as utilization of the existing tunnel system. We believe the existing tunnel system and basement area along with the multipurpose room can serve as an exit passageway to safe areas and also act as a weather protected enclosure. The challenge would be of course the prolonged time necessary for occupants to relocate to the basement level in an emergency situation.

Security controlled devices may be implemented in areas requiring security, however they would require release in an alarm condition or if security elects to release due to non- fire emergencies that require occupants still to exit.

Given the extensive work at the basement and subbasement levels, they will be fully sprinkler protected and compartmentalized. This is not necessarily the case with ground-floor through the fourth level. Currently, these floor levels are not sprinkler protected and have insufficient fire alarm and notification. A potential fire may produce sufficient smoke and allow for vertical fire spread if not readily detected and controlled.

Extensive vertical openings from the ground floor to the roof level allow potential paths for smoke and fire to spread. However, the large volume of space in the rotunda and the openings allows smoke to both potentially dissipate and spread- creating competing fire safety challenges. The large volume of space may assist in smoke management for the area so that tenable egress is achieved. Interestingly, one of the most effective forms of smoke management is a sprinkler system. Test data clearly indicates fire control by sprinklers subsequently limits the cumulative output of smoke that creates untenable egress conditions. While the rotunda and common areas to the rotunda normally present a light fire load, adjacent spaces based on use traditionally have higher fire loads. Sprinkler protection of these areas is an effective means of fire and smoke mitigation. By controlling the fire, the cumulative output of smoke is limited relative to an uncontrolled burning fire.

Utilizing mechanical systems, whether dedicated or part of the HVAC systems, provide some assistance in the restriction of smoke spread. The sheer volume of the rotunda and common areas to it will allow smoke to dissipate. The rotunda may serve as a smoke reservoir. However, smoke migration may be restricted by directing airflow in the opposing path of smoke movement or purging the rotunda as we commonly would an atrium.

The sooner a fire is detected, the faster it can be mitigated. Early warning detection throughout the State Capitol is recommended so that in the event of a fire, detection would provide the early warning to begin exiting and notify the appropriate emergency responders. From an egress perspective, time is everything. There are various strategies to minimize false alarms. Manual pull stations located at security check points for trained personnel and not accessible to the public are recommended.

Coordinated alarm communications is an effective form of a crowd and occupant control strategy. An integrated voice communications system with zone speakers throughout improves the appropriate response of occupants with specific prerecorded announcements and public address capabilities by emergency responders and security staff. Studies indicate Voice Commands from a voice communications system can increase response time and occupant action by several minutes. Occupants desire specific instructions during an emergency.

The State Capitol can be divided into distinct fire and smoke zones. Each floor level represents a general zone while individual spaces or areas are subdivided into more discreet zones. The zoning strategy would be based upon emergency management plan for the building. This would be developed as the design progresses. In any event, a coordinated zoning strategy provides for a more effective emergency responder effort and orderly evacuation.

RECOMMENDED PROTECTION

1. Automatic sprinkler protection throughout the building where feasible. Sprinklers are zoned to coordinate with specific fire areas and are constantly monitored by the buildings fire alarm system. Sprinklers in most areas are quick response type wet systems. Areas with contents sensitive to water are designed as pre-action systems.
    a. All new construction work.
    b. The periphery support spaces surrounding the rotunda at ground-floor through fourth level
    c. The basement and subbasement levels.
    d. Chambers
    e. Specific areas within the rotunda/common spaces that have ceiling heights less than 25 feet.
    f. Areas where there is concealed combustible construction.
    g. Hazardous areas.
2. Class I standpipes located in required exit stairs and then spaced to cover up to 200 feet. The final location of standpipes is based on the feedback from the Saint Paul Fire Department
3. Addressable automatic smoke detection and alarm notification throughout the building.
    a. Beam Projection type smoke detection or air sampling in the Rotunda and adjacent common space to the rotunda.
    b. Spot detection through all other areas of the building unless ambient conditions prevent this.
    c. Notification devices through complying with the Minnesota Accessibility Code. Speaker strobes and horn strobes are recommended.
4. Emergency voice/alarm communications system.
    a. Total coverage voice communication system with pre-recorded messages addressed fire, weather and security scenarios. Manual override capabilities. Zoned by area and coordinated with the emergency plan for the State Capitol.
5. Fire department communications system – provide communications at al levels throughout the facility
6. Fire command room which houses all fire communications and fire alarm zones. This can be within a security room surrounded by one hour construction.
7. Standby power to the fire command center, electrically powered fire pumps and ventilation/automatic detection equipment for smoke management.
8. Emergency power systems for all exit signs and means of egress illumination, elevator car lighting, emergency voice/mutation systems, fire alarm system, fire detection system and smoke management systems.
9. Exiting

Identification	Communicating Levels	Comment
Sub-Level	SB to ground	- 2 hour enclosure SB to ground – direct discharge to grade or - use tunnels as exit passageways

Identification	Communicating Levels	Comment
Grand Stairs – East and West Wing	Basement though 2nd level	- remain open-
NE Stair	B through 3	- Circulation only
SE Stair	G through 3	- Circulation only
NW Stair – West Wing	2 through 3	- Circulation only
SW Stair – West Wing	2 through 3	- Circulation only
House Stair- Circular - Center	G through 3	Only public accessible circulation- two new exit stairs are required to compensate for the insufficient exiting.
Senate Chamber Gallery	2 through 4	Far West unclear – circulation to exit
House Gallery	Exit into Rotunda	No direct egress path; Only public accessible circulation- two new exit stairs are required to compensate for the insufficient exiting.
Supreme Court gallery	Exit into corridor	Use NE and SE stairs
House (Back of House – north – two stairs	NE: 2 through 4 SE: 3-4	Not for public use - enclose in one hour construction - meet MCC provisions for handrails - verify rise/run
Multipurpose assembly– basement	Basement	Create a 2 hour horizontal exit surrounding it

a. Current egress routes involving levels ground through four are insufficiently distributed. This includes all areas that are both accessible and not accessible to the public.
b. The stairs located at the corners of the wings (NE, SE, NW and SW) are for circulation purposes only. Office suites along the East and West wings will discharge into the Rotunda for exiting purposes.
c. Add two new exit stairs at the south end of the Rotunda. Constructed of two hour construction, these exits provide additional exit capacity and discharge to the outside.
d. The new multipurpose assembly at the basement level shall be enclosed with two hour construction and horizontal exits created around it.
    i. This space may also serve as an area of refuge.
e. Use the tunnel system as an exit passageway and weather protected area.

10. Compartmentalization
    a. Periphery spaces and office suites to the Rotunda common areas should form smoke barriers
    b. Vertical openings within the rotunda and adjacent common areas remain open
    c. At the basement level of the rotunda opening, place closed spaced sprinklers around the periphery of the opening.
11. Smoke management:
    a. Take advantage of the large volume of space to dissipate smoke. The rotunda itself may serve as a smoke reservoir.
    b. Integrate an opposing airflow method of spaces adjacent to the rotunda to restrict vertical smoke spread. Depending upon the fire location, air can be directed against the spread of smoke to restrict its movement into vertical openings.

i. An option to consider is a smoke purge system for the rotunda; however its design should not foster vertical smoke movement. The intent of a smoke purge system to maintain theoretical smoke layer 10 feet above the highest occupied floor. Depending upon the smoke zone strategy, make up air would be supplied from unaffected smoke zones. Appropriately sized exhaust fans with equal make up their introduced at specific locations creates air and smoke entrainment towards the top of the rotunda.

c. Sprinkler the building

d. Minnesota code requires a post fire incident exhaust system for use by firefighters after the fact. This is not a life safety system rather a tool for firefighters to purge spaces of smoke. Utilizing the buildings HVAC system is acceptable.

i. Consider an exhaust fan at the top of the rotunda for use by fire fighters to evacuate lingering smoke.

12. Emergency action plan as required by the fire code

APPLICABLE CODES

This outline documents general code design features based upon the requirements that will be enforced by the city of Saint Paul since they have jurisdiction for code enforcement of:

- Building Code: 2003 Minnesota State Building Code, which adopts by reference and amends the 2000 International Building Code Chapter 1300 Administration of the State Building Code
- Chapter 1301 Building Official Certification
- Chapter 1302 Construction Approvals
- Chapter 1303 Minnesota Provisions of the State Building Code
- Chapter 1305 Adoption of the 2000 International Building Code
- Chapters 1300, 1303,1311 - Minnesota Conservation Code
- Fire Code: Minnesota State Fire Code (Chapter 7510) which adopts by reference and amends the 2000 International Fire Code 7510.3510 Rules and Standards Adopted by Reference. The International Fire Code 2000
- Chapter 1311 Adoption of the Guidelines for the Rehabilitation of Existing Buildings
- Mechanical Code: Minnesota State Mechanical Code (Minnesota Rules Chapter 1346) which adopts by reference and amends the 2000 edition of the Uniform Mechanical Code.
- Energy Code: Minnesota Energy Code, consists of Minnesota Statutes 16B.617 (7670) and Minnesota Rules chapters 7672,7674,7676 and 7678.
- Plumbing Code: Minnesota Plumbing Code, Minnesota Rules Chapter 4715
- Electrical Code: Chapter 1315 Adoption of the 2005 National Electrical Code
- Elevator Code: Chapter 1307 of the Minnesota State Building Code which adopts by reference and amends the American Society of Mechanical Engineers ASME A17.1 1996.
- Accessibility Code: Chapter 1341 of the Minnesota Building Code

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End